Graph entropy based on the number of spanning forests of c-cyclic graphs

Graph entropies have been introduced to quantitatively measure the structural information content of graphs and networks; they have plenty of applications in various fields. Utilizing the number of subgraphs to establish measures for determining the complexity of molecular graphs are also prevalent in the study of mathematical chemistry. In this paper, we develop a new graph entropy measure that is based on the number of spanning forests. We prove explicit expressions for the entropy for trees, unicyclic and bicyclic graphs, and show that the cycle graph C_n attains the maximal value of the entropy for unicyclic graphs with order n and large cycle lengths. Based on generating numerical results, we conjecture extremal unicyclic graphs with respect to the entropy as well as we compare the values of our entropy for c-cyclic graphs, and generate graphs of bicyclic graphs and tricyclic graphs with 6 vertices for performing further research.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Research group: Predictive Society and Data Analytics (PSDA), Northwestern Polytechnical University, Yulin University, Beijing University of Chemical Technology, University of Applied Sciences Upper Austria, School of Management, Nankai University, Hall in Tyrol, Mathematics Faculty of Information Technology and Communication Sciences
Contributors: Wan, P., Tu, J., Dehmer, M., Zhang, S., Emmert-Streib, F.
Publication date: 15 Dec 2019
Peer-reviewed: Yes

Publication information

Journal: Applied Mathematics and Computation
Volume: 363
Article number: 124616
ISSN (Print): 0096-3003
Original language: English
ASJC Scopus subject areas: Computational Mathematics, Applied Mathematics
Keywords: Graph entropy, Spanning forest, Subgraph
DOIs:
10.1016/j.amc.2019.124616
Source: Scopus
Source ID: 85073703315
Research output: Contribution to journal › Article › Scientific › peer-review

Hyperbolic Function Theory in the Skew-Field of Quaternions

We are studying hyperbolic function theory in the total skew-field of quaternions. Earlier the theory has been studied for quaternion valued functions depending only on three reduced variables. Our functions are depending on all four coordinates of quaternions. We consider functions, called α-hyperbolic harmonic, that are harmonic with respect to the Riemannian metric dsα2=dx02+dx12+dx22+dx32x3αin the upper half space R+4={(x0,x1,x2,x3)∈R4:x3>0}. If α= 2 , the metric is the hyperbolic metric of the Poincaré upper half-space. Hempfling and Leutwiler started to study this case and noticed that the quaternionic power function xm(m∈Z), is a conjugate gradient of a 2-hyperbolic harmonic function. They researched polynomial solutions. Using fundamental α-hyperbolic harmonic functions, depending only on the hyperbolic distance and x_3, we verify a Cauchy type integral formula for conjugate gradient of α-hyperbolic harmonic functions. We also compare these results with the properties of paravector valued α-hypermonogenic in the Clifford algebra Cℓ0,3.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Department of Mathematics and Statistics, Helsinki University
Contributors: Eriksson, S., Orelma, H.
Publication date: 1 Nov 2019
Peer-reviewed: Yes

Publication information

Journal: Advances in Applied Clifford Algebras
Volume: 29
Issue number: 5
Article number: 97
ISSN (Print): 0188-7009
Original language: English
ASJC Scopus subject areas: Applied Mathematics
Keywords: Clifford algebra, Hyperbolic Laplace operator, Hyperbolic metric, Laplace–Beltrami operator, Monogenic function, Quaternions, α-hyperbolic harmonic, α-hypermonogenic
Electronic versions:

Eriksson-Orelma2019_Article_HyperbolicFunctionTheoryInTheS
DOIs:
10.1007/s00006-019-1017-5
URLs:
http://urn.fi/URN:NBN:fi:tuni-201911055741

Bibliographical note
EXT="Eriksson, Sirkka-Liisa"
Source: Scopus
Source ID: 85073523419
Research output: Contribution to journal › Article › Scientific › peer-review

Non-destructive tree volume estimation through quantitative structure modelling: Comparing UAV laser scanning with terrestrial LIDAR
Above-Ground Biomass (AGB) product calibration and validation require ground reference plots at hectometric scales to match space-borne missions' resolution. Traditional forest inventory methods that use allometric equations for single tree AGB estimation suffer from biases and low accuracy, especially when dealing with large trees. Terrestrial Laser Scanning (TLS) and explicit tree modelling show high potential for direct estimates of tree volume, but at the cost of time demanding fieldwork. This study aimed to assess if novel Unmanned Aerial Vehicle Laser Scanning (UAV-LS) could overcome this limitation, while delivering comparable results. For this purpose, the performance of UAV-LS in comparison with TLS for explicit tree modelling was tested in a Dutch temperate forest. In total, 200 trees with Diameter at Breast Height (DBH) ranging from 6 to 91 cm from 5 stands, including coniferous and deciduous species, have been scanned, segmented and subsequently modelled with TreeQSM. TreeQSM is a method that builds explicit tree models from laser scanner point clouds. Direct comparison with TLS derived models showed that UAV-LS reliably modelled the volume of trunks and branches with diameter ≥30 cm in the mature beech and oak stand with Concordance Correlation Coefficient (CCC) of 0.85 and RMSE of1.12 m^3. Including smaller branch volume led to a considerable overestimation and decrease in correspondence to CCC of 0.51 and increase in RMSE to 6.59 m^3. Denser stands prevented sensing of trunks and further decreased CCC to 0.36 in the Norway spruce stand. Also small, young trees posed problems by preventing a proper depiction of the trunk circumference and decreased CCC to 0.01. This dependence on stand indicated a strong impact of canopy structure on the UAV-LS volume modelling capacity. Improved flight paths, repeated acquisition flights or alternative modelling strategies could improve UAV-LS modelling performance under these conditions. This study contributes to the use of UAV-LS for fast tree volume and AGB estimation on scales relevant for satellite AGB product calibration and validation.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Wageningen University and Research Centre, Universiteit Gent
Contributors: Brede, B., Calders, K., Lau, A., Raumonen, P., Bartholomeus, H. M., Herold, M., Kooistra, L.
Publication date: 1 Nov 2019
Peer-reviewed: Yes

Publication information
Journal: Remote Sensing of Environment
Volume: 233
Article number: 111355
ISSN (Print): 0034-4257
Original language: English
ASJC Scopus subject areas: Soil Science, Geology, Computers in Earth Sciences
Keywords: Above-Ground Biomass (AGB), Forest, Laser scanning, Quantitative Structure Model (QSM), UAV
DOIs:
10.1016/j.rse.2019.111355
Source: Scopus
Source ID: 85071628636
Research output: Contribution to journal › Article › Scientific › peer-review

Studying the inertias of LCM matrices and revisiting the Bourque-Ligh conjecture
Let $S=\{x_1,x_2,\ldots,x_n\}$ be a finite set of distinct positive integers. Throughout this article we assume that the set S is GCD closed. The LCM matrix [S] of the set S is defined to be the n×n matrix with $\operatorname{lcm}(x_i,x_j)$ as its ij element. The famous Bourque-Ligh conjecture used to state that the LCM matrix of a GCD closed set S is always invertible, but currently it is a well-known fact that any nontrivial LCM matrix is indefinite and under the right circumstances it can be even singular (even if the set S is assumed to be GCD closed). However, not much more is known about the inertia of LCM matrices in general. The ultimate goal of this article is to improve this situation. Assuming that S is a meet closed set we define an entirely new lattice-theoretic concept by saying that an element $x_i \in S$ generates a double-chain set in S if the set $\operatorname{meetcl}(C_S(x_i))\backslash C_S(x_i)$ can be expressed as a union of two disjoint chains (here the set $C_S(x_i)$ consists of all the elements of the set

S that are covered by x_i and meetcl($C_S(x_i)$) is the smallest meet closed subset of S that contains the set $C_S(x_i)$). We then proceed by studying the values of the Möbius function on sets in which every element generates a double-chain set and use the properties of the Möbius function to explain why the Bourque-Ligh conjecture holds in so many cases and fails in certain very specific instances. After that we turn our attention to the inertia and see that in some cases it is possible to determine the inertia of an LCM matrix simply by looking at the lattice-theoretic structure of (S,|) alone. Finally, we are going to show how to construct LCM matrices in which the majority of the eigenvalues is either negative or positive.

General information

Publication status: E-pub ahead of print
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Research group: Computer Science and Applied Logics, Tampere University
Contributors: Haukkanen, P., Mattila, M., Mäntysalo, J.
Publication date: 1 Apr 2020
Peer-reviewed: Yes
Early online date: 14 Oct 2019

Publication information

Journal: Journal of Combinatorial Theory. Series A
Volume: 171
Article number: 105161
ISSN (Print): 0097-3165
Original language: English
ASJC Scopus subject areas: Theoretical Computer Science, Discrete Mathematics and Combinatorics, Computational Theory and Mathematics
Keywords: Bourque-Ligh conjecture, GCD matrix, LCM matrix, Smith determinant
DOIs:

10.1016/j.jcta.2019.105161
Source: Scopus
Source ID: 85073148974
Research output: Contribution to journal › Article › Scientific › peer-review

On Computational Complexity Reduction Methods for Kalman Filter Extensions

The Kalman filter and its extensions are used in a vast number of aerospace and navigation applications for nonlinear state estimation of time series. In the literature, different approaches have been proposed to exploit the structure of the state and measurement models to reduce the computational demand of the algorithms. In this tutorial, we survey existing code optimization methods and present them using unified notation that allows them to be used with various Kalman filter extensions. We develop the optimization methods to cover a wider range of models, show how different structural optimizations can be combined, and present new applications for the existing optimizations. Furthermore, we present an example that shows that the exploitation of the structure of the problem can lead to improved estimation accuracy while reducing the computational load. This tutorial is intended for persons who are familiar with Kalman filtering and want to get insights for reducing the computational demand of different Kalman filter extensions.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Research group: Automation and Systems Theory
Contributors: Raitoharju, M., Piche, R.
Number of pages: 18
Pages: 2-19
Publication date: 7 Oct 2019
Peer-reviewed: Yes

Publication information

Journal: IEEE Aerospace and Electronic Systems Magazine
Volume: 34
Issue number: 10
ISSN (Print): 0885-8985
Original language: English
Electronic versions:

Raitoharju_Piche_2019
DOIs:

10.1109/MAES.2019.2927898
URLs:

http://urn.fi/URN:NBN:fi:tuni-201911145954

Research output: Contribution to journal › Article › Scientific › peer-review

Multiplierless filtered-OFDM transmitter for narrow-band IoT devices

In cyclic-prefix orthogonal frequency-division multiplexing (CP-OFDM) based radio access, the coexistence of different technologies without precise time-frequency synchronization is limited due to high out-of-band emissions. Therefore, spectrum enhancement techniques play a key role to relax the synchronization and power control requirements. This allows higher degree of opportunistic spectrum use with minimized interference. In addition, all transmitting devices have to fulfill specific transmitted signal quality requirements, including the maximum out-of-band radiated signal power. With OFDM based radio access, some additional signal processing for improved spectrum containment is commonly needed to achieve these requirements. Filtering and time-domain windowing are two fundamentally different approaches for spectrum enhancement. Filtered OFDM (F-OFDM) provides better spectrum localization than the timewindowing schemes (such as windowed overlap-add, WOLA), with the cost of higher complexity. This paper introduces lowcomplexity solutions for spectrally enhanced narrow-band OFDM transmitters based on the use of a look-up tables (LUTs). The proposed LUT approach, requiring only memory units and a low number of additions, allows to avoid all computationally expensive operations in on-line transmitter processing, as it builds the transmitted signal by summing the stored partial waveforms optimized off-line. In certain cases, completely multiplication and summation free designs are possible. The transmitters of narrowband Internet of things (NB-IoT) devices are natural applications for the proposed LUT approach, as they require additional digital baseband signal processing to reach the emission requirements. It is shown that the proposed LUT schemes can provide signicant savings in real-time computations of NB-IoT devices, while fulfilling the 3GPP requirements.

General information

Publication status: E-pub ahead of print
MoE publication type: A1 Journal article-refereed
Organisations: Electrical Engineering, Research group: Wireless Communications and Positioning, Nokia Bell Labs
Contributors: Loulou, A. E., Yli-Kaakinen, J., Levanen, T., Lehtinen, V., Schaich, F., Wild, T., Renfors, M., Valkama, M.
Number of pages: 16
Publication date: 2 Oct 2019
Peer-reviewed: Yes

Publication information

Journal: IEEE Internet of Things Journal
ISSN (Print): 2327-4662
Original language: English
DOIs:
10.1109/JIOT.2019.2945186

Research output: Contribution to journal › Article › Scientific › peer-review

The Graph Curvature Calculator and the curvatures of cubic graphs

We classify all cubic graphs with either non-negative Ollivier-Ricci curvature or non-negative Bakry-Émery curvature everywhere. We show in both curvature notions that the non-negatively curved graphs are the prism graphs and the Möbius ladders. We also highlight an online tool for calculating the curvature of graphs under several variants of these curvature notions that we use in the classification. As a consequence of the classification result we show, that non-negatively curved cubic expanders do not exist.

General information

Publication status: E-pub ahead of print
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Aalto University, Newcastle University, United Kingdom, Durham University, University of Science and Technology of China
Contributors: Cushing, D., Kangaslampi, R., Lipiäinen, V., Liu, S., Stagg, G. W.
Publication date: 14 Sep 2019
Peer-reviewed: Yes
Early online date: 14 Sep 2019

Publication information

Journal: Experimental Mathematics
ISSN (Print): 1058-6458
Original language: English
DOIs:
10.1080/10586458.2019.1660740

Research output: Contribution to journal › Article › Scientific › peer-review

Tomographic inversion of gravity gradient field for a synthetic Itokawa model

This article investigates reconstructing the internal mass density of a numerical asteroid model using the gradient of a simulated gravity field as synthetic measurement data. Our goal is to advance the mathematical inversion methodology and find feasibility constraints for the resolution, noise and orbit selection for future space missions. We base our model on the shape of the asteroid Itokawa as well as on the recent observations and simulation studies which suggest that the internal density varies, increasing towards the center, and that the asteroid may have a detailed structure. We introduce randomized multiresolution scan algorithm which might provide a robust way to cancel out bias and artifact effects related to the measurement noise and numerical discretization. In this scheme, the inverse algorithm can reconstruct details of various sizes without fixing the exact resolution a priori, and the randomization minimizes the effect of discretization on the solution. We show that the adopted methodology provides an advantageous way to diminish the surface bias of the inverse solution. The results also suggest that a noise level below 80 Eotvos will be sufficient for the detection of internal voids and high density anomalies, if a sparse set of measurements can be obtained from a close-enough distance to the target.

General information

Publication status: E-pub ahead of print
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Research group: Inverse Problems, Max Planck Institute for Solar System Research , Gedex Systems Inc., Royal Observatory of Belgium
Contributors: Sorsa, L., Takala, M., Bambach, P., Deller, J., Vilenius, E., Agarwal, J., Carroll, K. A., Karatekin, Ö., Pursiainen, S.
Publication date: 15 Jan 2020
Peer-reviewed: Yes
Early online date: 3 Sep 2019

Publication information

Journal: Icarus
Volume: 336
Article number: 113425
ISSN (Print): 0019-1035
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Asteroid Itokawa, Geophysical techniques, Interiors
DOIs:
10.1016/j.icarus.2019.113425
Source: Scopus
Source ID: 85072210970
Research output: Contribution to journal › Article › Scientific › peer-review

Hypermonogenic Plane Wave Solutions of the Dirac Equation in Superspace

In this paper, we obtain Cauchy–Kovalevskaya theorems for hypermonogenic superfunctions depending only on purely bosonic and fermionic vector variables. In addition, we use these results to construct plane wave examples of such functions.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Civil Engineering, Universiteit Gent
Contributors: Adán, A. G., Orelma, H., Sommen, F.
Publication date: 1 Sep 2019
Peer-reviewed: Yes

Publication information

Journal: Advances in Applied Clifford Algebras
Volume: 29
Issue number: 4
Article number: 71
ISSN (Print): 0188-7009
Original language: English
ASJC Scopus subject areas: Applied Mathematics
Keywords: Cauchy–Kovalevskaya extension, Clifford analysis, Hypermonogenic functions, Plane waves, Superspace
DOIs:
10.1007/s00006-019-0981-0
Source: Scopus
Source ID: 85069655339

Similar temperature sensitivity of soil mineral-associated organic carbon regardless of age

Most of the carbon (C) stored in temperate arable soils is present in organic matter (OM) intimately associated with soil minerals and with slow turnover rates. The sensitivity of mineral-associated OM to changes in temperature is crucial for reliable predictions of the response of soil C turnover to global warming and the associated flux of carbon dioxide (CO_2) from the soil to the atmosphere. We studied the temperature sensitivity of C in <63 μm fractions rich in mineral-associated organic matter (MOM) and of C in >63 μm fractions rich in particulate organic matter (POM). The fractions were isolated by physical separation of two light-textured arable soils where the C4-plant silage maize had replaced C3-crops 25 years ago. Differences in ^{13}C abundance allowed for calculation of the age of C in the soil-size fractions (old C, C3–C > 25 years; recent C, C4–C < 25 years). We incubated bulk soils (<2 mm) and size fractions sequentially at 6, 18, 26 and 34 °C (ramping up and down the temperature scale) and calculated the temperature sensitivity of old and recent C from $^{12}CO_2$ and $^{13}CO_2$ evolution rates. The temperature sensitivity was similar or slightly higher for POM than for MOM. Within the POM fraction, old C3–C was more sensitive to changes in temperature than recent C4–C. For the MOM fraction, the temperature sensitivity was unrelated to the age of C. Quantitative PCR analysis indicated that the proportions of bacteria, archaea and fungi did not change during incubation. Our results suggest that while OM stabilizing mechanisms affect the temperature sensitivity of soil C, temperature sensitivity appears unrelated to the age of mineral-associated OM.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, University of Helsinki, Finnish Environment Institute, Finnish Museum of Natural History, Aarhus Universitet, Natural Resources Institute Finland (Luke), Finnish Meteorological Institute
Contributors: Karhu, K., Hilasvuori, E., Järvenpää, M., Arppe, L., Christensen, B. T., Fritze, H., Kulmala, L., Oinonen, M., Pitkänen, J. M., Vanhala, P., Heinonsalo, J., Liski, J.
Publication date: 1 Sep 2019
Peer-reviewed: Yes

Publication information

Journal: Soil Biology and Biochemistry
Volume: 136
Article number: 107527
ISSN (Print): 0038-0717
Original language: English
ASJC Scopus subject areas: Microbiology, Soil Science
Keywords: C natural abundance, Bayesian statistics, Climate change, Decomposition, Soil organic matter, Temperature sensitivity
DOIs:
10.1016/j.soilbio.2019.107527
Source: Scopus
Source ID: 85068121820
Research output: Contribution to journal › Article › Scientific › peer-review

On the Structure of Octonion Regular Functions

In this paper, we study octonion regular functions and the structural differences between regular functions in octonion, quaternion, and Clifford analyses.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Civil Engineering
Contributors: Kauhanen, J., Orelma, H.
Number of pages: 17
Publication date: Sep 2019
Peer-reviewed: Yes
Early online date: 2 Aug 2019

Publication information

Journal: Advances in Applied Clifford Algebras
Volume: 29
Issue number: 4
Article number: 77
ISSN (Print): 0188-7009
Original language: English
Electronic versions:

Kauhanen-Orelma2019_OnTheStructureOfOctonionRegular
DOIs:
10.1007/s00006-019-0983-y
URLs:
http://urn.fi/URN:NBN:fi:tty-201909092083
Research output: Contribution to journal › Conference article › Scientific › peer-review

On the Succinctness of Atoms of Dependency

Propositional team logic is the propositional analog to first-order team logic. Non-classical atoms of dependence, independence, inclusion, exclusion and anonymity can be expressed in it, but for all atoms except dependence only exponential translations are known. In this paper, we systematically compare their succinctness in the existential fragment, where the splitting disjunction only occurs positively, and in full propositional team logic with unrestricted negation. By introducing a variant of the Ehrenfeucht-Fra\"{i}ssé game called formula size game into team logic, we obtain exponential lower bounds in the existential fragment for all atoms. In the full fragment, we present polynomial upper bounds also for all atoms.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Leibniz-Universität Hannover
Contributors: Vilander, M., Lück, M.
Number of pages: 28
Pages: 17:1-17:28
Publication date: 20 Aug 2019
Peer-reviewed: Yes

Publication information

Journal: Logical Methods in Computer Science
Volume: 15
Issue number: 3
ISSN (Print): 1860-5974
Original language: English
ASJC Scopus subject areas: Logic, Computational Theory and Mathematics
Keywords: team semantics, succinctness, dependence atom
URLs:
https://lmcs.episciences.org/5698
Research output: Contribution to journal › Article › Scientific › peer-review

Reduced Order Controller Design for Robust Output Regulation

We study robust output regulation for parabolic partial differential equations and other infinite-dimensional linear systems with analytic semigroups. As our main results we show that robust output tracking and disturbance rejection for our class of systems can be achieved using a finite-dimensional controller and present algorithms for construction of two different internal model based robust controllers. The controller parameters are chosen based on a Galerkin approximation of the original PDE system and employ balanced truncation to reduce the orders of the controllers. In the second part of the paper we design controllers for robust output tracking and disturbance rejection for a 1D reaction-diffusion equation with boundary disturbances, a 2D diffusion-convection equation, and a 1D beam equation with Kelvin-Voigt damping.

General information

Publication status: E-pub ahead of print
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Research group: Computer Science and Applied Logics
Contributors: Paunonen, L., Phan, D.
Publication date: 22 Jul 2019
Peer-reviewed: Yes

Publication information

Journal: IEEE Transactions on Automatic Control
ISSN (Print): 0018-9286
Original language: English
Keywords: Mathematical model, Method of moments, Closed loop systems, Hilbert space, Reduced order systems, Adaptive control, Robust output regulation, partial differential equation, controller design, Galerkin approximation, model reduction
Electronic versions:
Author accepted version

DOIs:
10.1109/TAC.2019.2930185
URLs:
http://urn.fi/URN:NBN:fi:tuni-201911145959
Source: Bibtex
Source ID: 8768063
Research output: Contribution to journal › Article › Scientific › peer-review

Approximate Controllability for Navier–Stokes Equations in 3D Rectangles Under Lions Boundary Conditions

The 3D Navier–Stokes system, under Lions boundary conditions, is proven to be approximately controllable provided a suitable saturating set does exist. An explicit saturating set for 3D rectangles is given.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Johann Radon Institute for Computational and Applied Mathematics
Contributors: Phan, D., Rodrigues, S. S.
Number of pages: 26
Pages: 351-376
Publication date: Jul 2019
Peer-reviewed: Yes
Early online date: 10 Jul 2018

Publication information

Journal: Journal of Dynamical and Control Systems
Volume: 25
Issue number: 3
ISSN (Print): 1079-2724
Original language: English
ASJC Scopus subject areas: Control and Systems Engineering, Algebra and Number Theory, Numerical Analysis, Control and Optimization
Keywords: Approximate controllability, Navier–Stokes equations, Saturating set
DOIs:
10.1007/s10883-018-9412-0
Source: Scopus
Source ID: 85049619310
Research output: Contribution to journal › Article › Scientific › peer-review

An architectural understanding of natural sway frequencies in trees

The relationship between form and function in trees is the subject of a longstanding debate in forest ecology and provides the basis for theories concerning forest ecosystem structure and metabolism. Trees interact with the wind in a dynamic manner and exhibit natural sway frequencies and damping processes that are important in understanding wind damage. Tree-wind dynamics are related to tree architecture, but this relationship is not well understood. We present a comprehensive view of natural sway frequencies in trees by compiling a dataset of field measurement spanning conifers and broadleaves, tropical and temperate forests. The field data show that a cantilever beam approximation adequately predicts the fundamental frequency of conifers, but not that of broadleaf trees. We also use structurally detailed tree dynamics simulations to test fundamental assumptions underpinning models of natural frequencies in trees. We model the dynamic properties of greater than 1000 trees using a finite-element approach based on accurate three-dimensional model trees derived from terrestrial laser scanning data. We show that (1) residual variation, the variation not explained by the cantilever beam approximation, in fundamental frequencies of broadleaf trees is driven by their architecture; (2) slender trees behave like a simple pendulum, with a single natural frequency dominating their motion, which makes them vulnerable to wind damage and (3) the presence of leaves decreases both the fundamental frequency and the damping ratio. These findings demonstrate the value of new three-dimensional measurements for understanding wind impacts on trees and suggest new directions for improving our understanding of tree dynamics from conifer plantations to natural forests.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, University of Oxford, SCION, University of Connecticut, Delft University of Technology, Wageningen University and Research Centre, University of Massachusetts Amherst, National Parks Board, University of Melbourne, Oregon State University, Universiteit Gent, National Physical Laboratory, University College London, NERC National Centre for Earth Observation (NCEO), 16 Center for International Forestry Research (CIFOR), Swedish University of Agricultural Sciences, INRA

Contributors: Jackson, T., Shenkin, A., Moore, J., Bunce, A., van Emmerik, T., Kane, B., Burcham, D., James, K., Selker, J., Calders, K., Origo, N., Disney, M., Burt, A., Wilkes, P., Raumonen, P., Gonzalez de Tanago Menaca, J., Lau, A., Herold, M., Goodman, R. C., Fourcaud, T., Malhi, Y.
Number of pages: 1
Publication date: 28 Jun 2019
Peer-reviewed: Yes

Publication information
Journal: Journal of the Royal Society. Interface
Volume: 16
Issue number: 155
ISSN (Print): 1742-5689
Original language: English
ASJC Scopus subject areas: Biotechnology, Biophysics, Bioengineering, Biomaterials, Biochemistry, Biomedical Engineering
Keywords: finite-element analysis, fundamental frequency, natural frequencies, terrestrial laser scanning, tree architecture , wind damage
DOIs:
10.1098/rsif.2019.0116
Source: Scopus
Source ID: 85067464325
Research output: Contribution to journal › Article › Scientific › peer-review

Robust output regulation of counter-flow heat exchangers
We consider a partial differential equation model widely used for counter-flow heat exchangers and the related robust output regulation problem with boundary control and boundary observation. We show that the control system is an exponentially stable regular linear system, which enables us to use a specific known controller design to robustly regulate the system. The results are illustrated with numerical simulations.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Computing Sciences, Research group: Computer Science and Applied Logics
Contributors: Huhtala, K., Paunonen, L.
Number of pages: 6
Pages: 201-206
Publication date: 1 Jun 2019

Host publication information
Title of host publication: 3rd IFAC Workshop on Control of Systems Governed by Partial Differential Equations, CPDE 2019
Publisher: IFAC

Publication series
Name: IFAC-PapersOnLine
Volume: 52
ISSN (Print): 2405-8963
ASJC Scopus subject areas: Control and Systems Engineering
Keywords: Heat exchangers, Linear control systems, Output regulation, Partial differential equations, Robust control
DOIs:
10.1016/j.ifacol.2019.08.036

Bibliographical note
jufoid=86671
Source: Scopus
Source ID: 85072374049
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

The internal model principle for boundary control systems with polynomially bounded exogenous signals
We extend the internal model principle for boundary control system to cover robust tracking of sinusoidal reference signals with polynomial coefficients. The internal model principle is presented in the form of both the internal model structure and the G-conditions. A controller structure will be presented and its internal model properties will be analyzed in order to solve the tracking problem in a robust manner. As an example, a robust controller is constructed for the one-dimensional heat equation with Dirichlet boundary control at one endpoint and temperature measurement at the other endpoint of the interval. The performance of the controller is demonstrated by numerical simulations.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Computing Sciences, Research group: Computer Science and Applied Logics
Contributors: Humaloja, J., Paunonen, L.
Number of pages: 6
Pages: 156-161
Publication date: 1 Jun 2019

Host publication information
Title of host publication: 3rd IFAC Workshop on Control of Systems Governed by Partial Differential Equations, CPDE 2019
Publisher: IFAC

Publication series
Name: IFAC-PapersOnLine
Volume: 52
ISSN (Print): 2405-8963
ASJC Scopus subject areas: Control and Systems Engineering
Keywords: Distributed parameter systems, Feedback control, Linear control systems, Output regulation, Regulator theory, Robust control
DOIs:

10.1016/j.ifacol.2019.08.028

Bibliographical note
jufoid=86671
Source: Scopus
Source ID: 85072375159
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Tree biomass equations from terrestrial LiDAR: A case study in Guyana
Large uncertainties in tree and forest carbon estimates weaken national efforts to accurately estimate aboveground biomass (AGB) for their national monitoring, measurement, reporting and verification system. Allometric equations to estimate biomass have improved, but remain limited. They rely on destructive sampling; large trees are under-represented in the data used to create them; and they cannot always be applied to different regions. These factors lead to uncertainties and systematic errors in biomass estimations. We developed allometric models to estimate tree AGB in Guyana. These models were based on tree attributes (diameter, height, crown diameter) obtained from terrestrial laser scanning (TLS) point clouds from 72 tropical trees and wood density. We validated our methods and models with data from 26 additional destructively harvested trees. We found that our best TLS-derived allometric models included crown diameter, provided more accurate AGB estimates (R^2 = 0.92-0.93) than traditional pantropical models (R^2 = 0.85-0.89), and were especially accurate for large trees (diameter > 70 cm). The assessed pantropical models underestimated AGB by 4 to 13%. Nevertheless, one pantropical model (Chave et al. 2005 without height) consistently performed best among the pantropical models tested (R^2 = 0.89) and predicted AGB accurately across all size classes-which but for this could not be known without destructive or TLS-derived validation data. Our methods also demonstrate that tree height is difficult to measure in situ, and the inclusion of height in allometric models consistently worsened AGB estimates. We determined that TLS-derived AGB estimates were unbiased. Our approach advances methods to be able to develop, test, and choose allometric models without the need to harvest trees.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Research group: Inverse Problems, Wageningen University and Research Centre, 16 Center for International Forestry Research (CIFOR), Universiteit Gent, Center for International Forestry Research (CIFOR) Germany, University College London, Guyana Forestry Commission, Swedish University of Agricultural Sciences
Contributors: Lau, A., Calders, K., Bartholomeus, H., Martius, C., Raumonen, P., Herold, M., Vicari, M., Sukhdeo, H., Singh, J., Goodman, R. C.
Publication date: 1 Jun 2019
Peer-reviewed: Yes

Publication information
Journal: Forests
Volume: 10
Issue number: 6
Article number: 527
ISSN (Print): 1999-4907
Original language: English

ASJC Scopus subject areas: Forestry
Keywords: 3D tree modelling, Aboveground biomass estimation, Destructive sampling, Guyana, LiDAR, Local tree allometry, Model evaluation, Quantitative structural model
Electronic versions:

forests-10-00527-v2
DOIs:

10.3390/f10060527
URLs:

http://urn.fi/URN:NBN:fi:tty-201909032057
Source: Scopus
Source ID: 85068868104
Research output: Contribution to journal › Article › Scientific › peer-review

Algorithms and Logic as Programming Primers

To adapt all-immersive digitalization, the Finnish National Curriculum 2014 (FNC-2014) 'digi-jumps' by integrating programming into elementary education. However, applying the change to mathematics teachers' everyday praxis is hindered by a too high-level specification. To elaborate FNC-2014 into more concrete learning targets, we review the computer science syllabi of countries that are well ahead, as well as the education recommendations set by computer science organizations, such as ACM and IEEE. The whole mathematics syllabus should be critically viewed in the light of these recommendations and feedback collected from software professionals and educators. The feedback reveals an imbalance between supply and demand, i.e., what is over-taught versus under-taught, from the point of the requirements of current working life. The surveyed software engineers criticize the unnecessary surplus of calculus and differential equations, i.e., continuous mathematics. In contrast, the emphasis should shift more towards algorithms and data structures, flexibility in handling multiple data representations, and logic: in short – discrete mathematics. The ground for discrete mathematics should be prepared early enough, started already from primary level and continued consistently throughout the secondary till tertiary education. This paper aims to contribute to the further refinement of the mathematics syllabus by proposing such a discrete mathematics subset that especially supports the needs of computer science education, the focus being on algorithms and data structures, and logic in particular.

General information

Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Computing Sciences, University of Jyväskylä
Contributors: Niemelä, P., Valmari, A., Ali-Löytty, S.
Pages: 357-383
Publication date: Jun 2019

Host publication information

Title of host publication: Computer Supported Education : 10th International Conference, CSEDU 2018, Revised Selected Papers
Publisher: Springer Nature
ISBN (Print): 9783030211509

Publication series

Name: Communications in Computer and Information Science
Volume: 1022
ISSN (Print): 1865-0929
Keywords: Computational thinking, algorithms, logic
DOIs:

10.1007/978-3-030-21151-6_18
URLs:

http://urn.fi/URN:NBN:fi:tty-201908282040. Embargo ends: 20/06/20

Bibliographical note

jufoid=53801
EXT="Valmari, Antti"
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Gaussian Process Regression for Forest Attribute Estimation From Airborne Laser Scanning Data

While the analysis of airborne laser scanning (ALS) data often provides reliable estimates for certain forest stand attributes-such as total volume or basal area-there is still room for improvement, especially in estimating species-specific attributes. Moreover, while the information on the estimate uncertainty would be useful in various economic and environmental analyses on forests, a computationally feasible framework for uncertainty quantifying in ALS is still missing. In this paper, the species-specific stand attribute estimation and uncertainty quantification (UQ) is approached using Gaussian process regression (GPR), which is a nonlinear and nonparametric machine learning method. Multiple species-

specific stand attributes are estimated simultaneously: tree height, stem diameter, stem number, basal area, and stem volume. The cross-validation results show that GPR yields on average an improvement of 4.6% in estimate root mean square error over a state-of-the-art k-nearest neighbors (kNNs) implementation, negligible bias and well performing UQ (credible intervals), while being computationally fast. The performance advantage over kNN and the feasibility of credible intervals persists even when smaller training sets are used.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, University of Eastern Finland
Contributors: Varvia, P., Lähivaara, T., Maltamo, M., Packalen, P., Seppänen, A.
Pages: 3361-3369
Publication date: Jun 2019
Peer-reviewed: Yes
Early online date: 2018

Publication information
Journal: IEEE Transactions on Geoscience and Remote Sensing
Volume: 57
Issue number: 6
ISSN (Print): 0196-2892
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Earth and Planetary Sciences(all)
Keywords: Area-based approach (ABA), forest inventory, Gaussian process (GP), light detection and ranging (LiDAR), machine learning.
DOIs:

10.1109/TGRS.2018.2883495
Source: Scopus
Source ID: 85058898004
Research output: Contribution to journal › Article › Scientific › peer-review

Remarks on Similarities among Ternary Bent Functions
Bent functions have low autocorrelation and it is interesting to consider if there are some relationships that may be found among values a bent function takes, i.e., to find some possible patterns expressing similarity among certain bent functions in terms of the structure of their value-vectors. A possible approach towards exploring that problem proposed in this paper is based on partial Vilenkin-Chrestenson spectra, which are conveniently interpreted as matrix-valued Vilenkin-Chrestenson spectra of matrix-valued equivalents of ternary bent functions.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Computing Sciences, Mathematical Institute of SANU, Faculty of Electronic Engineering, Technical University of Dortmund
Contributors: Stankovic, R. S., Stankovic, M., Astola, J. T., Moraga, C.
Number of pages: 6
Pages: 79-84
Publication date: 1 May 2019

Host publication information
Title of host publication: 2019 IEEE 49th International Symposium on Multiple-Valued Logic, ISMVL 2019
Publisher: IEEE
ISBN (Electronic): 9781728100913
ASJC Scopus subject areas: Computer Science(all), Mathematics(all)
Keywords: Bent functions, Matrix-valued bent functions, Ternary functions, Vilenkin-Chrestenson spectrum, Vilenkin-Chrestenson transform
DOIs:

10.1109/ISMVL.2019.00022

Bibliographical note
EXT="Stankovic, Radomir S."
Source: Scopus
Source ID: 85069214555
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Asymptotics for periodic systems

This paper investigates the asymptotic behaviour of solutions of periodic evolution equations. Starting with a general result concerning the quantified asymptotic behaviour of periodic evolution families we go on to consider a special class of dissipative systems arising naturally in applications. For this class of systems we analyse in detail the spectral properties of the associated monodromy operator, showing in particular that it is a so-called Ritt operator under a natural ‘resonance’ condition. This allows us to deduce from our general result a precise description of the asymptotic behaviour of the corresponding solutions. In particular, we present conditions for rational rates of convergence to periodic solutions in the case where the convergence fails to be uniformly exponential. We illustrate our general results by applying them to concrete problems including the one-dimensional wave equation with periodic damping.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, St Giles
Contributors: Paunonen, L., Seifert, D.
Pages: 7152-7172
Publication date: May 2019
Peer-reviewed: Yes
Early online date: 2018

Publication information

Journal: Journal of Differential Equations
Volume: 266
Issue number: 11
ISSN (Print): 0022-0396
Original language: English
ASJC Scopus subject areas: Analysis, Applied Mathematics
Keywords: Damped wave equation, Evolution family, Non-autonomous system, Periodic, Rates of convergence, Ritt operator
DOIs:
10.1016/j.jde.2018.11.028
URLs:
http://urn.fi/URN:NBN:fi:tuni-201910023647. Embargo ends: 13/03/20
Source: Scopus
Source ID: 85057519870
Research output: Contribution to journal › Article › Scientific › peer-review

On the complexity of restoring corrupted colorings

In the r-Fix problem, we are given a graph G, a (non-proper) vertex-coloring c: V(G) → [r] , and a positive integer k. The goal is to decide whether a proper r-coloring c is obtainable from c by recoloring at most k vertices of G. Recently, Junosza-Szaniawski et al. (in: SOFSEM 2015: theory and practice of computer science, Springer, Berlin, 2015) asked whether the problem has a polynomial kernel parameterized by the number of recolorings k. In a full version of the manuscript, the authors together with Garnero and Montealegre, answered the question in the negative: for every r≥ 3 , the problem r-Fix does not admit a polynomial kernel unless [InlineEquation not available: see fulltext.]. Independently of their work, we give an alternative proof of the theorem. Furthermore, we study the complexity of r-Swap, where the only difference from r-Fix is that instead of k recolorings we have a budget of k color swaps. We show that for every r≥ 3 , the problem r-Swap is [InlineEquation not available: see fulltext.]-hard whereas r-Fix is known to be FPT. Moreover, when r is part of the input, we observe both Fix and Swap are [InlineEquation not available: see fulltext.]-hard parameterized by the treewidth of the input graph. We also study promise variants of the problems, where we are guaranteed that a proper r-coloring c is indeed obtainable from c by some finite number of swaps. For instance, we prove that for r= 3 , the problems r-Fix-Promise and r-Swap-Promise are [InlineEquation not available: see fulltext.]-hard for planar graphs. As a consequence of our reduction, the problems cannot be solved in 2o(n) time unless the Exponential Time Hypothesis fails.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Bell Labs
Contributors: De Biasi, M., Lauri, J.
Number of pages: 20
Pages: 1150-1169
Publication date: May 2019
Peer-reviewed: Yes

Publication information

Journal: Journal of Combinatorial Optimization

Volume: 37
Issue number: 4
ISSN (Print): 1382-6905
Original language: English
ASJC Scopus subject areas: Computer Science Applications, Discrete Mathematics and Combinatorics, Control and Optimization, Computational Theory and Mathematics, Applied Mathematics
Keywords: Combinatorial reconfiguration, Computational complexity, Graph coloring, Local search, Parameterized complexity
DOIs:
10.1007/s10878-018-0342-2
Source: Scopus
Source ID: 85053264976
Research output: Contribution to journal › Article › Scientific › peer-review

The shape of (7) Iris as evidence of an ancient large impact?

Context. Asteroid (7) Iris is an ideal target for disk-resolved imaging owing to its brightness (V ~ 7-8) and large angular size of 0.33″ during its apparitions. Iris is believed to belong to the category of large unfragmented asteroids that avoided internal differentiation, implying that its current shape and topography may record the first few 100 Myr of the solar system's collisional evolution. Aims. We recovered information about the shape and surface topography of Iris from disk-resolved VLT/SPHERE/ZIMPOL images acquired in the frame of our ESO large program. Methods. We used the All-Data Asteroid Modeling (ADAM) shape reconstruction algorithm to model the 3D shape of Iris, using optical disk-integrated data and disk-resolved images from SPHERE and earlier AO systems as inputs. We analyzed the SPHERE images and our model to infer the asteroid's global shape and the morphology of its main craters. Results. We present the 3D shape, volume-equivalent diameter D_{eq} = 214 ± 5 km, and bulk density ρ = 2.7 ± 0.3 g cm $^{-3}$ of Iris. Its shape appears to be consistent with that of an oblate spheroid with a large equatorial excavation. We identified eight putative surface features 20-40 km in diameter detected at several epochs, which we interpret as impact craters, and several additional crater candidates. Craters on Iris have depth-To-diameter ratios that are similar to those of analogous 10 km craters on Vesta. Conclusions. The bulk density of Iris is consistent with that of its meteoritic analog based on spectroscopic observations, namely LL ordinary chondrites. Considering the absence of a collisional family related to Iris and the number of large craters on its surface, we suggest that its equatorial depression may be the remnant of an ancient (at least 3 Gyr) impact. Iris's shape further opens the possibility that large planetesimals formed as almost perfect oblate spheroids. Finally, we attribute the difference in crater morphology between Iris and Vesta to their different surface gravities, and the absence of a substantial impact-induced regolith on Iris.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Charles University in Prague, Massachusetts Institute of Technology, Queen's University, Belfast, Northern Ireland, Laboratoire d'Astrophysique de Marseille, CNRS, ONERA - The French Aerospace Lab, SETI Institute, IMCCE - Institut de Mecanique Celeste et de Calcul des Ephemerides, Adam Mickiewicz University, University of Szczecin, Université de Liège, Open University, Jet Propulsion Laboratory, California Institute of Technology , ESTEC - European Space Research and Technology Centre, TMT Observatory, Pontifical Catholic University of Peru San Miguel, European Southern Observatory (ESO)
Contributors: Hanuš, J., Marsset, M., Vernazza, P., Viikinkoski, M., Drouard, A., Broa, M., Carry, B., Fetick, R., Marchis, F. , Jorda, L., Fusco, T., Birlan, M., Santana-Ros, T., Podlewska-Gaca, E., Jehin, E., Ferrais, M., Grice, J., Bartczak, P., Berthier, J., Castillo-Rogez, J., Cipriani, F., Colas, F., Dudziński, G., Dumas, C., Äž Urech, J., Kaasalainen, M., Kryszczynska, A., Lamy, P., Le Coroller, H., Marciniak, A., Michalowski, T., Michel, P., Pajuelo, M., Tanga, P., Vachier, F. , Vigan, A., Witasse, O., Yang, B.
Publication date: 1 Apr 2019
Peer-reviewed: Yes

Publication information

Journal: Astronomy and Astrophysics
Volume: 624
Article number: A121
ISSN (Print): 0004-6361
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Methods: numerical, Methods: observational, Minor planets, asteroids: individual: 7 Iris
DOIs:
10.1051/0004-6361/201834541
Source: Scopus
Source ID: 85065230444
Research output: Contribution to journal › Article › Scientific › peer-review

Robust and Model Predictive Control for Boundary Control Systems

In this thesis, robust and model predictive control are considered for boundary control systems. In terms of robust control, the existing results, especially the internal model principle, are generalized to cover this class of systems. The concept of approximate robust regulation for boundary control systems is presented, as, due to the internal model principle, in practice it is not possible to construct an exact robust regulating controller if the output space of the controlled system is infinite-dimensional. A practical controller design is presented to achieve robust regulation in this approximate sense.

Model predictive control (MPC) is considered for the class of regular linear systems which includes regular boundary control systems. The continuous-time system is approximated by a discrete-time one by using the Cayley-Tustin transform, and MPC is considered for the discrete-time system. Stability and optimality are proved for the proposed discrete-time MPC designs, which extends the corresponding finitedimensional MPC designs to the class of regular linear systems.

General information

Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Computing Sciences
Contributors: Humaloja, J.
Number of pages: 26
Publication date: 5 Mar 2019

Publication information

Publisher: Tampere University
ISBN (Print): 978-952-03-0978-7
ISBN (Electronic): 978-952-03-0979-4
Original language: English

Publication series

Name: Tampere University Dissertations
Volume: 32
ISSN (Print): 2489-9860
ISSN (Electronic): 2490-0028
Electronic versions:

humaloja 32
URLs:

http://urn.fi/URN:ISBN:978-952-03-0979-4
Research output: Book/Report › Doctoral thesis › Collection of Articles

Closing the gap between Earth-based and interplanetary mission observations: Vesta seen by VLT/SPHERE

Context. Over the past decades, several interplanetary missions have studied small bodies in situ, leading to major advances in our understanding of their geological and geophysical properties. These missions, however, have had a limited number of targets. Among them, the NASA Dawn mission has characterised in detail the topography and albedo variegation across the surface of asteroid (4) Vesta down to a spatial resolution of ~20 m pixel $^{-1}$ scale. Aims. Here our aim was to determine how much topographic and albedo information can be retrieved from the ground with VLT/SPHERE in the case of Vesta, having a former space mission (Dawn) providing us with the ground truth that can be used as a benchmark. Methods. We observed Vesta with VLT/SPHERE/ZIMPOL as part of our ESO large programme (ID 199.C-0074) at six different epochs, and deconvolved the collected images with a parametric point spread function (PSF). We then compared our images with synthetic views of Vesta generated from the 3D shape model of the Dawn mission, on which we projected Vesta's albedo information. Results. We show that the deconvolution of the VLT/SPHERE images with a parametric PSF allows the retrieval of the main topographic and albedo features present across the surface of Vesta down to a spatial resolution of ~20-30 km. Contour extraction shows an accuracy of ~1 pixel (3.6 mas). The present study provides the very first quantitative estimate of the accuracy of ground-based adaptive-optics imaging observations of asteroid surfaces. Conclusions. In the case of Vesta, the upcoming generation of 30-40 m telescopes (ELT, TMT, GMT) should in principle be able to resolve all of the main features present across its surface, including the troughs and the north-south crater dichotomy, provided that they operate at the diffraction limit.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Laboratoire d'Astrophysique de Marseille, Massachusetts Institute of Technology, Queen's University, Belfast, Northern Ireland, ONERA - The French Aerospace Lab, CNRS, SETI Institute, Charles University in Prague, IMCCE - Institut de Mecanique Celeste et de Calcul des Ephemerides, Adam Mickiewicz University, Jet Propulsion Laboratory, California Institute of Technology, ESTEC - European Space Research and Technology Centre , TMT Observatory, Université de Liège, Pontifical Catholic University of Peru San Miguel, University of Szczecin,

European Southern Observatory (ESO)
Contributors: Fétick, R. J., Jorda, L., Vernazza, P., Marsset, M., Drouard, A., Fusco, T., Carry, B., Marchis, F., Hanuš, J., Viikinkoski, M., Birlan, M., Bartczak, P., Berthier, J., Castillo-Rogez, J., Cipriani, F., Colas, F., Dudziński, G., Dumas, C., Ferrais, M., Jehin, E., Kaasalainen, M., Kryszczynska, A., Lamy, P., Le Coroller, H., Marciniak, A., Michalowski, T., Michel, P., Mugnier, L. M., Neichel, B., Pajuelo, M., Podlewska-Gaca, E., Santana-Ros, T., Tanga, P., Vachier, F., Vigan, A., Witasse, O., Yang, B.
Publication date: 1 Mar 2019
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 623
Article number: A6
ISSN (Print): 0004-6361
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Methods: observational, Minor planets, asteroids: individual: Vesta, Techniques: high angular resolution, Techniques: image processing
Electronic versions:

aa34749-18
DOIs:

10.1051/0004-6361/201834749
URLs:

http://urn.fi/URN:NBN:fi:tty-201905241748
Source: Scopus
Source ID: 85062791633
Research output: Contribution to journal › Article › Scientific › peer-review

Homogeneous internal structure of CM-like asteroid (41) Daphne

Context. CM-like asteroids (Ch and Cgh classes) are a major population within the broader C-complex, encompassing about 10% of the mass of the main asteroid belt. Their internal structure has been predicted to be homogeneous, based on their compositional similarity as inferred from spectroscopy and numerical modeling of their early thermal evolution. Aims. Here we aim to test this hypothesis by deriving the density of the CM-like asteroid (41) Daphne from detailed modeling of its shape and the orbit of its small satellite. Methods. We observed Daphne and its satellite within our imaging survey with the Very Large Telescope extreme adaptive-optics SPHERE/ZIMPOL camera and complemented this data set with earlier Keck/NIRC2 and VLT/NACO observations. We analyzed the dynamics of the satellite with our Genoid meta-heuristic algorithm. Combining our high-angular resolution images with optical lightcurves and stellar occultations, we determine the spin period, orientation, and 3D shape, using our ADAM shape modeling algorithm. Results. The satellite orbits Daphne on an equatorial, quasi-circular, prograde orbit, like the satellites of many other large main-belt asteroids. The shape model of Daphne reveals several large flat areas that could be large impact craters. The mass determined from this orbit combined with the volume computed from the shape model implies a density for Daphne of 1.77 ± 0.26 g cm^{-3} (3 σ). This densityis consistent with a primordial CM-like homogeneous internal structure with some level of macroporosity (≈ 17%). Conclusions. Based on our analysis of the density of Daphne and 75 other Ch/Cgh-type asteroids gathered from the literature, we conclude that the primordial internal structure of the CM parent bodies was homogeneous.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, CNRS, IMCCE - Institut de Mecanique Celeste et de Calcul des Ephemerides, Queen's University, Belfast, Northern Ireland, Laboratoire d'Astrophysique de Marseille, Open University, Southwest Research Institute, Université Côte d'Azur, University of Arizona, Adam Mickiewicz University, University of Szczecin, Charles University in Prague, Thirty-Meter-Telescope, Leidos Inc., Binary Astronomy, Universite de Geneve, Cadi Ayyad University, Jet Propulsion Laboratory, California Institute of Technology, ESTEC - European Space Research and Technology Centre, Observatoire du Bois de Bardon, Université de Liège, Max Planck Institute for Astronomy, SETI Institute, Pontifical Catholic University of Peru San Miguel, Center for Solar System Studies, European Southern Observatory (ESO), Universidad Diego Portales
Contributors: Carry, B., Vachier, F., Berthier, J., Marsset, M., Vernazza, P., Grice, J., Merline, W. J., Lagadec, E., Fienga, A., Conrad, A., Podlewska-Gaca, E., Santana-Ros, T., Viikinkoski, M., Hanuš, J., Dumas, C., Drummond, J. D., Tamblyn, P. M., Chapman, C. R., Behrend, R., Bernasconi, L., Bartczak, P., Benkhaldoun, Z., Birlan, M., Castillo-Rogez, J., Cipriani, F., Colas, F., Drouard, A., Durech, J., Enke, B. L., Fauvaud, S., Ferrais, M., Fetick, R., Fusco, T., Gillon, M., Jehin, E., Jorda, L., Kaasalainen, M., Keppler, M., Kryszczynska, A., Lamy, P., Marchis, F., Marciniak, A., Michalowski, T. , Michel, P., Pajuelo, M., Tanga, P., Vigan, A., Warner, B., Witasse, O., Yang, B., Zurlo, A.
Publication date: 1 Mar 2019
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 623
Article number: A132
ISSN (Print): 0004-6361
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: asteroids: general, Methods: observational, Minor planets, Minor planets, asteroids: individual: Daphne, Techniques: high angular resolution
Electronic versions:
aa33898-18
DOIs:
10.1051/0004-6361/201833898
URLs:
http://urn.fi/URN:NBN:fi:tty-201906061844
Source: Scopus
Source ID: 85063919795
Research output: Contribution to journal › Article › Scientific › peer-review

Improved EEG source localization with Bayesian uncertainty modelling of unknown skull conductivity

Electroencephalography (EEG) source imaging is an ill-posed inverse problem that requires accurate conductivity modelling of the head tissues, especially the skull. Unfortunately, the conductivity values are difficult to determine in vivo. In this paper, we show that the exact knowledge of the skull conductivity is not always necessary when the Bayesian approximation error (BAE) approach is exploited. In BAE, we first postulate a probability distribution for the skull conductivity that describes our (lack of) knowledge on its value, and model the effects of this uncertainty on EEG recordings with the help of an additive error term in the observation model. Before the Bayesian inference, the likelihood is marginalized over this error term. Thus, in the inversion we estimate only our primary unknown, the source distribution. We quantified the improvements in the source localization when the proposed Bayesian modelling was used in the presence of different skull conductivity errors and levels of measurement noise. Based on the results, BAE was able to improve the source localization accuracy, particularly when the unknown (true) skull conductivity was much lower than the expected standard conductivity value. The source locations that gained the highest improvements were shallow and originally exhibited the largest localization errors. In our case study, the benefits of BAE became negligible when the signal-to-noise ratio dropped to 20 dB.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, University of Bath, Institute for Biomagnetism and Biosignalanalysis, University of Münster, Aristotle University of Thessaloniki, Centrum Wiskunde & Informatica, University College London, The University of Auckland, University of Eastern Finland
Contributors: Rimpiläinen, V., Koulouri, A., Lucka, F., Kaipio, J. P., Wolters, C. H.
Number of pages: 9
Pages: 252-260
Publication date: 1 Mar 2019
Peer-reviewed: Yes
Early online date: 6 Dec 2018

Publication information
Journal: NeuroImage
Volume: 188
ISSN (Print): 1053-8119
Original language: English
ASJC Scopus subject areas: Neurology, Cognitive Neuroscience
Keywords: Bayesian inverse problem, Electroencephalography, Skull conductivity, Source localization, Uncertainty modelling
DOIs:
10.1016/j.neuroimage.2018.11.058
URLs:
http://urn.fi/URN:NBN:fi:tuni-201910013624. Embargo ends: 15/12/19

Bibliographical note
EXT="Rimpiläinen, Ville"
Source: Scopus
Source ID: 85058408352
Research output: Contribution to journal › Article › Scientific › peer-review

Finite element analysis of trees in the wind based on terrestrial laser scanning data

Wind damage is an important driver of forest structure and dynamics, but it is poorly understood in natural broadleaf forests. This paper presents a new approach in the study of wind damage: combining terrestrial laser scanning (TLS) data and finite element analysis. Recent advances in tree reconstruction from TLS data allowed us to accurately represent the 3D geometry of a tree in a mechanical simulation, without the need for arduous manual mapping or simplifying assumptions about tree shape. We used this simulation to predict the mechanical strains produced on the trunks of 21 trees in Wytham Woods, UK, and validated it using strain data measured on these same trees. For a subset of five trees near the anemometer, the model predicted a five-minute time-series of strain with a mean cross-correlation coefficient of 0.71, when forced by the locally measured wind speed data. Additionally, the maximum strain associated with a 5 ms^{-1} or 15 ms^{-1} wind speed was well predicted by the model (N = 17, R^2 = 0.81 and R^2 = 0.79, respectively). We also predicted the critical wind speed at which the trees will break from both the field data and models and find a good overall agreement (N = 17, R^2 = 0.40). Finally, the model predicted the correct trend in the fundamental frequencies of the trees (N = 20, R^2 = 0.38) although there was a systematic underprediction, possibly due to the simplified treatment of material properties in the model. The current approach relies on local wind data, so must be combined with wind flow modelling to be applicable at the landscape-scale or over complex terrain. This approach is applicable at the plot level and could also be applied to open-grown trees, such as in cities or parks.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, University of Oxford, Facility for Airborne Atmospheric Measurements, Universiteit Gent, National Physical Laboratory, University College London, NERC National Centre for Earth Observation (NCEO), EFI Planted Forest Facility, Wageningen University and Research Centre, INRA
Contributors: Jackson, T., Shenkin, A., Wellpott, A., Calders, K., Origo, N., Disney, M., Burt, A., Raumonen, P., Gardiner, B., Herold, M., Fourcaud, T., Malhi, Y.
Number of pages: 8
Pages: 137-144
Publication date: 15 Feb 2019
Peer-reviewed: Yes
Early online date: 2018

Publication information

Journal: Agricultural and Forest Meteorology
Volume: 265
ISSN (Print): 0168-1923
Original language: English
ASJC Scopus subject areas: Forestry, Global and Planetary Change, Agronomy and Crop Science, Atmospheric Science
Keywords: Critical wind speed, Finite element analysis, Resonant frequency, Terrestrial laser scanning, TLS, Wind damage
Electronic versions:

1-s2.0-S0168192318303605-main
DOIs:

10.1016/j.agrformet.2018.11.014
URLs:

http://urn.fi/URN:NBN:fi:tty-201901071018
Source: Scopus
Source ID: 85056823859
Research output: Contribution to journal › Article › Scientific › peer-review

Mathematical model order reduction in computational neuroscience

Multi-scale models in neuroscience typically integrate detailed biophysical
neurobiological phenomena from molecular level up to network and system levels. Such models are very challenging to simulate despite the availability of
massively parallel computing systems. Model Order Reduction (MOR) is an
established method in engineering sciences, such as control theory. MOR is used in improving computational efficiency of simulations of large-scale and complex
nonlinear mathematical models. In this study the dimension of a nonlinear
mathematical model of plasticity in the brain is reduced using mathematical MOR methods.

Traditionally, models are simplified by eliminating variables, such as
molecular entities and ionic currents, from the system. Additionally,
assumptions of the system behavior can be made, for example regarding the
steady state of the chemical reactions. However, the current trend in
neuroscience is incorporating multiple physical scales of the brain in

simulations. Comprehensive models with full system dynamics are needed in order to increase understanding of different mechanisms in one brain area. Thus the elimination approach is not suitable for the consequent analysis of neural phenomena.

The loss of information typically induced by eliminating variables of the system can be avoided by mathematical MOR methods that strive to approximate the entire system with a smaller number of dimensions compared to the original system. Here, the effectiveness of MOR in approximating the behavior of all the variables in the original system by simulating a model with a radically reduced dimension, is demonstrated.

In the present work, mathematical MOR is applied in the context of an experimentally verified signaling pathway model of plasticity [kim2013]. This nonlinear chemical equation based model describes the biochemical calcium signaling steps required for plasticity and learning in the subcortical area of the brain. In addition to nonlinear characteristics, the model includes time-dependent terms which pose an additional challenge both computational efficiency and reduction wise.

The MOR method employed in this study is Proper Orthogonal Decomposition with Discrete Empirical Interpolation Method (POD+DEIM), a subspace projection
method for reducing the dimensionality of nonlinear systems [chaturantabut2010]. By applying these methods, the simulation time of the
model is radically shortened. However, our preliminary studies show approximation error if the model is simulated for a very long time. The tolerated amount of approximation error depends on the final application of the model. Based on these promising results, POD+DEIM is recommended for dimensionality reduction in computational neuroscience.

In summary, the reduced order model consumes a considerably smaller amount of computational resources than the original model, while maintaining a low root mean square error between the variables in the original and reduced models. This was achieved by simulating the system dynamics in a lower dimensional subspace without losing any of the variables from the model. The results presented here are novel as mathematical MOR has not been studied in neuroscience without linearisation of the mathematical model and never in the context of the model presented here.

General information

Publication status: Published
Organisations: Faculty of Biomedical Sciences and Engineering, Mathematics
Contributors: Lehtimäki, M., Paunonen, L., Linne, M.
Publication date: 6 Feb 2019
Peer-reviewed: Unknown
Event: Paper presented at 3rd HBP Student Conference on Interdisciplinary Brain Research, Ghent, Belgium.
Keywords: Computational Neuroscience, Control theory, Mathematics
Research output: Other conference contribution › Paper, poster or abstract › Scientific

A realistic, accurate and fast source modeling approach for the EEG forward problem

The aim of this paper is to advance electroencephalography (EEG) source analysis using finite element method (FEM) head volume conductor models that go beyond the standard three compartment (skin, skull, brain) approach and take brain tissue inhomogeneity (gray and white matter and cerebrospinal fluid) into account. The new approach should enable accurate EEG forward modeling in the thin human cortical structures and, more specifically, in the especially thin cortices in children brain research or in pathological applications. The source model should thus be focal enough to be usable in the thin cortices, but should on the other side be more realistic than the current standard mathematical point dipole. Furthermore, it should be numerically accurate and computationally fast. We propose to achieve the best balance between these demands with a current preserving (divergence conforming) dipolar source model. We develop and investigate a varying number of current preserving source basis elements n (n=1,…,n=5). For validation, we conducted numerical experiments within a multi-layered spherical domain, where an analytical solution exists. We show that the accuracy increases along with the number of basis elements, while focality decreases. The results suggest that the best balance between accuracy and focality in thin cortices is achieved with n=4 (or in extreme cases even n=3) basis functions, while in thicker cortices n=5 is recommended to obtain the highest accuracy. We also compare the current preserving approach to two further FEM source modeling techniques, namely partial integration and St. Venant, and show that the best current preserving source model outperforms the competing methods with regard to overall balance. For all tested approaches, FEM transfer matrices enable high computational speed. We implemented the new EEG forward modeling approaches into the open source duneuro library for forward modeling in bioelectromagnetism to enable its broader use by the brain research community. This library is build upon the DUNE framework for parallel finite elements simulations and integrates with high-level toolboxes like FieldTrip. Additionally, an inversion test has been implemented using the realistic head model to demonstrate and compare the differences between the aforementioned source models.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Signal Processing, Research group: Inverse Problems, University of Münster, University of Eastern Finland, Laboratory of Signal Processing
Contributors: Miinalainen, T., Rezaei, A., Us, D., Nüßing, A., Engwer, C., Wolters, C. H., Pursiainen, S.
Number of pages: 12
Pages: 56-67
Publication date: 2019
Peer-reviewed: Yes
Early online date: 28 Aug 2018

Publication information
Journal: NeuroImage
Volume: 184
Issue number: 1
ISSN (Print): 1053-8119
Original language: English
ASJC Scopus subject areas: Neurology, Cognitive Neuroscience
Keywords: Divergence conforming vector fields, DUNE toolbox, Electroencephalography (EEG), Finite element method (FEM), Focal sources
DOIs:

10.1016/j.neuroimage.2018.08.054
Source: Scopus
Source ID: 85053387965
Research output: Contribution to journal › Article › Scientific › peer-review

Cuts for 3-D magnetic scalar potentials: Visualizing unintuitive surfaces arising from trivial knots
A wealth of literature exists on computing and visualizing cuts for the magnetic scalar potential of a current carrying conductor via Finite Element Methods (FEM) and harmonic maps to the circle. By a cut we refer to an orientable surface bounded by a given current carrying path (such that the flux through it may be computed) that restricts contour integrals on a curl-zero vector field to those that do not link the current-carrying path, analogous to branch cuts of complex analysis. This work is concerned with a study of a peculiar contour that illustrates topologically unintuitive aspects of cuts obtained from a trivial loop and raises questions about the notion of an optimal cut. Specifically, an unknotted curve that bounds only high genus surfaces in its convex hull is analyzed. The current work considers the geometric realization as a current-carrying wire in order to construct a magnetic scalar potential. Moreover, we consider the problem of choosing an energy functional on the space of maps, suggesting an algorithm for computing cuts via minimizing a conformally invariant functional utilizing Newton iteration.

General information
Publication status: Accepted/In press
MoE publication type: A1 Journal article-refereed
Organisations: Electrical Engineering, Boston University
Contributors: Stockrahm, A., Lahtinen, V., Kangas, J. J., Kotiuga, P. R.
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Computers and Mathematics with Applications
ISSN (Print): 0898-1221
Original language: English
ASJC Scopus subject areas: Modelling and Simulation, Computational Theory and Mathematics, Computational Mathematics
Keywords: Homology, Magnetic fields, Visualization
DOIs:

10.1016/j.camwa.2019.05.023
Source: Scopus
Source ID: 85067239229
Research output: Contribution to journal › Article › Scientific › peer-review

Neighbour species richness and local structural variability modulate aboveground allocation patterns and crown morphology of individual trees
Local neighbourhood interactions are considered a main driver for biodiversity–productivity relationships in forests. Yet, the structural responses of individual trees in species mixtures and their relation to crown complementarity remain poorly understood. Using a large-scale forest experiment, we studied the impact of local tree species richness and structural

variability on above-ground wood volume allocation patterns and crown morphology. We applied terrestrial laser scanning to capture the three-dimensional structure of trees and their temporal dynamics. We found that crown complementarity and crown plasticity increased with species richness. Trees growing in species-rich neighbourhoods showed enhanced aboveground wood volume both in trunks and branches. Over time, neighbourhood diversity induced shifts in wood volume allocation in favour of branches, in particular for morphologically flexible species. Our results demonstrate that diversity-mediated shifts in allocation pattern and crown morphology are a fundamental mechanism for crown complementarity and may be an important driver of overyielding.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Leuphana University Lüneburg, Martin-Luther-Universität Halle-Wittenberg, German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Technische Universität Dresden
Contributors: Kunz, M., Fichtner, A., Härdtle, W., Raumonen, P., Bruelheide, H., von Oheimb, G.
Number of pages: 11
Pages: 2130-2140
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: ECOLOGY LETTERS
Volume: 22
Issue number: 12
ISSN (Print): 1461-023X
Original language: English
ASJC Scopus subject areas: Ecology, Evolution, Behavior and Systematics
Keywords: BEF-China, biodiversity, crown complementarity, ecosystem functioning, forests, productivity, terrestrial laser scanning
Electronic versions:

ele.13400
DOIs:

10.1111/ele.13400
URLs:

http://urn.fi/URN:NBN:fi:tuni-201911125880
Source: Scopus
Source ID: 85074105680
Research output: Contribution to journal › Letter › Scientific › peer-review

Optimal energy decay for the wave-heat system on a rectangular domain
We study the rate of energy decay for solutions of a coupled wave-heat system on a rectangular domain. Using techniques from the theory of C_0-semigroups, and in particular a well-known result due to Borichev and Tomilov, we prove that the energy of classical solutions decays like $t^{-2/3}$ as $t \rightarrow \infty$. This rate is moreover shown to be sharp. Our result implies in particular that a general estimate in the literature, which predicts at least logarithmic decay and is known to be best possible in general, is suboptimal in the special case under consideration here. Our strategy of proof involves direct estimates based on separation of variables and a refined version of the technique developed in our earlier paper for a one-dimensional wave-heat system.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, St Giles
Contributors: Batty, C., Paunonen, L., Seifert, D.
Number of pages: 12
Pages: 808-819
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: SIAM JOURNAL ON MATHEMATICAL ANALYSIS
Volume: 51
Issue number: 2
ISSN (Print): 0036-1410
Original language: English
ASJC Scopus subject areas: Analysis, Computational Mathematics, Applied Mathematics
Keywords: C -semigroups, Coupled, Energy, Heat equation, Rates of decay, Rectangular domain, Resolvent estimates, Wave equation

DOIs:
10.1137/18M1195796
Source: Scopus
Source ID: 85065492247
Research output: Contribution to journal › Article › Scientific › peer-review

Quaternionic Hyperbolic Function Theory

We are studying hyperbolic function theory in the skew-field of quaternions. This theory is connected to k-hyperbolic harmonic functions that are harmonic with respect to the hyperbolic Riemannian metric (Formula Presented) in the upper half space (Formula Presented). In the case k = 2, the metric is the hyperbolic metric of the Poincaré upper half-space. Hempfling and Leutwiler started to study this case and noticed that the quaternionic power function xm(m ε Z), is a conjugate gradient of a 2-hyperbolic harmonic function. They researched polynomial solutions. We find fundamental k-hyperbolic harmonic functions depending only on the hyperbolic distance and x_3. Using these functions we are able to verify a Cauchy type integral formula. Earlier these results have been verified for quaternionic functions depending only on reduced variables (x_0, x_1, x_2). Our functions are depending on four variables.

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Computing Sciences, Department of Mathematics and Statistics, University of Helsinki
Contributors: Eriksson, S., Orelma, H.
Number of pages: 28
Pages: 25-52
Publication date: 2019

Host publication information
Title of host publication: Topics in Clifford Analysis
Publisher: Springer
ISBN (Print): 978-3-030-23853-7
ISBN (Electronic): 978-3-030-23854-4

Publication series
Name: Trends in Mathematics
ISSN (Print): 2297-0215
ISSN (Electronic): 2297-024X
ASJC Scopus subject areas: Mathematics(all)
Keywords: Clifford algebra, Hyperbolic Laplace operator, Hyperbolic metric, Laplace-Beltrami operator, Monogenic function, Quaternions, α-Hyperbolic harmonic, α-Hypermonogenic
DOIs:
10.1007/978-3-030-23854-4_2

Bibliographical note
EXT="Eriksson, Sirkka-Liisa"
jufoid=87581
Source: Scopus
Source ID: 85073497419
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Simulating solar-induced chlorophyll fluorescence in a boreal forest stand reconstructed from terrestrial laser scanning measurements

Solar-induced chlorophyll fluorescence (SIF) has been shown to be a suitable remote sensing proxy of photosynthesis at multiple scales. However, the relationship between fluorescence and photosynthesis observed at the leaf level cannot be directly applied to the interpretation of retrieved SIF due to the impact of canopy structure. We carried out a SIF modelling study for a heterogeneous forest canopy considering the effect of canopy structure in the Discrete Anisotropic Radiative Transfer (DART) model. A 3D forest simulation scene consisting of realistic trees and understory, including multi-scale clumping at branch and canopy level, was constructed from terrestrial laser scanning data using the combined model TreeQSM and FaNNI for woody structure and leaf insertion, respectively. Next, using empirical data and a realistic range of leaf-level biochemical and physiological parameters, we conducted a local sensitivity analysis to demonstrate the potential of the approach for assessing the impact of structural, biochemical and physiological factors on top of canopy (TOC) SIF. The analysis gave insight into the factors that drive the intensity and spectral properties of TOC SIF in heterogeneous boreal forest canopies. DART simulated red TOC fluorescence was found to be less affected by biochemical factors such as chlorophyll and dry matter contents or the senescent factor than far-red fluorescence. In contrast, canopy structural factors such as overstory leaf area index (LAI), leaf angle distribution and fractional cover had a substantial and comparable impact across all SIF wavelengths, with the exception of understory LAI that affected predominantly far-red fluorescence. Finally, variations in the fluorescence quantum efficiency (Fqe) of photosystem II

affected all TOC SIF wavelengths. Our results also revealed that not only canopy structural factors but also understory fluorescence should be considered in the interpretation of tower, airborne and satellite SIF datasets, especially when acquired in the (near-) nadir viewing direction and for forests with open canopies. We suggest that the modelling strategy introduced in this study, coupled with the increasing availability of TLS and other 3D data sources, can be applied to resolve the interplay between physiological, biochemical and structural factors affecting SIF across ecosystems and independently of canopy complexity, paving the way for future SIF-based 3D photosynthesis models.

General information
Publication status: E-pub ahead of print
MoE publication type: A1 Journal article-refereed
Organisations: Computing Sciences, Chinese Academy of Sciences, University of Chinese Academy of Sciences, University of Helsinki, VTT Technical Research Centre of Finland, University of Toulouse, INP, LAAS-CNRS, University of Tasmania, Natural Resources Institute Finland (Luke)
Contributors: Liu, W., Atherton, J., Mõttus, M., Gastellu-Etchegorry, J. P., Malenovský, Z., Raumonen, P., Åkerblom, M., Mäkipää, R., Porcar-Castell, A.
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Remote Sensing of Environment
Article number: 111274
ISSN (Print): 0034-4257
Original language: English
ASJC Scopus subject areas: Soil Science, Geology, Computers in Earth Sciences
Keywords: Boreal forest, DART, FaNNI, Far-red SIF, LiDAR, Red SIF, Silver birch, Solar-induced chlorophyll fluorescence , TreeQSM, Understory
Electronic versions:

1-s2.0-S0034425719302937-main
DOIs:

10.1016/j.rse.2019.111274
URLs:

http://urn.fi/URN:NBN:fi:tty-201907081951
Source: Scopus
Source ID: 85068047686
Research output: Contribution to journal › Article › Scientific › peer-review

Software-defined radio prototype for fast-convolution-based filtered OFDM in 5G NR
In this work, we provide first-in-class measurement results for fast-convolution-based filtered orthogonal frequencydivision multiplexing (FC-F-OFDM) processing implemented on a universal software radio peripheral (USRP) software-defined radio (SDR). The fast-convolution-based processing offers a highly efficient and flexible filtered OFDM scheme allowing to achieve high spectral utilization in different channel bandwidths. Through the SDR implementation and transmitter spectrum emission measurements, we show that FC-F-OFDM allows to increase spectrum utilization compared to the fifth generation new radio (5G NR) Release-15 requirements. Furthermore, considering the out-of-band emission masks and adjacent-channel-leakage-ratio requirements, FC-F-OFDM provides a larger interference margin than well-known windowed overlap-and-add OFDM processing.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Electrical Engineering, Nokia Mobile Networks
Contributors: Gokceli, S., Levanen, T., Yli-Kaakinen, J., Turunen, M., Allen, M., Riihonen, T., Palin, A., Renfors, M., Valkama, M.
Pages: 235-240
Publication date: 2019

Host publication information
Title of host publication: 2019 European Conference on Networks and Communications, EuCNC 2019
Publisher: IEEE
ISBN (Electronic): 9781728105468
DOIs:

10.1109/EuCNC.2019.8802008

Bibliographical note
INT=elen,"Turunen, Matias"
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

DISCUS – The Deep Interior Scanning CubeSat mission to a rubble pile near-Earth asteroid

We have performed an initial stage conceptual design study for the Deep Interior Scanning CubeSat (DISCUS), a tandem 6U CubeSat carrying a bistatic radar as the main payload. DISCUS will be operated either as an independent mission or accompanying a larger one. It is designed to determine the internal macroporosity of a 260–600 m diameter Near Earth Asteroid (NEA) from a few kilometers distance. The main goal will be to achieve a global penetration with a low-frequency signal as well as to analyze the scattering strength for various different penetration depths and measurement positions. Moreover, the measurements will be inverted through a computed radar tomography (CRT) approach. The scientific data provided by DISCUS would bring more knowledge of the internal configuration of rubble pile asteroids and their collisional evolution in the Solar System. It would also advance the design of future asteroid deflection concepts. We aim at a single-unit (1U) radar design equipped with a half-wavelength dipole antenna. The radar will utilize a stepped-frequency modulation technique the baseline of which was developed for ESA's technology projects GINGER and PIRA. The radar measurements will be used for CRT and shape reconstruction. The CubeSat will also be equipped with an optical camera system and laser altimeter to support navigation and shape reconstruction. We provide the details of the measurement methods to be applied along with the requirements derived from the known characteristics of rubble pile asteroids. Additionally, an initial design study of the platform and targets accessible within 20 lunar distances are presented.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Max Planck Institute for Solar System Research, RST Radar Systemtechnik AG, MEW-Aerospace UG
Contributors: Bambach, P., Deller, J., Vilenius, E., Pursiainen, S., Takala, M., Braun, H. M., Lentz, H., Wittig, M.
Pages: 3357-3368
Publication date: Dec 2018
Peer-reviewed: Yes
Early online date: 2018

Publication information

Journal: Advances in Space Research
Volume: 62
Issue number: 12
ISSN (Print): 0273-1177
Ratings:

Scopus rating (2018): CiteScore 1.97 SJR 0.589 SNIP 1.186
Original language: English
ASJC Scopus subject areas: Aerospace Engineering, Space and Planetary Science
Keywords: Computed radar tomography, Deep-space CubeSat, Near earth asteroid, Radar, Rubble pile asteroid
DOIs:

10.1016/j.asr.2018.06.016
Source: Scopus
Source ID: 85049333928
Research output: Contribution to journal › Article › Scientific › peer-review

(16) Psyche: A mesosiderite-like asteroid?

Context. Asteroid (16) Psyche is the target of the NASA Psyche mission. It is considered one of the few main-belt bodies that could be an exposed proto-planetary metallic core and that would thus be related to iron meteorites. Such an association is however challenged by both its near- and mid-infrared spectral properties and the reported estimates of its density. Aims. Here, we aim to refine the density of (16) Psyche to set further constraints on its bulk composition and determine its potential meteoritic analog. Methods. We observed (16) Psyche with ESO VLT/SPHERE/ZIMPOL as part of our large program (ID 199.C-0074). We used the high angular resolution of these observations to refine Psyche's three-dimensional (3D) shape model and subsequently its density when combined with the most recent mass estimates. In addition, we searched for potential companions around the asteroid. Results. We derived a bulk density of 3.99 ± 0.26 ± cm^{-3} for Psyche. While such density is incompatible at the 3-sigma level with any iron meteorites (~7.8 ± cm^{-3}), it appears fully consistent with that of stony-iron meteorites such as mesosiderites (density ~4.25 ± cm^{-3}). In addition, we found no satellite in our images and set an upper limit on the diameter of any non-detected satellite of 1460 ± 200 m at 150 km from Psyche (0.2% × R_{Hill}, the Hill radius) and 800 ± 200 m at 2000 km (3% × R_{Hill}). Conclusions. Considering that the visible and near-infrared spectral properties of mesosiderites are similar to those of Psyche, there is merit to a long-published initial hypothesis that Psyche could be a plausible candidate parent body for mesosiderites.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Laboratoire d'Astrophysique de Marseille, Charles University in Prague, CNRS, Queen's University, Belfast, Northern Ireland, SETI Institute, IMCCE - Institut de Mecanique Celeste et de Calcul des Ephemerides

, Adam Mickiewicz University, Thirty-Meter-Telescope, Jet Propulsion Laboratory, California Institute of Technology, ESTEC - European Space Research and Technology Centre, Université de Liège, Open University, Université de Versailles Saint-Quentin-en-Yvelines, Pontifical Catholic University of Peru San Miguel, University of Szczecin, Center for Solar System Studies, European Southern Observatory (ESO)
Contributors: Viikinkoski, M., Vernazza, P., Hanuš, J., Le Coroller, H., Tazhenova, K., Carry, B., Marsset, M., Drouard, A., Marchis, F., Fetick, R., Fusco, T., Ďurech, J., Birlan, M., Berthier, J., Bartczak, P., Dumas, C., Castillo-Rogez, J., Cipriani, F., Colas, F., Ferrais, M., Grice, J., Jehin, E., Jorda, L., Kaasalainen, M., Kryszczynska, A., Lamy, P., Marciniak, A., Michalowski, T., Michel, P., Pajuelo, M., Podlewska-Gaca, E., Santana-Ros, T., Tanga, P., Vachier, F., Vigan, A., Warner, B., Witasse, O., Yang, B.
Publication date: 1 Nov 2018
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 619
Article number: L3
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2018): CiteScore 4.54 SJR 2.527 SNIP 1.233
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Methods: observational, Minor planets, asteroids: general, Minor planets, asteroids: individual: (16) Psyche, Techniques: high angular resolution
DOIs:

10.1051/0004-6361/201834091
Source: Scopus
Source ID: 85056511149
Research output: Contribution to journal › Article › Scientific › peer-review

Compute mindlessly. Not! map consciously
This paper utilizes concept mapping as a tool for conscious and deliberate knowledge building in mathematics and its extension to algorithms. Currently, alleged defects in mathematics education are obvious: instead of conceptual elaboration, everyday praxis relies on routine computations that are likely to lead into alienated concepts with weak connections to prior knowledge. A concept map visualizes the existing conceptual structure, and whenever new information is brought in, it will be placed in the map by clearly explicating its linkage to the previous concepts. In the Finnish mathematics education, such new knowledge is programming content that is integrated into elementary school mathematics in 2014 Finnish National Curriculum. This content is crystallized as the requirements of computational and algorithmic thinking, the utilization of respective data structures, and adequate amount of hands-on practice to internalize good coding conventions. This study examines secondary (N = 19) and higher education students (N = 10) and their conceptual knowledge of mathematics concentrating on the domain of algorithms in particular. The concept maps drawn by the students are evaluated using the SOLO taxonomy. To conclude, a consensus map of algorithms is represented and linked to the elementary mathematics syllabus.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research area: Software engineering, Computing Sciences, Department of Education, Ideal Learning Oy
Contributors: Niemelä, P., Mikkolainen, V., Vuorinen, J.
Number of pages: 10
Pages: 2669-2678
Publication date: 1 Nov 2018
Peer-reviewed: Yes

Publication information
Journal: Universal Journal of Educational Research
Volume: 6
Issue number: 11
ISSN (Print): 2332-3205
Original language: English
ASJC Scopus subject areas: Education
Keywords: Concept Mapping, Meta-cognitive Skills, SOLO Taxonomy, Visualizations
Electronic versions:

UJER33-19511998-1
DOIs:

10.13189/ujer.2018.061133

URLs:

http://urn.fi/URN:NBN:fi:tty-201905231747
Source: Scopus
Source ID: 85061665318
Research output: Contribution to journal › Article › Scientific › peer-review

The impact crater at the origin of the Julia family detected with VLT/SPHERE?

Context. The vast majority of the geophysical and geological constraints (e.g., internal structure, cratering history) for main-belt asteroids have so far been obtained via dedicated interplanetary missions (e.g., ESA Rosetta, NASA Dawn). The high angular resolution of SPHERE/ZIMPOL, the new-generation visible adaptive-optics camera at ESO VLT, implies that these science objectives can now be investigated from the ground for a large fraction of D 100 km main-belt asteroids. The sharp images acquired by this instrument can be used to accurately constrain the shape and thus volume of these bodies (hence density when combined with mass estimates) and to characterize the distribution and topography of D 30 km craters across their surfaces. Aims. Here, via several complementary approaches, we evaluated the recently proposed hypothesis that the S-type asteroid (89) Julia is the parent body of a small compact asteroid family that formed via a cratering collisional event. Methods. We observed (89) Julia with VLT/SPHERE/ZIMPOL throughout its rotation, derived its 3D shape, and performed a reconnaissance and characterization of the largest craters. We also performed numerical simulations to first confirm the existence of the Julia family and to determine its age and the size of the impact crater at its origin. Finally, we utilized the images/3D shape in an attempt to identify the origin location of the small collisional family. Results. On the one hand, our VLT/SPHERE observations reveal the presence of a large crater (D 75 km) in Julias southern hemisphere. On the other hand, our numerical simulations suggest that (89) Julia was impacted 30-120 Myrs ago by a D 8 km asteroid, thereby creating a D 60 km impact crater at the surface of Julia. Given the small size of the impactor, the obliquity of Julia and the particular orientation of the family in the (a,i) space, the imaged impact crater is likely to be the origin of the family. Conclusions. New doors into ground-based asteroid exploration, namely, geophysics and geology, are being opened thanks to the unique capabilities of VLT/SPHERE. Also, the present work may represent the beginning of a new era of asteroid-family studies. In the fields of geophysics, geology, and asteroid family studies, the future will only get brighter with the forthcoming arrival of 30-40 m class telescopes like ELT, TMT, and GMT.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Laboratoire d'Astrophysique de Marseille, Charles University in Prague, Queen's University, Belfast, Northern Ireland, CNRS, SETI Institute, IMCCE - Institut de Mecanique Celeste et de Calcul des Ephemerides, Adam Mickiewicz University, University of Szczecin, Université de Liège, Jet Propulsion Laboratory, California Institute of Technology, ESTEC - European Space Research and Technology Centre, TMT Observatory, Pontifical Catholic University of Peru San Miguel, Center for Solar System Studies, European Southern Observatory (ESO), Arizona State University, University of Maryland, Cadi Ayyad University
Contributors: Vernazza, P., Broz, M., Drouard, A., Hanuš, J., Viikinkoski, M., Marsset, M., Jorda, L., Fetick, R., Carry, B., Marchis, F., Birlan, M., Fusco, T., Santana-Ros, T., Podlewska-Gaca, E., Jehin, E., Ferrais, M., Bartczak, P., Dudziński, G. , Berthier, J., Castillo-Rogez, J., Cipriani, F., Colas, F., Dumas, C., Urech, J., Kaasalainen, M., Kryszczynska, A., Lamy, P. , Le Coroller, H., Marciniak, A., Michalowski, T., Michel, P., Pajuelo, M., Tanga, P., Vachier, F., Vigan, A., Warner, B., Witasse, O., Yang, B., Asphaug, E., Richardson, D. C., Ševeček, P., Gillon, M., Benkhaldoun, Z.
Publication date: 1 Oct 2018
Peer-reviewed: Yes

Publication information

Journal: Astronomy and Astrophysics
Volume: 618
Article number: 33477
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2018): CiteScore 4.54 SJR 2.527 SNIP 1.233
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Methods: numerical, Methods: observational, Minor planets asteroids: individual: (89) Julia, Techniques: high angular resolution
Electronic versions:

aa33477-18
DOIs:

10.1051/0004-6361/201833477
URLs:

http://urn.fi/URN:NBN:fi:tty-201812202885
Source: Scopus
Source ID: 85056083227

Quantifying branch architecture of tropical trees using terrestrial LiDAR and 3D modelling

Key message: A method using terrestrial laser scanning and 3D quantitative structure models opens up new possibilities to reconstruct tree architecture from tropical rainforest trees. Abstract: Tree architecture is the three-dimensional arrangement of above ground parts of a tree. Ecologists hypothesize that the topology of tree branches represents optimized adaptations to tree's environment. Thus, an accurate description of tree architecture leads to a better understanding of how form is driven by function. Terrestrial laser scanning (TLS) has demonstrated its potential to characterize woody tree structure. However, most current TLS methods do not describe tree architecture. Here, we examined nine trees from a Guyanese tropical rainforest to evaluate the utility of TLS for measuring tree architecture. First, we scanned the trees and extracted individual tree point clouds. TreeQSM was used to reconstruct woody structure through 3D quantitative structure models (QSMs). From these QSMs, we calculated: (1) length and diameter of branches > 10 cm diameter, (2) branching order and (3) tree volume. To validate our method, we destructively harvested the trees and manually measured all branches over 10 cm (279). TreeQSM found and reconstructed 95% of the branches thicker than 30 cm. Comparing field and QSM data, QSM overestimated branch lengths thicker than 50 cm by 1% and underestimated diameter of branches between 20 and 60 cm by 8%. TreeQSM assigned the correct branching order in 99% of all cases and reconstructed 87% of branch lengths and 97% of tree volume. Although these results are based on nine trees, they validate a method that is an important step forward towards using tree architectural traits based on TLS and open up new possibilities to use QSMs for tree architecture.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Wageningen University and Research Centre, Center for International Forestry Research (CIFOR), Sonoma State University, University of Oxford
Contributors: Lau, A., Bentley, L. P., Martius, C., Shenkin, A., Bartholomeus, H., Raumonen, P., Malhi, Y., Jackson, T., Herold, M.
Number of pages: 13
Pages: 1219-1231
Publication date: Oct 2018
Peer-reviewed: Yes
Early online date: 25 May 2018

Publication information

Journal: Trees - Structure and Function
Volume: 32
Issue number: 5
ISSN (Print): 0931-1890
Ratings:

Scopus rating (2018): CiteScore 2.04 SJR 0.702 SNIP 1.001
Original language: English
ASJC Scopus subject areas: Forestry, Physiology, Ecology, Plant Science
Keywords: Destructive harvesting, Quantitative structure models, Terrestrial LiDAR, Tree architecture, Tree metrics
Electronic versions:

Lau2018_Article_QuantifyingBranchArchitectureO
DOIs:

10.1007/s00468-018-1704-1
URLs:

http://urn.fi/URN:NBN:fi:tty-201806212008
Source: Scopus
Source ID: 85047390214
Research output: Contribution to journal › Article › Scientific › peer-review

Improvement of computational efficiency of a biochemical plasticity model

Multi-scale models in neuroscience integrate detailed neurobiological phenomena from molecular level up to network and system levels. such models are very challenging to simulate despite the availability of massively parallel computing systems. model order reduction (mor) is an established method in engineering sciences, such as control theory. mor is used in improving computational efficiency of simulations of complex nonlinear mathematical models. in this study the dimension of a nonlinear mathematical model of plasticity in the brain is reduced using mathematical mor methods.

Traditionally, models are simplified by eliminating variables, such as molecular entities and ionic currents, from the system. additionally, assumptions of the system behavior can be made, for example regarding the

steady state of the chemical reactions. however, comprehensive models with full system dynamics are needed in order to increase understanding of different mechanisms in one brain area. thus the elimination approach is not suitable for the consequent analysis of neural phenomena.

The loss of information induced by eliminating variables of the system can be avoided by mathematical mor methods that approximate the entire system with a smaller number of dimensions compared to the original system. here,
mathematical MOR is applied in the context of an experimentally verified signaling pathway model of plasticity (Kim et al., PLoS Comp. Biol., 2013).
This nonlinear chemical equation based model describes the biochemical calcium signaling steps required for plasticity and learning in the subcortical area of the brain. By applying these methods, the simulation time of the model is radically shortened.

General information
Publication status: Published
Organisations: Faculty of Biomedical Sciences and Engineering, Mathematics
Contributors: Lehtimäki, M., Paunonen, L., Linne, M.
Publication date: 20 Sep 2018
Peer-reviewed: Unknown
Event: Paper presented at Brain and Mind Symposium 2018, Helsinki, Finland.
Keywords: Neuroscience, Computational Neuroscience, Control theory
Research output: Other conference contribution › Paper, poster or abstract › Scientific

On the complexity of rainbow coloring problems
An edge-colored graph G is said to be rainbow connected if between each pair of vertices there exists a path which uses each color at most once. The rainbow connection number , denoted by rc(G), is the minimum number of colors needed to make G rainbow connected. Along with its variants, which consider vertex colorings and/or so-called strong colorings, the rainbow connection number has been studied from both the algorithmic and graph-theoretic points of view.

In this paper we present a range of new results on the computational complexity of computing the four major variants of the rainbow connection number. In particular, we prove that the Strong Rainbow Vertex Coloring problem is View the MathML source-complete even on graphs of diameter 3, and also when the number of colors is restricted to 2. On the other hand, we show that if the number of colors is fixed then all of the considered problems can be solved in linear time on graphs of bounded treewidth. Moreover, we provide a linear-time algorithm which decides whether it is possible to obtain a rainbow coloring by saving a fixed number of colors from a trivial upper bound. Finally, we give a linear-time algorithm for computing the exact rainbow connection numbers for three variants of the problem on graphs of bounded vertex cover number.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, TU Vienna
Contributors: Eiben, E., Ganian, R., Lauri, J.
Pages: 38-48
Publication date: Sep 2018
Peer-reviewed: Yes
Early online date: 2016

Publication information
Journal: Discrete Applied Mathematics
Volume: 246
ISSN (Print): 0166-218X
Ratings:

Scopus rating (2018): CiteScore 1.2 SJR 0.815 SNIP 1.263
Original language: English
DOIs:

10.1016/j.dam.2016.10.021
Research output: Contribution to journal › Article › Scientific › peer-review

A study of crown development mechanisms using a shoot-based tree model and segmented terrestrial laser scanning data
Background and Aims Functional-structural plant models (FSPMs) allow simulation of tree crown development as the sum of modular (e.g. shoot-level) responses triggered by the local environmental conditions. The actual process of space filling by the crowns can be studied. Although the FSPM simulations are at organ scale, the data for their validation have usually been at more aggregated levels (whole-crown or whole-tree). Measurements made by terrestrial laser scanning (TLS) that

have been segmented into elementary units (internodes) offer a phenotyping tool to validate the FSPM predictions at levels comparable with their detail. We demonstrate the testing of different formulations of crown development of Scots pine trees in the LIGNUM model using segmented TLS data. Methods We made TLS measurements from four sample trees growing in a forest on a relatively poor soil from sapling size to mature stage. The TLS data were segmented into internodes. The segmentation also produced information on whether needles were present in the internode. We applied different formulations of crown development (flushing of buds and length of growth of new internodes) in LIGNUM. We optimized the parameter values of each formulation using genetic algorithms to observe the best fit of LIGNUM simulations to the measured trees. The fitness function in the estimation combined both tree-level characteristics (e.g. tree height and crown length) and measures of crown shape (e.g. spatial distribution of needle area). Key Results Comparison of different formulations against the data indicates that the Extended Borchert-Honda model for shoot elongation works best within LIGNUM. Control of growth by local density in the crown was important for all shoot elongation formulations. Modifying the number of lateral buds as a function of local density in the crown was the best way to accomplish density control. Conclusions It was demonstrated how segmented TLS data can be used in the context of a shoot-based model to select model components.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Natural Resources Institute Finland (Luke), University of Helsinki
Contributors: Sievänen, R., Raumonen, P., Perttunen, J., Nikinmaa, E., Kaitaniemi, P.
Number of pages: 12
Pages: 423-434
Publication date: 27 Aug 2018
Peer-reviewed: Yes

Publication information
Journal: Annals of Botany
Volume: 122
Issue number: 3
ISSN (Print): 0305-7364
Ratings:

Scopus rating (2018): CiteScore 4.24 SJR 1.705 SNIP 1.697
Original language: English
ASJC Scopus subject areas: Plant Science
Keywords: forest stand, Functional-structural model, Scots pine, terrestrial laser scanning
DOIs:

10.1093/aob/mcy082
Source: Scopus
Source ID: 85054790809
Research output: Contribution to journal › Article › Scientific › peer-review

Linear Model Predictive Control for Schrödinger Equation

The paper considers the finite-horizon constrained optimal control problem for Schrödinger equation with boundary controls and boundary observations. The plant is mapped from continuous to discrete time using the Cayley-Tustin transform, which preserves input-output-stability of the plant. The proposed transformation is structure and energy preserving and does not induce order reduction associated with the spatial discretization. The controller design setting leads to the finite horizon constrained quadratic regulator problem, which is easily realized and accounts in explicit manner for input and output/state constraints. The model predictive control (MPC) design is realized for Schrödinger equation and the results are illustrated with numerical simulations showing successful stabilization of Schrödinger equation with simultaneous satisfaction of input and output/state constraints.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, University of Alberta
Contributors: Humaloja, J., Dubljevic, S.
Number of pages: 6
Pages: 2569-2574
Publication date: 9 Aug 2018

Host publication information
Title of host publication: 2018 Annual American Control Conference, ACC 2018
Publisher: IEEE
ISBN (Print): 9781538654286

ASJC Scopus subject areas: Electrical and Electronic Engineering
Electronic versions:

HumDubACC18
DOIs:

10.23919/ACC.2018.8431686
URLs:

http://urn.fi/URN:NBN:fi:tty-201812052817

Bibliographical note
jufoid=65442
Source: Scopus
Source ID: 85052556418
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A Partial Internal Model for Approximate Robust Output Regulation of Boundary Control Systems
Introduced for finite-dimensional systems by Fran- cis and Wonham in the mid 70's, the internal model principle states that a stabilizing controller achieves asymptotic output tracking and disturbance rejection robustly if and only if it contains a p-copy of the exosystem frequencies, where p is the dimension of the output space of the plant. Later, the internal model principle has been extended, e.g., to boundary control systems on multidimensional spatial domains, and in this setting it follows from the principle that every robust output regulator is necessarily infinite-dimensional. However, it was recently established by the authors that robust approximate output tracking can be achieved with a finite-dimensional controller, and in the present paper, we formulate an internal model for this purpose. The efficiency of the method is numerically demonstrated using the heat equation on the unit square in $\mathbb{R}^2$ with boundary control and boundary observation.

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Mathematics, Research group: Computer Science and Applied Logics, Åbo Akademi University
Contributors: Humaloja, J., Paunonen, L., Kurula, M.
Number of pages: 6
Pages: 586-591
Publication date: 20 Jul 2018

Host publication information
Title of host publication: 23rd International Symposium on Mathematical Theory of Networks and Systems
Electronic versions:

HumPauMTNS18
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Robust controllers for a heat equation using the Galerkin approximation
We consider the robust output tracking problem for an unstable one-dimensional heat equation. As the main contribution we propose a new way of designing infinite-dimensional robust controllers based on Galerkin approximations of infinite-dimensional observer-based controllers. The results are illustrated with a concrete example where the finite-dimensional controllers are constructed using the Finite Element Method. The results are extendable for more general parabolic control systems.

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Phan-Duc, D., Paunonen, L.
Number of pages: 8
Pages: 856-863
Publication date: Jul 2018

Host publication information
Title of host publication: Proceedings of the 23rd International Symposium on Mathematical Theory of Networks and Systems
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Light, Shape and Space: Direct and Inverse Problems of Individual Objects and Populations
In this thesis, we examine two case studies. The first case studies how the shape of a celestial body influences an effect caused by light, while the second case analyzes how the light, in the form of brightness measurements, can give us

information about the shapes of celestial bodies. In the first problem, we discuss an effect where sunlight produces a torque that affects the rotational dynamics of small bodies. The effect was named YORP, after its observers Yarkovsky, O'Keefe, Radzievskii and Paddack. We derive analytical formulas for the YORP torques and a new quantity that expresses the maximum YORP effect caused by the sunlight for a given shape. We called this quantity YORP capacity. In addition, we estimate the upper bound of the YORP capacity, showing how it is theoretically unbounded, but for practical shapes, there is an approximate, finite upper bound. We also study the stability of the YORP effect against noise in the shape model, discovering that the absolute change in YORP capacity remains small with minor shape perturbations, but the relative change becomes large if the YORP capacity was initially small. Analyzing the shape models found in an asteroid database, we discovered that a majority of the shapes is unstable against shape perturbations, while a fraction of the shapes is semistable. The former case may explain why astronomers have obtained completely different results on the YORP effect when using shapes with different resolutions. All of the aforementioned are new results in the field of YORP research.

In the second case, we study an inverse problem where the quality of the data, given as time series, is so weak that it is no longer possible to reconstruct a model for an individual target. Therefore, rather than examining single targets, we focus on a large population of targets, and attempt to obtain information on the population. That is, we attempt to reconstruct a population-wide model. The characteristics of the population are described with a distribution function. This approach is completely new in the field of inverse problems. We discuss the forward model and the inverse problem, showing that even with weak data and a crude model, it is possible to obtain a unique joint distribution that gives us information about our two parameters, shape elongation and spin latitude. The accuracy of the solution is rough, but brings out the information that can be recovered from the data, and the distribution method is tolerant to data and model noise. We introduce some applications of the distribution method, such as a synthetic simulator for estimating the accuracy of the obtained solution, and some ways to measure the differences between the distributions obtained for different populations. In addition, we developed a software package that implements the distribution method and the above-mentioned applications on a user-given asteroid database. The software package can be used for experimenting with different populations, and inspecting different hypotheses or correlations. For example, we confirmed a previous study that the YORP effect has a noticeable effect on the distribution of spin latitudes on a specific asteroid family.

General information
Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Mathematics, Research group: Inverse Problems
Contributors: Nortunen, H.
Number of pages: 53
Publication date: 29 Jun 2018

Publication information
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-4164-3
ISBN (Electronic): 978-952-15-4169-8
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Volume: 1555
ISSN (Print): 1459-2045
Electronic versions:

nortunen 1555
URLs:

http://urn.fi/URN:ISBN:978-952-15-4169-8
Research output: Book/Report › Doctoral thesis › Collection of Articles

Multigrid-Based Inversion for Volumetric Radar Imaging With Asteroid Interior Reconstruction as a Potential Application

This study concentrates on advancing mathematical and computational methodology for radar tomography imaging in which the unknown volumetric velocity distribution of a wave within a bounded domain is to be reconstructed. Our goal is to enable effective simulation and inversion of a large amount of full-wave data within a realistic 2-D or 3-D geometry. For propagating and inverting the wave, we present a rigorous multigrid-based forward approach that utilizes the finite-difference time-domain method and a nested finite element grid structure. We also introduce and validate a multigrid-based inversion algorithm that allows regularization of the unknown distribution through a coarse-to-fine inversion scheme. Using this approach, sparse signals can be effectively inverted, as the coarse fluctuations are reconstructed before the finer ones. Furthermore, the number of nonzero entries in the system matrix can be compressed and, thus, the inversion procedure can be speeded up. As the test scenario, we investigate satellite-based asteroid interior reconstruction. We use both full-wave and projected wave data and estimate the accuracy of the inversion under different error sources: noise and positioning inaccuracies. The results suggest that the present inversion technique allows recovering the interior with a single satellite recording backscattering data. Robust results can be achieved, when the peak-to-peak signal-to-noise ratio is above 10 dB. Furthermore, the robustness for the deep interior part can be enhanced if two satellites can be utilized in

the measurements.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics
Contributors: Takala, M., Us, D., Pursiainen, S.
Number of pages: 13
Pages: 228-240
Publication date: 1 Jun 2018
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Computational Imaging
Volume: 4
Issue number: 2
ISSN (Print): 2333-9403
Ratings:

Scopus rating (2018): CiteScore 5.4 SJR 0.837 SNIP 3.18
Original language: English
Keywords: finite difference time-domain analysis, geometry, inverse problems, radar imaging, tomography, unknown volumetric velocity distribution, bounded domain, full-wave data, 3-D geometry, rigorous multigrid-based forward approach , finite-difference time-domain method, nested finite element grid structure, multigrid-based inversion algorithm, coarse-to-fine inversion scheme, asteroid interior reconstruction, inversion technique, single satellite recording backscattering data, peak-to-peak signal-to-noise ratio, deep interior part, volumetric radar imaging, mathematical methodology, computational methodology, radar tomography imaging, Image reconstruction, Solar system, Radar imaging, Permittivity, Tomography, Computational modeling, Multigrid methods, radio tomography, microw-ave tomography, asteroids, biomedical imaging
DOIs:

10.1109/TCI.2018.2811908
Source: Bibtex
Source ID: urn:e8d6524261193d516a9b65740487b26d
Research output: Contribution to journal › Article › Scientific › peer-review

Stabilization to trajectories for parabolic equations
Both internal and boundary feedback exponential stabilization to trajectories for semilinear parabolic equations in a given bounded domain are addressed. The values of the controls are linear combinations of a finite number of actuators which are supported in a small region. A condition on the family of actuators is given which guarantees the local stabilizability of the control system. It is shown that a linearization-based Riccati feedback stabilizing controller can be constructed. The results of numerical simulations are presented and discussed.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Johann Radon Institute for Computational and Applied Mathematics
Contributors: Phan, D., Rodrigues, S. S.
Publication date: 1 Jun 2018
Peer-reviewed: Yes

Publication information
Journal: Mathematics of Control, Signals, and Systems
Volume: 30
Issue number: 2
Article number: 11
ISSN (Print): 0932-4194
Ratings:

Scopus rating (2018): CiteScore 0.95 SJR 0.386 SNIP 0.701
Original language: English
ASJC Scopus subject areas: Control and Systems Engineering, Signal Processing, Control and Optimization, Applied Mathematics
Keywords: Feedback stabilization to trajectories, Semilinear parabolic equations
DOIs:

10.1007/s00498-018-0218-0
Source: Scopus
Source ID: 85050079985
Research output: Contribution to journal › Article › Scientific › peer-review

Asymptotic Behaviour of Coupled Systems in Discrete and Continuous Time

This paper investigates the asymptotic behaviour of solutions to certain infinite systems of coupled recurrence relations. In particular, we obtain a characterisation of those initial values which lead to a convergent solution, and for initial values satisfying a slightly stronger condition we obtain an optimal estimate on the rate of convergence. By establishing a connection with a related problem in continuous time, we are able to use this optimal estimate to improve the rate of convergence in the continuous setting obtained by the authors in a previous paper. We illustrate the power of the general approach by using it to study several concrete examples, both in continuous and in discrete time.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, St Giles
Contributors: Paunonen, L., Seifert, D.
Number of pages: 13
Pages: 433-445
Publication date: Jun 2018
Peer-reviewed: Yes
Early online date: 22 Aug 2016

Publication information

Journal: JOURNAL OF DYNAMICS AND DIFFERENTIAL EQUATIONS
Volume: 30
Issue number: 2
ISSN (Print): 1040-7294
Ratings:

Scopus rating (2018): CiteScore 1.29 SJR 1.014 SNIP 1.055
Original language: English
ASJC Scopus subject areas: Analysis
Keywords: C_0-semigroups, Asymptotic behaviour, Power-boundeness, Rates of convergence, Recurrence relations, Spectral theory, System
Electronic versions:

Author accepted manuscript
DOIs:

10.1007/s10884-016-9547-1
URLs:

http://urn.fi/URN:NBN:fi:tty-201709191892
Source: Scopus
Source ID: 84983514153
Research output: Contribution to journal › Article › Scientific › peer-review

Quantitative Tree Reconstruction from Terrestrial Laser Scanning Data and Applications

Understanding the structure and dynamics of trees and forest is key in studying the environment and understanding current and future climates. Development has been fast in measurement technology for these purposes, as it is currently possible to measure forest terrestrially with photography-based instruments or either static or mobile laser scanning, and airborne using drones, helicopters or aeroplanes, and even from space using satellitemounted instruments. However, as all these measurements are indirect presentations of the key attributes to study, they require powerful analysis methods to accompany them. This thesis focuses on terrestrial laser scanning data and presents a method for reconstructing comprehensive, quantitative structure models of trees from such data. The method is designed to be a tool for understanding tree and forest structure, as well as, dynamics and functionality, without the need for destructive measurements. The reconstructed models provide access to tree attributes previously impossible or laborious to measure, either at a single tree-scale, at forest-plot-scale or even at forest-scale. The thesis will present the reconstruction method and will focus on two of its applications: automatic tree species recognition and augmenting the produced structure models with leaves or needles, enabling more accurate simulations involving light propagation and plant interaction with the atmosphere. Additionally, parts of the thesis describe forms of dissemination used to promote the reconstruction method and its applications, increasing the rate of adoption into operational use. The dissemination approaches include several animations, interactive 3D models and open-source software.

General information

Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Mathematics, Research group: Inverse Problems
Contributors: Åkerblom, M.
Number of pages: 67

Publication date: 25 May 2018

Publication information
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-4140-7
ISBN (Electronic): 978-952-15-4147-6
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Volume: 1547
ISSN (Print): 1459-2045
Electronic versions:
akerblom 1547
URLs:
http://urn.fi/URN:NBN:fi:tty-201805091630
Research output: Book/Report › Doctoral thesis › Collection of Articles

The StarT Project Competition from the Perspective of Mathematics and Academic Literacy

This article concerns mathematical project work in the context of Finnish StarT project competition. The focus is on how well pupils achieve the learning objective of their project work: learning mathematics and practicing 21st century skills. Development of the learning objectives is considered from the viewpoint of Finnish national core curriculum and evaluated using the framework of academic literacy. The research material consists of teams' project reports, observation, and questionnaires. Project work in the StarT competition seems to develop the learning objectives of project-based learning: pupils practice 21st century skills while studying mathematical contents.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Viro, E., Joutsenlahti, J.
Publication date: 4 May 2018
Peer-reviewed: Yes

Publication information
Journal: EDUCATION SCIENCES
Volume: 8
Issue number: 2
ISSN (Print): 2227-7102
Ratings:
Scopus rating (2018): SNIP 5.305
Original language: English
Keywords: project-based learning, academic literacy, Mathematics, Education
Electronic versions:
education-08-00067
DOIs:
10.3390/educsci8020067
URLs:
http://urn.fi/URN:NBN:fi:tty-201805291877
Research output: Contribution to journal › Article › Scientific › peer-review

Paraconsistent Many-Valued Logic in GUHA Framework

The primary aim of this paper is to establish a formal connection between a particular many-valued paraconsistent logic and the logic of a KDD method, namely the GUHA data mining method by introducing a new quantifier called Paraconsistent Separation quantifier. This quantifier is implemented to LISp-Miner Software. The secondary aim is to demonstrate a possible usefulness of this quantifier in social and other applied sciences by examples taking from family planning context.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Turunen, E.
Number of pages: 8

Pages: 104-111
Publication date: 3 May 2018
Peer-reviewed: Yes

Publication information
Journal: Acta Informatica Pragensia, University of Economics, Prague
Volume: 7
Issue number: 1
ISSN (Print): 1805-4951
Original language: English
DOIs:

10.18267/j.aip.116
Research output: Contribution to journal › Article › Scientific › peer-review

Uncertainty in multispectral lidar signals caused by incidence angle effects
Multispectral terrestrial laser scanning (TLS) is an emerging technology. Several manufacturers already offer commercial dual or three wavelength airborne laser scanners, while multispectral TLS is still carried out mainly with research instruments. Many of these research efforts have focused on the study of vegetation. The aim of this paper is to study the uncertainty of the measurement of spectral indices of vegetation with multispectral lidar. Using two spectral indices as examples, we find that the uncertainty is due to systematic errors caused by the wavelength dependency of laser incidence angle effects. This finding is empirical, and the error cannot be removed by modelling or instrument modification. The discovery and study of these effects has been enabled by hyperspectral and multispectral TLS, and it has become a subject of active research within the past few years. We summarize the most recent studies on multi-wavelength incidence angle effects and present new results on the effect of specular reflection from the leaf surface, and the surface structure, which have been suggested to play a key role. We also discuss the consequences to the measurement of spectral indices with multispectral TLS, and a possible correction scheme using a synthetic laser footprint.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Department of Navigation and Positioning, FGI
Contributors: Kaasalainen, S., Åkerblom, M., Nevalainen, O., Hakala, T., Kaasalainen, M.
Publication date: 6 Apr 2018
Peer-reviewed: Yes

Publication information
Journal: Interface Focus
Volume: 8
Issue number: 2
Article number: 20170033
ISSN (Print): 2042-8898
Ratings:

Scopus rating (2018): CiteScore 2.97 SJR 1.138 SNIP 0.939
Original language: English
ASJC Scopus subject areas: Biotechnology, Biophysics, Bioengineering, Biochemistry, Biomaterials, Biomedical Engineering
Keywords: Hyperspectral, Incidence angle, Laser scanning, Vegetation
Electronic versions:

20170033.full
DOIs:

10.1098/rsfs.2017.0033
URLs:

http://urn.fi/URN:NBN:fi:tty-201804061460
Source: Scopus
Source ID: 85043458754
Research output: Contribution to journal › Article › Scientific › peer-review

Distribution of shape elongations of main belt asteroids derived from Pan-STARRS1 photometry
Context. A considerable amount of photometric data is produced by surveys such as Pan-STARRS, LONEOS, WISE, or Catalina. These data are a rich source of information about the physical properties of asteroids. There are several possible approaches for using these data. Light curve inversion is a typical method that works with individual asteroids. Our approach in focusing on large groups of asteroids, such as dynamical families and taxonomic classes, is statistical; the data are not sufficient for individual models.Aim. Our aim is to study the distributions of shape elongation ba and the spin axis latitude β for various subpopulations of asteroids and to compare our results, based on Pan-STARRS1 survey, with statistics previously carried out using various photometric databases, such as Lowell and WISE.Methods. We used the

LEADER algorithm to compare the ba and β distributions for various subpopulations of asteroids. The algorithm creates a cumulative distributive function (CDF) of observed brightness variations, and computes the ba and β distributions with analytical basis functions that yield the observed CDF. A variant of LEADER is used to solve the joint distributions for synthetic populations to test the validity of the method.Results. When comparing distributions of shape elongation for groups of asteroids with different diameters D, we found that there are no differences for D < 25 km. We also constructed distributions for asteroids with different rotation periods and revealed that the fastest rotators with P = 0 - 4 h are more spheroidal than the population with P = 4-8 h.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Charles University in Prague, Harvard-Smithsonian Center for Astrophysics, Institute for Astronomy University of Hawaii, Northern Arizona University
Contributors: Cibulková, H., Nortunen, H., Ďurech, J., Kaasalainen, M., Vereš, P., Jedicke, R., Wainscoat, R. J., Mommert, M., Trilling, D. E., Schunová-Lilly, E., Magnier, E. A., Waters, C., Flewelling, H.
Number of pages: 10
Publication date: 1 Mar 2018
Peer-reviewed: Yes

Publication information

Journal: Astronomy and Astrophysics
Volume: 611
Article number: A86
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2018): CiteScore 4.54 SJR 2.527 SNIP 1.233
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: asteroids, general, Methods, Minor planets, photometric, statistical, Techniques
Electronic versions:

aa31554-17
DOIs:

10.1051/0004-6361/201731554
URLs:

http://urn.fi/URN:NBN:fi:tuni-201910033663
Source: Scopus
Source ID: 85045197138
Research output: Contribution to journal › Article › Scientific › peer-review

Analysis of common rail pressure signal of dual-fuel large industrial engine for identification of injection duration of pilot diesel injectors

In this paper, we address the problem of identification of injection duration of common rail (CR) diesel pilot injectors of dual-fuel engines. In these pilot injectors, the injected volume is small and the repeatability of injections and identification of drifts of injectors are important factors, which need to be taken into account in order to achieve good repeatability (shot-to-shot with every cylinder) and therefore a well-balanced engine and furthermore reduced overall wear. This information can then be used for calibration and diagnostics purposes to guarantee engine longevity facilitated by consistent operating conditions throughout the life of the unit. A diagnostics method based on analysis of CR pressure with experimental results is presented in this paper. Using the developed method, the relative duration of injection events can be identified for multiple injectors. We use the phenomenon of drop in rail pressure due to an injection event as a feature of the injection process. The method is based on filtered CR pressure data during and after the injection event. First, the pressure signal during injection is extracted after control of each injection event. After that, the signal is normalized and filtered. Then a derivative of the filtered signal is calculated. Change in the derivative of the filtered signal larger than a predefined threshold indicates an injection event that can be detected and its relative duration can be identified. We present the experimental results and demonstrate the efficacy of the proposed methods using two different types of pressure sensors. We are able to properly identify a change of ≥10 μs (2%, 500 μs) in injection time. This shows that the developed method detects drifts in injection duration and the magnitude of drift. This information can be used for adaptive control of injection duration, so that finally the injected fuel volume is the same as the original.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Automation and Hydraulic Engineering
Contributors: Krogerus, T., Hyvönen, M., Huhtala, K.
Pages: 1-9
Publication date: Mar 2018

Peer-reviewed: Yes
Early online date: 6 Dec 2017

Publication information
Journal: Fuel
Volume: 216
ISSN (Print): 0016-2361
Ratings:

Scopus rating (2018): CiteScore 5.8 SJR 1.745 SNIP 2.012
Original language: English
ASJC Scopus subject areas: Mechanical Engineering, Signal Processing, Modelling and Simulation, Applied Mathematics
Keywords: Analysis , Dual-fuel engine , Diesel , Common rail , Injector , Rail pressure
DOIs:

10.1016/j.fuel.2017.11.152
URLs:

http://urn.fi/URN:NBN:fi:tty-201712222489. Embargo ends: 6/12/19
Research output: Contribution to journal › Article › Scientific › peer-review

Approximate Bayesian inference methods for stochastic state space models

This thesis collects together research results obtained during my doctoral studies related to approximate Bayesian inference in stochastic state-space models. The published research spans a variety of topics including 1) application of Gaussian filtering in satellite orbit prediction, 2) outlier robust linear regression using variational Bayes (VB) approximation, 3) filtering and smoothing in continuous-discrete Gaussian models using VB approximation and 4) parameter estimation using twisted particle filters. The main goal of the introductory part of the thesis is to connect the results to the general framework of estimation of state and model parameters and present them in a unified manner.

Bayesian inference for non-linear state space models generally requires use of approximations, since the exact posterior distribution is readily available only for a few special cases. The approximation methods can be roughly classified into to groups: deterministic methods, where the intractable posterior distribution is approximated from a family of more tractable distributions (e.g. Gaussian and VB approximations), and stochastic sampling based methods (e.g. particle filters). Gaussian approximation refers to directly approximating the posterior with a Gaussian distribution, and can be readily applied for models with Gaussian process and measurement noise. Well known examples are the extended Kalman filter and sigma-point based unscented Kalman filter. The VB method is based on minimizing the Kullback-Leibler divergence of the true posterior with respect to the approximate distribution, chosen from a family of more tractable simpler distributions.

The first main contribution of the thesis is the development of a VB approximation for linear regression problems with outlier robust measurement distributions. A broad family of outlier robust distributions can be presented as an infinite mixture of Gaussians, called Gaussian scale mixture models, and include e.g. the t-distribution, the Laplace distribution and the contaminated normal distribution. The VB approximation for the regression problem can be readily extended to the estimation of state space models and is presented in the introductory part.

VB approximations can be also used for approximate inference in continuous-discrete Gaussian models, where the dynamics are modeled with stochastic differential equations and measurements are obtained at discrete time instants. The second main contribution is the presentation of a VB approximation for these models and the explanation of how the resulting algorithm connects to the Gaussian filtering and smoothing framework.

The third contribution of the thesis is the development of parameter estimation using particle Markov Chain Monte Carlo (PMCMC) method and twisted particle filters. Twisted particle filters are obtained from standard particle filters by applying a special weighting to the sampling law of the filter. The weighting is chosen to minimize the variance of the marginal likelihood estimate, and the resulting particle filter is more efficient than conventional PMCMC algorithms. The exact optimal weighting is generally not available, but can be approximated using the Gaussian filtering and smoothing framework.

General information
Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Mathematics
Contributors: Ala-Luhtala, J.
Number of pages: 56
Publication date: 23 Feb 2018

Publication information
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-4091-2
ISBN (Electronic): 978-952-15-4106-3

Original language: English

Publication series
Name: Tampere University of Technology. Publication
Volume: 1528
ISSN (Print): 1459-2045
Electronic versions:
alaluhtala 1528
URLs:
http://urn.fi/URN:ISBN:978-952-15-4106-3
Research output: Book/Report › Doctoral thesis › Collection of Articles

Minimal Characterization of O-notation in Algorithm Analysis
Previously, we showed that linear dominance is the only definition of O-notation suitable for algorithm analysis [1,2]. Linear dominance was characterized by 8 primitive properties as a down-set of a non-trivial scale-invariant preorder which is preserved under certain modifications to algorithms and is consistent with pointwise partial order. In this paper, we provide a minimal characterization of O-notation, where there are no redundant properties. Such is given by excluding locality from primitive properties.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics
Contributors: Rutanen, K.
Pages: 31-41
Publication date: Feb 2018
Peer-reviewed: Yes
Early online date: 27 Dec 2017

Publication information
Journal: Theoretical Computer Science
Volume: 713
ISSN (Print): 0304-3975
Ratings:
Scopus rating (2018): CiteScore 1.23 SJR 0.494 SNIP 1.072
Original language: English
Keywords: O-notation, characterization, minimal
DOIs:
10.1016/j.tcs.2017.12.026
Source: RIS
Source ID: urn:31587026E9CB9CBC88F2461C9E8F550F
Research output: Contribution to journal › Article › Scientific › peer-review

Robust output tracking and disturbance rejection for a 2D heat equation

General information
Publication status: Published
MoE publication type: I1 Audiovisual material
Organisations: Mathematics
Contributors: Paunonen, L.
Publication date: 17 Jan 2018
Media of output: Online
URLs:
https://www.youtube.com/watch?v=BkUZ0jt2ogY
Research output: Artistic and non-textual form › Digital or Visual Products › Scientific

Analysing and Improving Student's Mathematics Skills using ICT-tools
In this paper the supportive actions taken at Tampere University of Technology (TUT) for the first year students in engineering mathematics are discussed. The measures include Basic Skill’s Test (BST), Mathematics Remedial Instruction (MRI), and student profiling based on students' attitudes on learning. Specially, we describe how MRI was implemented in Math-Bridge and carried out at TUT. The effects of MRI for different learner groups using success indicators, log file analysis, and statistical methods are presented and clarified using data visualization.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics, School of Ylöjärvi
Contributors: Pohjolainen, S., Nykänen, O., Venho, J., Kangas, J.
Number of pages: 7
Pages: 1221-1227
Publication date: 8 Jan 2018
Peer-reviewed: Yes

Publication information
Journal: EURASIA JOURNAL OF MATHEMATICS, SCIENCE & TECHNOLOGY EDUCATION
Volume: 14
Issue number: 4
Article number: 14(4)
ISSN (Print): 1305-8223
Ratings:

Scopus rating (2018): CiteScore 1.27
Original language: English
Keywords: Science education, Teacher education, Biology Education, Environmental education
Electronic versions:

Analysing and Improving
DOIs:

10.29333/ejmste/81869
URLs:

http://urn.fi/URN:NBN:fi:tty-201801171106
Research output: Contribution to journal › Article › Scientific › peer-review

NP-completeness results for partitioning a graph into total dominating sets
A total domatic k-partition of a graph is a partition of its vertex set into k subsets such that each intersects the open neighborhood of each vertex. The maximum k for which a total domatic k-partition exists is known as the total domatic number of a graph G, denoted by $d_t(G)$. We extend considerably the known hardness results by showing it is[Formula presented]-complete to decide whether $d_t(G)\geq 3$ where G is a bipartite planar graph of bounded maximum degree. Similarly, for every $k\geq 3$, it is[Formula presented]-complete to decide whether $d_t(G)\geq k$, where G is split or k-regular. In particular, these results complement recent combinatorial results regarding $d_t(G)$ on some of these graph classes by showing that the known results are, in a sense, best possible. Finally, for general n-vertex graphs, we show the problem is solvable in $2^n n^{O(1)}$ time, and derive even faster algorithms for special graph classes.

General information
Publication status: E-pub ahead of print
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, University of Helsinki
Contributors: Koivisto, M., Laakkonen, P., Lauri, J.
Publication date: 1 Jan 2018
Peer-reviewed: Yes

Publication information
Journal: Theoretical Computer Science
ISSN (Print): 0304-3975
Ratings:

Scopus rating (2018): CiteScore 1.23 SJR 0.494 SNIP 1.072
Original language: English
ASJC Scopus subject areas: Theoretical Computer Science, Computer Science(all)
Keywords: Combinatorics, Computational complexity, Graph theory, Total domatic number
DOIs:

10.1016/j.tcs.2018.04.006
Source: Scopus
Source ID: 85045701638
Research output: Contribution to journal › Article › Scientific › peer-review

On the spectral and Frobenius norm of a generalized Fibonacci r-circulant matrix
Consider the recursion $g_0 = a$, $g_1 = b$, $g_n = g_{n-1} + g_{n-2}$, $n = 2, 3, \ldots$. We compute the Frobenius norm of the r-circulant matrix corresponding to $g_0, \ldots, g_{n-1}$. We also give three lower bounds (with equality conditions) for the spectral norm of this matrix. For this purpose, we present three ways to estimate the spectral norm from below in general.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Lulea University of Technology
Contributors: Merikoski, J. K., Haukkanen, P., Mattila, M., Tossavainen, T.
Number of pages: 14
Pages: 23-36
Publication date: 1 Jan 2018
Peer-reviewed: Yes

Publication information
Journal: Special Matrices
Volume: 6
Issue number: 1
ISSN (Print): 2300-7451
Ratings:

Scopus rating (2018): CiteScore 0.64 SJR 0.408 SNIP 1.005
Original language: English
ASJC Scopus subject areas: Algebra and Number Theory, Geometry and Topology
Keywords: Euclidean norm, Frobenius norm, generalized Fibonacci numbers, r-circulant matrix, spectral norm
Electronic versions:

spma-2018-0003
DOIs:

10.1515/spma-2018-0003
URLs:

http://urn.fi/URN:NBN:fi:tty-201803131371
Source: Scopus
Source ID: 85042290997
Research output: Contribution to journal › Article › Scientific › peer-review

10 kA Joints for HTS Roebel Cables
Future HTS high field magnets using multi-tape HTS cables need 10 kA low resistance connections. The connections are needed between the poles of the magnets and at the terminals in a wide operating temperature range, from 1.9-85 K. The EuCARD WP10 Future Magnets collaboration aims at testing HTS based Roebel cables in an accelerator magnet. Usually, LTS cables are jointed inside a relatively short soldered block. Powering tests at CERN have highlighted excess heating of a joint following classical LTS joint design. The HTS Roebel cables are assembled from REBCO coated conductor tapes in a transposed configuration. Due to this, the tapes surface the cable at an angle with the cable axis. A low-resistance joint requires a sufficiently large interface area for each tape. Within one twist pitch length, each tape is located at the surface of the cable over a relatively small non-constant area. This geometry prevents making a well-controlled joint in a compact length along the cable. This paper presents a compact joint configuration for the Roebel cable overcoming these practical challenges. A new joint called fin-block is designed. The joint resistance is estimated computationally. Finally the test results as a function of current and temperature are presented.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Electrical Energy Engineering, European Organization for Nuclear Research
Contributors: Murtomaeki, J. S., Kirby, G., van Nugteren, J., Contat, P. A., Fleiter, J., De Frutos, O. S., Pincot, F. O., DeRijk, G., Rossi, L., Ruuskanen, J., Stenvall, A., Wolf, F.
Publication date: 2018
Peer-reviewed: Yes
Early online date: 9 Feb 2018

Publication information
Journal: IEEE Transactions on Applied Superconductivity
Volume: 28
Issue number: 3
ISSN (Print): 1051-8223
Ratings:

Scopus rating (2018): CiteScore 1.65 SJR 0.406 SNIP 0.969
Original language: English
ASJC Scopus subject areas: Electronic, Optical and Magnetic Materials, Condensed Matter Physics, Electrical and Electronic Engineering
Keywords: Cables and current leads, Heating systems, High-temperature superconductors, HTS Magnets, Pressure Measurement, Resistance, Resistance measurement, Soldering, Superconducting cables, Superconducting magnets, Superconducting Magnets, Temperature measurement

DOIs:
10.1109/TASC.2018.2804951
Source: Scopus
Source ID: 85041856536
Research output: Contribution to journal › Article › Scientific › peer-review

A case study of focal bayesian EEG inversion for whitney element source spaces: Mesh-based vs. cartesian orientations
This paper concentrates on the Bayesian detection of the neuronal current distributions in the electroencephalography (EEG) imaging of the brain activity. In particular, we focus on a hierarchical maximum a posteriori inversion technique applicable when the lead field matrix is constructed via the finite element method. We utilize the linear Whitney (Raviart-Thomas) basis functions as source currents. In the numerical experiments, the accuracy was investigated using two spherical head models. The results obtained suggest that the interpolation of the dipolar source space does not necessarily bring any advantage for FEM based inverse computations. Furthermore, the divergence conforming Whitney-type sources were found to be sufficient for precise and highly focal Bayesian modeling of dipole-like currents.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Inverse Problems
Contributors: Miinalainen, T., Pursiainen, S.
Number of pages: 4
Pages: 1065-1068
Publication date: 2018

Host publication information
Title of host publication: EMBEC and NBC 2017 - Joint Conference of the European Medical and Biological Engineering Conference EMBEC 2017 and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics, NBC 2017
Publisher: Springer Verlag
ISBN (Print): 9789811051210

Publication series
Name: IFMBE Proceedings
Volume: 65
ISSN (Print): 1680-0737
ASJC Scopus subject areas: Biomedical Engineering, Bioengineering
Keywords: Electroencephalography (EEG), Finite element method (FEM), Hierarchical Bayesian inverse model, Whitney elements
DOIs:
10.1007/978-981-10-5122-7_266

Bibliographical note
jufoid=58152
Source: Scopus
Source ID: 85021711207
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Cauchy–Riemann Operators in Octonionic Analysis
In this paper we first recall the definition of the octonion algebra and its algebraic properties. We derive the so called e_4-calculus and using it we obtain the list of generalized Cauchy–Riemann systems for octonionic monogenic functions.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics, Civil Engineering
Contributors: Kauhanen, J., Orelma, H.
Publication date: 2018
Peer-reviewed: Yes
Early online date: Jan 2018

Publication information
Journal: Advances in Applied Clifford Algebras
Volume: 28
Issue number: 1
Article number: 1
ISSN (Print): 0188-7009

Ratings:

Scopus rating (2018): CiteScore 0.9 SJR 0.4 SNIP 0.899
Original language: English
ASJC Scopus subject areas: Applied Mathematics
Keywords: Cauchy–Riemann operators, Dirac operators, Monogenic functions, Octonions
Electronic versions:

CauchyRiemannOperators
DOIs:

10.1007/s00006-018-0826-2
URLs:

http://urn.fi/URN:NBN:fi:tty-201908211996
Source: Scopus
Source ID: 85041309780
Research output: Contribution to journal › Article › Scientific › peer-review

Computing minimum rainbow and strong rainbow colorings of block graphs

A path in an edge-colored graph G is rainbow if no two edges of it are colored the same. The graph G is rainbowconnected if there is a rainbow path between every pair of vertices. If there is a rainbow shortest path between every pair of vertices, the graph G is strongly rainbow-connected. The minimum number of colors needed to make G rainbow-connected is known as the rainbow connection number of G, and is denoted by rc(G). Similarly, the minimum number of colors needed to make G strongly rainbow-connected is known as the strong rainbow connection number ofG, and is denoted by src(G). We prove that for every k ≥ 3, deciding whether src(G) ≤ k is NP-complete for split graphs, which form a subclass of chordal graphs. Furthermore, there exists no polynomial-time algorithm for approximating the strong rainbow connection number of an n-vertex split graph with a factor of n^{1-2-} for any > 0 unless P = NP. We then turn our attention to block graphs, which also form a subclass of chordal graphs. We determine the strong rainbow connection number of block graphs, and show it can be computed in linear time. Finally, we provide a polynomial-time characterization of bridgeless block graphs with rainbow connection number at most 4.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Michigan Technological University, Bell Labs
Contributors: Keranen, M., Lauri, J.
Publication date: 2018
Peer-reviewed: Yes

Publication information

Journal: Discrete Mathematics and Theoretical Computer Science
Volume: 20
Issue number: 1
Article number: 22
ISSN (Print): 1462-7264
Original language: English
ASJC Scopus subject areas: Theoretical Computer Science, Computer Science(all), Discrete Mathematics and Combinatorics
Keywords: Block graph, Computational complexity, Rainbow coloring
Electronic versions:

pdf
DOIs:

10.23638/DMTCS-20-1-22
URLs:

http://urn.fi/URN:NBN:fi:tty-201807312042
Source: Scopus
Source ID: 85049392046
Research output: Contribution to journal › Article › Scientific › peer-review

Engineering Mathematics Education in Finland: A Comparative Analysis of EU, Russia, Georgia and Armenia

General information

Publication status: Published
MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material
Organisations: Mathematics, Research group: Computer Science and Applied Logics

Contributors: Pohjolainen, S., Myllykoski, T.
Number of pages: 7
Pages: 69-75
Publication date: 2018

Host publication information
Title of host publication: Modern Mathematics Education for Engineering Curricula in Europe
Publisher: Birkhäuser
Editors: Pohjolainen, S., Myllykoski, T., Mercat, C., Sosnovsky, S.
ISBN (Print): 978-3-319-71415-8
ISBN (Electronic): 978-3-319-71416-5
URLs:

https://link.springer.com/book/10.1007%2F978-3-319-71416-5
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

Fair testing and stubborn sets
Partial order methods alleviate state explosion by considering only a subset of actions in each constructed state. The choice of the subset depends on the properties that the method promises to preserve. Many methods have been developed ranging from deadlock-preserving to CTL(Formula presented.)-preserving and divergence-sensitive branching bisimilarity preserving. The less the method preserves, the smaller state spaces it constructs. Fair testing equivalence unifies deadlocks with livelocks that cannot be exited and ignores the other livelocks. It is the weakest congruence that preserves whether or not the system may enter a livelock that it cannot leave. We prove that a method that was designed for trace equivalence also preserves fair testing equivalence. We demonstrate its effectiveness on a protocol with a connection and data transfer phase. This is the first practical partial order method that deals with a practical fairness assumption.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, University of Augsburg
Contributors: Valmari, A., Vogler, W.
Number of pages: 22
Pages: 589-610
Publication date: 2018
Peer-reviewed: Yes
Early online date: 11 Dec 2017

Publication information
Journal: International Journal on Software Tools for Technology Transfer
ISSN (Print): 1433-2779
Ratings:

Scopus rating (2018): CiteScore 2.39 SJR 0.472 SNIP 1.648
Original language: English
ASJC Scopus subject areas: Software, Information Systems
Keywords: Fair testing equivalence, Fairness, Partial order methods, Progress, Stubborn sets
Electronic versions:

fairSTTT. Embargo ended: 11/12/18
DOIs:

10.1007/s10009-017-0481-2
URLs:

http://urn.fi/URN:NBN:fi:tty-201811222757. Embargo ended: 11/12/18
Source: Scopus
Source ID: 85037686390
Research output: Contribution to journal › Article › Scientific › peer-review

Far-Field Inversion for the Deep Interior Scanning CubeSat
This study aims at advancing mathematical and computational techniques for reconstructing the interior structure of a small Solar System body via Computed Radar Tomography (CRT). We introduce a far-field model for full-wave CRT and validate it numerically for an orbiting distance of 5 km using a synthetic 3D target asteroid and sparse limited-angle data. As a potential future application of the proposed method, we consider the Deep Interior Scanning CUbeSat (DISCUS) concept in which the goal is to localize macroporosities inside a rubble pile near-Earth asteroid with two small spacecraft carrying a bistatic radar.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Max Planck Institute for Solar System Research, MEW-Aerospace, RST Radar Systemtechnik AG
Contributors: Takala, M., Bambach, P., Deller, J., Vilenius, E., Wittig, M., Lentz, H., Braun, H. M., Kaasalainen, M., Pursiainen, S.
Number of pages: 27
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Aerospace and Electronic Systems
ISSN (Print): 0018-9251
Ratings:

Scopus rating (2018): CiteScore 3.5 SJR 0.798 SNIP 1.749
Original language: English
ASJC Scopus subject areas: Aerospace Engineering, Electrical and Electronic Engineering
Keywords: Cathode ray tubes, Computed Radar Tomography, Extraterrestrial measurements, Far-Field Measurements, Frequency measurement, Inverse Imaging, Near-Earth Asteroids, Radar, Small Solar System Bodies, Space vehicles
DOIs:

10.1109/TAES.2018.2874755
Source: Scopus
Source ID: 85054614162
Research output: Contribution to journal › Article › Scientific › peer-review

Kehittämistutkimus: vuorovaikutteisten Matlab-opetusohjelmien vaikutus minäpystyvyyteen ja oppimistuloksiin yliopistomatematiikassa

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics, Research group: Positioning
Contributors: Kaarakka, T. E., Ali-Löytty, S., Huhtanen, M.
Number of pages: 11
Pages: 67-77
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: FMSERA Journal
Volume: 2
Issue number: 1
ISSN (Print): 2489-4583
Original language: Finnish
URLs:

https://journal.fi/fmsera/issue/view/5356
Research output: Contribution to journal › Article › Scientific › peer-review

Matematiikan oppimisen tukeminen teknillisessä yliopistokoulutuksessa

General information
Publication status: Published
MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material
Organisations: Mathematics, Guangdong Technion-Israel Institute of Technology, Technion
Contributors: Pohjolainen, S., Rasila, A., Kuosa, K.
Number of pages: 24
Pages: 450-474
Publication date: 2018

Host publication information
Title of host publication: Matematiikan opetus ja oppiminen
Place of publication: Porvoo
Publisher: Niilo Mäki Instituutti

Editors: Joutsenlahti, J., Silfverberg, H., Räsänen, P.
ISBN (Print): 978-951-39-7584-5
ASJC Scopus subject areas: Mathematics(all), Social Sciences(all)
Keywords: mathematics education, mathematics teaching, mathematics learning
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

Mathematics Education in EU for STEM Disciplines

General information
Publication status: Published
MoE publication type: B2 Part of a book or another research book
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Pohjolainen, S.
Number of pages: 6
Pages: 1-6
Publication date: 2018

Host publication information
Title of host publication: Modern Mathematics Education for Engineering Curricula in Europe : A Comparative Analysis of EU, Russia, Georgia and Armenia
Publisher: Birkhäuser
Editors: Pohjolainen, S., Myllykoski, T., Mercat, C., Sosnovsky, S.
ISBN (Print): 978-3-319-71415-8
ISBN (Electronic): 978-3-319-71416-5
Electronic versions:

Pohjolainen2018_Chapter_Introduction
DOIs:

10.1007/978-3-319-71416-5_1
URLs:

http://urn.fi/URN:NBN:fi:tty-201812172864
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific

Modern Mathematics Education for Engineering Curricula in Europe: A Comparative Analysis of EU, Russia, Georgia and Armenia

General information
Publication status: Published
MoE publication type: C2 Edited books
Organisations: Mathematics, Universite Claude Bernard Lyon 1, France, October 19th, 2009, German Research Center for Artificial Intelligence
Contributors: Pohjolainen, S. (ed.), Myllykoski, T. (ed.), Mercat, C. (ed.), Sosnovsky, S. (ed.)
Publication date: 2018

Publication information
Publisher: Birkhäuser
ISBN (Electronic): 978-3-319-71416-5
Original language: English
DOIs:

10.1007/978-3-319-71416-5
Research output: Book/Report › Anthology › Scientific › peer-review

On the fine-grained complexity of rainbow coloring
The Rainbow k-Coloring problem asks whether the edges of a given graph can be colored in k colors so that every pair of vertices is connected by a rainbow path, i.e., a path with all edges of different colors. Our main result states that for any k ≥ 2, there is no algorithm for Rainbow k-Coloring running in time $2^{o(n^{3/2})}$, unless the exponential time hypothesis fails. Motivated by this negative result we consider two parameterized variants of the problem. In the Subset Rainbow k-Coloring problem, introduced by Chakraborty et al. [J. Comb. Optim., 21 (2009), pp. 330-347], we are additionally given a set S of pairs of vertices and we ask if there is a coloring in which all the pairs in S are connected by rainbow paths. We show that Subset Rainbow k-Coloring is fixed parameter tractable (FPT) when parameterized by |S|. We also study the Maximum Rainbow k-Coloring problem, where we are additionally given an integer q, and we ask if there is a coloring in which at least q anti-edges are connected by rainbow paths. We show that the problem is FPT when parameterized by q and has a kernel of size O(q) for every k ≥ 2, extending the result of Ananth, Nasre, and Sarpatwar, in FSTTCS, LIPIcs, Schloss Dagstuhl-Leibniz-Zentum für Informatik, Dagstuhl, Germany, 2011, pp. 241-251. We believe that our techniques used for the lower bounds may shed some light on the complexity of the classical Edge Coloring problem, where it is a

major open question if a $2^{O(n)}$-time algorithm exists.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, University of Warsaw, Institute of Informatics, Bell Labs
Contributors: Kowalik, L., Lauri, J., La, A. S.
Number of pages: 34
Pages: 1672-1705
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: SIAM Journal on Discrete Mathematics
Volume: 32
Issue number: 3
ISSN (Print): 0895-4801
Ratings:

Scopus rating (2018): CiteScore 1.07 SJR 0.958 SNIP 1.221
Original language: English
ASJC Scopus subject areas: Mathematics(all)
Keywords: Computational complexity, FPT algorithms, Graph coloring, Lower bounds
DOIs:

10.1137/16M1102690
Source: Scopus
Source ID: 85053925686
Research output: Contribution to journal › Article › Scientific › peer-review

Overview of the Results and Recommendations

General information
Publication status: Published
MoE publication type: B2 Part of a book or another research book
Organisations: Mathematics, Research group: Computer Science and Applied Logics, Department of Information and Computing Sciences (Utrecht University), Universite Claude Bernard Lyon 1, France, October 19th, 2009
Contributors: Pohjolainen, S., Sosnovsky, S., Mercat, C.
Number of pages: 12
Pages: 185-196
Publication date: 2018

Host publication information
Title of host publication: Modern Mathematics Education for Engineering Curricula in Europe : A Comparative Analysis of EU, Russia, Georgia and Armenia
Place of publication: Switzerland
Publisher: Birkhäuser
Editors: Pohjolainen, S., Myllykoski, T., Mercat, C., Sosnovsky, S.
ISBN (Print): 978-3-319-71415-8
ISBN (Electronic): 978-3-319-71416-5
Electronic versions:

Sosnovsky2018_Chapter_OverviewOfTheResultsAndRecomme
DOIs:

10.1007/978-3-319-71416-5_10
URLs:

http://urn.fi/URN:NBN:fi:tty-201812172863
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific

Projektityöskentelyn kehittäminen yläkoulun matematiikan opetuksessa
Perusopetuksen opetussuunnitelman perusteiden 2014 aikana ovat ilmiölähtöinen oppiminen ja projektiluontoinen työskentely lisääntyneet peruskouluissa merkittävästi. Tässä tutkimuksessa tarkastellaan oppilaan ja opettajan näkökulmasta lähinnä yläkoulun matematiikan opetukseen liitetyn projektityöskentelyn kehittämiskohteita sekä niihin mahdollisia kehittämisehdotuksia. Tutkimusaineistoa on kerätty kyselylomakkeilla ja havainnoinnilla LUMA Suomen Projektioppiminen-kehittämishankkeesta, StarT-projektikilpailusta ja Teknologiateollisuuden My TecH –ohjelmasta. Tutkimukseen osallistui 365 oppilasta ja 19 opettajaa. Projektityöskentelyn suurimmat haasteet voidaan luokitella oppilaan ja opettajan toimintaan, itse projektiin tai koulutoiminnan puitteisiin liittyviksi. Jokaiseen osa-alueeseen opettaja voi omalla toiminnallaan vaikuttaa.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Tampereen yliopisto
Contributors: Viro, I. E., Joutsenlahti, J.
Number of pages: 10
Pages: 90-99
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: FMSERA Journal
Volume: 2
Issue number: 1
ISSN (Print): 2489-4583
Original language: Finnish
URLs:

https://journal.fi/fmsera/article/view/69879
Research output: Contribution to journal › Article › Scientific › peer-review

Robust Regulation of Infinite-Dimensional Port-Hamiltonian Systems
We will give general sufficient conditions under which a controller achieves robust regulation for a boundary control and observation system. Utilizing these conditions we construct a minimal order robust controller for an arbitrary order impedance passive linear port-Hamiltonian system. The theoretical results are illustrated with a numerical example where we implement a controller for a one-dimensional Euler-Bernoulli beam with boundary controls and boundary observations.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Humaloja, J., Paunonen, L.
Publication date: 2018
Peer-reviewed: Yes
Early online date: 31 Aug 2017

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 63
Issue number: 5
ISSN (Print): 0018-9286
Ratings:

Scopus rating (2018): CiteScore 6.72 SJR 3.233 SNIP 2.626
Original language: English
ASJC Scopus subject areas: Control and Systems Engineering, Computer Science Applications, Electrical and Electronic Engineering
Keywords: Aerospace electronics, Closed loop systems, distributed parameter systems, Generators, Impedance, linear systems, port-Hamiltonian systems, robust control, Robustness, Transfer functions
Electronic versions:

08023782
DOIs:

10.1109/TAC.2017.2748055
URLs:

http://urn.fi/URN:NBN:fi:tty-201710162011
Source: Scopus
Source ID: 85029173308
Research output: Contribution to journal › Article › Scientific › peer-review

Wearable RFID perspiration sensor tags for well-being applications – From laboratory to field use
RFID technology has proven to have many possibilities in sensing applications. Smart sensor solutions would be especially helpful in the health and well-being sectors. There is already research on wearable RFID-based sensors, but most are only tested in controlled laboratory environments. The emphasis of this paper is 1) to analyze the performance of two moisture sensor textile tags in realistic field use and through this 2) to discuss their application possibilities. Based on the measurement results, different kinds of textile tags were differently affected by moisture. Especially with embroidered tags the presence of moisture could be detected, including in field conditions. Many applications were also found for the tags. The results indicate potential of RFID-based sensing also in field use, but the actual use environment must be

carefully taken into account when implementing the technology.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Wireless Identification and Sensing Systems Research Group, Mathematics, Research group: Inverse Problems, BioMediTech, Satakunta University of Applied Sciences, Satakunta University of Applied Sciences
Contributors: Mulholland, K., Virkki, J., Raumonen, P., Merilampi, S.
Number of pages: 4
Pages: 1012-1015
Publication date: 2018

Host publication information
Title of host publication: EMBEC and NBC 2017 - Joint Conference of the European Medical and Biological Engineering Conference EMBEC 2017 and the Nordic-Baltic Conference on Biomedical Engineering and Medical Physics, NBC 2017
Publisher: Springer Verlag
ISBN (Print): 9789811051210

Publication series
Name: IFMBE Proceedings
Volume: 65
ISSN (Print): 1680-0737
ASJC Scopus subject areas: Biomedical Engineering, Bioengineering
Keywords: Field use, Perspiration sensing, RFID-based sensing, Textile antennas, Welfare technology
DOIs:

10.1007/978-981-10-5122-7_253

Bibliographical note
jufoid=58152
EXT="Merilampi, S."
Source: Scopus
Source ID: 85021712564
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

What's inside a rubble pile asteroid? DiSCUS - A tomographic twin radar Cubesat to find out
A large fraction of asteroids with diameter d > 240 m are suspected to be loose piles of rocks and boulders bound together mainly by gravity and only weak cohesion. Still to date the size and distribution of voids and monolithic fragments inside these "rubble-piles" are not known. To perform a full tomographic interior reconstruction a bistatic CubeSat configuration has been investigated by Tampere University of Technology (TUT), Radar Systemtechnik GmbH (RST) and the Max Planck Institute for Solar System Research (MPS). The concept is based on two 6U CubeSats, both carrying an identical 1U sized stepped frequency radar. As stepped frequency radars can be built compact, require less power and generate less data volume compared to other radar applications they are well-suited for small satellite platforms. In 2017 the Concurrent Design Facility of ESA/ESTEC conducted two studies relevant for DISCUS. In the Small Planetary Probes (SPP) study DISCUS served as a reference payload for a piggyback mission to a Near-Earth Asteroid (NEA) or even a Main Belt Asteroid (MBA). The M-ARGO study investigated a stand-alone mission to a NEA, with a DISCUS sized instrument. Based on the spacecraft design of SPP and M-ARGO we could prove the instrument requirements as feasible and evaluate our science case from the orbits and mission duration that have been identified by these studies. Using inversion methods developed for medical tomography the data would allow to reconstruct the large scale interior structure of a small body. Simulations have shown that the measurement principle and the inversion method are robust enough to allow full reconstruction of the interior even if the orbits do not cover the entire surface of the asteroid. The measurement results of the mission will help to gain a better understanding of asteroids and the formation mechanisms of the solar system. In addition, the findings will increase the predictability of asteroid impact consequences on Earth and improve future concepts of asteroid deflection.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Computing Sciences, Research group: Inverse Problems, Max Planck Institute for Solar System Research , GomSpace A/S, 3D Profi GmbH, RST Radar Systemtechnik AG, University of Bern, MEW-Aerospace UG, GMV Innovating Solutions S.L, Royal Observatory of Belgium
Contributors: Bambach, P., Deller, J., Martel, J., Vilenius, E., Goldberg, H., Sorsa, L., Pursiainen, S., Takala, M., Wurster, A., Braun, H. M., Lentz, H., Jutzi, M., Wittig, M., Chitu, C. C., Ritter, B., Karatekin, O.
Publication date: 2018

Host publication information

Title of host publication: 69th International Astronautical Congress, IAC 2018

Publication series
Name: Proceedings of the International Astronautical Congress, IAC
ISSN (Print): 0074-1795
ASJC Scopus subject areas: Aerospace Engineering, Astronomy and Astrophysics, Space and Planetary Science

Bibliographical note
jufoid=85566
Source: Scopus
Source ID: 85065313725
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Yliopistomatematiikan sähköisten tehtävien ja matemaattisen ajattelun kehittäminen

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Positioning, Research group: Computer Science and Applied Logics
Contributors: Myllykoski, T. J., Mattila, P., Ali-Löytty, S., Kaarakka, T., Viro, E.
Number of pages: 11
Pages: 46-56
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: FMSERA Journal
Volume: 2
Issue number: 1
ISSN (Print): 2489-4583
Original language: Finnish
URLs:

https://journal.fi/fmsera/article/view/69887/38422
Additional files:

Myllykoski_et_al
Research output: Contribution to journal › Article › Scientific › peer-review

A Reduced-Order Two-Degree-of-Freedom Composite Nonlinear Feedback Control for a Rotary DC Servo Motor

We study in this paper nonlinear control of a rotary DC servo motor application. To be more specific, we design a reduced-order two-degree-of-freedom (2DOF) composite nonlinear feedback (CNF) controller for a Quanser QUBE-Servo 2 unit with a disc attachment. We compare our results with a carefully tuned proportional-derivative (PD) controller with set point weighting. Our simulation and experimental results show that the closed-loop system using 2DOF CNF controller yields much better set point tracking performance compared with the system using conventional PD-controller in terms of settling time.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Automation and Hydraulic Engineering, Research area: Information Systems in Automation, Research area: Dynamic Systems, Research area: Information Systems in Automation
Contributors: Pyrhönen, V., Koivisto, H., Vilkko, M.
Number of pages: 7
Pages: 2065-2071
Publication date: 12 Dec 2017

Host publication information
Title of host publication: Proceedings of the 56th IEEE Conference on Decision and Control
Place of publication: Melbourne, Australia
ISBN (Electronic): 978-1-5090-2872-6
ASJC Scopus subject areas: Control and Systems Engineering, Electrical and Electronic Engineering, Mechanical Engineering
Keywords: Nonlinear control, Composite nonlinear feedback, motion control, Robust control, High performance control, Servo systems
Electronic versions:

A Reduced-Order Two-Degree-of-Freedom Composite Nonlinear Feedback Control for a Rotary DC Servo Motor
DOIs:
10.1109/CDC.2017.8263951
URLs:
http://urn.fi/URN:NBN:fi:tuni-201910224004
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Using GUHA Data Mining Method in Analyzing Road Traffic Accidents Occurred in the Years 2004–2008 in Finland

The suitability of the GUHA data mining method in analyzing a big data matrix is studied in this report in general, and, in particular, a data matrix containing more than 80,000 road traffic accidents occurred in Finland in 2004–2008 is examined by LISp-Miner, a software implementation of GUHA. The general principles of GUHA are first outlined, and then, the road accident data is analyzed. As a result, more than 10,000 associations and dependencies, called hypothesis in the GUHA language, were found; some easily understandable of them are presented here. Our conclusion is that the GUHA method is useful, in particular when one wants to explore relatively small size, but still significant dependencies in a given large data matrix.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Turunen, E.
Number of pages: 8
Pages: 224-231
Publication date: 27 Nov 2017
Peer-reviewed: Yes

Publication information
Journal: Data Science and Engineering
Volume: 2
Issue number: 3
ISSN (Print): 2364-1185
Original language: English
Electronic versions:
s41019-017-0044-2
DOIs:
10.1007/s41019-017-0044-2
URLs:
http://urn.fi/URN:NBN:fi:tty-201712142364
Research output: Contribution to journal › Article › Scientific › peer-review

Estimation of above-ground biomass of large tropical trees with terrestrial LiDAR

1. Tropical forest biomass is a crucial component of global carbon emission estimations. However, calibration and validation of such estimates require accurate and effective methods to estimate in situ above-ground biomass (AGB). Present methods rely on allometric models that are highly uncertain for large tropical trees. Terrestrial laser scanning (TLS) tree modelling has demonstrated to be more accurate than these models to infer forest AGB. Nevertheless, applying TLS methods on tropical large trees is still challenging. We propose a method to estimate AGB of large tropical trees by three-dimensional (3D) tree modelling of TLS point clouds.

2. Twenty-nine plots were scanned with a TLS in three study sites (Peru, Indonesia and Guyana). We identified the largest tree per plot (mean diameter at breast height of 73.5 cm), extracted its point cloud and calculated its volume by 3D modelling its structure using quantitative structure models (QSM) and converted to AGB using species-specific wood density. We also estimated AGB using pantropical and local allometric models. To assess the accuracy of our and allometric methods, we harvest the trees and took destructive measurements.

3. AGB estimates by the TLS–QSM method showed the best agreement in comparison to destructive harvest measurements (28.37% coefficient of variation of root mean square error [CV-RMSE] and concordance correlation coefficient [CCC] of 0.95), outperforming the pantropical allometric models tested (35.6%–54.95% CV-RMSE and CCC of 0.89–0.73). TLS–QSM showed also the lowest bias (overall underestimation of 3.7%) and stability across tree size range, contrasting with the allometric models that showed a systematic bias (overall underestimation ranging 15.2%–35.7%) increasing linearly with tree size. The TLS–QSM method also provided accurate tree wood volume estimates (CV RMSE of 23.7%) with no systematic bias regardless the tree structural characteristics.

4. Our TLS–QSM method accounts for individual tree biophysical structure more effectively than allometric models, providing more accurate and less biased AGB estimates for large tropical trees, independently of their morphology. This

non-destructive method can be further used for testing and calibrating new allometric models, reducing the current under-representation of large trees in and enhancing present and past estimates of forest biomass and carbon emissions from tropical forests.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Wageningen Univ, Wageningen University & Research Center, Swedish University of Agricultural Sciences, University College London
Contributors: Gonzalez de Tanago, J., Lau, A., Bartholomeus, H., Herold, M., Avitabile, V., Raumonen, P., Martius, C., Goodman, R., Disney, M., Manuri, S., Burt, A., Calders, K.
Number of pages: 12
Publication date: 13 Nov 2017
Peer-reviewed: Yes

Publication information
Journal: Methods in Ecology and Evolution
ISSN (Print): 2041-210X
Ratings:

Scopus rating (2017): CiteScore 6.72 SJR 4.018 SNIP 2.456
Original language: English
Electronic versions:

Menaca_et_al-2017-Methods_in_Ecology_and_Evolution
DOIs:

10.1111/2041-210X.12904
URLs:

http://urn.fi/URN:NBN:fi:tty-201712192417
Research output: Contribution to journal › Article › Scientific › peer-review

Adaptive optics and lightcurve data of asteroids: Twenty shape models and information content analysis
We present shape models and volume estimates of twenty asteroids based on relative photometry and adaptive optics images. We discuss error estimation and the effects of myopic deconvolution on shape solutions. For further analysis of the information capacities of data sources, we also present and discuss ambiguity and uniqueness results for the reconstruction of nonconvex shapes from photometry.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Charles University in Prague, SETI Institute
Contributors: Viikinkoski, M., Hanuš, J., Kaasalainen, M., Marchis, F., Ďurech, J.
Publication date: 1 Nov 2017
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 607
Article number: A117
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.257
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Instrumentation: adaptive optics, Methods: analytical, Methods: numerical, Minor planets, asteroids: general, Techniques: photometric
Electronic versions:

Adaptive Optics and lightcurve
DOIs:

10.1051/0004-6361/201731456
URLs:

https://arxiv.org/abs/1708.05191

http://urn.fi/URN:NBN:fi:tty-201802141216
Source: Scopus
Source ID: 85035125736
Research output: Contribution to journal › Article › Scientific › peer-review

Opiskelijoiden oppimistyökalujen käyttö tietokoneavusteisessa Matematiikkajumppa -tukiopetuksessa

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Positioning, Research group: MAT Intelligent Information Systems Laboratory, Research group: Computer Science and Applied Logics
Contributors: Myllykoski, T., Ali-Löytty, S. S., Pohjolainen, S.
Number of pages: 12
Pages: 54-65
Publication date: 31 Oct 2017

Host publication information
Title of host publication: 2017: Proceedings of the annual FMSERA symposium 2016

Publication series
Name: Proceedings of the FMSERA annual symposium
Publisher: Finnish Mathematics and Science Education Research Association (FMSERA)
ISSN (Electronic): 2489-4583
ASJC Scopus subject areas: Mathematics(all)
Electronic versions:

Myllykoski_FIMSERA
URLs:

https://journal.fi/fmsera/article/view/60937

http://urn.fi/URN:NBN:fi:tty-201711082120
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Projektityöskentely matematiikan opiskelussa yläkoululaisten ja heidän opettajiensa kokemana

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics, University of Helsinki
Contributors: Viro, E., Joutsenlahti, J., Eriksson, S.
Publication date: 31 Oct 2017

Host publication information
Title of host publication: 2017: Proceedings of the annual FMSERA symposium 2016

Publication series
Name: Proceedings of the FMSERA annual symposium
Publisher: Finnish Mathematics and Science Education Research Association (FMSERA)
ISSN (Electronic): 2489-4583
Electronic versions:

FMSERA
URLs:

https://journal.fi/fmsera/article/view/60934

http://urn.fi/URN:NBN:fi:tty-201711202177

Bibliographical note
EXT=”Eriksson, Sirkka-Liisa”
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Sähköisen matematiikan tentin toteuttaminen ja opiskelijoiden kokemukset sähköisestä tentistä
Tässä tutkimuksessa selvitettiin substanssiosaamisen integroinnin vaikutusta ensimmäisen vuoden Insinöörimatematiikka 2-opintojakson opiskelijoiden asenteisiin ja motivaatioon matematiikkaa kohtaan. Tutkimus toteutettiin jakamalla opiskelijat verrokki- ja interventioryhmään, joista toisessa opiskelijat tekivät perinteisiä harjoitustehtäviä koko kurssin kuuden harjoitusviikon ajan ja toisessa opiskelijat tekivät enemmän alasoveltavia tehtäviä harjoitusviikoilla 2-4. Tutkimusta varten muodostettiin kyselylomake, johon opiskelijat vastasivat kolme kertaa kurssin aikana Moodlessa. Tulosten perusteella substanssiosaamisen integroinnilla on vaikutuksia asenteisiin ja motivaation, mutta tulosten vahvistaminen vaatii lisää tutkimuksia. Integroinnilla ei ollut vaikutusta opiskelijoiden tentistä saatuihin pisteisiin.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Teaching and Learning Services, Mathematics, Research group: Positioning
Contributors: Koskinen, S., Kela, J., Ali-Löytty, S. S., Joutsenlahti, J.
Number of pages: 11
Pages: 110-120
Publication date: 31 Oct 2017

Host publication information
Title of host publication: 2017: Proceedings of the annual FMSERA symposium 2016

Publication series
Name: Proceedings of the FMSERA annual symposium
Publisher: Finnish Mathematics and Science Education Research Association (FMSERA)
ISSN (Electronic): 2489-4583
Electronic versions:

Koskinen_FMSERA
URLs:

https://journal.fi/fmsera/article/view/60927

http://urn.fi/URN:NBN:fi:tty-201711082122

Bibliographical note
INT=mat,"Kela, Jesse"
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Substanssiosaamisen integroinnin vaikutus asenteisiin ja motivaatioon yliopistomatematiikassa
Tässä tutkimuksessa selvitettiin substanssiosaamisen integroinnin vaikutusta ensimmäisen vuoden Insinöörimatematiikka 2-opintojakson opiskelijoiden asenteisiin ja motivaatioon matematiikkaa kohtaan. Tutkimus toteutettiin jakamalla opiskelijat verrokki- ja interventioryhmään, joista toisessa opiskelijat tekivät perinteisiä harjoitustehtäviä koko kurssin kuuden harjoitusviikon ajan ja toisessa opiskelijat tekivät enemmän alasoveltavia tehtäviä harjoitusviikoilla 2-4. Tutkimusta varten muodostettiin kyselylomake, johon opiskelijat vastasivat kolme kertaa kurssin aikana Moodlessa. Tulosten perusteella substanssiosaamisen integroinnilla on vaikutuksia asenteisiin ja motivaation, mutta tulosten vahvistaminen vaatii lisää tutkimuksia. Integroinnilla ei ollut vaikutusta opiskelijoiden tentistä saatuihin pisteisiin.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics, Research group: Positioning, Industrial and Information Management, Research group: Knowledge and Learning Research Center
Contributors: Tengvall, M., Kaarakka, T., Ali-Löytty, S. S., Nokelainen, P.
Number of pages: 12
Pages: 76-87
Publication date: 31 Oct 2017

Host publication information
Title of host publication: 2017: Proceedings of the annual FMSERA symposium 2016

Publication series
Name: Proceedings of the FMSERA annual symposium
Publisher: Finnish Mathematics and Science Education Research Association (FMSERA)
ISSN (Electronic): 2489-4583
Electronic versions:

Tengvall_FMSERA
URLs:

https://journal.fi/fmsera/article/view/60942

http://urn.fi/URN:NBN:fi:tty-201711082121

Bibliographical note
INT=mat,”Tengvall, Mira”
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

FiB: Squeezing loop invariants by interpolation between forward/backward predicate transformers
Loop invariant generation is a fundamental problem in program analysis and verification. In this work, we propose a new approach to automatically constructing inductive loop invariants. The key idea is to aggressively squeeze an inductive

invariant based on Craig interpolants between forward and backward reachability analysis. We have evaluated our approach by a set of loop benchmarks, and experimental results show that our approach is promising.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Lin, S., Sun, J., Xiao, H., Liu, Y., Sanán, D., Hansen, H.
Number of pages: 11
Pages: 793-803
Publication date: Oct 2017

Host publication information
Title of host publication: Proceedings of the 32nd IEEE/ACM International Conference on Automated Software Engineering : ASE 2017
Publisher: IEEE Press
Editors: Rosu, G., Di Penta, M., Nguyen, T. N.
ISBN (Electronic): 978-1-5386-2684-9

Publication series
Name: IEEE/ACM International Conference on Automated Software Engineering
Publisher: IEEE
ISSN (Print): 1938-4300
DOIs:

10.1109/ASE.2017.8115690
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Supporting an estimation of satellite locations
An apparatus computes first locations of a satellite for several points in time based on a first set of parameters values broadcast by the satellite for a first validity period and second locations of the satellite for these points in time based on a second set of parameter values with associated second validity period. The first or second validity period is extended by an equation of motion, which includes forces acting on the satellite. The apparatus computes a value of an error component for points in time by comparing first with second locations and fits parameter values of a model to the values of the error component to obtain a model of a time-evolution of values of the error component. The apparatus provides the model of the time-evolution as a basis for a correction of locations of the satellite that are computed based on the first set of parameter values.

General information
Publication status: Published
MoE publication type: H1 Granted patent
Organisations: Mathematics, Research group: Positioning, Automation and Hydraulic Engineering, Research group: Positioning, Research area: Dynamic Systems
Contributors: Rautalin, S., Ali-Löytty, S., Piche, R., Ala-Luhtala, J.
Publication date: 21 Sep 2017

Publication information
IPC: G01S19/40
Patent number: US20170269221
Priority date: 15/03/16
Original language: English
URLs:

https://www.google.com/patents/US20170269221
Research output: Patent › Scientific

Finite-dimensional regulators for a class of regular hyperbolic PDE systems
In this paper, the output regulation problem is addressed for a class of linear hyperbolic infinite-dimensional systems with spatially varying coefficients modelling a large class of convection-dominated transport reaction systems. In particular, distributed parameter systems with bounded input and unbounded output operators are considered. First, we demonstrate a general conclusion about the exponential stability of the considered system by relating the stability to the solution of an associated differential equation. Based on the assumption that the hyperbolic system satisfies the exponential stability conditions, the main manuscript contribution is the development of two novel finite-dimensional regulators, output and error feedback regulators, such that the controlled output of the plant tracks a reference signal generated by a known signal process (exosystem). In order to guarantee the feasibility of the proposed regulators, the solvability of the corresponding Sylvester equations is discussed and the solvability conditions are provided. Finally, simulations of output regulation of an axial dispersion reactor and a relevant numerical example illustrate the main results and performance of the proposed regulators synthesis.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics, Univ Alberta, University of Alberta
Contributors: Xu, X., Pohjolainen, S., Dubljevic, S.
Number of pages: 18
Pages: 1-18
Publication date: 30 Aug 2017
Peer-reviewed: Yes

Publication information
Journal: International Journal of Control
ISSN (Print): 0020-7179
Ratings:

Scopus rating (2017): CiteScore 2.51 SJR 1.152 SNIP 1.267
Original language: English
Keywords: Hyperbolic PDE systems, finite-dimensional regulators, output feedback regulator, Sylvester equation
DOIs:

10.1080/00207179.2017.1369575
Research output: Contribution to journal › Article › Scientific › peer-review

Semantic Labeling of User Location Context Based on Phone Usage Features
In mobile phones, the awareness of the user's context allows services better tailored to the user's needs. We propose a machine learning based method for semantic labeling that utilizes phone usage features to detect the user's home, work, and other visited places. For place detection, we compare seven different classification methods. We organize the phone usage data based on periods of uninterrupted time that the user has been in a certain place. We consider three approaches to represent this data: visits, places, and cumulative samples. Our main contribution is semantic place labeling using a small set of privacy-preserving features and novel data representations suitable for resource constrained mobile devices. The contributions include (1) introduction of novel data representations including accumulation and averaging of the usage, (2) analysis of the effect of the data accumulation time on the accuracy of the place classification, (3) analysis of the confidence on the classification outcome, and (4) identification of the most relevant features obtained through feature selection methods. With a small set of privacy-preserving features and our data representations, we detect the user's home and work with probability of 90% or better, and in 3-class problem the overall classification accuracy was 89% or better.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Automation and Hydraulic Engineering, Research group: Positioning, Research area: Dynamic Systems, Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Research group: Positioning, Research group: Positioning, Tampere University of Technology, HD Automotive Positioning Solutions at HERE, GE Healthcare Finland
Contributors: Leppäkoski, H., Rivero-Rodriguez, A., Rautalin, S., Muñoz Martínez, D., Käppi, J., Ali-Löytty, S., Piche, R.
Number of pages: 21
Pages: 1-21
Publication date: 24 Aug 2017
Peer-reviewed: Yes

Publication information
Journal: Mobile Information Systems
Volume: 2017
ISSN (Print): 1574-017X
Ratings:

Scopus rating (2017): CiteScore 1.13 SJR 0.224 SNIP 0.571
Original language: English
Electronic versions:

SemanticLabeling_3876906
DOIs:

10.1155/2017/3876906
URLs:

http://urn.fi/URN:NBN:fi:tty-201708281833

Bibliographical note
INT=mat,"Rautalin, Sakari"

3D shape of asteroid (6) Hebe from VLT/SPHERE imaging: Implications for the origin of ordinary H chondrites

Context. The high-angular-resolution capability of the new-generation ground-based adaptive-optics camera SPHERE at ESO VLT allows us to assess, for the very first time, the cratering record of medium-sized (D ~ 100-200 km) asteroids from the ground, opening the prospect of a new era of investigation of the asteroid belt's collisional history. Aims. We investigate here the collisional history of asteroid (6) Hebe and challenge the idea that Hebe may be the parent body of ordinary H chondrites, the most common type of meteorites found on Earth (~34% of the falls). Methods. We observed Hebe with SPHERE as part of the science verification of the instrument. Combined with earlier adaptive-optics images and optical light curves, we model the spin and three-dimensional (3D) shape of Hebe and check the consistency of the derived model against available stellar occultations and thermal measurements. Results. Our 3D shape model fits the images with sub-pixel residuals and the light curves to 0.02 mag. The rotation period (7.274 47 h), spin (ECJ2000 λ, β of 343°, +47°), and volume-equivalent diameter (193 ± 6 km) are consistent with previous determinations and thermophysical modeling. Hebe's inferred density is 3.48 ± 0.64 g cm^{-3}, in agreement with an intact interior based on its H-chondrite composition. Using the 3D shape model to derive the volume of the largest depression (likely impact crater), it appears that the latter is significantly smaller than the total volume of close-by S-type H-chondrite-like asteroid families. Conclusions. Our results imply that (6) Hebe is not the most likely source of H chondrites. Over the coming years, our team will collect similar high-precision shape measurements with VLT/SPHERE for ~40 asteroids covering the main compositional classes, thus providing an unprecedented dataset to investigate the origin and collisional evolution of the asteroid belt.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Queen's University, Belfast, Northern Ireland, CNRS, IMCCE - Institut de Mecanique Celeste et de Calcul des Ephemerides, TMT Observatory, Charles University in Prague, Laboratoire d'Astrophysique de Marseille, Max-Planck-Institut für Extraterrestrische Physik, Université de Liège, Open University, European Southern Observatory (ESO), ONERA - The French Aerospace Lab, Planetary Science Institute, Universite de Geneve
Contributors: Marsset, M., Carry, B., Dumas, C., Hanuš, J., Viikinkoski, M., Vernazza, P., Müller, T. G., Delbo, M., Jehin, E., Gillon, M., Grice, J., Yang, B., Fusco, T., Berthier, J., Sonnett, S., Kugel, F., Caron, J., Behrend, R.
Publication date: 1 Aug 2017
Peer-reviewed: Yes

Publication information

Journal: Astronomy and Astrophysics
Volume: 604
Article number: A64
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.257
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: asteroids: individual: (6) Hebe, Meteorites, meteoroids, meteors, Minor planets, Techniques: high angular resolution
Electronic versions:

3D shape of asteroid (6) Hebe
DOIs:

10.1051/0004-6361/201731021
URLs:

http://urn.fi/URN:NBN:fi:tty-201802141213
Source: Scopus
Source ID: 85027245899
Research output: Contribution to journal › Article › Scientific › peer-review

How management intensity and neighborhood composition affect the structure of beech (Fagus sylvatica L.) trees

Key message: The intensity of silvicultural interventions and the neighborhood composition determine branching patterns, crown shape, and trunk attributes of beech (Fagus sylvaticaL.) trees.Abstract: The intensity of silvicultural interventions and the composition of tree species are important forest management decisions. Both determine tree shape and thus influence the value of a tree, be it in terms of economy (trunk form, branchiness), or in terms of ecology (microhabitats). However, our knowledge on the distinct changes in tree architecture due to silvicultural management intensity or different neighborhood diversities is still limited, especially if the focus is on single tree attributes, e.g., branching patterns or crown shapes. We used terrestrial laser scanner data to calculate 25 structural measures for 55 European beech (Fagus sylvatica L.) trees that grew either in pure stands along a gradient of management intensity or in intra or interspecific neighborhoods in unmanaged stands. We found a lower height of maximal horizontal crown extension, a higher crown

surface area, and straighter trunks with increasing management intensity. Moreover, our study revealed that beech trees surrounded by valuable hardwoods showed a lower height of maximal horizontal crown extension, a lower height–diameter ratio, and longer branches with flatter branch angles than beech trees surrounded by conspecific neighbors. Our findings provide evidence of phenotypic plasticity of European beech to diverse environmental conditions. The differences in tree structure indicate an increasing crown competition with decreasing management intensity and stronger competitive pressure for beech surrounded by conspecific neighbors in comparison to alien neighbors.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, University of Goettingen, Department of Applied Health Research
Contributors: Juchheim, J., Annighöfer, P., Ammer, C., Calders, K., Raumonen, P., Seidel, D.
Number of pages: 13
Pages: 1723–1735
Publication date: 14 Jul 2017
Peer-reviewed: Yes

Publication information
Journal: TREES-STRUCTURE AND FUNCTION
Volume: 31
Issue number: 5
ISSN (Print): 0931-1890
Ratings:

Scopus rating (2017): CiteScore 1.88 SJR 0.726 SNIP 0.945
Original language: English
ASJC Scopus subject areas: Forestry, Physiology, Ecology, Plant Science
Keywords: Competition, Crown plasticity, Quantitative structural models, Terrestrial laser scanning, Thinning, Tree architecture
DOIs:

10.1007/s00468-017-1581-z
Source: Scopus
Source ID: 85023781959
Research output: Contribution to journal › Article › Scientific › peer-review

Order reduction for a signaling pathway model of neuronal synaptic plasticity
In this study a nonlinear mathematical model of plasticity in the brain is reduced using the Proper Orthogonal Decomposition and Discrete Empirical Interpolation Method. Such methods are remarkably useful for connecting reduced small scale models via the inputs and outputs to form optimally performing large scale models. Novel results were obtained as mathematical model order reduction has not been applied in neuroscience without linearization of the mathematical model and never to the model presented here. The reduced order model consumes considerably less computational resources than the original while maintaining a low root mean square error between the original and reduced model.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: BioMediTech, Faculty of Biomedical Sciences and Engineering, Mathematics, Research group: Computational Neuro Science-CNS
Contributors: Lehtimäki, M., Paunonen, L., Pohjolainen, S., Linne, M.
Number of pages: 6
Pages: 7687-7692
Publication date: 1 Jul 2017

Host publication information
Title of host publication: 20th IFAC World Congress
Publisher: IFAC

Publication series
Name: IFAC-PapersOnLine
Volume: 50
ISSN (Electronic): 2405-8963
ASJC Scopus subject areas: Control and Systems Engineering
Keywords: cell signaling, Discrete Empirical Interpolation Method, model reduction, nonlinear models, Proper Orthogonal Decomposition, synaptic plasticity

DOIs:
10.1016/j.ifacol.2017.08.1143

Bibliographical note
jufoid=55187
INT=mat,"Lehtimäki, Mikko"
Source: Scopus
Source ID: 85031781216
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robust Regulation of MIMO systems: A Reformulation of the Internal Model Principle

The internal model principle is a fundamental result stating a necessary and sufficient condition for a stabilizing controller to be robustly regulating. Its classical formulation is given in terms of coprime factorizations and the largest invariant factor of the signal generator which sets unnecessary restrictions for the theory and its applicability. In this article, the internal model principle is formulated using a general factorization approach and the generators of the fractional ideals generated by the elements of the signal generator. The proposed results are related to the classical ones.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Laakkonen, P.
Number of pages: 5
Pages: 693-697
Publication date: 1 Jul 2017

Host publication information
Title of host publication: 20th IFAC World Congress
Publisher: IFAC

Publication series
Name: IFAC-PapersOnLine
Volume: 50
ISSN (Electronic): 2405-8963
ASJC Scopus subject areas: Control and Systems Engineering
Keywords: Algebraic systems theory, Factorization approach, MIMO, Output regulation, Robust control
DOIs:
10.1016/j.ifacol.2017.08.125

Bibliographical note
jufoid=55187
Source: Scopus
Source ID: 85031777040
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Predicting Heat Propagation in Roebel-Cable Based Accelerator Magnet Prototype: One-Dimensional Approach with Coupled Turns

When designing superconductor based magnets, it is of the utmost importance to be prepared for the loss of thermal stability under operation. In this paper, heat propagation during a quench in Roebel-cable based accelerator magnet prototype is predicted using one-dimensional approach. The heat diffusion equation is solved using the finite element method and thermal coupling between the turns is taken into account using thermal network model. However, when reducing the dimensions of the problem, modelling decisions are often unavoidable. Here, we present the challenges of this approach and discuss the appropriateness of these decisions via simulations.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Research area: Electromagnetics
Contributors: Ruuskanen, J., Stenvall, A., Lahtinen, V.
Publication date: Jun 2017
Peer-reviewed: Yes
Early online date: 21 Nov 2016

Publication information
Journal: IEEE Transactions on Applied Superconductivity

Volume: 27
Issue number: 4
ISSN (Print): 1051-8223
Ratings:

Scopus rating (2017): CiteScore 1.45 SJR 0.408 SNIP 0.962
Original language: English
Keywords: Delays, Heating, Magnetic domains, Magnetosphere, Mathematical model, Superconducting magnets, Switches, Accelerator magnets, Finite element methods, HTS cables, Quench
DOIs:

10.1109/TASC.2016.2630844
Source: Bibtex
Source ID: urn:92c2b5fa9629fd4e2a7b4073195a4e32
Research output: Contribution to journal › Article › Scientific › peer-review

The effect of hardware-computed travel time on localization accuracy in the inversion of experimental (acoustic) waveform data

This study aims to advance hardware-level computations for travel-time tomography applications in which the wavelength is close to the diameter of the information that has to be recovered. Such can be the case, for example, in the imaging applications of 1) biomedical physics; 2) astrogeophysics; and 3) civil engineering. Our aim is to shed light on the effect of that preprocessing the digital waveform signal has on the inversion results and to find computational solutions that guarantee robust inversion when there are incomplete and/or noisy measurements. We describe a hardware-level implementation for integrated and thresholded travel-time computation (ITT and TTT). We compare the ITT and TTT approaches in inversion analysis with experimental acoustic travel-time data recorded using a ring geometry for the transmission and measurement points. The results obtained suggest that ITT is essential for maintaining the robustness of the inversion with imperfect signal digitization and sparsity. In order to ensure the relevance of the results, the specifications of the test setup were related to those of applications 1-3.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Pervasive Computing, Research area: Computer engineering
Contributors: Takala, M., Hämäläinen, T., Pursiainen, S.
Number of pages: 11
Pages: 344-354
Publication date: Jun 2017
Peer-reviewed: Yes

Publication information

Journal: IEEE Transactions on Computational Imaging
Volume: 3
Issue number: 2
ISSN (Print): 2333-9403
Ratings:

Scopus rating (2017): SNIP 1.655
Original language: English
DOIs:

10.1109/TCI.2017.2686698
Research output: Contribution to journal › Article › Scientific › peer-review

A fractional representation approach to the robust regulation problem for SISO systems

The purpose of this article is to develop a new approach to the robust regulation problem for plants which do not necessarily admit coprime factorizations. The approach is purely algebraic and allows us dealing with a very general class of systems in a unique simple framework. We formulate the famous internal model principle in a form suitable for plants defined by fractional representations which are not necessarily coprime factorizations. By using the internal model principle, we are able to give necessary and sufficient solvability conditions for the robust regulation problem and to parameterize all robustly regulating controllers.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Parc Scientifique de la Haute Borne
Contributors: Laakkonen, P., Quadrat, A.
Number of pages: 6

Pages: 32-37
Publication date: 1 May 2017
Peer-reviewed: Yes

Publication information
Journal: Systems and Control Letters
Volume: 103
ISSN (Print): 0167-6911
Ratings:

Scopus rating (2017): CiteScore 3.4 SJR 1.939 SNIP 1.712
Original language: English
ASJC Scopus subject areas: Control and Systems Engineering, Computer Science(all), Mechanical Engineering, Electrical and Electronic Engineering
Keywords: Fractional representation approach, Linear systems, Robust regulation
DOIs:

10.1016/j.sysconle.2017.02.006
Source: Scopus
Source ID: 85016517305
Research output: Contribution to journal › Article › Scientific › peer-review

Asymptotic behaviour in the robot rendezvous problem
This paper presents a natural extension of the results obtained by Feintuch and Francis in (2012a,b) concerning the so-called robot rendezvous problem. In particular, we revisit a known necessary and sufficient condition for convergence of the solution in terms of Cesàro convergence of the translates $S^k x_0$, $k\geq 0$, of the sequence x_0 of initial positions under the right-shift operator S, thus shedding new light on questions left open in Feintuch and Francis (2012a,b). We then present a new proof showing that a certain stronger ergodic condition on x_0 ensures that the corresponding solution converges to its limit at the optimal rate $O(t^{-1/2})$ as $t\to\infty$. After considering a natural two-sided variant of the robot rendezvous problem already studied in Feintuch and Francis (2012a) and in particular proving a new quantified result in this case, we conclude by relating the robot rendezvous problem to a more realistic model of vehicle platoons.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: MAT Mathematical and semantic modelling, St Giles
Contributors: Paunonen, L., Seifert, D.
Number of pages: 4
Pages: 127-130
Publication date: 1 May 2017
Peer-reviewed: Yes

Publication information
Journal: Automatica
Volume: 79
ISSN (Print): 0005-1098
Ratings:

Scopus rating (2017): CiteScore 7.45 SJR 3.896 SNIP 3.422
Original language: English
ASJC Scopus subject areas: Control and Systems Engineering, Electrical and Electronic Engineering
Keywords: Autonomous systems, Mobile robots, Rates of convergence, Stability
Electronic versions:

Author accepted version. Embargo ended: 6/03/19
DOIs:

10.1016/j.automatica.2017.02.015
URLs:

http://urn.fi/URN:NBN:fi:tty-201709191893. Embargo ended: 6/03/19
Source: Scopus
Source ID: 85014150245
Research output: Contribution to journal › Article › Scientific › peer-review

Volumes and bulk densities of forty asteroids from ADAM shape modeling
Context. Disk-integrated photometric data of asteroids do not contain accurate information on shape details or size scale. Additional data such as disk-resolved images or stellar occultation measurements further constrain asteroid shapes and allow size estimates. Aims. We aim to use all the available disk-resolved images of approximately forty asteroids obtained by the Near-InfraRed Camera (Nirc2) mounted on the W.M. Keck II telescope together with the disk-integrated photometry

and stellar occultation measurements to determine their volumes. We can then use the volume, in combination with the known mass, to derive the bulk density. Methods. We downloaded and processed all the asteroid disk-resolved images obtained by the Nirc2 that are available in the Keck Observatory Archive (KOA). We combined optical disk-integrated data and stellar occultation profiles with the disk-resolved images and use the All-Data Asteroid Modeling (ADAM) algorithm for the shape and size modeling. Our approach provides constraints on the expected uncertainty in the volume and size as well. Results. We present shape models and volume for 41 asteroids. For 35 of these asteroids, the knowledge of their mass estimates from the literature allowed us to derive their bulk densities. We see a clear trend of lower bulk densities for primitive objects (C-complex) and higher bulk densities for S-complex asteroids. The range of densities in the X-complex is large, suggesting various compositions. We also identified a few objects with rather peculiar bulk densities, which is likely a hint of their poor mass estimates. Asteroid masses determined from the Gaia astrometric observations should further refine most of the density estimates.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Charles University in Prague, SETI Institute, CNRS Centre National de la Recherche Scientifique, RASNZ Occultation Section, Euraster, JOIN-Japan Occultation Infomation Network, International Occultation Timing Association (IOTA), RASNZ Occultation Section
Contributors: Hanuš, J., Viikinkoski, M., Marchis, F., Durech, J., Kaasalainen, M., Delbo, M., Herald, D., Frappa, E., Hayamizu, T., Kerr, S., Preston, S., Timerson, B., Dunham, D., Talbot, J.
Publication date: 1 May 2017
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 601
Article number: A114
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.257
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Methods: Numerical, Methods: Observational, Minor planets, asteroids: General, Techniques: Photometric
Electronic versions:

Volumes and bulk densities of forty asteroids from ADAM shape modeling
DOIs:

10.1051/0004-6361/201629956
URLs:

http://urn.fi/URN:NBN:fi:tty-201802141214
Source: Scopus
Source ID: 85019553562
Research output: Contribution to journal › Article › Scientific › peer-review

Output Regulation of Infinite-Dimensional Time-Delay Systems
We study output tracking and disturbance rejection for linear infinite-dimensional time-delay systems using dynamic error feedback controllers with state delays. The class of systems covers many partial differential equations with state, input, and output delays. As our main result we characterize the solvability of the control problem in terms of the solvability of the associated regulator equations.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Paunonen, L.
Number of pages: 5
Pages: 3189-3193
Publication date: May 2017

Host publication information
Title of host publication: American Control Conference (ACC), 2017
Publisher: IEEE
ISBN (Electronic): 978-1-5090-5992-8

Publication series
Name: Proceedings of the American Control Conference

Publisher: IEEE
Volume: 2017
ISSN (Print): 0743-1619
ISSN (Electronic): 2378-5861
ASJC Scopus subject areas: Analysis, Control and Systems Engineering
Electronic versions:

Accepted manuscript
DOIs:

10.23919/ACC.2017.7963438
URLs:

http://urn.fi/URN:NBN:fi:tty-201707271634
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

The logics taught and used at high schools are not the same

Typical treatises on propositional and predicate logic do not tell how to deal with undefined expressions, such as division by zero. However, there seems to be a sound (albeit inexplicit) reasoning system that addresses undefined expressions, because equations and inequations involving them are routinely solved in schools and universities without running into fundamental inconsistencies. In this study we discover this school logic and formalize its semantics. The need to do so arose when developing software that gives students feedback on every reasoning step of their solution, instead of just telling whether the roots that they finally report are the correct roots. The problem of undefined expressions has been addressed in computer science. However, school logic proves different from those approaches. School logic is based on a Kleene-style third “undefined” truth value and the treatment of “⇒” and “⇔” not as propositional operators but as reasoning operators.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Pervasive Computing, University of Tampere
Contributors: Valmari, A., Hella, L.
Number of pages: 15
Pages: 172-186
Publication date: May 2017

Host publication information
Title of host publication: Proceedings of the Fourth Russian Finnish Symposium on Discrete Mathematics
Place of publication: Turku
Publisher: TURKU CENTRE FOR COMPUTER SCIENCE
Editors: Karhumäki, J., Matiyasevich, Y., Saarela, A.
ISBN (Print): 978-952-12-3547-4

Publication series
Name: TUCS Lecture Notes
Publisher: Turku Centre for Computer Science
No.: 26
ISSN (Print): 1797-8823
ASJC Scopus subject areas: Mathematics(all)
Keywords: logic
URLs:

http://www.doria.fi/handle/10024/143322
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A Mixed Finite Element Method to Solve the EEG Forward Problem

Finite element methods have been shown to achieve high accuracies in numerically solving the EEG forward problem and they enable the realistic modeling of complex geometries and important conductive features such as anisotropic conductivities. To date, most of the presented approaches rely on the same underlying formulation, the continuous Galerkin (CG)-FEM. In this article, a novel approach to solve the EEG forward problem based on a mixed finite element method (Mixed-FEM) is introduced. To obtain the Mixed-FEM formulation, the electric current is introduced as an additional unknown besides the electric potential. As a consequence of this derivation, the Mixed-FEM is, by construction, current preserving, in contrast to the CG-FEM. Consequently, a higher simulation accuracy can be achieved in certain scenarios, e.g., when the diameter of thin insulating structures, such as the skull, is in the range of the mesh resolution. A theoretical derivation of the Mixed-FEM approach for EEG forward simulations is presented, and the algorithms implemented for solving the resulting equation systems are described. Subsequently, first evaluations in both sphere and realistic head models are presented, and the results are compared to previously introduced CG-FEM approaches. Additional visualizations are shown to illustrate the current preserving property of the Mixed-FEM. Based on these results, it is concluded that the newly presented Mixed-FEM can at least complement and in some scenarios even outperform the

established CG-FEM approaches, which motivates a further evaluation of the Mixed-FEM for applications in bioelectromagnetism.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, University of Utah, Cluster of Excellence EXC, University of Münster
Contributors: Vorwerk, J., Engwer, C., Pursiainen, S., Wolters, C. H.
Number of pages: 12
Pages: 930-941
Publication date: 1 Apr 2017
Peer-reviewed: Yes

Publication information

Journal: IEEE Transactions on Medical Imaging
Volume: 36
Issue number: 4
Article number: 7731161
ISSN (Print): 0278-0062
Ratings:

Scopus rating (2017): CiteScore 6.6 SJR 1.895 SNIP 2.86
Original language: English
ASJC Scopus subject areas: Software, Radiological and Ultrasound Technology, Computer Science Applications, Electrical and Electronic Engineering
Keywords: EEG, forward problem, mixed finite element method, realistic head modeling, source analysis
DOIs:

10.1109/TMI.2016.2624634
Source: Scopus
Source ID: 85017598893
Research output: Contribution to journal › Article › Scientific › peer-review

Comparison of wood volume estimates of young trees from terrestrial laser scan data

Many analyses in ecology and forestry require wood volume estimates of trees. However, non-destructive measurements are not straightforward because trees are differing in their three-dimensional structures and shapes. In this paper we compared three methods (one voxel-based and two cylinder-based methods) for wood volume calculation of trees from point clouds obtained by terrestrial laser scanning. We analysed a total of 24 young trees, composed of four different species ranging between 1.79 m to 7.96 m in height, comparing the derived volume estimates from the point clouds with xylometric reference volumes for each tree. We found that both voxel-and cylinder-based approaches are able to compute wood volumes with an average accuracy above 90% when compared to reference volumes. The best results were achieved with the voxel-based method (r^2 = 0.98). Cylinder-model based methods (r^2 = 0.90 and 0.92 respectively) did perform slightly less well but offer valuable additional opportunities to analyse structural parameters for each tree. We found that the error of volume estimates from point clouds are strongly species-specific. Therefore, species-specific parameter sets for point-cloud based wood volume estimation methods are required for more robust estimates across a number of tree species.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Vodafone Department of Mobile Communications Systems, Leuphana University Lüneburg, INRA Centre de Nancy
Contributors: Kunz, M., Hess, C., Raumonen, P., Bienert, A., Hackenberg, J., Maas, H. G., Härdtle, W., Fichtner, A., Von Oheimb, G.
Number of pages: 8
Pages: 451-458
Publication date: 1 Apr 2017
Peer-reviewed: Yes

Publication information

Journal: iForest - Biogeosciences and Forestry
Volume: 10
Issue number: 2
ISSN (Print): 1971-7458
Ratings:

Scopus rating (2017): CiteScore 1.47 SJR 0.533 SNIP 0.793

Original language: English
ASJC Scopus subject areas: Forestry, Ecology, Nature and Landscape Conservation
Keywords: Mixed forests, Quantitative structure models, Voxel-based, Xylometry
Electronic versions:

Comparison of wood volume estimates of young trees from terrestrial laser scan data
DOIs:

10.3832/ifor2151-010
URLs:

http://urn.fi/URN:NBN:fi:tty-201712182396
Source: Scopus
Source ID: 85019560771
Research output: Contribution to journal › Article › Scientific › peer-review

Meeting a deadline: shortest paths on stochastic directed acyclic graphs with information gathering

We consider the problem of an agent traversing a directed graph with the objective of maximizing the probability of reaching a goal node before a given deadline. Only the probability of the travel times of edges is known to the agent. The agent must balance between traversal actions towards the goal, and delays due to actions improving information about graph edge travel times. We describe the relationship of the problem to the more general partially observable Markov decision process. Further, we show that if edge travel times are independent and the underlying directed graph is acyclic, a closed loop solution can be computed. The solution specifies whether to execute a traversal or information-gathering action as a function of the current node, the time remaining until the deadline, and the information about edge travel times. We present results from two case studies, quantifying the usefulness of information-gathering as opposed to applying only traversal actions.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Contributors: Lauri, M., Ropponen, A., Ritala, R.
Number of pages: 34
Pages: 337–370
Publication date: Apr 2017
Peer-reviewed: Yes
Early online date: 28 Sep 2016

Publication information

Journal: Annals of Mathematics and Artificial Intelligence
Volume: 79
Issue number: 4
ISSN (Print): 1012-2443
Ratings:

Scopus rating (2017): CiteScore 1.21 SJR 0.413 SNIP 1.036
Original language: English
ASJC Scopus subject areas: Artificial Intelligence, Applied Mathematics
Keywords: Applied probability, Decision processes, Dynamic programming, Markov processes, Transportation
DOIs:

10.1007/s10472-016-9527-5
Source: Scopus
Source ID: 84988712384
Research output: Contribution to journal › Article › Scientific › peer-review

Automatic tree species recognition with quantitative structure models

We present three robust methods to accurately and automatically recognize tree species from terrestrial laser scanner data. The recognition is based on the use of quantitative structure tree models, which are hierarchical geometric primitive models accurately approximating the branching structure, geometry, and volume of the trees. Fifteen robust tree features are presented and tested with all different combinations for tree species classification. The classification methods presented are k-nearest neighbours, multinomial regression, and support vector machine based approaches. Three mainly single-species forest plots of Silver birch, Scots pine and Norway spruce, and two mixed-species forest plots located in Finland and a total number of trees over 1200 were used for demonstration. The results show that by using single-species forest plots for training and testing, it is possible to find a feature combination between 5 and 15 features, that results in an average classification accuracy above 93% for all the methods. For the preliminary mixed-species forest plot testing, accuracy was lower but the classification approach presented potential to generalize to more diverse cases. Moreover, the results show that the post-processing of terrestrial laser scanning data of multi-hectare forest, from tree extraction and modelling to species classification, can be done automatically.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Natural Resources Institute Finland (Luke)
Contributors: Åkerblom, M., Raumonen, P., Mäkipää, R., Kaasalainen, M.
Number of pages: 12
Pages: 1-12
Publication date: 15 Mar 2017
Peer-reviewed: Yes

Publication information
Journal: Remote Sensing of Environment
Volume: 191
ISSN (Print): 0034-4257
Ratings:

Scopus rating (2017): CiteScore 7.16 SJR 3.121 SNIP 2.592
Original language: English
ASJC Scopus subject areas: Soil Science, Geology, Computers in Earth Sciences
Keywords: Quantitative structure model, Terrestrial laser scanning, Tree reconstruction, Tree species recognition
Electronic versions:

Author post-print. Embargo ended: 19/01/19
DOIs:

10.1016/j.rse.2016.12.002
URLs:

http://urn.fi/URN:NBN:fi:tty-201802141212. Embargo ended: 19/01/19
Source: Scopus
Source ID: 85009742761
Research output: Contribution to journal › Article › Scientific › peer-review

Complexity of Rainbow Vertex Connectivity Problems for Restricted Graph Classes
A path in a vertex-colored graph G is vertex rainbow if all of its internal vertices have a distinct color. The graph G is said to be rainbow vertex connected if there is a vertex rainbow path between every pair of its vertices. Similarly, the graph G is strongly rainbow vertex connected if there is a shortest path which is vertex rainbow between every pair of its vertices. We consider the complexity of deciding if a given vertex-colored graph is rainbow or strongly rainbow vertex connected. We call these problems Rainbow Vertex Connectivity and Strong Rainbow Vertex Connectivity, respectively. We prove both problems remain NP-complete on very restricted graph classes including bipartite planar graphs of maximum degree 3, interval graphs, and kk-regular graphs for k≥3k≥3. We settle precisely the complexity of both problems from the viewpoint of two width parameters: pathwidth and tree-depth. More precisely, we show both problems remain NP-complete for bounded pathwidth graphs, while being fixed-parameter tractable parameterized by tree-depth. Moreover, we show both problems are solvable in polynomial time for block graphs, while Strong Rainbow Vertex Connectivity is tractable for cactus graphs and split graphs.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Lauri, J.
Number of pages: 14
Pages: 132-146
Publication date: 11 Mar 2017
Peer-reviewed: Yes
Early online date: 15 Dec 2016

Publication information
Journal: Discrete Applied Mathematics
Volume: 219
ISSN (Print): 0166-218X
Ratings:

Scopus rating (2017): CiteScore 1.05 SJR 0.785 SNIP 1.241
Original language: English
DOIs:

10.1016/j.dam.2016.11.023
Research output: Contribution to journal › Article › Scientific › peer-review

Shape model of asteroid (130) Elektra from optical photometry and disk-resolved images from VLT/SPHERE and Nirc2/Keck

Context. Asteroid (130) Elektra belongs to one of the six known triple asteroids in the main belt, so its mass has been reliably determined.
Aims. We aim to use all available disk-resolved images of (130) Elektra obtained by the SPHERE instrument at VLT and by the Nirc2 of the Keck telescope together with the disk-integrated photometry to determine its shape model and its size. The volume can be then used in combination with the known mass to derive the bulk density of the primary.
Methods. We have applied the All-Data Asteroid Modeling (ADAM) algorithm to the optical disk-integrated data, two disk-resolved images obtained by the SPHERE instrument, and 13 disk-resolved images from the Nirc2 of the Keck telescope. We have also derived the shape model and size of Elektra.
Results. We present the shape model, volume-equivalent diameter (199 ± 7 km) and bulk density (1.60 ± 0.13 g cm^{-3}) of the C-type asteroid Elektra.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: MAT Inverse Problems, Charles University in Prague, SETI Institute, European Southern Observatory (ESO)
Contributors: Hanuš, J., Marchis, F., Viikinkoski, M., Yang, B., Kaasalainen, M.
Publication date: 1 Mar 2017
Peer-reviewed: Yes

Publication information

Journal: Astronomy and Astrophysics
Volume: 599
Article number: A36
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.257
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Methods: numerical, Methods: observational, Minor planets, asteroids: individual: (130) Elektra
Electronic versions:

shape model of asteroid (130) Elektra
DOIs:

10.1051/0004-6361/201629592
URLs:

https://arxiv.org/abs/1611.03632

http://urn.fi/URN:NBN:fi:tty-201802141215
Source: Scopus
Source ID: 85013894020
Research output: Contribution to journal › Article › Scientific › peer-review

Forward and Inverse Effects of the Complete Electrode Model in Neonatal EEG

This paper investigates finite element method (FEM) based modeling in the context of neonatal electroencephalography (EEG). In particular, the focus lies on electrode boundary conditions. We compare the complete electrode model (CEM) to the point electrode model (PEM), which is the current standard in EEG. In the CEM, the voltage experienced by an electrode is modeled more realistically as the integral average of the potential distribution over its contact surface, whereas the PEM relies on a point value. Consequently, the CEM takes into account the sub-electrode shunting currents which are absent in the PEM. In this study, we aim to find out how the electrode voltage predicted by these two models differ, if standard size electrodes are attached to a head of a neonate. Additionally, we study voltages and voltage variation on electrode surfaces with two source locations: (A) next to the 5-th electrode and (B) directly under the frontal fontanel. A realistic model of a neonatal head including a skull with fontanels and sutures is used. Based on the results, the forward simulation differences between CEM and PEM are in general small, but significant outliers can occur in the vicinity of the electrodes. The CEM can be considered as an integral part of the outer head model. The outcome of this study helps understanding volume conduction of neonatal EEG as it enlightens the role of advanced skull and electrode modeling in forward and inverse computations.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Pursiainen, S., Lew, S., Wolters, C. H.

Pages: 876-884
Publication date: Mar 2017
Peer-reviewed: Yes
Early online date: 16 Nov 2016

Publication information
Journal: Journal of Neurophysiology
Volume: 117
Issue number: 3
ISSN (Print): 0022-3077
Ratings:
Scopus rating (2017): CiteScore 2.51 SJR 1.65 SNIP 0.897
Original language: English
DOIs:
10.1152/jn.00427.2016

Source: PubMed
Source ID: 27852731
Research output: Contribution to journal › Article › Scientific › peer-review

The Congruences Below Fair Testing with Initial Stability

When analysing behaviours of concurrent systems with process-algebraic methods, the notion of congruence plays a central role. It means an equivalence that remains valid if any subsystem is replaced by an equivalent one. It facilitates powerful compositional methods for the verification of systems. Unfortunately, so many congruences have been defined in the literature that it is difficult to know about them all. Furthermore, it may be that the best congruence for the task at hand is not yet known. The present study continues a line of research that tries to help the situation by choosing a region, listing all congruences in it, and proving that there are no others. The present study covers the congruences that are implied by fair testing equivalence with initial stability. The most important finding is that this region contains only few previously unknown congruences, and none of them seems interesting.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Valmari, A.
Number of pages: 10
Pages: 25-34
Publication date: 6 Feb 2017

Host publication information
Title of host publication: 2016 16th International Conference on Application of Concurrency to System Design
Publisher: IEEE
ISBN (Print): 978-1-5090-0763-9
ISBN (Electronic): 978-1-5090-2589-3
ASJC Scopus subject areas: Computer Science(all)
Keywords: congruence; fair testing equivalence; initial stability
DOIs:
10.1109/ACSD.2016.15
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Abstractions for transition systems with applications to stubborn sets

Partial order reduction covers a range of techniques based on eliminating unnecessary transitions when generating a state space. On the other hand, abstractions replace sets of states of a system with abstract representatives in order to create a smaller state space. This article explores how stubborn sets and abstraction can be combined. We provide examples to provide intuition and expand on some recent results. We provide a classification of abstractions and give some novel results on what is needed to combine abstraction and partial order reduction in a sound way.

General information
Publication status: Published
MoE publication type: B2 Part of a book or another research book
Organisations: Research group: MAT Computer Science and Applied Logics, Mathematics
Contributors: Hansen, H.

Number of pages: 20
Pages: 104-123
Publication date: 1 Jan 2017

Host publication information
Title of host publication: Concurrency, Security, and Puzzles : Essays Dedicated to Andrew William Roscoe on the Occasion of His 60th Birthday
Publisher: Springer International Publishing
Editors: Gibson-Robinson, T., Hopcroft, P., Lazić, R.
ISBN (Print): 978-3-319-51045-3
ISBN (Electronic): 978-3-319-51046-0

Publication series
Name: Lecture Notes in Computer Science
Volume: 10160
ISSN (Print): 0302-9743
ISSN (Electronic): 1611-3349
ASJC Scopus subject areas: Theoretical Computer Science, Computer Science(all)
DOIs:

10.1007/978-3-319-51046-0_6
Source: Scopus
Source ID: 85006700598
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific

More stubborn set methods for process algebras
Six stubborn set methods for computing reduced labelled transition systems are presented. Two of them preserve the traces, and one is tailored for on-the-fly verification of safety properties. The rest preserve the tree failures, fair testing equivalence, or the divergence traces. Two methods are entirely new, the ideas of three are recent and the adaptation to the process-algebraic setting with non-deterministic actions is new, and one is recent but slightly generalized. Most of the methods address problems in earlier solutions to the so-called ignoring problem. The correctness of each method is proven, and efficient implementation is discussed.

General information
Publication status: Published
MoE publication type: B2 Part of a book or another research book
Organisations: Research group: MAT Computer Science and Applied Logics, Mathematics
Contributors: Valmari, A.
Number of pages: 26
Pages: 246-271
Publication date: 1 Jan 2017

Host publication information
Title of host publication: Concurrency, Security, and Puzzles : Essays Dedicated to Andrew William Roscoe on the Occasion of His 60th Birthday
Publisher: Springer International Publishing
Editors: Gibson-Robinson, T., Hopcroft, P., Lazić, R.
ISBN (Print): 978-3-319-51045-3
ISBN (Electronic): 978-3-319-51046-0

Publication series
Name: Lecture Notes in Computer Science
Volume: 10160
ISSN (Print): 0302-9743
ISSN (Electronic): 1611-3349
ASJC Scopus subject areas: Theoretical Computer Science, Computer Science(all)
DOIs:

10.1007/978-3-319-51046-0_13
URLs:

http://www.scopus.com/inward/record.url?scp=85006810860&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 85006810860
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific

Stop it, and be stubborn!

This publication discusses how automatic verification of concurrent systems can be made more efficient by focusing on always may-terminating systems. First, making a system always may-terminating is a method formeeting a modelling need that exists independently of this publication. It is illustrated that without doing so, non-progress errors may be lost. Second, state explosion is often alleviated with stubborn, ample, and persistent set methods. They use expensive cycle or terminal strong component conditions in many cases. It is proven that for many important classes of properties, if the systems are always may-terminating, then these conditions can be left out.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Valmari, A.
Publication date: 1 Jan 2017
Peer-reviewed: Yes

Publication information

Journal: ACM Transactions on Embedded Computing Systems
Volume: 16
Issue number: 2
Article number: 46
ISSN (Print): 1539-9087
Ratings:

Scopus rating (2017): CiteScore 1.59 SJR 0.32 SNIP 1.011
Original language: English
ASJC Scopus subject areas: Software, Hardware and Architecture
Keywords: Ignoring problem, Safety/progress/liveness properties, Stubborn set/ample set/persistent set/partial order methods
DOIs:

10.1145/3012279
Source: Scopus
Source ID: 85011350059
Research output: Contribution to journal › Article › Scientific › peer-review

Advanced boundary electrode modeling for tES and parallel tES/EEG

This paper explores advanced electrode modeling in the context of separate and parallel transcranial electrical stimulation (tES) and electroencephalography (EEG) measurements.We focus on boundary condition based approaches that do not necessitate adding auxiliary elements, e.g. sponges, to the computational domain. In particular, we investigate the complete electrode model (CEM) which incorporates a detailed description of the skin-electrode interface including its contact surface, impedance and normal current distribution. The CEM can be applied for both tES and EEG electrodes which is advantageous when a parallel system is used. In comparison to the CEM, we test two important reduced approaches: the gap model (GAP) and the point electrode model (PEM). We aim to find out the differences of these approaches for a realistic numerical setting based on the stimulation of the auditory cortex. The results obtained suggest, among other things, that GAP and GAP/PEM are sufficiently accurate for the practical application of tES and parallel tES/EEG, respectively. Differences between CEM and GAP were observed mainly in the skin compartment, where only CEM explains the heating effects characteristic to tES.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, University of Münster
Contributors: Pursiainen, S., Agsten, B., Wagner, S., Wolters, C. H.
Pages: 37-44
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: IEEE Transactions on Neural Systems and Rehabilitation Engineering
Volume: 26
Issue number: 1
ISSN (Print): 1534-4320
Ratings:

Scopus rating (2017): CiteScore 5.14 SJR 1.152 SNIP 2.092
Original language: English
ASJC Scopus subject areas: Neuroscience(all), Biomedical Engineering, Computer Science Applications

Keywords: Boundary conditions, Brain modeling, Complete electrode model (CEM), Computational modeling, Electric potential, Electrodes, Electroencephalography, Electroencephalography (EEG) electrode modeling, Finite element method (FEM)., Skin, Transcranial electrical stimulation (tES)
DOIs:

10.1109/TNSRE.2017.2748930
Source: Scopus
Source ID: 85030762392
Research output: Contribution to journal › Article › Scientific › peer-review

Asymptotics for infinite systems of differential equations

This paper investigates the asymptotic behavior of solutions to certain infinite systems of ordinary differential equations. In particular, we use results from ergodic theory and the asymptotic theory of C0-semigroups to obtain a characterization, in terms of convergence of certain Cesàro averages, of those initial values which lead to convergent solutions. Moreover, we obtain estimates on the rate of convergence for solutions whose initial values satisfy a stronger ergodic condition. These results rely on a detailed spectral analysis of the operator describing the system, which is made possible by certain structural assumptions on the operator. The resulting class of systems is sufficiently broad to cover a number of important applications including, in particular, both the so-called robot rendezvous problem and an important class of platoon systems arising in control theory. Our method leads to new results in both cases.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Paunonen, L., Seifert, D.
Number of pages: 26
Pages: 1153-1178
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: SIAM Journal on Control and Optimization
Volume: 55
Issue number: 2
ISSN (Print): 0363-0129
Ratings:

Scopus rating (2017): CiteScore 1.94 SJR 1.399 SNIP 1.723
Original language: English
ASJC Scopus subject areas: Control and Optimization, Applied Mathematics
Keywords: Asymptotic behavior, C0-semigroup, Ergodic theory, Ordinary differential equations, Rates of convergence, Spectrum, System
Electronic versions:

Final published version
DOIs:

10.1137/15M1051993
URLs:

http://urn.fi/URN:NBN:fi:tty-201709191896
Source: Scopus
Source ID: 85018956934
Research output: Contribution to journal › Article › Scientific › peer-review

Bayes Forest: A data-intensive generator of morphological tree clones

Detailed and realistic tree form generators have numerous applications in ecology and forestry. For example, the varying morphology of trees contributes differently to formation of landscapes, natural habitats of species, and eco-physiological characteristics of the biosphere. Here, we present an algorithm for generating morphological tree "clones" based on the detailed reconstruction of the laser scanning data, statistical measure of similarity, and a plant growth model with simple stochastic rules. The algorithm is designed to produce tree forms, i.e., morphological clones, similar (and not identical) in respect to tree-level structure, but varying in fine-scale structural detail. Although we opted for certain choices in our algorithm, individual parts may vary depending on the application, making it a general adaptable pipeline. Namely, we showed that a specific multipurpose procedural stochastic growth model can be algorithmically adjusted to produce the morphological clones replicated from the target experimentally measured tree. For this, we developed a statistical measure of similarity (structural distance) between any given pair of trees, which allows for the comprehensive comparing of the tree morphologies by means of empirical distributions describing the geometrical and topological features of a tree. Finally, we developed a programmable interface to manipulate data required by the algorithm. Our algorithm can be used in a variety of applications for exploration of the morphological potential of the growth models (both theoretical and experimental), arising in all sectors of plant science research.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Department of Computer Science, Aalto University
Contributors: Potapov, I., Järvenpää, M., Åkerblom, M., Raumonen, P., Kaasalainen, M.
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: GigaScience
Volume: 6
Issue number: 10
Article number: gix079
ISSN (Print): 2047-217X
Ratings:

Scopus rating (2017): CiteScore 6.81 SJR 5.022 SNIP 1.836
Original language: English
ASJC Scopus subject areas: Health Informatics, Computer Science Applications
Keywords: Empirical distributions, Large scale data, Morphological clone, Quantitative structure tree model, Stochastic data driven model, Terrestrial laser scanning
Electronic versions:

gix079
DOIs:

10.1093/gigascience/gix079
URLs:

http://urn.fi/URN:NBN:fi:tty-201711212191

Bibliographical note
EXT="Järvenpää, Marko"
Source: Scopus
Source ID: 85032857287
Research output: Contribution to journal › Article › Scientific › peer-review

Computational Model for Simulating Multifocal Imaging in Optical Projection Tomography
We present a computational model describing the blurring of particles with respect to focal distance in 3D optical imaging. The model can be used to improve reconstructions in optical projection tomography.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Faculty of Biomedical Sciences and Engineering, Research group: Computational Biophysics and Imaging Group, Mathematics, Research group: Inverse Problems, International Iberian Nanotechnology Laboratory
Contributors: Koskela, O., Belay, B., Pursiainen, S., Figueiras, E., Hyttinen, J.
Number of pages: 3
Publication date: 2017

Host publication information
Title of host publication: Mathematics in Imaging 2017
Publisher: Optical Society of America
Article number: MTu1C.3
ISBN (Electronic): 978-1-943580-29-3
Electronic versions:

osa17FINAL. Embargo ended: 29/06/18
DOIs:

10.1364/MATH.2017.MTu1C.3
URLs:

http://urn.fi/URN:NBN:fi:tty-201712212454. Embargo ended: 29/06/18
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Context Awareness for Semantic Mobile Computing
In a plethora of smart phones and related mobile applications, users crave innovative and personalized services that adapt to their situation. To achieve that, smart phones need to understand user context and needs for latter providing them with adequate services. This chapter discusses how context can be understood, represented and exploited in smart phones, using techniques from the fields of Semantic Computing, Machine Learning and Graph Theory.

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Mathematics, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Rivero-Rodriguez, A., Nykänen, O.
Number of pages: 17
Pages: 251-267
Publication date: 2017

Host publication information
Title of host publication: Multi-Technology Positioning
Place of publication: Cham
Publisher: Springer International Publishing
Editors: Nurmi, J., Lohan, E., Wymeersch, H., Seco-Granados, G., Nykänen, O.
ISBN (Print): 978-3-319-50426-1
ISBN (Electronic): 978-3-319-50427-8
DOIs:

10.1007/978-3-319-50427-8_12
Source: Bibtex
Source ID: urn:2f5582c69455f55e5551e9f220081242
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

General Integral Formulas for k-hyper-mono-genic Functions
We are studying a function theory of k-hypermonogenic functions connected to k-hyperbolic harmonic functions that are harmonic with respect to the hyperbolic Riemannian metric k2=xn2k1-n(dx02+⋯+dxn2)in the upper half space R+n+1={(x0,…,xn)|xi∈R,xn>0}. The function theory based on this metric is important, since in case k= n- 1 , the metric is the hyperbolic metric of the Poincaré upper half space and Leutwiler noticed that the power function xm(m∈N0), calculated using Clifford algebras, is a conjugate gradient of a hyperbolic harmonic function. We find a fundamental k-hyperbolic harmonic function. Using this function we are able to find kernels and integral formulas for k-hypermonogenic functions. Earlier these results have been verified for hypermonogenic functions (k= n- 1) and for k-hyperbolic harmonic functions in odd dimensional spaces.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Contributors: Eriksson, S., Orelma, H.
Number of pages: 12
Pages: 99-110
Publication date: 2017
Peer-reviewed: Yes
Early online date: 22 Dec 2015

Publication information
Journal: Advances in Applied Clifford Algebras
Volume: 27
Issue number: 1
ISSN (Print): 1661-4909
Ratings:

Scopus rating (2017): CiteScore 0.96 SJR 0.698 SNIP 1.444
Original language: English
DOIs:

10.1007/s00006-015-0629-7
Source: Bibtex
Source ID: urn:3be942d6de9c9305f7f491e2b5180855
Research output: Contribution to journal › Article › Scientific › peer-review

Independent Loops Search in Flow Networks Aiming for Well-Conditioned System of Equations
We approach the problem of choosing linearly independent loops in a pipeflow network as choosing the best-conditioned submatrix of a given larger matrix. We present some existing results of graph theory and submatrix selection problems, based on which we construct three heuristic algorithms for choosing the loops. The heuristics are tested on two pipeflow networks that differ significantly on the distribution of pipes and nodes in the network.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics, Research group: Positioning, Research group: MAT Intelligent Information Systems Laboratory, Tekes
Contributors: Humaloja, J., Ali-Löytty, S., Pohjolainen, S., Hämäläinen, T.
Publication date: 2017

Host publication information
Title of host publication: Progress in Industrial Mathematics at ECMI 2016
Publisher: Springer International Publishing
Editors: Quintela, P., Barral, P., Gómez, D., Pena, F. J., Rodríguez, J., Salgado, P., Vázquez-Mendéz, M. E.
ISBN (Print): 978-3-319-63081-6
ISBN (Electronic): 978-3-319-63082-3

Publication series
Name: Mathematics in industry
Publisher: Springer
Volume: 26
ISSN (Print): 1612-3956
ISSN (Electronic): 2198-3283
ASJC Scopus subject areas: Applied Mathematics, Modelling and Simulation
Keywords: pipeflow analysis, independent loops
Electronic versions:

ecmi16. Embargo ended: 4/12/18
DOIs:

10.1007/978-3-319-63082-3
URLs:

http://urn.fi/URN:NBN:fi:tty-201710182012. Embargo ended: 4/12/18

https://www.springer.com/gp/book/9783319630816
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Integral kernels for k-hypermonogenic functions
We consider the modified Cauchy–Riemann operator (Formula presented.) in the universal Clifford algebra (Formula presented.) with the basis (Formula presented.). The null-solutions of this operator are called k-hypermonogenic functions. We calculate the k-hyperbolic harmonic fundamental solutions, i.e. solutions to (Formula presented.), and use these solutions to find k-hypermonogenic kernels for a Cauchy-type integral formula in the upper half-space.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, University of Helsinki
Contributors: Vuojamo, V., Eriksson, S.
Number of pages: 12
Pages: 1-12
Publication date: 2017
Peer-reviewed: Yes
Early online date: 21 Feb 2017

Publication information
Journal: Complex Variables and Elliptic Equations
Volume: 62
Issue number: 9
ISSN (Print): 1747-6933
Ratings:

Scopus rating (2017): CiteScore 0.73 SJR 0.616 SNIP 0.989
Original language: English
ASJC Scopus subject areas: Analysis, Numerical Analysis, Computational Mathematics, Applied Mathematics
Keywords: Cauchy integral formula, Clifford algebra, hyperbolic Laplace–Beltrami, k-hyperbolic harmonic, k-hypermonogenic
DOIs:

10.1080/17476933.2016.1250402

Bibliographical note
EXT="Eriksson, Sirkka-Liisa"

Source: Scopus
Source ID: 85013192611
Research output: Contribution to journal › Article › Scientific › peer-review

Kriging prediction of stand-level forest information using mobile laser scanning data adjusted for nondetection

This study presents an approach for predicting stand-level forest attributes utilizing mobile laser scanning data collected as a nonprobability sample. Firstly, recordings of stem density were made at point locations every 10th metre along a subjectively chosen mobile laser scanning track in a forest stand. Secondly, kriging was applied to predict stem density values for the centre point of all grid cells in a 5 m x 5 m lattice across the stand. Thirdly, due to nondetectability issues, a correction term was computed based on distance sampling theory. Lastly, the mean stem density at stand level was predicted as the mean of the point-level predictions multiplied with the correction factor, and the corresponding variance was estimated. Many factors contribute to the uncertainty of the stand-level prediction; in the variance estimator, we accounted for the uncertainties due to kriging prediction and due to estimating a detectability model from the laser scanning data. The results from our new approach were found to correspond fairly well to estimates obtained using field measurements from an independent set of 54 circular sample plots. The predicted number of stems in the stand based on the proposed methodology was 1366 with a 12.9% relative standard error. The corresponding estimate based on the field plots was 1677 with a 7.5% relative standard error.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems, Norwegian Inst Bioecon Res, Swedish University of Agricultural Sciences, University System Of New Hampshire
Contributors: Saarela, S., Breidenbach, J., Raumonen, P., Grafström, A., Ståhl, G., Ducey, M. J., Astrup, R.
Number of pages: 9
Pages: 1257-1265
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: CANADIAN JOURNAL OF FOREST RESEARCH-REVUE CANADIENNE DE RECHERCHE FORESTIERE
Volume: 47
Issue number: 9
ISSN (Print): 0045-5067
Ratings:

Scopus rating (2017): CiteScore 2.06 SJR 0.969 SNIP 0.956
Original language: English
Keywords: covariogram, detectability function, forest management, model-based inference, TREE STEM, ABOVEGROUND BIOMASS, ASSISTED ESTIMATION, SPACEBORNE LIDAR, BOUNDARY OVERLAP, AIRBORNE, INVENTORY, MODELS, SYSTEM, VOLUME
DOIs:

10.1139/cjfr-2017-0019
Source: WOS
Source ID: 000408223000012
Research output: Contribution to journal › Article › Scientific › peer-review

Kullback-Leibler Divergence Approach to Partitioned Update Kalman Filter

Kalman filtering is a widely used framework for Bayesian estimation. The partitioned update Kalman filter applies a Kalman filter update in parts so that the most linear parts of measurements are applied first. In this paper, we generalize partitioned update Kalman filter, which requires the use of the second order extended Kalman filter, so that it can be used with any Kalman filter extension such as the unscented Kalman filter. To do so, we use a Kullback-Leibler divergence approach to measure the nonlinearity of the measurement, which is theoretically more sound than the nonlinearity measure used in the original partitioned update Kalman filter. Results show that the use of the proposed partitioned update filter improves the estimation accuracy.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems, Research group: Positioning
Contributors: Raitoharju, M., García-Fernádez, Á., Piche, R.
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Signal Processing
Volume: 130
ISSN (Print): 0165-1684
Ratings:
Scopus rating (2017): CiteScore 3.94 SJR 0.94 SNIP 1.947
Original language: English
Electronic versions:
KLPUKF. Embargo ended: 15/07/18
DOIs:
10.1016/j.sigpro.2016.07.007
URLs:
https://arxiv.org/pdf/1503.02857v2
http://urn.fi/URN:NBN:fi:tty-201709191897. Embargo ended: 15/07/18
Research output: Contribution to journal › Article › Scientific › peer-review

LEADER: fast estimates of asteroid shape elongation and spin latitude distributions from scarce photometry

Context. Many asteroid databases with lightcurve brightness measurements (e.g. WISE, Pan-STARRS1) contain enormous amounts of data for asteroid shape and spin modelling. While lightcurve inversion is not plausible for individual targets with scarce data, it is possible for large populations with thousands of asteroids, where the distributions of the shape and spin characteristics of the populations are obtainable.

Aims. We aim to introduce a software implementation of a method that computes the joint shape elongation p and spin latitude β distributions for a population, with the brightness observations given in an asteroid database. Other main goals are to include a method for performing validity checks of the algorithm, and a tool for a statistical comparison of populations.

Methods. The LEADER software package read the brightness measurement data for a user-defined subpopulation from a given database. The observations were used to compute estimates of the brightness variations of the population members. A cumulative distribution function (CDF) was constructed of these estimates. A superposition of known analytical basis functions yielded this CDF as a function of the (shape, spin) distribution. The joint distribution can be reconstructed by solving a linear constrained inverse problem. To test the validity of the method, the algorithm can be run with synthetic asteroid models, where the shape and spin characteristics are known, and by using the geometries taken from the examined database.

Results. LEADER is a fast and robust software package for solving shape and spin distributions for large populations. There are major differences in the quality and coverage of measurements depending on the database used, so synthetic simulations are always necessary before a database can be reliably used. We show examples of differences in the results when switching to another database.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Inverse Problems
Contributors: Nortunen, H., Kaasalainen, M.
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 608
Article number: A91
ISSN (Print): 0004-6361
Ratings:
Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.257
Original language: English
Electronic versions:
aa31360-17
DOIs:
10.1051/0004-6361/201731360
URLs:
http://urn.fi/URN:NBN:fi:tty-201712152392
Research output: Contribution to journal › Article › Scientific › peer-review

Matematiikan Perustaitojen Testi: Testin tehtävien ja vuosien 2010-2016 tulosten analyysi

Tampereen teknillisessä yliopistossa aloittavat uudet opiskelijat ovat vuodesta 2002 lähtien suorittaneet opintojensa aluksi matematiikan perustaitotestin. Perustaitotesti koostuu 16:sta kysymyksestä, joihin vastaamiseen opiskelijoilla on aikaa 45 minuuttia. Opiskelijat käyttävät testissä vain kynää ja paperia, ja syöttävät vastauksensa tietokoneelle. Samanlainen testi on ollut TTY:n lisäksi käytössä myös mm. Aalto-yliopistossa sekä Tampereen yliopistossa. Tässä tutkimuksessa on tavoitteena tutkia Perustaitotestin tehtävien linkittymistä vuonna 2003 laadittuun lukion opetussuunnitelmaan, sekä analysoida tilastollisin menetelmin Perustaitotestin pisteiden kehitystä vuosien 2007-2016 aikana.

Vuoden 2003 opetussuunnitelman mukaan “matematiikan asema aikamme kulttuurissa edellyttää valmiutta ymmärtää, hyödyntää ja tuottaa matemaattisesti esitettyä tietoa”. Tämän lisäksi “opetuksen tehtävänä on tutustuttaa opiskelija matemaattisen ajattelun malleihin sekä matematiikan perusideoihin ja rakenteisiin”. Perustaitotesti on pyritty laatimaan siten, että se mittaisi mahdollisimman laaja-alaisesti opiskelijoiden kykyä ratkaista yksinkertaisia yhtälöitä ja manipuloida matemaattisia lausekkeita. Tehtäviä on yhteensä 16, ja ne ovat seuraavista aihealueista: luvut, lausekkeet, yhtälöt, epäyhtälöt, logaritmi, eksponentti, trigonometria, derivaatta ja integraali.

TTY kouluttaa pääasiassa diplomi-insinöörejä, ja tämä sanelee pitkälti sen, minkälaisia matemaattisia taitoja yliopisto toivoisi opiskelijoillaan olevan. TTY:llä ei kuitenkaan ole laadittu omaa standardia siitä, mitkä matematiikan osat ovat insinöörille tärkeimpiä. Sen sijaan, Euroopan insinöörikoulutuksen yhteisö (European Society of Engineering Education, SEFI) on määrittänyt insinöörien tärkeimmät matemaattiset kompetenssit dokumentissaan “A Framework for Mathematics Curricula in Engineering Education”. Perustaitotestin vaatimia kompetensseja voidaan tarkistella myös kyseisen dokumentin Core 0 -tason (yliopistoon tulevien toivottu pohjataso) kompetenssien kanssa.

Komparatiivisen analyysin lisäksi paperissa esitetään perustaitotestin tehtäväkohtainen analyysi perinteisin tilastollisin menetelmin. Testidataa on kerätty useita vuosia testin pysyessä muuttumattomana. Tästä johtuen testitulosten tilastollisesti merkittävimpiä vaihteluita voidaan yrittää ymmärtää paremmin tarkistelemalla koulutuspoliittisia päätöksiä kuten ylioppilaskirjoitusten sallitut työkalut.

General information

Publication status: In preparation
MoE publication type: D4 Published development or research report or study
Organisations: Mathematics
Contributors: Myllykoski, T., Ali-Löytty, S. S.
Publication date: 2017

Publication information

Research output: Working paper › Professional

Maximal perpendicularity in certain Abelian groups

We define perpendicularity in an Abelian group G as a binary relation satisfying certain five axioms. Such a relation is maximal if it is not a subrelation of any other perpendicularity in G. A motivation for the study is that the poset (P, ⊆) of all perpendicularities in G is a lattice if G has a unique maximal perpendicularity, and only a meet-semilattice if not. We study the cardinality of the set of maximal perpendicularities and, on the other hand, conditions on the existence of a unique maximal perpendicularity in the following cases: $G \cong \mathbb{Z}^n$, G is finite, G is finitely generated, and $G = \mathbb{Z} \oplus \mathbb{Z} \oplus \cdots$. A few such conditions are found and a few conjectured. In studying $\mathbb{R}^n$, we encounter perpendicularity in a vector space.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Lulea University of Technology
Contributors: Mattila, M., Merikoski, J. K., Haukkanen, P., Tossavainen, T.
Number of pages: 13
Pages: 235-247
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: ACTA UNIVERSITATIS SAPIENTIAE: MATHEMATICA
Volume: 9
Issue number: 1
ISSN (Print): 1844-6094
Ratings:

Scopus rating (2017): CiteScore 0.31 SJR 0.38 SNIP 0.607
Original language: English
ASJC Scopus subject areas: Mathematics(all)
Keywords: Abelian group, Perpendicularity
Electronic versions:

Maximal perpendicularity in certain Abelian groups
DOIs:

10.1515/ausm-2017-0016
URLs:

http://urn.fi/URN:NBN:fi:tty-201708291840
Source: Scopus
Source ID: 85026624639
Research output: Contribution to journal › Article › Scientific › peer-review

Minimal solutions of general fuzzy relation equations on linear carriers. An algebraic characterization
This paper considers a general fuzzy relation equation, which has minimal solutions, if it is solvable. In this case, an algebraic characterization is introduced which provides an interesting method to compute minimal solutions in this general setting. Moreover, a comparison with other frameworks is also given.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research Community on Data-to-Decision (D2D), Mathematics, Research group: Computer Science and Applied Logics
Contributors: Diaz-Moreno, J. C., Medina, J., Turunen, E.
Pages: 112–123
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Fuzzy Sets and Systems
Volume: 311
ISSN (Print): 0165-0114
Ratings:

Scopus rating (2017): CiteScore 2.86 SJR 1.138 SNIP 1.733
Original language: English
DOIs:

10.1016/j.fss.2016.02.004
Research output: Contribution to journal › Article › Scientific › peer-review

Modelling anisotropy in non-oriented electrical steel sheet using vector Jiles-Atherton model

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Electrical Energy Engineering, Research area: Power engineering, Aalto University, Graz University of Technology, Tallinn University of Technology
Contributors: Upadhaya, B., Martin, F., Rasilo, P., Handgruber, P., Belahcen, A., Arkkio, A.
Pages: 764-773
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering
Volume: 36
Issue number: 3
ISSN (Print): 0332-1649
Ratings:

Scopus rating (2017): CiteScore 0.75 SJR 0.22 SNIP 0.523
Original language: English
Electronic versions:

epnc_brijesh

DOIs:
10.1108/COMPEL-09-2016-0399
URLs:
http://urn.fi/URN:NBN:fi:tuni-201910023642
Research output: Contribution to journal › Article › Scientific › peer-review

NP-completeness results for partitioning a graph into total dominating sets

A total domatic k-partition of a graph is a partition of its vertex set into k subsets such that each intersects the open neighborhood of each vertex. The maximum k for which a total domatic k-partition exists is known as the total domatic number of a graph G, denoted by d:t(G). We extend considerably the known hardness results by showing it istextsc {NP} -complete to decide whether d:t(G)ge 3 where G is a bipartite planar graph of bounded maximum degree. Similarly, for every kge 3, it istextsc {NP} -complete to decide whether d:t(G)ge k, where G is a split graph or k-regular. In particular, these results complement recent combinatorial results regarding d:t(G) on some of these graph classes by showing that the known results are, in a sense, best possible. Finally, for general n-vertex graphs, we show the problem is solvable in 2^n n^{O(1)} time, and derive even faster algorithms for special graph classes.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics, University of Helsinki, Bell Labs
Contributors: Koivisto, M., Laakkonen, P., Lauri, J.
Number of pages: 13
Pages: 333-345
Publication date: 2017

Host publication information

Title of host publication: Computing and Combinatorics - 23rd International Conference, COCOON 2017, Proceedings
Publisher: Springer Verlag
ISBN (Print): 9783319623887

Publication series

Name: Lecture Notes in Computer Science
Volume: 10392
ISSN (Print): 0302-9743
ASJC Scopus subject areas: Theoretical Computer Science, Computer Science(all)
DOIs:
10.1007/978-3-319-62389-4_28

Bibliographical note

jufoid=62555
Source: Scopus
Source ID: 85028457743
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On homomorphisms between products of median algebras

Homomorphisms of products of median algebras are studied with particular attention to the case when the codomain is a tree. In particular, we show that all mappings from a product (Formula presented.) of median algebras to a median algebra (Formula presented.) are essentially unary whenever the codomain (Formula presented.) is a tree. In view of this result, we also characterize trees as median algebras and semilattices by relaxing the defining conditions of conservative median algebras.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Université de Lorraine, TEI of Epirus
Contributors: Couceiro, M., Foldes, S., Meletiou, G. C.
Number of pages: 9
Pages: 545–553
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: Algebra Universalis
Volume: 78

Issue number: 4
ISSN (Print): 0002-5240
Ratings:

Scopus rating (2017): CiteScore 0.63 SJR 0.583 SNIP 1.038
Original language: English
ASJC Scopus subject areas: Algebra and Number Theory
DOIs:

10.1007/s00012-017-0468-6
Source: Scopus
Source ID: 85031922238
Research output: Contribution to journal › Article › Scientific › peer-review

Positive definite arithmetical functions

We are going to define a concept of positive definiteness for arithmetical functions by using GCD matrices. At the same time we are able to define a partial ordering in the set of arithmetical functions.

General information

Publication status: Published
Organisations: Mathematics
Contributors: Mattila, M.
Publication date: 2017
Peer-reviewed: Unknown
Event: Paper presented at Finnish Number Theory Days 2017, Tampere, Finland.
Research output: Other conference contribution › Paper, poster or abstract › Scientific

Robust controllers for regular linear systems with infinite-dimensional exosystems

We construct two error feedback controllers for robust output tracking and disturbance rejection of a regular linear system with nonsmooth reference and disturbance signals. We show that for sufficiently smooth signals the output converges to the reference at a rate that depends on the behavior of the transfer function of the plant on the imaginary axis. In addition, we construct a controller that can be designed to achieve robustness with respect to a given class of uncertainties in the system, and we present a novel controller structure for output tracking and disturbance rejection without the robustness requirement. We also generalize the internal model principle for regular linear systems with boundary disturbance and for controllers with unbounded input and output operators. The construction of controllers is illustrated with an example where we consider output tracking of a nonsmooth periodic reference signal for a two-dimensional heat equation with boundary control and observation, and with periodic disturbances on the boundary.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Paunonen, L.
Number of pages: 31
Pages: 1567-1597
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: SIAM Journal on Control and Optimization
Volume: 55
Issue number: 3
ISSN (Print): 0363-0129
Ratings:

Scopus rating (2017): CiteScore 1.94 SJR 1.399 SNIP 1.723
Original language: English
ASJC Scopus subject areas: Control and Optimization, Applied Mathematics
Keywords: Controller Design, Feedback, Regular Linear Systems, Robust Output Regulation, Stability
Electronic versions:

Final published version
DOIs:

10.1137/16M107181X
URLs:

http://urn.fi/URN:NBN:fi:tty-201709191895
Source: Scopus

Source ID: 85021700145
Research output: Contribution to journal › Article › Scientific › peer-review

Some Theoretical Remarks of Octonionic Analysis

In this article we first review the classical results of octonions and octonionic analysis. Then we consider some theoretical properties of the theory and compare it to quaternionic analysis and Clifford analysis.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: Computer Science and Applied Logics
Contributors: Kauhanen, J., Orelma, H.
Publication date: 2017

Host publication information

Title of host publication: Proceedings of the 8th International Conference On Mathematical Modeling (ICMM-2017)
Volume: 1907
Publisher: American Institute of Physics AIP
Editors: Egorov, I. E., Popov, S. V., Vabishchevich, P. N., Antonov, M. Y., Lazarev, N. P., Troeva, M. S., Ivanova, A. O., Grigor'ev, Y. M.
Article number: 030056
ISBN (Electronic): 978-0-7354-1599-7

Publication series

Name: AIP Conference Proceedings
Publisher: American Institute of Physics
ISSN (Print): 0094-243X
ISSN (Electronic): 1935-0465
Electronic versions:

Some-function-theoretical-remarks-of-octonionic-analysis. Embargo ended: 14/11/18
DOIs:

10.1063/1.5012678
URLs:

http://urn.fi/URN:NBN:fi:tty-201712212453. Embargo ended: 14/11/18
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Structure-preserving mesh coupling based on the Buffa-Christiansen complex

The state of the art for mesh coupling at nonconforming interfaces is presented and reviewed. Mesh coupling is frequently applied to the modeling and simulation of motion in electromagnetic actuators and machines. The paper exploits Whitney elements to present the main ideas. Both interpolation- and projection-based methods are considered. In addition to accuracy and efficiency, we emphasize the question whether the schemes preserve the structure of the de Rham complex, which underlies Maxwell's equations. As a new contribution, a structure-preserving projection method is presented, in which Lagrange multiplier spaces are chosen from the Buffa-Christiansen complex. Its performance is compared with a straightforward interpolation based on Whitney and de Rham maps, and with Galerkin projection.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Research area: Electromagnetics
Contributors: Niemimäki, O., Kurz, S., Kettunen, L.
Pages: 507-524
Publication date: 2017
Peer-reviewed: Yes
Early online date: 17 May 2016

Publication information

Journal: Mathematics of Computation
Volume: 86
ISSN (Print): 0025-5718
Ratings:

Scopus rating (2017): CiteScore 1.83 SJR 1.939 SNIP 1.729
Original language: English
DOIs:

10.1090/mcom/3121

Research output: Contribution to journal › Article › Scientific › peer-review

Stubborn set intuition explained

This study focuses on the differences between stubborn sets and other partial order methods. First a major problem with step graphs is pointed out with an example. Then the deadlock-preserving stubborn set method is compared to the deadlock-preserving ample set and persistent set methods. Next, conditions are discussed whose purpose is to ensure that the reduced state space preserves the ordering of visible transitions, that is, transitions that may change the truth values of the propositions that the formula under verification has been built from. Finally solutions to the ignoring problem are analysed both when the purpose is to preserve only safety properties and when also liveness properties are of interest.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Pervasive Computing, Mathematics
Contributors: Valmari, A., Hansen, H.
Number of pages: 26
Pages: 140-165
Publication date: 2017

Host publication information

Title of host publication: Transactions on Petri Nets and Other Models of Concurrency XII
Publisher: Springer Verlag
ISBN (Print): 9783662558614

Publication series

Name: Lecture Notes in Computer Science
Volume: 10470
ISSN (Print): 0302-9743
ISSN (Electronic): 1611-3349
ASJC Scopus subject areas: Theoretical Computer Science, Computer Science(all)
DOIs:

10.1007/978-3-662-55862-1_7

Bibliographical note

jufoid=62555
Source: Scopus
Source ID: 85030723564
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Teollinen internet ja semanttinen mallinnus

General information

Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Research group: Computer Science and Applied Logics
Contributors: Nykänen, O.
Number of pages: 22
Pages: 102-123
Publication date: 2017

Host publication information

Title of host publication: Teollinen internet uudistaa palveluliiketoimintaa ja kunnossapitoa
Place of publication: Kerava
Publisher: Kunnossapitoyhdistys ProMaint
Editors: Martinsuo, M., Kärri, T.
ISBN (Print): 978-952-68687-0-7
ISBN (Electronic): 978-952-68687-1-4
URLs:

http://urn.fi/URN:NBN:fi:tty-201706061586
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

The arithmetic Jacobian matrix and determinant

Let α1,..., α_m be such real numbers that can be expressed as a finite product of prime powers with rational exponents. Using arithmetic partial derivatives, we define the arithmetic Jacobian matrix Ja of the vector a = (α_1,..., α_m) analogously to the Jacobian matrix Jf of a vector function f. We introduce the concept of multiplicative independence of {α_1,..., α_m} and show that Ja plays in it a similar role as J_f does in functional independence. We also present a kind of arithmetic implicit function 1 theorem and show that Ja applies to it somewhat analogouslytheorem and show that Ja applies to it somewhat analogously as Jf applies to the ordinary implicit function theorem.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Mathematics, Lulea University of Technology
Contributors: Haukkanen, P., Merikoski, J. K., Mattila, M., Tossavainen, T.
Publication date: 2017
Peer-reviewed: Yes

Publication information

Journal: Journal of Integer Sequences
Volume: 20
Issue number: 9
Article number: 17.9.2
ISSN (Print): 1530-7638
Ratings:

Scopus rating (2017): CiteScore 0.41 SJR 0.57 SNIP 0.929
Original language: English
ASJC Scopus subject areas: Discrete Mathematics and Combinatorics
Keywords: Arithmetic derivative, Arithmetic partial derivative, Implicit function theorem, Jacobian determinant, Jacobian matrix, Multiplicative independence
URLs:

https://cs.uwaterloo.ca/journals/JIS/VOL20/Tossavainen/tossa11.pdf
Source: Scopus
Source ID: 85029696435
Research output: Contribution to journal › Article › Scientific › peer-review

Two-Sided Hypergenic Functions

In this paper we present an analogous of the class of two-sided axial monogenic functions to the case of axial κ-hypermonogenic functions. In order to do that we will solve a Vekua-type system in terms of Bessel functions.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Clifford analysis, Department of Mathematics, CIDMA, Center for Research and Development in Mathematics and Applications
Contributors: Eriksson, S., Orelma, H., Vieira, N.
Number of pages: 14
Pages: 111–123
Publication date: 2017
Peer-reviewed: Yes
Early online date: 12 Sep 2015

Publication information

Journal: Advances in Applied Clifford Algebras
Volume: 27
Issue number: 1
ISSN (Print): 0188-7009
Ratings:

Scopus rating (2017): CiteScore 0.96 SJR 0.698 SNIP 1.444
Original language: English
ASJC Scopus subject areas: Applied Mathematics
Keywords: $${\kappa}$$κ-Hypergenic functions, Clifford algebras, Hypergenic functions, Two-side hypergenic functions
DOIs:

10.1007/s00006-015-0605-2
URLs:

http://www.scopus.com/inward/record.url?scp=84941331725&partnerID=8YFLogxK (Link to publication in Scopus)

Source: Scopus
Source ID: 84941331725
Research output: Contribution to journal › Article › Scientific › peer-review

RS-BL-algebras are MV-algebras

We prove that RS-BL-algebras are MV-algebras.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Turunen, E.
Number of pages: 2
Pages: 153-154
Publication date: 1 Dec 2016
Peer-reviewed: Yes

Publication information

Journal: Iranian Journal of Fuzzy Systems
Volume: 13
Issue number: 6
ISSN (Print): 1735-0654
Ratings:

Scopus rating (2016): CiteScore 0.69 SJR 0.278 SNIP 0.532
Original language: English
URLs:

http://ijfs.usb.ac.ir/article_2826.html
Research output: Contribution to journal › Article › Scientific › peer-review

Distribution of spin-axes longitudes and shape elongations of main-belt asteroids

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Cibulkova, H., Durech, J., Vokrouhlicky, D., Kaasalainen, M., Oszkiewicz, D. A.
Number of pages: 10
Publication date: Dec 2016
Peer-reviewed: Yes
Early online date: 30 Nov 2016

Publication information

Journal: Astronomy and Astrophysics
Volume: 596
Article number: A57
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2016): CiteScore 3.68 SJR 2.234 SNIP 1.253
Original language: English
DOIs:

10.1051/0004-6361/201629192
Research output: Contribution to journal › Article › Scientific › peer-review

A New Cauchy Type Integral Formula for Quaternionic k-hypermonogenic Functions

In complex function theory holomorphic functions are conjugate gradient of real harmonic functions. We may build function theories in higher dimensions based on this idea if we generalize harmonic functions and define the conjugate gradient operator. We study this type of function theory in R3 connected to harmonic functions with respect to the Laplace–Beltrami operator of the Riemannian metric ds2=x−2k2(∑2i=0dx2i). The domain of the definition of our functions is in R3 and the image space is the associative algebra of quaternions H generated by 1, e1, e2 and e12 = e1e2 satisfying the relation e i e j + e j e i = –2δ ij , i, j = 1, 2. The complex field C is identified by the set {x0+x1e1|x0,x1εB}. The conjugate gradient is defined in terms of modified Dirac operator, introduced by Mkf=Df+kx−12Qf‾‾‾‾‾‾, where Qf is given by the decomposition f (x) = Pf (x) + Qf (x) e2 with Pf (x) and Qf (x) in C and Qf‾‾‾‾‾‾ is the usual complex conjugation.

Leutwiler noticed around 1990 that if the usual Euclidean metric is changed to the hyperbolic metric of the Poincaré upper

half-space model (k = 1), then the power function (x0 + x1e1 + x2e2) n , calculated using quaternions, is the conjugate gradient of the a hyperbolic harmonic function. We study functions, called k-hypermonogenic, satisfying M k f = 0. Monogenic functions are 0-hypermonogenic. Moreover, 1-hypermonogenic functions are hypermonogenic defined by H. Leutwiler and the first author.

We prove a new Cauchy type integral formulas for k-hypermonogenic functions where the kernels are calculated using the hyperbolic distance and are k-hypermonogenic functions. This formula gives the known formulas in case of monogenic and hypermonogenic functions. It also produces new Cauchy and Teodorescu type integral operators investigated in the future research.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, University of Helsinki
Contributors: Eriksson, S., Orelma, H.
Number of pages: 15
Pages: 175-189
Publication date: 23 Nov 2016

Host publication information
Title of host publication: Modern Trends in Hypercomplex Analysis
Publisher: Springer International Publishing
Editors: Bernstein, S., Kähler, U., Sabadini, I., Sommen, F.
ISBN (Print): 978-3-319-42528-3
ISBN (Electronic): 978-3-319-42529-0

Publication series
Name: Trends in Mathematics
ISSN (Electronic): 2297-0215
DOIs:
10.1007/978-3-319-42529-0_9

Bibliographical note
EXT="Eriksson, Sirkka-Liisa"
Source: RIS
Source ID: Eriksson2016
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Electroencephalography (EEG) forward modeling via H(div) finite element sources with focal interpolation
The goal of this study is to develop focal, accurate and robust finite element method (FEM) based approaches which can predict the electric potential on the surface of the computational domain given its structure and internal primary source current distribution. While conducting an EEG evaluation, the placement of source currents to the geometrically complex grey matter compartment is a challenging but necessary task to avoid forward errors attributable to tissue conductivity jumps. Here, this task is approached via a mathematically rigorous formulation, in which the current field is modeled via divergence conforming H(div) basis functions. Both linear and quadratic functions are used while the potential field is discretized via the standard linear Lagrangian (nodal) basis. The resulting model includes dipolar sources which are interpolated into a random set of positions and orientations utilizing two alternative approaches: the position based optimization (PBO) and the mean position/orientation (MPO) method. These results demonstrate that the present dipolar approach can reach or even surpass, at least in some respects, the accuracy of two classical reference methods, the partial integration (PI) and St. Venant (SV) approach which utilize monopolar loads instead of dipolar currents.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Pursiainen, S., Vorwerk, J., Wolters, C. H.
Number of pages: 19
Pages: 8502-8520
Publication date: 15 Nov 2016
Peer-reviewed: Yes

Publication information
Journal: Physics in Medicine and Biology
Volume: 61
Issue number: 24
ISSN (Print): 0031-9155

Ratings:
Scopus rating (2016): CiteScore 3.08 SJR 1.381 SNIP 1.449
Original language: English
DOIs:
10.1088/0031-9155/61/24/8502
URLs:
https://arxiv.org/abs/1608.05286
Source: PubMed
Source ID: 27845929
Research output: Contribution to journal › Article › Scientific › peer-review

Chasing the Rainbow Connection: Hardness, Algorithms, and Bounds

We study rainbow connectivity of graphs from the algorithmic and graph-theoretic points of view. The study is divided into three parts. First, we study the complexity of deciding whether a given edge-colored graph is rainbow-connected. That is, we seek to verify whether the graph has a path on which no color repeats between each pair of its vertices. We obtain a comprehensive map of the hardness landscape of the problem. While the problem is NP-complete in general, we identify several structural properties that render the problem tractable. At the same time, we strengthen the known NP-completeness results for the problem. We pinpoint various parameters for which the problem is fixed-parameter tractable, including dichotomy results for popular width parameters, such as treewidth and pathwidth. The study extends to variants of the problem that consider vertex-colored graphs and/or rainbow shortest paths. We also consider upper and lower bounds for exact parameterized algorithms. In particular, we show that when parameterized by the number of colors k, the existence of a rainbow s-t path can be decided in $O^*(2^k)$ time and polynomial space. For the highly related problem of finding a path on which all the k colors appear, i.e., a colorful path, we explain the modest progress over the last twenty years. Namely, we prove that the existence of an algorithm for finding a colorful path in $(2-\varepsilon)^k n^{O(1)}$ time for some $\varepsilon > 0$ disproves the so-called Set Cover Conjecture.

Second, we focus on the problem of finding a rainbow coloring. The minimum number of colors for which a graph G is rainbow-connected is known as its rainbow connection number, denoted by rc(G). Likewise, the minimum number of colors required to establish a rainbow shortest path between each pair of vertices in G is known as its strong rainbow connection number, denoted by src(G). We give new hardness results for computing rc(G) and src(G), including their vertex variants. The hardness results exclude polynomial-time algorithms for restricted graph classes and also fast exact exponential-time algorithms (under reasonable complexity assumptions). For positive results, we show that rainbow coloring is tractable for e.g., graphs of bounded treewidth. In addition, we give positive parameterized results for certain variants and relaxations of the problems in which the goal is to save k colors from a trivial upper bound, or to rainbow connect only a certain number of vertex pairs.

Third, we take a more graph-theoretic view on rainbow coloring. We observe upper bounds on the rainbow connection numbers in terms of other well-known graph parameters. Furthermore, despite the interest, there have been few results on the strong rainbow connection number of a graph. We give improved bounds and determine exactly the rainbow and strong rainbow connection numbers for some subclasses of chordal graphs. Finally, we pose open problems and conjectures arising from our work.

General information
Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Contributors: Lauri, J.
Number of pages: 67
Publication date: 3 Nov 2016

Publication information
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-3836-0
ISBN (Electronic): 978-952-15-3842-1
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Volume: 1428
ISSN (Print): 1459-2045
Electronic versions:
lauri 1428
URLs:
http://urn.fi/URN:ISBN:978-952-15-3842-1

Research output: Book/Report › Doctoral thesis › Collection of Articles

Projektipankki yläkoulun matematiikkaan

General information
Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Mathematics
Contributors: Viro, E.
Number of pages: 2
Pages: 29-30
Publication date: 26 Oct 2016
Peer-reviewed: Unknown

Publication information
Journal: Dimensio
Volume: 2016
Issue number: 5
ISSN (Print): 0782-6648
Original language: Finnish
Research output: Contribution to journal › Article › Professional

Identifying weak ties from publicly available social media data in an event
The concept of weak ties was introduced by Granovetter through the seminal paper titled "Strength of weak ties". Since then the role of weak ties in general and their specific role as occupying the structural hole has been explored in many different fields. In this study, we identify actual or potential weak ties using publicly available social media data in the context of an event. Our case study environment is community managers' online discussions in social media in connection to the yearly-organized Community Manager Appreciation Day (CMAD 2016) event in Finland. We were able to identify potential weak ties using the conversation based structural holes, making use of social network analysis methods (like clustering) and content analysis in the context of events. We add to the understanding of and useful data sources for the Strength of weak ties theory originated from Granovetter, and developed further by other researchers. Our approach may be used in future to make more sophisticated conference recommendation systems, and significantly automate the data extraction for making useful contact recommendations from them for conference participants.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Research group: Novi, Department of Mathematics , Research group: MAT Intelligent Information Systems Laboratory, Managing digital industrial transformation (mDIT), Copenhagen Business School
Contributors: Gupta, J. P., Menon, K., Kärkkäinen, H., Huhtamäki, J., Mukkamala, R. R., Hussain, A., Vatrapu, R., Jussila, J., Pirkkalainen, H.
Number of pages: 9
Pages: 11-19
Publication date: 17 Oct 2016

Host publication information
Title of host publication: AcademicMindtrek '16 Proceedings of the 20th International Academic Mindtrek Conference
Publisher: ACM
ISBN (Electronic): 978-1-4503-4367-1
ASJC Scopus subject areas: Computational Theory and Mathematics, Sociology and Political Science
Keywords: weak ties, social media
DOIs:

10.1145/2994310.2994354
URLs:

http://www.mindtrek.org/2016/
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Resurssitehokkaampi ja ilmastoneutraalimpi energiajärjestelmä, mutta miten? Suomalaiset avaintoimijat vastaavat

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems, Research area: Measurement Technology and Process Control, Department of Electrical Engineering, Research area: Power engineering

, Department of Physics, Research area: Aerosol Physics, University of Tampere, Tampere University of Applied Science
Contributors: Lehtonen, P., Toivanen, P., Aalto, P., Björkqvist, T., Hakkarainen, M., Harsia, P., Holttinen, H., Järventausta, P., Jaakkola, I., Kallioharju, K., Kojo, M., Mylläri, F., Oksa, A. M.
Number of pages: 11
Publication date: 11 Oct 2016

Publication information
Publisher: EL-TRAN Analyysi
Volume: 5/2016
ISBN (Electronic): 978-952-03-0299-3
Original language: Finnish
URLs:
https://tt.eduuni.fi/sites/EL-TRAN/Julkiset%20tiedostot/Pinja%20Lehtonen%20et%20al.,%20Resurssitehokkaampi%20ja%20ilmastoneutraalimpi%20energiaj%C3%A4rjestelm%C3%A4%20--%20avaintoimijat%20vastaavat,%20miten.pdf
Research output: Book/Report › Commissioned report › Professional

Students' Use of Learning Tools and Tool Types: Solving Self-Study Assignments on an Online Platform
ince 2002, a test titled Mathematics Basic Skills Test (BST) has been organized annually at Tampere University of Technology.In order to pass the Basic Skills Test, a student should be able to complete a set amount out of the 16 assignments within 45 minutes (in fall of 2015, the passing limit was 6 for engineering students, 8 for science and mathematics students). Students who failed the test were directed to the Remedial Instruction (RI). The Remedial Instruction is a set of 71 high school mathematics problems designed to brush up the skills of engineering students.

TUT students have, since 2006, been divided into different learner profile groups. This paper is the summary of studies on the behaviour of these different learner profile groups in the Remedial Instruction regarding their use of time and learning tools when solving their assignments.

Different types of learners indicate that their self-study habits on an online platform are very different. Students that are surface oriented in their studies use a lot of different learning tools, but do not produce good examination results. Skillful students seem to do well even without using a lot of tools. Thus, the current way at TUT, where students work on their remedial mathematics problems on their own could be developed further. Some change is needed, and one suggestion is using testing to ensure that the remedial training has had the desired effect.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Research group: MAT Positioning
Contributors: Myllykoski, T., Pohjolainen, S., Ali-Löytty, S.
Publication date: 16 Sep 2016

Host publication information
Title of host publication: SEFI 2016 Annual Conference Proceedings : Engineering Education on Top of the World: Industry University Cooperation
Publisher: European Society for Engineering Education SEFI
ISBN (Electronic): 9782873520144
Keywords: math-bridge, mathematics teaching, e-learning
URLs:
http://www.sefi.be/conference-2016/papers/Mathematics_and_Engineering_Education/myllykoski-students-use-of-learning-tools-and-tool-types-in-solving-self-study-assignments-93_a.pdf
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Developing Learning and Teaching in Engineering Mathematics with and without Technology
University teachers of mathematics have begun to observe that nowadays new students when beginning their studies do not have as good a mathematical proficiency as before. The phenomenon has been noticed in all western countries during recent decades [1, 2]. What shall we do? We think that there are at least two available courses of action for improved learning results in university mathematics: 1) to identify as soon as possible the students who have an insufficient knowledge base in mathematics, and to begin remedial instruction for them, and 2) to develop mathematics learning environments both with and without technology.

The aim of this paper is to describe how Tampere University of Technology (TUT) has developed learning environments in mathematics during the last decade. We focus in the paper on two cases: 1) a multisemiotic approach to mathematical concepts and procedures, and 2) computer aided assessment and learning systems.

The first case consists of developing studies in mathematical exercises in which new kinds of problem-solving have been constructed. In the second case new students have participated in an ICT –based basic skills test at the beginning of their mathematics studies, to enable them to practice mathematical procedures in solving processes [3]. Electronic and web-based tools make it possible for students to learn independently at any time, and for teachers, offer an effective way to evaluate students' proficiency.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Mathematics, Research group: MAT Positioning, Research group: Positioning, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Joutsenlahti, J., Ali-Löytty, S., Pohjolainen, S.
Publication date: 15 Sep 2016

Host publication information
Title of host publication: SEFI 2016 Annual Conference Proceedings : Engineering Education on Top of the World: Industry University Cooperation
Publisher: European Society for Engineering Education SEFI
ISBN (Electronic): 9782873520144
URLs:

http://www.sefi.be/conference-2016/papers/Mathematics_and_Engineering_Education/joutsenlahti-developing-learning-and-teaching-in-engineering-mathematics-with-and-without-technology-153_a.pdf
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Application and theory of Petri nets and other models of concurrency: Special issue of selected papers from Petri Nets 2015

General information
Publication status: Published
MoE publication type: B1 Article in a scientific magazine
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Devillers, R., Valmari, A., Penczek, W.
Pages: v-vi
Publication date: 13 Sep 2016
Peer-reviewed: No

Publication information
Journal: Fundamenta Informaticae
Volume: 146
Issue number: 1
ISSN (Print): 0169-2968
Ratings:

Scopus rating (2016): CiteScore 0.86 SJR 0.371 SNIP 0.712
Original language: English
ASJC Scopus subject areas: Theoretical Computer Science, Algebra and Number Theory, Information Systems, Computational Theory and Mathematics
DOIs:

10.3233/FI-2016-1373
Source: Scopus
Source ID: 84988662462
Research output: Contribution to journal › Editorial › Scientific

Interval decomposition lattices are balanced
Intervals in binary or n-ary relations or other discrete structures generalize the concept of an interval in a linearly ordered set. They are defined abstractly as closed sets of a closure system on a set, satisfying certain axioms. Join-irreducible partitions into intervals are characterized in the lattice of all interval decompositions. This result is used to show that the lattice of interval decompositions is balanced, and the case when this lattice is distributive is also characterised.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Miskolc
Contributors: Foldes, S., Radeleczki, S.
Number of pages: 11

Pages: 271-281
Publication date: 1 Sep 2016
Peer-reviewed: Yes

Publication information
Journal: DEMONSTRATIO MATHEMATICA
Volume: 49
Issue number: 3
ISSN (Print): 0420-1213
Ratings:

Scopus rating (2016): CiteScore 0.3 SJR 0.355 SNIP 0.657
Original language: English
ASJC Scopus subject areas: Mathematics(all)
Keywords: Balanced lattice, Closure system, Interval decomposition, Join-irreducible element, Semimodular lattice, Strong set
Electronic versions:

dema-2016-0023.xml
DOIs:

10.1515/dema-2016-0023
URLs:

http://urn.fi/URN:NBN:fi:tty-201610284667
Source: Scopus
Source ID: 84991000276
Research output: Contribution to journal › Article › Scientific › peer-review

MathCheck: a tool for checking math solutions in detail

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Valmari, A., Kaarakka, T.
Publication date: Sep 2016

Host publication information
Title of host publication: SEFI 2016 Annual Conference Proceedings : Engineering Education on Top of the World: Industry University Cooperation
Publisher: European Society for Engineering Education SEFI
ISBN (Print): 9782873520144
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Optimal energy decay in a one-dimensional coupled wave–heat system
We study a simple one-dimensional coupled wave–heat system and obtain a sharp estimate for the rate of energy decay of classical solutions. Our approach is based on the asymptotic theory of C_0-semigroups and in particular on a result due to Borichev and Tomilov (Math Ann 347:455–478, 2010), which reduces the problem of estimating the rate of energy decay to finding a growth bound for the resolvent of the semigroup generator. This technique not only leads to an optimal result, it is also simpler than the methods used by other authors in similar situations.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, St Giles
Contributors: Batty, C., Paunonen, L., Seifert, D.
Number of pages: 16
Pages: 649–664
Publication date: Sep 2016
Peer-reviewed: Yes

Publication information
Journal: Journal of Evolution Equations
Volume: 16
Issue number: 3
ISSN (Print): 1424-3199
Ratings:

Scopus rating (2016): CiteScore 0.9 SJR 1.356 SNIP 1.051
Original language: English
ASJC Scopus subject areas: Mathematics (miscellaneous)
Keywords: C-semigroups, Coupled, Energy, Heat equation, Rates of decay, Resolvent estimates, Wave equation
Electronic versions:

Author accepted version
DOIs:

10.1007/s00028-015-0316-0
URLs:

http://urn.fi/URN:NBN:fi:tty-201709191894
Source: Scopus
Source ID: 84954191330
Research output: Contribution to journal › Article › Scientific › peer-review

Safety Property-Driven Stubborn Sets

A new reduced state space construction method is presented where in every constructed state, the set of transitions that are fired is chosen based on the safety property that is being verified. Typical earlier methods only take the property into account in one state of each cycle or in one state of each terminal strong component of the reduced state space. They may fire totally irrelevant transitions in the other states. Where the property is taken into account, typically many or all enabled transitions are fired. This has spoiled attempts to be property-driven in every state. The present study exploits an idea that was published in 2016 with which this can be avoided. Furthermore, most earlier methods classify the transitions to visible and invisible. The new method uses a novel improved concept. An experiment is presented where the new concept provides significant improvement to the reduction results.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Hansen, H., Valmari, A.
Number of pages: 14
Pages: 90-103
Publication date: Sep 2016

Host publication information

Title of host publication: Reachability Problems : 10th International Workshop, RP 2016, Aalborg, Denmark, September 19-21, 2016, Proceedings
Publisher: Springer International Publishing
Editors: Larsen, K., Potapov, I., Srba, J.
ISBN (Print): 978-3-319-45993-6
ISBN (Electronic): 978-3-319-45994-3

Publication series

Name: Lecture notes in computer science
Publisher: Springer
Volume: 9899
ISSN (Print): 0302-9743
ISSN (Electronic): 1611-3349
DOIs:

10.1007/978-3-319-45994-3_7

Bibliographical note

JUFOID=62555
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Mathematical Modelling

General information

Publication status: Published
MoE publication type: C2 Edited books
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Research group: MAT Mathematical and semantic modelling, Lappeenranta Univ Technol, Lappeenranta University of Technology, Dept Math & Phys, Univ Eastern Finland, University of Eastern Finland, Dept Appl Phys, University of Oulu, Tampere University, University of Vaasa, Huawei Technologies Oy, Tampere Univ Technol, Tampere University of Technology, University of Jyväskylä, University of Eastern Finland

Contributors: Heiliö, M., Lähivaara, T., Laitinen, E., Mantere, T., Merikoski, J., Pohjolainen, S., Raivio, K., Silvennoinen, R. , Suutala, A., Tarvainen, T., Tiihonen, T., Tuomela, J., Turunen, E., Vauhkonen, M.
Number of pages: 242
Publication date: 31 Jul 2016

Publication information
Place of publication: Switzerland
Publisher: Springer International Publishing
ISBN (Print): 978-3-319-27834-6
ISBN (Electronic): 978-3-319-27836-0
Original language: English
DOIs:
10.1007/978-3-319-27836-0
Research output: Book/Report › Anthology › Scientific › peer-review

Experienced risks in social media use – longitudinal study among university students

Several recent studies indicate that there is a need for increased use of ICT and social media in the Finnish education [1], [2]. This research was conducted in order to explore the attitude towards social media use among university students. The motivation for seeking answer to the research question: “What risks students experience in social media use?” derived from the need to discover learning barriers in social media based learning environments. In particular, there is a need for novel interaction means in order to co-create and learn informally [3] also beyond the traditional classroom. The assumptions, beliefs and attitudes towards social media are studied from the perspective of perceived risks of the students. The study was conducted among graduate students attending “Communities and Social Media in Knowledge Management” course between the years 2012-2016. A web-based survey was executed annually, with a total of 113 respondents. Based on the results we were able to categorize the perceived risks and derive implications on how to lower learning barriers of students in social media based learning environments.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Research group: Novi, Pori Department, Research group: Business Ecosystems, Networks and Innovations, Managing digital industrial transformation (mDIT)
Contributors: Jussila, J., Aramo-Immonen, H.
Number of pages: 6
Pages: 1255-1260
Publication date: 4 Jul 2016

Host publication information
Title of host publication: EDULEARN16 Proceedings : 8th annual International Conference on Education and New Learning Technologies, Barcelona (Spain). 4th - 6th of July, 2016.
Volume: 8
Publisher: IATED Academy
Editors: Gómez Chova, L., López Martínez, A., Candel Torres, I.
ISBN (Electronic): 978-84-608-8860-4

Publication series
Name: EDULEARN Proceedings
Publisher: IATED Academy
ISSN (Electronic): 2340-1117
Keywords: social media, social media risks, e-communication, knowledge management
DOIs:
10.21125/edulearn.2016.1257
URLs:
https://iated.org/edulearn/
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Asymptotic Behaviour of Platoon Systems

In this paper we study the asymptotic behaviour of various platoon-type systems using the general theory developed by the authors in a recent article. The aim is to steer an infinite number of vehicles towards a target configuration in which each vehicle has a prescribed separation from its neighbour and all vehicles are moving at a given velocity. More specifically, we study systems in which state feedback is possible, systems in which observer-based dynamic output feedback is required, and also a situation in which the control objective is modified to allow the target separations to depend on the vehicles’ velocities. We show that in the first and third cases the objective can be achieved, but that in the second case the system is unstable in the sense that the associated semigroup is not uniformly bounded. We also present some quantified results concerning the rate of convergence of the platoon to its limit state when the limit exists.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, University of Oxford
Contributors: Paunonen, L., Seifert, D.
Number of pages: 7
Pages: 830-836
Publication date: Jul 2016

Host publication information
Title of host publication: Proceedings of the 22nd International Symposium on Mathematical Theory of Networks and Systems
Publisher: University of Minnesota
ISBN (Electronic): 978-1-5323-1358-5
ASJC Scopus subject areas: Analysis, Control and Optimization
Keywords: Vehicle platoon, ordinary differential equations, asymptotic behaviour, state feedback, rates of convergence
Electronic versions:

Paunonen & Seifert - MTNS 2016 preprint
URLs:

http://urn.fi/URN:NBN:fi:tty-201611244796

http://hdl.handle.net/11299/181518
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Acoustic Modelling
Let us examine the behaviour of sound in a gas or in a liquid medium. From a physical point of view, the sound we hear is created by the pressure change in the medium surrounding us that is sensed by our ears. The equations describing the behaviour of a liquid or a gas are based on well-known equations of fluid mechanics. Therefore in acoustics, they are often referred to as fluids. In the following sections we present a simple wave equation, which is the simplest of (linear) equations used to model acoustical phenomena. Even though the wave equation is quite a simplified model, it has proven to be extremely useful for describing the behaviour of sound in the most common fluid we face every day, namely air.

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Research group: MAT Mathematical and semantic modelling, Tampere Univ Technol, Tampere University of Technology
Contributors: Pohjolainen, S., Suutala, A.
Number of pages: 21
Pages: 185-205
Publication date: 30 Jun 2016

Host publication information
Title of host publication: Mathematical Modelling
Place of publication: Switzerland
Publisher: Springer
Editor: Pohjolainen, S.
ISBN (Print): 978-3-319-27834-6
ISBN (Electronic): 978-3-319-27836-0
ASJC Scopus subject areas: Applied Mathematics, Modelling and Simulation, Acoustics and Ultrasonics
DOIs:

10.1007/978-3-319-27836-0_11

Bibliographical note
INT=mat,”Suutala, Antti"
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

The Structure of Robust Controllers for Distributed Parameter Systems
Using a very general formulation of the Internal Model Principle for infinite-dimensional systems it is shown that a robust controller tracking/rejecting signals generated by an infinite-dimensional exosystem can be decomposed into a servocompensator and a stabilizing controller. The servocompensator contains an internal model of the exosystem generating the reference and disturbance signals and the stabilizing controller stabilizes the infinite-dimensional closed-loop system. As such the decomposition gives a parametrization of robustly regulating controllers in the time domain. Various ways of stabilizing the closed-loop system are presented.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Hämäläinen, T., Pohjolainen, S.
Number of pages: 6
Publication date: 29 Jun 2016

Host publication information
Title of host publication: Proceedings of the European Control Conference, June 29 - July 1, 2016, Aalborg Denmark
Place of publication: Aalborg, Denmark
Publisher: IEEE
ISBN (Electronic): 978-1-5090-2590-9
Keywords: Internal Model Principle, Robust Regulation, Infinite-Dimensional Systems
Electronic versions:

ECC16
DOIs:

10.1109/ECC.2016.7810619
URLs:

http://urn.fi/URN:NBN:fi:tty-201612294921
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Partitioned Update Kalman Filter
In this paper we present a new Kalman filter extension for state update called Partitioned Update Kalman Filter (PUKF). PUKF updates state using multidimensional measurements in parts. PUKF evaluates the nonlinearity of the measurement function within Gaussian prior by comparing the innovation covariance caused by the second order linearization to the Gaussian measurement noise. A linear transformation is applied to measurements to minimize the nonlinearity of a part of the measurement. The measurement update is applied then using only the part of the measurement that has low nonlinearity and the process is then repeated for the updated state using the remaining part of the transformed measurement until the whole measurement has been used. PUKF does the linearizations numerically and no analytical differentiation is required. Results show that when measurement geometry allows effective partitioning, the proposed algorithm improves estimation accuracy and produces accurate covariance estimates.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems, Department of Mathematics, Research group: MAT Positioning, Research group: Positioning
Contributors: Raitoharju, M., Piché, R., Ala-Luhtala, J., Ali-Löytty, S.
Number of pages: 12
Pages: 3-14
Publication date: Jun 2016
Peer-reviewed: Yes

Publication information
Journal: Journal of Advances in Information Fusion
Volume: 11
Issue number: 1
ISSN (Print): 1557-6418
Ratings:

Scopus rating (2016): CiteScore 1.42 SJR 0.213 SNIP 1.171
Original language: English
Keywords: math.OC, math.PR
URLs:

http://confcats_isif.s3.amazonaws.com/web-files/journals/entries/Partitioned%20Update%20Kalman%20Filter.pdf

Bibliographical note
ORG=ase,0.75 ORG=mat,0.25
Source: ArXiv
Source ID: http://arxiv.org/abs/1503.02857v1
Research output: Contribution to journal › Article › Scientific › peer-review

Two Consistent Many-Valued Logics for Paraconsistent Phenomena

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics, Research Community on Data-to-Decision (D2D)
Contributors: Turunen, E., Rodrigues, J. T.
Number of pages: 25
Pages: 185-210
Publication date: 9 Mar 2016

Host publication information
Title of host publication: New Directions in Paraconsistent Logic : 5th WCP, Kolkata, India, February 2014
Place of publication: New Delhi Heidelberg New York Dordrecht London
Publisher: Springer Verlag
Editors: Beziau, J., Chakraborty, M., Dutta, S.
ISBN (Print): 978-81-322-2717-5
ISBN (Electronic): 978-81-322-2719-9

Publication series
Name: Springer Proceedings in Mathematics & Statistics
Publisher: Springer
Volume: 152
ISSN (Electronic): 2194-1009
DOIs:
10.1007/978-81-322-2719-9

Bibliographical note
JUFOID=84290
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Constructing Minimal Coverability Sets
This publication addresses two bottlenecks in the construction of minimal coverability sets of Petri nets: the detection of situations where the marking of a place can be converted to ω, and the manipulation of the set A of maximal ω-markings that have been found so far. For the former, a technique is presented that consumes very little time in addition to what maintaining A consumes. It is based on Tarjan's algorithm for detecting maximal strongly connected components of a directed graph. For the latter, a data structure is introduced that resembles BDDs and Covering Sharing Trees, but has additional heuristics designed for the present use. Results from a few experiments are shown. They demonstrate significant savings in running time and varying savings in memory consumption compared to an earlier state-of-the-art technique.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Piipponen, A., Valmari, A.
Number of pages: 22
Pages: 393-414
Publication date: 4 Mar 2016
Peer-reviewed: Yes

Publication information
Journal: Fundamenta Informaticae
Volume: 143
Issue number: 3-4
ISSN (Print): 0169-2968
Ratings:
Scopus rating (2016): CiteScore 0.86 SJR 0.371 SNIP 0.712
Original language: English
ASJC Scopus subject areas: Information Systems, Computational Theory and Mathematics, Theoretical Computer Science, Algebra and Number Theory
Keywords: antichain data structure, coverability set, Tarjan's algorithm
Electronic versions:
Constructing Minimal Coverability Sets

DOIs:
10.3233/FI-2016-1319
URLs:
http://urn.fi/URN:NBN:fi:tty-201605274193
Source: Scopus
Source ID: 84959877143
Research output: Contribution to journal › Article › Scientific › peer-review

On the Complexity of Rainbow Coloring Problems

An edge-colored graph G is said to be rainbow connected if between each pair of vertices there exists a path which uses each color at most once. The rainbow connection number, denoted by rc(G), is the minimum number of colors needed to make G rainbow connected. Along with its variants, which consider vertex colorings and/or so-called strong colorings, the rainbow connection number has been studied from both the algorithmic and graph-theoretic points of view.

In this paper we present a range of new results on the computational complexity of computing the four major variants of the rainbow connection number. In particular, we prove that the Strong Rainbow Vertex Coloring problem is NP-complete even on graphs of diameter 3. We show that when the number of colors is fixed, then all of the considered problems can be solved in linear time on graphs of bounded treewidth. Moreover, we provide a linear-time algorithm which decides whether it is possible to obtain a rainbow coloring by saving a fixed number of colors from a trivial upper bound. Finally, we give a linear-time algorithm for computing the exact rainbow connection numbers for three variants of the problem on graphs of bounded vertex cover number.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, TU Vienna
Contributors: Eiben, E., Ganian, R., Lauri, J.
Number of pages: 12
Pages: 209-220
Publication date: 20 Feb 2016

Host publication information

Title of host publication: Combinatorial Algorithms : 26th International Workshop, IWOCA 2015, Verona, Italy, October 5-7, 2015, Revised Selected Papers
Publisher: Springer International Publishing
Editors: Lipták, Z., Smyth, W. F.
ISBN (Print): 978-3-319-29515-2
ISBN (Electronic): 978-3-319-29516-9

Publication series

Name: Lecture Notes in Computer Science
Publisher: Springer
Volume: 9538
ISSN (Print): 0302-9743
DOIs:
10.1007/978-3-319-29516-9_18
URLs:
http://iwoca2015.di.univr.it/ (IWOCA 2015 website)

Bibliographical note

JUFOID=62555
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Projekteja yläkoulun matematiikkaan

General information

Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Contributors: Eriksson, S., Salminen, J., Viro, E.
Publication date: 15 Feb 2016
Peer-reviewed: Unknown

Publication information

Journal: LUMA-sanomat
ISSN (Print): 1799-3385
Original language: Finnish
URLs:

http://www.luma.fi/artikkelit/4242/projekteja-ylakoulun-matematiikkaan
Research output: Contribution to journal › Article › Professional

On the Underlying Mathematical and Quantum Structure of Quantum Cryptography

Quantum cryptography is a novel approach to provide secure communication, based on the laws of physics. It offers perfect security for the communication between two authorized parties, while assuming very high computational capacity for the eavesdropper, who may be attempting to intrude into this communication. It provides a very high rate of intrusion detection as against the classical systems. Classical cryptography is built on a fundamental assumption that it is difficult to invert some of mathematical functions, in a limited time, with the use of efficient computing resources. While, quantum cryptography is based on formidable laws of nature, making it less prone to attack. With the advent of quantum computing, boundaries between various subjects like quantum physics, computer science and mathematics are getting reduced. In the early seventies, Steven Wiesner made pioneering efforts in the field Quantum Cryptography. In its present form, Quantum Cryptography depends on two essential principles of Quantum Mechanics. One is that no information is available without causing disturbance in the system and other is Principle of No-Cloning. In this paper we present some of fundamental aspects of Quantum Cryptography and the underlying structures that makes it a credible option for providing perfect security of information.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Gotkhindikar, A. D.
Pages: 15685-15699
Publication date: Feb 2016
Peer-reviewed: Yes

Publication information

Journal: International Journal of Engineering and Computer Science
Volume: 5
Issue number: 2
ISSN (Print): 2319-7242
Original language: English
DOIs:

10.18535/ijecs/v5i2.7
Source: Bibtex
Source ID: urn:7250acb0df8a579e30de45499bead3c2
Research output: Contribution to journal › Article › Scientific › peer-review

Opetusteknologiaa hyödyntävä oppimisympäristö MATLABin alkeiden opiskeluun

General information

Publication status: Published
Organisations: Department of Mathematics, Research group: MAT Positioning, Research group: MAT Intelligent Information Systems Laboratory, Research group: MAT Mathematical and semantic modelling
Contributors: Ali-Löytty, S., Parviainen, P., Pohjolainen, S.
Number of pages: 2
Pages: 42-43
Publication date: 8 Jan 2016
Peer-reviewed: Unknown
Event:
URLs:

http://www.math.utu.fi/materiaali/mathdays16/proceedings.pdf

Bibliographical note

INT=mat,"Parviainen, Panu"
Research output: Other conference contribution › Paper, poster or abstract › Scientific

Shape reconstruction from generalized projections

In this thesis we develop methods for recovering the three-dimensional shape of an object from generalized projections. We particularly focus on the problems encountered when data are presented as discrete image fields. We demonstrate

the usefulness of the Fourier transform in transferring the image data and shape model projections to a domain more suitable for gradient based optimization. To substantiate the general applicability of our methods to observational astronomy, we reconstruct shape models for several asteroids observed with adaptive optics, thermal infrared interferometry, or range-Doppler radar. The reconstructions are carried out with the ADAM software package that we have designed for general use.

General information
Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Viikinkoski, M.
Number of pages: 53
Publication date: 8 Jan 2016

Publication information
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-3665-6
ISBN (Electronic): 978-952-15-3673-1
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1358
ISSN (Print): 1459-2045
Electronic versions:

viikinkoski_1358
URLs:

http://URN.fi/URN:ISBN:978-952-15-3673-1

Bibliographical note
Awarding institution:Tampere University of Technology
viikinkoski_1358 ok 8.1.2016 KK
Research output: Book/Report › Doctoral thesis › Collection of Articles

Studying the various properties of MIN and MAX matrices - elementary vs. more advanced methods
Let $T = \{z1, z2, \ldots, zn\}$ be a finite multiset of real numbers, where $z1 \leq z2 \leq \cdots \leq zn$. The purpose of this article is to study the different properties of MIN and MAX matrices of the set T with min(zi , zj) and max(zi , zj) as their ij entries, respectively.We are going to do this by interpreting these matrices as so-called meet and join matrices and by applying some known results for meet and join matrices. Once the theorems are found with the aid of advanced methods, we also consider whether it would be possible to prove these same results by using elementary matrix methods only. In many cases the answer is positive.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Tampere, School of Information Sciences
Contributors: Mattila, M., Haukkanen, P.
Number of pages: 9
Pages: 101-109
Publication date: Jan 2016
Peer-reviewed: Yes

Publication information
Journal: Special Matrices
Volume: 4
Issue number: 1
ISSN (Print): 2300-7451
Ratings:

Scopus rating (2016): SJR 0.221 SNIP 0.468
Original language: English
Keywords: MIN matrix, MAX matrix, meet matrix, join matrix
Electronic versions:

spma-2016-0010
DOIs:

10.1515/spma-2016-0010
URLs:
http://urn.fi/URN:NBN:fi:tty-201606284313
Research output: Contribution to journal › Article › Scientific › peer-review

A Simple Controller with a Reduced Order Internal Model in the Frequency Domain

We use frequency domain methods to study robust output regulation of a stable plant in a situation where the controller is only required to be robust with respect to a predefined class of perturbations. We present a characterization for the solvability of the control problem and design a minimal order controller that achieves robustness with respect to a given class of uncertainties. The construction of the controller is illustrated with an example.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Contributors: Laakkonen, A., Paunonen, L.
Number of pages: 5
Pages: 1988-1992
Publication date: 2016

Host publication information

Title of host publication: Proceedings of European Control Conference 2016
Publisher: IEEE
ISBN (Electronic): 978-1-5090-2590-9
ASJC Scopus subject areas: Applied Mathematics
DOIs:
10.1109/ECC.2016.7810583
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Asteroid models from photometry and complementary data sources

I discuss inversion methods for asteroid shape and spin reconstruction with photometry (lightcurves) and complementary data sources such as adaptive optics or other images, occultation timings, interferometry, and range-Doppler radar data. These are essentially different sampling modes (generalized projections) of plane-of-sky images. An important concept in this approach is the optimal weighting of the various data modes. The maximum compatibility estimate, a multimodal generalization of the maximum likelihood estimate, can be used for this purpose. I discuss the fundamental properties of lightcurve inversion by examining the two-dimensional case that, though not usable in our three-dimensional world, is simple to analyze, and it shares essentially the same uniqueness and stability properties as the 3-D case. After this, I review the main aspects of 3-D shape representations, lightcurve inversion, and the inclusion of complementary data.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Kaasalainen, M.
Number of pages: 26
Publication date: 2016

Host publication information

Title of host publication: Graduate School In Astronomy : Xvi Special Courses At The National Observatory Of Rio De Janeiro: Xvi Cce
Publisher: AMER INST PHYSICS
Editors: Chavero, C., Cunha, K., Carvano, J., Fernandes, M., Dupke, R.
ISBN (Electronic): 978-0-7354-1383-2

Publication series

Name: AIP Conference Proceedings
Publisher: AMER INST PHYSICS
Volume: 1732
ISSN (Print): 0094-243X
Keywords: Asteroids, Inverse problems, Photometry, Adaptive optics, Interferometry, LIGHTCURVE INVERSION, OPTIMIZATION METHODS, SHAPE, RECONSTRUCTION, POLYHEDRON
DOIs:
10.1063/1.4948806

Bibliographical note
JUFOID=50722
Source: WOS
Source ID: 000375932000003
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Controller Design for Robust Output Regulation of Regular Linear Systems
We present three dynamic error feedback controllers for robust output regulation of regular linear systems. These controllers are (i) a minimal order robust controller for exponentially stable systems (ii) an observer-based robust controller and (iii) a new internal model based robust controller structure. In addition, we present two controllers that are by construction robust with respect to predefined classes of perturbations. The results are illustrated with an example where we study robust output tracking of a sinusoidal reference signal for a two-dimensional heat equation with boundary control and observation.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Contributors: Paunonen, L.
Pages: 2974-2986
Publication date: 2016
Peer-reviewed: Yes
Early online date: 2015

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 61
Issue number: 10
ISSN (Print): 0018-9286
Ratings:

Scopus rating (2016): CiteScore 5.54 SJR 3.232 SNIP 2.708
Original language: English
Keywords: Linear systems, Robustness, Robust output regulation, controller design, feedback, regular linear systems
Electronic versions:

Author accepted manuscript
DOIs:

10.1109/TAC.2015.2509439
URLs:

http://urn.fi/URN:NBN:fi:tty-201709191891
Source: Bibtex
Source ID: urn:da65ce94eaad6e902a97ef0e5d16351d
Research output: Contribution to journal › Article › Scientific › peer-review

Data-based stochastic modeling of tree growth and structure formation
We introduce a general procedure to match a stochastic functional-structural tree model (here LIGNUM augmented with stochastic rules) with real tree structures depicted by quantitative structure models (QSMs) based on terrestrial laser scanning. The matching is done by iteratively finding the maximum correspondence between the measured tree structure and the stochastic choices of the algorithm. First, we analyze the match to synthetic data (generated by the model itself), where the target values of the parameters to be estimated are known in advance, and show that the algorithm converges properly. We then carry out the procedure on real data obtaining a realistic model. We thus conclude that the proposed stochastic structure model (SSM) approach is a viable solution for formulating realistic plant models based on data and accounting for the stochastic influences.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Potapov, I., Järvenpää, M., Åkerblom, M., Raumonen, P., Kaasalainen, M.
Publication date: 2016
Peer-reviewed: Yes
Early online date: 3 Nov 2015

Publication information
Journal: Silva Fennica

Volume: 50
Issue number: 1
Article number: 1413
ISSN (Print): 0037-5330
Ratings:

Scopus rating (2016): CiteScore 1.45 SJR 0.702 SNIP 1.116
Original language: English
ASJC Scopus subject areas: Ecological Modelling, Forestry
Keywords: Data fitting, Form diversity, Morphological plasticity, Plant model, Quantitative structure models, Stochastic functional-structural, Terrestrial lidar
DOIs:

10.14214/sf.1413
Source: Scopus
Source ID: 84983200698
Research output: Contribution to journal › Article › Scientific › peer-review

Further hardness results on rainbow and strong rainbow connectivity

A path in an edge-colored graph is rainbow if no two edges of it are colored the same. The graph is said to be rainbow connected if there is a rainbow path between every pair of vertices. If there is a rainbow shortest path between every pair of vertices, the graph is strong rainbow connected. We consider the complexity of the problem of deciding if a given edge-colored graph is rainbow or strong rainbow connected. These problems are called Rainbow connectivity and Strong rainbow connectivity, respectively. We prove both problems remain NP-complete on interval outerplanar graphs and k-regular graphs for k≥3. Previously, no graph class was known where the complexity of the two problems would differ. We show that for block graphs, which form a subclass of chordal graphs, Rainbow connectivity is NP-complete while Strong rainbow connectivity is in P. We conclude by considering some tractable special cases, and show for instance that both problems are in XP when parameterized by tree-depth.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Lauri, J.
Pages: 191-200
Publication date: 2016
Peer-reviewed: Yes

Publication information

Journal: Discrete Applied Mathematics
Volume: 201
ISSN (Print): 0166-218X
Ratings:

Scopus rating (2016): CiteScore 1 SJR 0.863 SNIP 1.23
Original language: English
ASJC Scopus subject areas: Applied Mathematics, Discrete Mathematics and Combinatorics
Keywords: Computational complexity, Rainbow connectivity
DOIs:

10.1016/j.dam.2015.07.041
Source: Scopus
Source ID: 84956591316
Research output: Contribution to journal › Article › Scientific › peer-review

Fuzzy Logic of Quasi-Truth: An Algebraic Treatment

General information

Publication status: Published
MoE publication type: C1 Separate scientific books
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Di Nola, A., Grigolia, R., Turunen, E.
Number of pages: 116
Publication date: 2016

Publication information

Place of publication: Switzerland
Publisher: Springer

ISBN (Print): 978-3-319-30404-5
ISBN (Electronic): 978-3-319-30406-9
Original language: English

Publication series

Name: Studies in Fuzziness and Soft Computing
Publisher: Springer
Volume: 338
ISSN (Print): 1434-9922
ISSN (Electronic): 1860-0808
ASJC Scopus subject areas: Mathematics(all)
Keywords: MV-algebra
DOIs:
10.1007/978-3-319-30406-9
Research output: Book/Report › Book › Scientific › peer-review

Integer Models

The examples on “network design” (p. 15), “river and flood models” (p. 20) and “urban water systems” (p. 21) lead us to consider networks. A useful way to describe a network is to define for each pair of nodes a function whose value is 1 if there is a direct connection between these nodes in the network, and 0 otherwise. More generally, $x=1$ can be used to indicate that a certain event occurs and $x=0$ that it does not. Indeed, binary (i.e., 0-1-valued) variables appear in many models, and so do also other integer-valued variables. In this chapter we shall take a look at such models.

General information

Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Silvennoinen, R., Merikoski, J.
Number of pages: 20
Pages: 35-54
Publication date: 2016

Host publication information

Title of host publication: Mathematical Modelling
Publisher: Springer International Publishing
Editor: Pohjolainen, S.
ISBN (Print): 978-3-319-27834-6
ISBN (Electronic): 978-3-319-27836-0
DOIs:
10.1007/978-3-319-27836-0_4
Source: Bibtex
Source ID: urn:189c06c4e9adf0f563c32e7b3d719e29
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Mobile Context-Aware Systems: Technologies, Resources and Applications

Mobile applications often adapt their behavior according to user context, however, they are often limited to consider few sources of contextual information, such as user position or language. This article reviews existing work in context-aware systems (CAS), e.g., how to model context, and discusses further development of CAS and its potential applications by looking at available information, methods and technologies. Social Media seems to be an interesting source of personal information when appropriately exploited. In addition, there are many types of general information, ranging from weather and public transport to information of books and museums. These information sources can be combined in previously unexplored ways, enabling the development of smarter mobile services in different domains. Users are, however, reluctant to provide their personal information to applications; therefore, there is a crave for new regulations and systems that allow applications to use such contextual data without compromising the user privacy.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Rivero-Rodriguez, A., Pileggi, P., Nykänen, O. A.
Number of pages: 8
Pages: 25-32
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: International Journal of Interactive Mobile Technologies
Volume: 10
Issue number: 2
ISSN (Print): 1865-7923
Ratings:

Scopus rating (2016): CiteScore 0.27 SJR 0.169 SNIP 0.186
Original language: English
Keywords: Context-aware Services , Context Awareness, Context Management, Mobile Computing
Electronic versions:

Mobile Context-Aware Systems
DOIs:

10.3991/ijim.v10i2.5367
URLs:

http://urn.fi/URN:NBN:fi:tty-201604293895
Source: Bibtex
Source ID: urn:416cbddcc24982dbb51c9c6e1123e281
Research output: Contribution to journal › Article › Scientific › peer-review

Moodlen työpaja: Vertaisarviointi osana opetusta yliopistomatematiikan ensimmäisellä peruskurssilla

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Positioning
Contributors: Mäkelä, A., Ali-Löytty, S., Joutsenlahti, J., Kauhanen, J.
Number of pages: 10
Pages: 90-99
Publication date: 2016

Host publication information
Title of host publication: Matematiikan ja luonnontieteiden opetuksen tutkimusseuran tutkimuspäivät 2015
Publisher: Matematiikan ja luonnontiteiden opetuksen tutkimusseura r.y.
Editors: Silfvenberg, H., Hästö, P.
ISBN (Electronic): 978-952-93-8233-0
Keywords: Moodle, työpaja, workshop
URLs:

http://www.protsv.fi/mlseura/julkaisut/MALU2015_Final.pdf

Bibliographical note
INT=mat,"Joutsenlahti, Jorma"
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On Detecting the Shape of an Unknown Object in an Electric Field
The problem discussed in this paper is detecting the shape of an unknown object in a 2-dimensional static electric field. For simplicity, the problem is defined in a partially rectangular domain, where on a part of the boundary the potential and/or its normal derivative are known. On the other part of the boundary the boundary curve is unknown, and this curve is to be determined. The unknown part of the boundary curve describes the shape of the unknown object.
The problem is defined in the complex plane by an analytic function w=f(z) = u(x,y)+iv(x,y) with the potential u as its real part. Then the inverse function is given as f^{-1}(w) = x(u,v)+iy(u,v), where the functions x and y are harmonic in a rectangle with an unknown boundary condition on one boundary. The alternating-field technique is used to solve the unknown boundary condition.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Humaloja, J., Hämäläinen, T., Pohjolainen, S.
Publication date: 2016

Host publication information
Title of host publication: Progress in Industrial Mathematics at ECMI 2014
Publisher: Springer International Publishing

Editors: Russo, G., Capasso, V., Nicosia, G., Romano, V.
ISBN (Print): 978-3-319-23412-0
ISBN (Electronic): 978-3-319-23413-7

Publication series
Name: Mathematics in Industry
Publisher: Springer-Verlag
Volume: 22
ISSN (Electronic): 1612-3956
Keywords: free boundary problem, industrial mathematics
DOIs:
10.1007/978-3-319-23413-7
URLs:
http://urn.fi/URN:NBN:fi:tty-201606014205. No embargo end date input
https://www.springer.com/gp/book/9783319234120

Bibliographical note
Embargo avoinna, koska ei vielä julkaistu (Due May 3, 2017)
HO / 2.5.2016
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On finding rainbow and colorful paths

In the Colorful Path problem we are given a graph G=(V,E) and an arbitrary vertex coloring function c:V→[k]. The goal is to find a colorful path, i.e., a path on k vertices, that visits each color. This problem has been introduced in the classical work of Alon et al. (1995) [1], and the authors proposed a dynamic programming algorithm that runs in time 2knO(1) and uses O(2k) space. Since then the only progress obtained is reducing the space size to a polynomial at the cost of using randomization. In this work we show that a progress in time complexity is unlikely: if Colorful Path can be solved in time (2-ε)knO(1), then Set Cover admits a (2-ε')n(nm)O(1)-time algorithm. The same applies to other versions of the problem: when edges are colored instead of vertices, or we ask for a walk instead of a path, or when the requested path/walk has specified endpoints.We study also a second, very related problem. In Rainbow s t -Connectivity, we are given a k-edge-colored graph and two vertices s and t. The goal is to decide whether there is a rainbow path between s and t, that is, a path on which no color repeats. In its vertex variant (Rainbow Vertex s t -Connectivity) the input graph is k-vertex-colored, and a rainbow path is defined analogously. Uchizawa et al. (2011) [14] show that both variants can be solved in 2knO(1) time and exponential space. We show that the space size can be reduced to a polynomial, while keeping the same running time. In contrast to the polynomial space algorithm for Colorful Path, our algorithm for finding rainbow paths is deterministic.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Warsaw
Contributors: Kowalik, Ł., Lauri, J.
Number of pages: 5
Pages: 110-114
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Theoretical Computer Science
Volume: 628
ISSN (Print): 0304-3975
Ratings:
Scopus rating (2016): CiteScore 0.97 SJR 0.547 SNIP 0.968
Original language: English
DOIs:
10.1016/j.tcs.2016.03.017
Research output: Contribution to journal › Article › Scientific › peer-review

On k-Hypermonogenic Functions and Their Mean Value Properties

We study a hyperbolic version of holomorphic functions to higher dimensions. In this frame work, a generalization of holomorphic functions are called (Formula presented.)-hypermonogenic functions. These functions are depending on several real variables and their values are in a Clifford algebra. They are defined in terms of hyperbolic Dirac operators. They are connected to harmonic functions with respect to the Riemannian metric (Formula presented.) in the same way as the usual harmonic function to holomorphic functions. We present the mean value property for (Formula presented.)-hypermonogenic functions and related results. Earlier the mean value properties has been proved for hypermonogenic

functions. The key tools are the invariance properties of the hyperbolic metric.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Contributors: Eriksson, S., Orelma, H.
Number of pages: 15
Pages: 311-325
Publication date: 2016
Peer-reviewed: Yes
Early online date: 8 Mar 2015

Publication information
Journal: Complex Analysis and Operator Theory
Volume: 10
Issue number: 2
ISSN (Print): 1661-8254
Ratings:

Scopus rating (2016): CiteScore 0.57 SJR 0.554 SNIP 0.776
Original language: English
ASJC Scopus subject areas: Applied Mathematics, Computational Mathematics, Computational Theory and Mathematics
Keywords: Dirac operator, Hyperbolic metric, Hypermonogenic, Monogenic
DOIs:

10.1007/s11785-015-0445-z
Source: Scopus
Source ID: 84955725749
Research output: Contribution to journal › Article › Scientific › peer-review

Online tests of Kalman filter consistency
The normalised innovation squared (NIS) test, which is used to assess whether a Kalman filter's noise assumptions are consistent with realised measurements, can be applied online with real data, and does not require future data, repeated experiments or knowledge of the true state. In this work, it is shown that the NIS test is equivalent to three other model criticism procedures, which are as follows: (i) it can be derived as a Bayesian p-test for the prior predictive distribution; (ii) as a nested-model parameter significance test; and (iii) from a recently-proposed filter residual test. A new NIS-like test corresponding to a posterior predictive Bayesian p-test is presented.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Positioning
Contributors: Piché, R.
Pages: 115–124
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: International Journal of Adaptive Control and Signal Processing
Volume: 30
Issue number: 1
ISSN (Print): 0890-6327
Ratings:

Scopus rating (2016): CiteScore 2.04 SJR 0.749 SNIP 1.026
Original language: English
ASJC Scopus subject areas: Control and Systems Engineering, Electrical and Electronic Engineering, Signal Processing
Keywords: Kalman filter, Model consistency, Normalised innovations squared, Predictive distribution
Electronic versions:

KFconsistency2015
DOIs:

10.1002/acs.2571
URLs:

http://urn.fi/URN:NBN:fi:tty-201603173659
Source: Scopus
Source ID: 84954027695

On the arity gap of finite functions: Results and applications

Let A be a finite set and B an arbitrary set with at least two elements. The arity gap of a function $f : A^n \to B$ is the minimum decrease in the number of essential variables when essential variables of f are identified. A non- Trivial fact is that the arity gap of such B-valued functions on A is at most |A|. Even less trivial to verify is the fact that the arity gap of B-valued functions on A with more than |A| essential variables is at most 2. These facts ask for a classification of B-valued functions on A in terms of their arity gap. In this paper, we survey what is known about this problem. We present a general characterization of the arity gap of B-valued functions on A and provide explicit classifications of the arity gap of Boolean and pseudo-Boolean functions. Moreover, we reveal unsettled questions related to this topic, and discuss links and possible applications of some results to other subjects of research.

General information

Publication status: Published
MoE publication type: A2 Review article in a scientific journal
Organisations: Department of Mathematics, Université de Lorraine, Department of Combinatorics and Optimization, University of Waterloo, Computer Science and Communications Research Unit, University of Luxembourg
Contributors: Couceiro, M., Lehtonen, E.
Number of pages: 15
Pages: 193-207
Publication date: 2016
Peer-reviewed: Yes

Publication information

Journal: Journal of Multiple-Valued Logic and Soft Computing
Volume: 27
Issue number: 2-3
ISSN (Print): 1542-3980
Ratings:
Scopus rating (2016): CiteScore 0.47 SJR 0.26 SNIP 0.571
Original language: English
ASJC Scopus subject areas: Software, Logic, Theoretical Computer Science
URLs:
http://www.scopus.com/inward/record.url?scp=84979953947&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84979953947
Research output: Contribution to journal › Review Article › Scientific › peer-review

On the Fine-Grained Complexity of Rainbow Coloring

The Rainbow k-Coloring problem asks whether the edges of a given graph can be colored in k colors so that every pair of vertices is connected by a rainbow path, i.e., a path with all edges of different colors. Our main result states that for any k >= 2, there is no algorithm for Rainbow k-Coloring running in time 2^{o(n^{3/2})}, unless ETH fails. Motivated by this negative result we consider two parameterized variants of the problem. In the Subset Rainbow k-Coloring problem, introduced by Chakraborty et al. [STACS 2009, J. Comb. Opt. 2009], we are additionally given a set S of pairs of vertices and we ask if there is a coloring in which all the pairs in S are connected by rainbow paths. We show that Subset Rainbow k-Coloring is FPT when parameterized by |S|. We also study Subset Rainbow k-Coloring problem, where we are additionally given an integer q and we ask if there is a coloring in which at least q anti-edges are connected by rainbow paths. We show that the problem is FPT when parameterized by q and has a kernel of size O(q) for every k >= 2, extending the result of Ananth et al. [FSTTCS 2011]. We believe that our techniques used for the lower bounds may shed some light on the complexity of the classical Edge Coloring problem, where it is a major open question if a 2^{O(n)}-time algorithm exists.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, University of Warsaw
Contributors: Kowalik, L., Lauri, J., Socala, A.
Publication date: 2016

Host publication information

Title of host publication: 24th Annual European Symposium on Algorithms (ESA 2016)
Volume: 57
Editors: Sankowski, P., Zaroliagis, C.
ISBN (Electronic): 978-3-95977-015-6

Publication series
Name: Leibniz International Proceedings in Informatics (LIPIcs)
Volume: 57
ISSN (Electronic): 1868-8969
Keywords: graph coloring, computational complexity, lower bounds, exponential time hypothesis, FPT algorithms
Electronic versions:

LIPIcs-ESA-2016-58-1
DOIs:

10.4230/LIPIcs.ESA.2016.58
URLs:

http://urn.fi/URN:NBN:fi:tty-201810292496

Bibliographical note
JUFOID=79091
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Orbiter-to-orbiter tomography: a potential approach for small solar system bodies
The goal of this paper is to advance mathematical and computational methodology for orbiter-to-orbiter radio tomography of small solar system bodies. In this study, an advanced full waveform forward model is coupled with a total variation-based inversion technique. We use a satellite formation model in which a single unit receives a signal that is transmitted by one or more transponder satellites. Numerical results for a two-dimensional domain are presented.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Pursiainen, S., Kaasalainen, M.
Pages: 2747-2759
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Aerospace and Electronic Systems
Volume: 52
Issue number: 6
ISSN (Print): 0018-9251
Ratings:

Scopus rating (2016): CiteScore 2.89 SJR 0.742 SNIP 1.918
Original language: English
DOIs:

10.1109/TAES.2016.150638
Research output: Contribution to journal › Article › Scientific › peer-review

Poincaré inverse problem and torus construction in phase space
The phase space of an integrable Hamiltonian system is foliated by invariant tori. For an arbitrary Hamiltonian H such a foliation may not exist, but we can artificially construct one through a parameterised family of surfaces, with the intention of finding, in some sense, the closest integrable approximation to H . This is the Poincaré inverse problem (PIP). In this paper, we review the available methods of solving the PIP and present a new iterative approach which works well for the often problematic thin orbits.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Laakso, T., Kaasalainen, M.
Pages: 72-82
Publication date: 2016
Peer-reviewed: Yes
Early online date: 26 Oct 2015

Publication information
Journal: Physica D: Nonlinear Phenomena
Volume: 315
ISSN (Print): 0167-2789

Ratings:

Scopus rating (2016): CiteScore 1.71 SJR 0.847 SNIP 1.193
Original language: English
Keywords: Near integrability, Invariant torus, Torus construction, Surface construction in N dimensions, Poincare inverse problem, Geometric inverse problems
DOIs:

10.1016/j.physd.2015.10.011
URLs:

http://www.sciencedirect.com/science/article/pii/S0167278915002006
Source: RIS
Source ID: urn:D2F9E30B6CE6FDA228FD02A30B357C40
Research output: Contribution to journal › Article › Scientific › peer-review

Probabilistic assessment of the influence of lake properties in long-term radiation doses to humans

The assessment processes concerning the safety of nuclear waste repositories include the modelling of radionuclide transport in biosphere and the evaluation of the doses to the most affected humans. In this paper, a scenario, in which a contaminated lake is the water source for drinking water, irrigation water and watering of livestock, is presented. The objective of the paper is to probabilistically study the influence of lake properties as parameters in the assessment scenario. The properties of the lake are a result of previously conducted probabilistic studies, where the land uplift of the terrain surrounding the repositories and the formation of water bodies were studied in a 10,000-year time span using Monte Carlo simulation. The lake is formed at 3000 years from present day and the changing properties of the lake have been used in the study. The studied radionuclides 36Cl, 135Cs, 129I, 237Np, 90Sr, 99Tc and 238U enter the lake with a rate of 1 Bq/year. The transport process from the lake water to humans is described and the doses (dose conversion factors) to adult humans are evaluated based on a study on average food consumption. Sensitivity analysis is used for identifying the parameters having the most influence on the outcome of the dose. Based on the results from the sensitivity analysis, the volumetric outflow rate of the lake and the volume of the lake were taken into closer consideration. The results show the influence of probabilistically derived geomorphic lake input parameters on the dose.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Pori Department, Research group: Data-analytics and Optimization, EnviroCase, Ltd
Contributors: Pohjola, J., Turunen, J., Lipping, T., Ikonen, A. T.
Pages: 258–267
Publication date: 2016
Peer-reviewed: Yes

Publication information

Journal: JOURNAL OF ENVIRONMENTAL RADIOACTIVITY
Volume: 164
ISSN (Print): 0265-931X
Ratings:

Scopus rating (2016): CiteScore 2.39 SJR 0.956 SNIP 1.513
Original language: English
DOIs:

10.1016/j.jenvrad.2016.08.001
Research output: Contribution to journal › Article › Scientific › peer-review

Radar observations and shape model of asteroid 16 Psyche

Using the S-band radar at Arecibo Observatory, we observed 16 Psyche, the largest M-class asteroid in the main belt. We obtained 18 radar imaging and 6 continuous wave runs in November and December 2015, and combined these with 16 continuous wave runs from 2005 and 6 recent adaptive-optics (AO) images (Drummond et al., 2016) to generate a three-dimensional shape model of Psyche. Our model is consistent with a previously published AO image (Hanus et al., 2013) and three multi-chord occultations. Our shape model has dimensions $279 \times 232 \times 189$ km ($\pm 10\%$), $D_{eff} = 226 \pm 23$ km, and is 6% larger than, but within the uncertainties of, the most recently published size and shape model generated from the inversion of lightcurves (Hanus et al., 2013). Psyche is roughly ellipsoidal but displays a mass-deficit over a region spanning 90° of longitude. There is also evidence for two ~50–70 km wide depressions near its south pole. Our size and published masses lead to an overall bulk density estimate of 4500 ± 1400 kgm^{-3}. Psyche's mean radar albedo of 0.37 ± 0.09 is consistent with a near-surface regolith composed largely of iron-nickel and ~40% porosity. Its radar reflectivity varies by a factor of 1.6 as the asteroid rotates, suggesting global variations in metal abundance or bulk density in the near surface. The variations in radar albedo appear to correlate with large and small-scale shape features. Our size and Psyche's published absolute magnitude lead to an optical albedo of $p_V = 0.15 \pm 0.03$, and there is evidence for albedo variegations that correlate with shape features.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Bloomsburg University, Arecibo Observatory, University of Arizona, Berkeley, International Occultation Timing Assoc., University of Maine, Jet Propulsion Laboratory, California Institute of Technology, More Data! Inc. Eaton, More Data! Inc. La Cañada
Contributors: Shepard, M. K., Richardson, J., Taylor, P. A., Rodriguez-Ford, L. A., Conrad, A., de Pater, I., Adamkovics, M., de Kleer, K., Males, J. R., Morzinski, K. M., Close, L. M., Kaasalainen, M., Viikinkoski, M., Timerson, B., Reddy, V., Magri, C., Nolan, M. C., Howell, E. S., Benner, L. A. M., Giorgini, J. D., Warner, B. D., Harris, A. W.
Number of pages: 16
Pages: 388-403
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 281
ISSN (Print): 0019-1035
Ratings:

Scopus rating (2016): CiteScore 3.2 SJR 2.38 SNIP 1.269
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Asteroids, Asteroids Composition, Radar, Surfaces Asteroids
DOIs:

10.1016/j.icarus.2016.08.011
Source: Scopus
Source ID: 84992134162
Research output: Contribution to journal › Article › Scientific › peer-review

Risk-averse path planning with observation options

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Department of Automation Science and Engineering
Contributors: Ropponen, A., Lauri, M., Ritala, R.
Number of pages: 12
Pages: 25-36
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the 4th ICAPS Workshop on Planning and Robotics
Editors: Finzi, A., Karpas, E.

Publication series
Name: Workhop on Planning and Robotics
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Robust Regulation for First-Order Port-Hamiltonian Systems
We present a method for obtaining robust control over a first-order port-Hamiltonian system. The presented method is especially designed for controlling impedance energy-preserving port- Hamiltonian systems. By combining the stabilization results of port-Hamiltonian systems and the theory of robust output regulation for exponentially stable systems, we design a simple finite-dimensional controller for an unstable system that together with output feedback achieves robust output regulation. The method is demonstrated on an example where we implement a robust regulating controller for the one-dimensional wave equation with boundary control and observation.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Humaloja, J., Paunonen, L., Pohjolainen, S.
Number of pages: 6
Publication date: 2016

Host publication information

Title of host publication: Proceedings of the 15th European Control Conference, Aalborg, Denmark, June 29th - July 1st, 2016
Publisher: IEEE
ISBN (Electronic): 978-1-5090-2590-9
ASJC Scopus subject areas: Control and Optimization
Keywords: Robust output regulation, port-Hamiltonian systems
DOIs:

10.1109/ECC.2016.7810618

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robust Regulation for Port-Hamiltonian Systems of Even Order

We present a controller that achieves robust regulation for a port-Hamiltonian system of even order. The controller is especially designed for impedance energy-preserving systems. By utilizing the stabilization results for port-Hamiltonian systems together with the theory of robust output regulation for exponentially stable systems, we construct a simple controller that solves the Robust Output Regulation Problem for an initially unstable system. The theory is illustrated on an example where we construct a controller for one- dimensional Schrödinger equation with boundary control and observation.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Humaloja, J., Paunonen, L., Pohjolainen, S.
Number of pages: 5
Pages: 152-156
Publication date: 2016

Host publication information

Title of host publication: Proceedings of the 22nd International Symposium on Mathematical Theory of Networks and Systems, Minneapolis, MN, USA, July 12-15, 2016
Publisher: University of Minnesota
ISBN (Electronic): 978-1-5323-1358-5
ASJC Scopus subject areas: Control and Optimization
Keywords: Robust output regulation, port-Hamiltonian systems
Electronic versions:

HumPau_MTNS16
URLs:

http://hdl.handle.net/11299/181518

http://urn.fi/URN:NBN:fi:tty-201611284817

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Sähkömagneettinen malli funktoreina ja luonnollisina muunnoksina

General information

Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Electrical Engineering, Research area: Electromagnetics
Contributors: Kovanen, T., Tarhasaari, T., Kettunen, L.
Number of pages: 10
Pages: 21-30
Publication date: 2016
Peer-reviewed: Unknown

Publication information

Journal: Arkhimedes
ISSN (Print): 0004-1920
Original language: Finnish
Research output: Contribution to journal › Article › Professional

Soft Computing Methods

Soft computing methods of modelling usually include fuzzy logics , neural computation , genetical algorithms and probabilistic deduction , with the addition of data mining and chaos theory in some cases. Unlike the traditional “hardcore

methods" of modelling, these new methods allow for the gained results to be incomplete or inexact. Methodologically, the different approaches of these soft methods are quite heterogeneous. Still, all of them have a few things in common, namely that they have all been developed during the last 30–50 years (Bayes formula in 1763 and Lukasiewicz logic in 1920 being the exceptions), and that they would probably have not achieved their current standards without the exceptional growth in computational capacities of computers.

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Turunen, E., Raivio, K., Mantere, T.
Number of pages: 34
Pages: 79-112
Publication date: 2016

Host publication information
Title of host publication: Mathematical Modelling
Publisher: Springer International Publishing
Editor: Pohjolainen, S.
ISBN (Print): 978-3-319-27834-6
ISBN (Electronic): 978-3-319-27836-0
DOIs:

10.1007/978-3-319-27836-0_6
Source: Bibtex
Source ID: urn:2f085518a56520f4f0ad6be28a5dd8c8
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Spectral density function of the Doob transformation of fractional Brownian motion (i.e. the fractional Ornstein-Uhlenbeck process)

General information
Publication status: Published
Organisations: Department of Mathematics
Contributors: Kaarakka, T.
Number of pages: 2
Pages: 30-31
Publication date: 2016
Peer-reviewed: Unknown
Event: Paper presented at Finnish Mathematical Days 2016, Turku, Finland.
Research output: Other conference contribution › Paper, poster or abstract › Scientific

Stubborn Set Intuition Explained
This study focuses on the differences between stubborn sets and other partial order methods. First a major problem with step graphs is pointed out with an example. Then the deadlock-preserving stubborn set method is compared to the deadlock-preserving ample set and persistent set methods. Next, conditions are discussed whose purpose is to ensure that the reduced state space preserves the ordering of visible transitions, that is, transitions that may change the truth values of the propositions that the formula under verification has been built from. Finally solutions to the ignoring problem are analysed both when the purpose is to preserve only safety properties and when also liveness properties are of interest.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Valmari, A., Hansen, H.
Number of pages: 20
Pages: 213-232
Publication date: 2016

Host publication information
Title of host publication: Petri Nets and Software Engineering 2016 : Proceedings of the International Workshop on Petri Nets and Software Engineering 2016, including the International Workshop on Biological Processes & Petri Nets 2016
Publisher: CEUR-WS
Editors: Cabac, L., Kristensen, L. M., Rölke, H.

Publication series
Name: CEUR Workshop Proceedings
Publisher: CEUR-WS
Volume: 1591
ISSN (Electronic): 1613-0073
ASJC Scopus subject areas: Computer Science(all)
URLs:

http://ceur-ws.org/Vol-1591/paper15.pdf
URLs:

http://www.scopus.com/inward/record.url?scp=84977557005&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
JUFOID=53269
Source: Scopus
Source ID: 84977557005
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Towards a unified framework for decomposability of processes
The concept of process is ubiquitous in science, engineering and everyday life. Category theory, and monoidal categories in particular, provide an abstract framework for modelling processes of many kinds. In this paper, we concentrate on sequential and parallel decomposability of processes in the framework of monoidal categories: We will give a precise definition, what it means for processes to be decomposable. Moreover, through examples, we argue that viewing parallel processes as coupled in this framework can be seen as a category mistake or a misinterpretation. We highlight the suitability of category theory for a structuralistic interpretation of mathematical modelling and argue that for appliers of mathematics, such as engineers, there is a pragmatic advantage from this.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Research area: Electromagnetics
Contributors: Lahtinen, V., Stenvall, A.
Pages: 4411-4427
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: SYNTHESE
Volume: 194
Issue number: 11
ISSN (Print): 0039-7857
Ratings:

Scopus rating (2016): CiteScore 0.72 SJR 0.927 SNIP 1.317
Original language: English
DOIs:

10.1007/s11229-016-1139-4
URLs:

http://arxiv.org/abs/1606.05529
Research output: Contribution to journal › Article › Scientific › peer-review

Editorial: is Game-Based Math Learning Finally Coming of Age?

General information
Publication status: Published
MoE publication type: B1 Article in a scientific magazine
Organisations: Pori Department, Research group: TUT Game Lab, Stanford University
Contributors: Kiili, K., Devlin, K., Multisilta, J.
Number of pages: 4
Publication date: 8 Dec 2015
Peer-reviewed: No

Publication information
Journal: International Journal of Serious Games
Volume: 2
Issue number: 4

Article number: 1
ISSN (Print): 2384-8766
Original language: English
Research output: Contribution to journal › Editorial › Scientific

Binomial Gaussian mixture filter

In this work, we present a novel method for approximating a normal distribution with a weighted sum of normal distributions. The approximation is used for splitting normally distributed components in a Gaussian mixture filter, such that components have smaller covariances and cause smaller linearization errors when nonlinear measurements are used for the state update. Our splitting method uses weights from the binomial distribution as component weights. The method preserves the mean and covariance of the original normal distribution, and in addition, the resulting probability density and cumulative distribution functions converge to the original normal distribution when the number of components is increased. Furthermore, an algorithm is presented to do the splitting such as to keep the linearization error below a given threshold with a minimum number of components. The accuracy of the estimate provided by the proposed method is evaluated in four simulated single-update cases and one time series tracking case. In these tests, it is found that the proposed method is more accurate than other Gaussian mixture filters found in the literature when the same number of components is used and that the proposed method is faster and more accurate than particle filters.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Department of Mathematics, Research group: MAT Positioning, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Raitoharju, M., Ali-Löytty, S., Piché, R.
Publication date: 2 Dec 2015
Peer-reviewed: Yes

Publication information

Journal: Eurasip Journal on Advances in Signal Processing
Volume: 2015
Issue number: 1
Article number: 36
ISSN (Print): 1687-6172
Ratings:

Scopus rating (2015): CiteScore 0.83 SJR 0.351 SNIP 0.934
Original language: English
ASJC Scopus subject areas: Hardware and Architecture, Signal Processing, Electrical and Electronic Engineering
Keywords: Estimation, Gaussian mixture filter, Nonlinear filtering
Electronic versions:

s13634-015-0221-2
DOIs:

10.1186/s13634-015-0221-2
URLs:

http://urn.fi/URN:NBN:fi:tty-201706051582
URLs:

http://www.scopus.com/inward/record.url?scp=84934283964&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note

ORG=ase,0.75
ORG=mat,0.25
Source: Scopus
Source ID: 84934283964
Research output: Contribution to journal › Article › Scientific › peer-review

Graph-Based Map Matching for Indoor Positioning

This article presents a probabilistic motion model that is based on an economical graph-based indoor map representation, such that the motion of the user is constrained according to the floor plan of a building. The floor plan is modeled as a combination of links and open space polygons that are connected by nodes. In the authors' earlier work the link transition probabilities in this graph are proportional to the total link lengths that are the total lengths of the subgraphs accessible by choosing the considered link option, and this article extends this model to include open space polygons as well. A particle filter using the extended motion model in which all particles are constrained according to the map structure is presented. Furthermore, wireless local area network and Bluetooth Low Energy positioning tests show that the proposed algorithm outperforms comparison methods especially if the measurement rate is low.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: Wireless Communications and Positioning, Department of Automation Science and Engineering, Research area: Dynamic Systems, Department of Mathematics, Research group: MAT Positioning, Research group: Positioning
Contributors: Koivisto, M., Nurminen, H., Ali-Löytty, S., Piche, R.
Number of pages: 5
Publication date: 1 Dec 2015

Host publication information
Title of host publication: 10th International Conference on Information, Communications and Signal Processing (ICICS)
Publisher: IEEE
ISBN (Electronic): 9781467372176
Keywords: Indoor positioning, particle filter, motion model, map matching, graph
Electronic versions:

ICICS2015 postprint
DOIs:

10.1109/ICICS.2015.7459983
URLs:

http://urn.fi/URN:NBN:fi:tty-201603183699

Bibliographical note
ISBN of the USB proceedings. Will appear in IEEE Xplore.

ORG=ase,0.8
ORG=mat,0.2
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Kalman filter with a linear state model for PDR+WLAN positioning and its application to assisting a particle filter
Indoor positioning based on wireless local area network (WLAN) signals is often enhanced using pedestrian dead reckoning (PDR) based on an inertial measurement unit. The state evolution model in PDR is usually nonlinear. We present a new linear state evolution model for PDR. In simulated-data and real-data tests of tightly coupled WLAN-PDR positioning, the positioning accuracy with this linear model is better than with the traditional models when the initial heading is not known, which is a common situation. The proposed method is computationally light and is also suitable for smoothing. Furthermore, we present modifications to WLAN positioning based on Gaussian coverage areas and show how a Kalman filter using the proposed model can be used for integrity monitoring and (re)initialization of a particle filter.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Raitoharju, M., Nurminen, H., Piché, R.
Publication date: 1 Dec 2015
Peer-reviewed: Yes

Publication information
Journal: Eurasip Journal on Advances in Signal Processing
Volume: 2015
Issue number: 1
Article number: 33
ISSN (Print): 1687-6172
Ratings:

Scopus rating (2015): CiteScore 0.83 SJR 0.351 SNIP 0.934
Original language: English
ASJC Scopus subject areas: Hardware and Architecture, Signal Processing, Electrical and Electronic Engineering
Keywords: Computational modeling, Indoor positioning, Pedestrian dead reckoning, Wireless LAN
Electronic versions:

s13634-015-0216-z
DOIs:

10.1186/s13634-015-0216-z
URLs:

http://urn.fi/URN:NBN:fi:tty-201706051578

URLs:

http://www.scopus.com/inward/record.url?scp=84928397748&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84928397748
Research output: Contribution to journal › Article › Scientific › peer-review

SimpleTree: An Efficient Open Source Tool to Build Tree Models from TLS Clouds

An open source tool named SimpleTree, capable of modelling highly accurate cylindrical tree models from terrestrial laser scan point clouds, is presented and evaluated. All important functionalities, accessible in the software via buttons and dialogues, are described including the explanation of all necessary input parameters. The method is validated utilizing 101 point clouds of six different tree species, in the main evergreen and coniferous trees. All scanned trees have been destructively harvested to get accurate estimates of above ground biomass with which we assess the accuracy of the SimpleTree-reconstructed cylinder models. The trees were grouped into four data sets and for each one a Concordance Correlation Coefficient of at least 0.92 (0.92, 0.97, 0.92, 0.94) and an total relative error at most ~8 % (2.42%, 3.59%, –4.59%, 8.27%) was achieved in the comparison of the model results to the ground truth data. A global statistical improvement of derived cylinder radii is presented as well as an efficient optimization approach to automatically improve user given input parameters. An additional check of the SimpleTree results is presented via comparison to the results of trees reconstructed using an alternative, published method.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Hackenberg, J., Spiecker, H., Calders, K., Disney, M., Raumonen, P.
Number of pages: 50
Pages: 4245-4294
Publication date: 23 Nov 2015
Peer-reviewed: Yes

Publication information

Journal: Forests: Open Access Journal
Volume: 6
Issue number: 11
ISSN (Print): 1999-4907
Ratings:

Scopus rating (2015): CiteScore 1.76 SJR 0.633 SNIP 0.761
Original language: English
DOIs:

10.3390/f6114245
URLs:

http://www.mdpi.com/1999-4907/6/11/4245 (Webpage of the article)
Research output: Contribution to journal › Article › Scientific › peer-review

Fractional Ornstein-Uhlenbeck Processes

In this monograph, we are mainly studying Gaussian processes, in particularly three different types of fractional Ornstein – Uhlenbeck processes. Pioneers in this field may bementioned, e.g. Kolmogorov (1903-1987) and Mandelbrot (1924-2010).The Ornstein – Uhlenbeck diffusion can be constructed from Brownian motion via a Doobtransformation and also from a solution of the Langevin stochastic differential equation. Both of these processes have the same finite dimensional distributions. However the solution of the Langevin stochastic differential equation, which driving process is fractionalBrownian motion and a Doob transformation of fractional Brownian motion do not havesame finite dimensional distributions. Indeed we verify, that the covariance of the fractionalOrnstein – Uhlenbeck process of the first kind (which we call the solution of the Langevin stochastic differential equation in which the driving process is fractional Brownian motion) behaves at infinity like a power function and the covariance of the fractional Ornstein –Uhlenbeck process (constructed by a Doob transformation of fractional Brownian motion) behaves at infinity like an exponential function. Moreover we study the behaviour of the covariances of these fractional Ornstein – Uhlenbeck processes. We also calculate the spectral density function for the Doob transformation of fractional Brownian motion using a Bochner theorem.We present the Doob transformation of fractional Brownian motion via solution of the Langevin stochastic differential equation. One of the main aims of our research is to analyse its driving process. This driving process is $Y^{(\alpha)}=e^{-t\alpha} x_{\tau_t}$, where $\tau_t=(He^{\alpha t/H})/\alpha$ and $\{Z_t:t\geq 0\}$ is fractional Brownian motion. We find out that the process $Y^{(\alpha)} := \{Y_t^{(\alpha)}: t \geq 0\}$, if scaled properly, has the same finite dimensional distributions as the process $Y^{(1)} := \{Y_t^{(1)}: t \geq 0\}$. The main result in this monograph is that we define a stationary fractional Ornstein – Uhlenbeck process of the second kind as a process with a two-sided driving process $\{Y_t^{(1)}: t\in R\}$ and create a new family of fractional Ornstein-Uhlenbeck processes. We study many properties of the fractional Ornstein – Uhlenbeck process of the second kind. For example, we show that the fractional Ornstein – Uhlenbeck process of the second kind is Hölder continuous of any order $\beta < H$ and find the kernel

representation of its covariance.We research many properties of the processes Y^((α)) and Y^((1)) since they are quite interesting themselves. We represent these processes as stochastic integrals with respect to Brownian motion and prove that the sample paths of the process Y^((α)) are Hölder continuous of any order β < H. In the case H ∈(1/2,1), we find out the covariance kernel of increment process of Y^((α)), and using that we investicate the covariance of Y^((α)) and the variance of Y^((α)), when t tends to infinity. One of our main results is that the increment process of Y^((α)) is short-range dependent. We also study weak convergence and tightness and then finally prove that 1/√α Y_αt^((α)) converges weakly to scaled Brownian motion.In the case H ∈(1/2,1), fractional Brownian motion and the fractional Ornstein – Uhlenbeck process of the first kind both exhibit a long-range dependence, but the fractional Ornstein– Uhlenbeck process of the second kind exhibits a short-range dependence. This offers more opportunities to model network traffic or economic time series via tractable fractional processes. The fractional Ornstein – Uhlenbeck process of the first kind and the fractional Ornstein – Uhlenbeck process of the second kind are quite similar to simulate, since they can both be represented via stochastic differential equations.

General information
Publication status: Published
MoE publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Mathematics
Contributors: Kaarakka, T.
Number of pages: 102
Publication date: 6 Nov 2015

Publication information
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-3604-5
ISBN (Electronic): 978-952-15-3620-5
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1338
ISSN (Print): 1459-2045
Electronic versions:

kaarakka_1338
URLs:

http://URN.fi/URN:ISBN:978-952-15-3620-5

Bibliographical note
Awarding institution:Tampere University of Technology
Versio ok 14.12.2015
Research output: Book/Report › Doctoral thesis › Monograph

Comparison Study for Whitney (Raviart-Thomas) Type Source Models in Finite Element Method Based EEG Forward Modeling

This study concentrates on finite element method (FEM) based electroencephalography (EEG) forward simulation in which the electric potential evoked by neural activity in the brain is to be calculated at the surface of the head. The main advantage of the FEM is that it allows realistic modeling of tissue conductivity inhomogeneity. However, it is not straightforward to apply the classical model of a dipolar source with the FEM, due to its strong singularity and the resulting irregularity. The focus of this study is on comparing different methods to cope with this problem. In particular, we evaluate the accuracy of Whitney (Raviart-Thomas) type dipole-like source currents compared to two reference dipole modeling methods: the St. Venant and partial integration approach. Common to all these methods is that they enable direct approximation of the potential field utilizing linear basis functions. In the present context, Whitney elements are particularly interesting, as they provide a simple means to model a divergence-conforming primary current vector field satisfying the square integrability condition. Our results show that a Whitney type source model can provide simulation accuracy comparable to the present reference methods. It can lead to superior accuracy under optimized conditions with respect to both source location and orientation in a tetrahedral mesh. For random source orientations, the St. Venant approach turns out to be the method of choice over the interpolated version of the Whitney model. The overall moderate differences obtained

suggest that practical aspects, such as the focality, should be prioritized when choosing a source model.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Pursiainen, S., Bauer, M., Vorwerk, J., Köstler, H., Wolters, C. H.
Number of pages: 9
Pages: 2648-2656
Publication date: Nov 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Biomedical Engineering
Volume: 62
Issue number: 11
ISSN (Print): 0018-9294
Ratings:

Scopus rating (2015): CiteScore 3.74 SJR 1.133 SNIP 2.019
Original language: English
DOIs:

10.1109/TBME.2015.2439282
Research output: Contribution to journal › Article › Scientific › peer-review

Moodlen työpaja: Vertaisarviointi osana opetusta matematiikan ensimmäisellä peruskurssilla
Moodlen Työpaja - vertaisarviointi osana opetusta matematiikan ensimmäisellä peruskurssilla Tampereen teknillisessä yliopistossa tehdään kokeilu opiskelijoiden välisestä vertaisarvioinnista matematiikan ensimmäisellä peruskurssilla syksyllä 2015. Kokeilu toteutetaan Moodlen Työpaja- aktiviteetin avulla. Vertaisarviointi toteutetaan siten, että jokaisella harjoitusviikolla opiskelijat palauttavat yhden harjoitustehtävän Moodlen Työpajaan osana kyseisen viikon laskuharjoitus- ta. Palautuksen jälkeen he saavat kahden muun anonyymin opiskelijan tekemät ratkaisut vertai- sarvioitavakseen. Vertaisarvioija pisteyttää tehtävän annettujen arviointiohjeiden mukaisesti ja antaa ratkaisusta sanallisen palautteen. Tehtävät ovat pääosin todistustehtäviä (tai muuten haastavampia tehtäviä). Vertaisarvioinnin ajatus on, että voidakseen arvioida toisen opiskelijan tekemän tehtävän, opiskelijoiden tulee käy- dä ensin itse tehtävän ratkaisuprosessi perusteellisesti läpi, mikä mahdollisesti edesauttaa opis- keltavan asian syvempää ymmärtämistä.
Kokeilun tarkoituksena on tutkia, miten opiskelijat kokevat vertaisarvioinnin ja ennen kaikkea vaikuttaako vertaisarviointi positiivisesti heidän oppimistuloksiinsa niin arvioijana kuin arvioi- tavanakin. Esityksessä on mukana tutkimuksen alustavia tuloksia.

General information
Publication status: Published
Organisations: Department of Mathematics
Contributors: Mäkelä, A., Ali-Löytty, S. S., Kauhanen, J. P., Joutsenlahti, J.
Number of pages: 1
Pages: 15-15
Publication date: 30 Oct 2015
Peer-reviewed: Unknown
Event: Paper presented at MATEMATIIKAN, LUONNONTIETEEN JA TEKNOLOGIAN OPETUKSEN TUTKIMUKSEN PÄIVÄT, .
ASJC Scopus subject areas: Mathematics(all)
Additional files:

Vertaisarviointi Moodlen Työpajassa
URLs:

http://users.utu.fi/haunsi/Ohjelma_ja_abstraktit.pdf

Bibliographical note
xpresentation
Research output: Other conference contribution › Paper, poster or abstract › Professional

CytoSpectre: A tool for spectral analysis of oriented structures on cellular and subcellular levels
Background: Orientation and the degree of isotropy are important in many biological systems such as the sarcomeres of cardiomyocytes and other fibrillar structures of the cytoskeleton. Image based analysis of such structures is often limited to qualitative evaluation by human experts, hampering the throughput, repeatability and reliability of the analyses. Software tools are not readily available for this purpose and the existing methods typically rely at least partly on manual operation.

Results: We developed CytoSpectre, an automated tool based on spectral analysis, allowing the quantification of orientation and also size distributions of structures in microscopy images. CytoSpectre utilizes the Fourier transform to estimate the power spectrum of an image and based on the spectrum, computes parameter values describing, among others, the mean orientation, isotropy and size of target structures. The analysis can be further tuned to focus on targets of particular size at cellular or subcellular scales. The software can be operated via a graphical user interface without any programming expertise. We analyzed the performance of CytoSpectre by extensive simulations using artificial images, by benchmarking against FibrilTool and by comparisons with manual measurements performed for real images by a panel of human experts. The software was found to be tolerant against noise and blurring and superior to FibrilTool when analyzing realistic targets with degraded image quality. The analysis of real images indicated general good agreement between computational and manual results while also revealing notable expert-to-expert variation. Moreover, the experiment showed that CytoSpectre can handle images obtained of different cell types using different microscopy techniques. Finally, we studied the effect of mechanical stretching on cardiomyocytes to demonstrate the software in an actual experiment and observed changes in cellular orientation in response to stretching.
Conclusions: CytoSpectre, a versatile, easy-to-use software tool for spectral analysis of microscopy images was developed. The tool is compatible with most 2D images and can be used to analyze targets at different scales. We expect the tool to be useful in diverse applications dealing with structures whose orientation and size distributions are of interest. While designed for the biological field, the software could also be useful in non-biological applications.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: BioMediTech, Integrated Technologies for Tissue Engineering Research (ITTE), Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control, Univ Tampere, University of Tampere, Sch Med, Hearing & Balance Res Unit, Field Otolaryngol, Univ Tampere, University of Tampere, BioMediTech, BMT FM5, Univ Tampere, University of Tampere, Sch Informat Sci, Tampere Univ Technol, Tampere University of Technology, Heart Hosp
Contributors: Kartasalo, K., Polonen, R., Ojala, M., Rasku, J., Lekkala, J., Aalto-Setälä, K., Kallio, P.
Number of pages: 23
Publication date: 26 Oct 2015
Peer-reviewed: Yes

Publication information
Journal: BMC Bioinformatics
Volume: 16
Issue number: 1
Article number: 344
ISSN (Print): 1471-2105
Ratings:

Scopus rating (2015): CiteScore 2.77 SJR 1.737 SNIP 1.068
Original language: English
Keywords: Orientation, Isotropy, Spectral analysis, Fourier transform, Power spectrum, Image analysis, Microscopy, Artificial images, Cardiomyocytes, Stretching, FAST FOURIER-TRANSFORM, PLURIPOTENT STEM-CELLS, QUANTITATIVE-ANALYSIS, AUTOMATED MEASUREMENT, MICROSCOPY IMAGES, CARDIOMYOCYTES, ORIENTATION, ALIGNMENT, DIFFERENTIATION, MATURATION
Electronic versions:

CytoSpectre_Kartasalo
DOIs:

10.1186/s12859-015-0782-y
URLs:

http://urn.fi/URN:NBN:fi:tty-201603173653
URLs:

http://www.scopus.com/inward/record.url?scp=84958912496&partnerID=8YFLogxK (Link to publication in Scopus)
Source: WOS
Source ID: 000363375000001
Research output: Contribution to journal › Article › Scientific › peer-review

A NLOS-robust TOA positioning filter based on a skew-t measurement noise model
A skew-t variational Bayes filter (STVBF) is applied to indoor positioning with time-of-arrival (TOA) based distance measurements and pedestrian dead reckoning (PDR). The proposed filter accommodates large positive outliers caused by occasional non-line-of-sight (NLOS) conditions by using a skew-t model of measurement errors. Real-data tests using the fusion of inertial sensors based PDR and ultra-wideband based TOA ranging show that the STVBF clearly outperforms the extended Kalman filter (EKF) in positioning accuracy with the computational complexity about three times that of the EKF.

General information
Publication status: Published

MoE publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Nurminen, H., Ardeshiri, T., Piche, R., Gustafsson, F.
Number of pages: 7
Pages: 1-7
Publication date: 1 Oct 2015

Host publication information
Title of host publication: 2015 International Conference on Indoor Positioning and Indoor Navigation (IPIN)
Publisher: IEEE
ISBN (Print): 978-1-4673-8402-5
Keywords: Approximation methods, Computational modeling, Distance measurement, Gaussian distribution, Measurement errors, Noise measurement, Position measurement, NLOS, TOA, UWB, indoor positioning, robust filtering, skew t, skewness, variational Bayes
Electronic versions:

IPIN2015_postprint
DOIs:

10.1109/IPIN.2015.7346786
URLs:

http://urn.fi/URN:NBN:fi:tty-201603183702
Source: Bibtex
Source ID: urn:e960458d3c3e7f01508ed799f1fbe96d
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Polynomial Input-Output Stability for Linear Systems
We introduce the concept of polynomial input-output stability for infinite-dimensional linear systems. We show that this stability type corresponds exactly to the recent notion of P-stability in the frequency domain. In addition, we show that on a Hilbert space a regular linear system whose system operator generates a polynomially stable semigroup is always polynomially input-output stable, and present additional conditions under which the system is input-output stable. The results are illustrated with an example of a polynomially input-output stable one-dimensional wave system.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Contributors: Paunonen, L., Laakkonen, P.
Number of pages: 6
Pages: 2797-2802
Publication date: 1 Oct 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 60
Issue number: 10
ISSN (Print): 0018-9286
Ratings:

Scopus rating (2015): CiteScore 5.08 SJR 4.285 SNIP 3.218
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications
Keywords: Distributed parameter system, Stability
DOIs:

10.1109/TAC.2015.2398890
URLs:

http://www.scopus.com/inward/record.url?scp=84942853446&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84942853446
Research output: Contribution to journal › Article › Scientific › peer-review

VLT/SPHERE- and ALMA-based shape reconstruction of asteroid (3) Juno
We use the recently released Atacama Large Millimeter Array (ALMA) and VLT/SPHERE science verification data, together with earlier adaptive-optics images, stellar occultation, and lightcurve data to model the 3D shape and spin of the

large asteroid (3) Juno with the all-data asteroid modelling (ADAM) procedure. These data set limits on the plausible range of shape models, yielding reconstructions suggesting that, despite its large size, Juno has sizable unrounded features moulded by non-gravitational processes such as impacts.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact), Astronomical Institute, Faculty of Mathematics and Physics, Charles University in Prague, University of Latvia. Faculty of Physics and Mathematics, Charles University in Prague, ACME, IMCCE, Université de Lille 1, Laboratoire Lagrange, UMR 7293 CNRS, Observatoire de la Côte d'Azur, European Southern Observatory (ESO), Aix-Marseille University, CNRS, LAM (Laboratoire d'Astrophysique de Marseille) UMR 7326, ONERA - Optics Department, Southwest Research Institute, Unidad Mixta Internacional FCA (UMI 3386), CNRS/INSU, Universidad de Chile, LESIA (UMR 8109), Observatoire de Paris, Univ. Paris-Diderot
Contributors: Viikinkoski, M., Kaasalainen, M., Durech, J., Carry, B., Marsset, M., Fusco, T., Dumas, C., Merline, W. J., Yang, B., Berthier, J., Kervella, P., Vernazza, P.
Number of pages: 5
Publication date: 1 Sep 2015
Peer-reviewed: Yes

Publication information

Journal: Astronomy and Astrophysics
Volume: 581
Article number: L3
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2015): CiteScore 3.5 SJR 2.545 SNIP 1.247
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Instrumentation: adaptive optics, Instrumentation: interferometers, Methods: numerical, Minor planets, asteroids: individual: (3) Juno
DOIs:

10.1051/0004-6361/201526626
URLs:

http://www.scopus.com/inward/record.url?scp=84941207014&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84941207014
Research output: Contribution to journal › Article › Scientific › peer-review

Stop It, and Be Stubborn!

A system is always may-terminating, if and only if from every reachable state, a terminal state is reachable. This publication argues that it is beneficial for both catching non-progress errors and stubborn, ample, and persistent set state space reduction to try to make verification models always may-terminating. An incorrect mutual exclusion algorithm is used as an example. The error does not manifest itself, unless the first action of the customers is modelled differently from other actions. An appropriate method is to add an alternative first action that models the customer stopping for good. This method typically makes the model always may-terminating. If the model is always may-terminating, then the basic strong stubborn set method preserves safety and some progress properties without any additional condition for solving the ignoring problem. Furthermore, whether the model is always may-terminating can be checked efficiently from the reduced state space.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics, Regulation of learning and active learning methods (REALMEE)
Contributors: Valmari, A.
Number of pages: 10
Pages: 10-19
Publication date: 21 Jun 2015

Host publication information

Title of host publication: Application of Concurrency to System Design (ACSD) : 2015 15th International Conference on
Publisher: IEEE Computer Society
Editors: Haar, S., Meyer, R.
Article number: 2

ISBN (Electronic): 978-1-4673-7882-6
ASJC Scopus subject areas: Computer Science(all)
Keywords: model checking; stubborn set / partial order methods; safety; progress
Electronic versions:
AV2015ACSD
DOIs:
10.1109/ACSD.2015.14
URLs:
http://urn.fi/URN:NBN:fi:tty-201606064227
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Gaussian filtering and variational approximations for Bayesian smoothing in continuous-discrete stochastic dynamic systems

The Bayesian smoothing equations are generally intractable for systems described by nonlinear stochastic differential equations and discrete-time measurements. Gaussian approximations are a computationally efficient way to approximate the true smoothing distribution. In this work, we present a comparison between two Gaussian approximation methods. The Gaussian filtering based Gaussian smoother uses a Gaussian approximation for the filtering distribution to form an approximation for the smoothing distribution. The variational Gaussian smoother is based on minimizing the Kullback-Leibler divergence of the approximate smoothing distribution with respect to the true distribution. The results suggest that for highly nonlinear systems, the variational Gaussian smoother can be used to iteratively improve the Gaussian filtering based smoothing solution. We also present linearization and sigma-point methods to approximate the intractable Gaussian expectations in the variational Gaussian smoothing equations. In addition, we extend the variational Gaussian smoother for certain class of systems with singular diffusion matrix.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO), Aalto University
Contributors: Ala-Luhtala, J., Särkkä, S., Piche, R.
Number of pages: 13
Pages: 124-136
Publication date: Jun 2015
Peer-reviewed: Yes

Publication information

Journal: Signal Processing
Volume: 111
ISSN (Print): 0165-1684
Ratings:
Scopus rating (2015): CiteScore 3 SJR 0.898 SNIP 1.936
Original language: English
DOIs:
10.1016/j.sigpro.2014.12.013

Bibliographical note

Available online 19 Dec,2014, preprint http://arxiv.org/abs/1407.5874 (vol 111, June2015, s. 124-136)
Contribution: organisation=ase,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2015-01-09
Publisher name: Elsevier
 publication_forum:67104
Source: researchoutputwizard
Source ID: 80
Research output: Contribution to journal › Article › Scientific › peer-review

Fundamental solution of k-hyperbolic harmonic functions in odd spaces

We study k-hyperbolic harmonic functions in the upper half space . The operator is the Laplace-Beltrami operator with respect to the Riemannian metric . In case k = n - 1 the Riemannian metric is the hyperbolic distance of Poincare upper half space. The proposed functions are connected to the axially symmetric potentials studied notably by Weinstein, Huber and Leutwiler. We present the fundamental solution in case n is even using the hyperbolic metric. The main tool is the transformation of k-hyperbolic harmonic functions to eigenfunctions of the hyperbolic Laplace operator.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Clifford analysis

Contributors: Eriksson, S., Orelma, H.
Publication date: 13 Apr 2015
Peer-reviewed: Yes

Publication information
Journal: Journal of Physics: Conference Series
Volume: 597
Issue number: 1
Article number: 012034
ISSN (Print): 1742-6588
Ratings:

Scopus rating (2015): CiteScore 0.35 SJR 0.252 SNIP 0.374
Original language: English
ASJC Scopus subject areas: Physics and Astronomy(all)
DOIs:

10.1088/1742-6596/597/1/012034
URLs:

http://www.scopus.com/inward/record.url?scp=84928019119&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84928019119
Research output: Contribution to journal › Article › Scientific › peer-review

ADAM: A general method for using various data types in asteroid reconstruction
We introduce ADAM, the All-Data Asteroid Modelling algorithm. ADAM is simple and universal since it handles all disk-resolved data types (adaptive optics or other images, interferometry, and range-Doppler radar data) in a uniform manner via the 2D Fourier transform, enabling fast convergence in model optimization. The resolved data can be combined with disk-integrated data (photometry). In the reconstruction process, the difference between each data type is only a few code lines defining the particular generalized projection from 3D onto a 2D image plane. Occultation timings can be included as sparse silhouettes, and thermal infrared data are efficiently handled with an approximate algorithm that is sufficient in practice because of the dominance of the high-contrast (boundary) pixels over the low-contrast (interior) pixels. This is of particular importance to the raw ALMA data that can be directly handled by ADAM without having to construct the standard image. We study the reliability of the inversion, using the independent shape supports of function series and control-point surfaces. When other data are lacking, one can carry out fast non-convex lightcurve-only inversions, but any shape models resulting from it should only be taken as illustrative large-scale models.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact), Astronomical Institute, Faculty of Mathematics and Physics, Charles University in Prague
Contributors: Viikinkoski, M., Kaasalainen, M., Durech, J.
Number of pages: 11
Publication date: 1 Apr 2015
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 576
Article number: A8
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2015): CiteScore 3.5 SJR 2.545 SNIP 1.247
Original language: English
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science
Keywords: Methods: analytical, Methods: numerical, Minor planets, asteroids: general, Minor planets, asteroids: individual: 2000 ET70, Minor planets, asteroids: individual: Daphne
Electronic versions:

ADAM
DOIs:

10.1051/0004-6361/201425259
URLs:

http://URN.fi/URN:NBN:fi:tty-201603083624
URLs:

http://www.scopus.com/inward/record.url?scp=84925251323&partnerID=8YFLogxK (Link to publication in Scopus)

Source: Scopus
Source ID: 84925251323
Research output: Contribution to journal › Article › Scientific › peer-review

On improvement of transient stage of composite nonlinear feedback control using arbitrary order set point filters

This paper studies the generalization of composite nonlinear feedback (CNF) control using arbitrary order set point filters, which focus on the initial stage of the transient response. The set point filters can be used to provide more performance by shortening the rise and settling times of the control system. Furthermore, the filters operate outside the feedback loop, and hence, they do not sacrifice loop robustness. The new method is illustrated by a benchmark problem found in an open literature. The simulation results show that the proposed method improves the set point response more than 10% in terms of settling time.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research area: Information Systems in Automation, Research area: Dynamic Systems, Department of Automation Science and Engineering, Smart Energy Systems (SES)
Contributors: Pyrhönen, V., Koivisto, H.
Number of pages: 6
Pages: 147 - 152
Publication date: 1 Apr 2015

Host publication information

Title of host publication: 2014 IEEE International Conference on Control System, Computing and Engineering (ICCSCE)
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-5685-2
Keywords: Composite nonlinear feedback, actuator saturation, high performance, robust control, set point filter, control system synthesis, feedback, nonlinear control systems, transient response
DOIs:
10.1109/ICCSCE.2014.7072705
URLs:
http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7072705
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Composite Nonlinear Feedback Control of a Chemical Reactor

This paper studies the application of composite nonlinear feedback (CNF) control for a continuous time stirred tank reactor. Inside the reactor, an exothermic chemical reaction occurs, which requires cooling when concentration is commanded from low to high conversion rate to prevent a thermal runaway. A full-state CNF controller is designed for adjusting the temperature of the cooling jacket using concentration and temperature measurements. A continuous time gain-scheduled cascade controller, as well as a model predictive controller (MPC) is also fabricated for comparison. The gain-scheduled cascade controller has a proportional-integral (PI) controller as a primary loop controller, and a P-controller as a secondary loop controller. The simulation results show that the CNF controller is able to offer the best overall tracking performance as measured by the integral-of-absolute-error (IAE) criterion. In addition, the CNF controller does not need gain-scheduling for tuning purposes; the CNF controller is capable of changing its tuning as a function of control error only.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research area: Information Systems in Automation, Research area: Dynamic Systems, Department of Automation Science and Engineering
Contributors: Pyrhönen, V., Koivisto, H.
Publication date: 18 Mar 2015

Host publication information

Title of host publication: Proceedings of AutomaatioXXI, The Industrial Revolution of Internet – From Intelligent Devices to Networked Intelligence
Place of publication: Helsinki, Finland
Publisher: Suomen Automaatioseura ry
ISBN (Electronic): 978-952-5183-46-7

Publication series

Name: SAS julkaisusarja
Publisher: Finnish Society of Automation
Volume: 44
Keywords: exothermic reaction, nonlinear control, nonlinear dynamics, cascade control

Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Projektioppiminen: lähtökohtana ympäröivä maailma

Oppilaat tarvitsevat matematiikkaa arjessa ja tulevassa työelämässä, ei vain matematiikan tunneilla. Projektioppiminen-kehittämishankeen tarkoituksena on lisätä yläkouluikäisten oppilaiden motivaatiota matematiikkaa kohtaan ja luoda samalla matematiikkainnostusta.

General information

Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Contributors: Eriksson, S., Viro, E.
Publication date: 11 Mar 2015
Peer-reviewed: Unknown

Publication information

Journal: LUMA-sanomat
ISSN (Print): 1799-3385
Original language: Finnish
Keywords: Projektioppiminen, matematiikan opetus
URLs:

http://luma.fi/artikkelit/3675/projektioppiminen-lahtokohtana-ymparoiva-maailma
Research output: Contribution to journal › Article › Professional

Tampereen matemaattisten aineiden aineenopettajakoulutus

We present how the education of subject teachers is organized in mathematics, science and computer science in Tampere. It is based on the idea that both engineering students and students from mathematics and science may choose to become a subject teacher. Students are accepted either to the master's degree program in Science and Engineering of Tampere University of Technology or the master's program of Mathematics and Statistics of University of Tampere. Students from different universities are giving opportunities to learn from each other. They study physics and chemistry in Tampere University of Technology and do pedagogical studies in University of Tampere. Both universities have also developed special motivating courses based on the didactical research to their students. In mathematics, there is a joined course for the second or third year students motivating towards teaching carrier. In both universities there are possibilities to do the master or bachelor thesis in didactics of mathematics or science. Both universities have an important role in education of subject teachers in Finland. Tampere University of Technology is providing opportunities during studies to cooperate between schools and industry. It gives ideas how science and mathematics are applied in the modern society. University of Tampere also trains primary school teachers with specialization in mathematics.

General information

Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Mathematics, Research group: MAT Clifford analysis, Department of Chemistry and Bioengineering, Research group: Supramolecular photochemistry
Contributors: Eriksson, S., Haukkanen, P., Hukka, T. I., Lemmetyinen, H.
Number of pages: 8
Pages: 800-807
Publication date: 11 Mar 2015
Peer-reviewed: Unknown

Publication information

Journal: Lumat
Volume: 3
Issue number: 6
ISSN (Print): 2323-7112
Original language: Finnish
URLs:

http://www.luma.fi/lumat/4105

Bibliographical note

ORG=mat,0.7
ORG=keb,0.3
Research output: Contribution to journal › Article › Professional

Generalized hyperbolic harmonic functions in the plane

We consider solutions of the equation yΔh (x,y)-k ah/ay=0 in the plane. These functions already have been investigated by Weinstein around 1950 in connection of generalized axially symmetric potential theory. We have found several results concerning these type of functions, called k-hyperbolic harmonic functions, in higher dimensions. In this paper, we show in the plane case that it is possible to compute the explicit fundamental solutions in terms of the hyperbolic metric. These results may be used to find fundamental solutions in all even dimensional spaces. The key tools are the transformation properties of hyperbolic metric of the Poincaré upper half space model.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Contributors: Eriksson, S., Orelma, H., Vuojamo, V.
Publication date: 10 Mar 2015

Host publication information

Title of host publication: Proceedings of the International Conference on Numerical Analysis and Applied Mathematics 2014 (ICNAAM-2014)
Volume: 1648
Publisher: American Institute of Physics Inc.
Article number: 440007
ISBN (Print): 9780735412873
ASJC Scopus subject areas: Physics and Astronomy(all)
Keywords: axially symmetric, fundamental solution, Hyperbolic, Laplace-Beltrami
DOIs:

10.1063/1.4912658
Source: Scopus
Source ID: 84939648578
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Multi-stable dynamics of the non-adiabatic repressilator

The assumption of the fast binding of transcription factors (TFs) to promoters is a typical point in studies of synthetic genetic circuits functioning in bacteria. Although the assumption is effective for simplifying the models, it becomes questionable in the light of in vivo measurements of the times TF spends searching for its cognate DNA sites. We investigated the dynamics of the full idealized model of the paradigmatic genetic oscillator, the repressilator, using deterministic mathematical modelling and stochastic simulations. We found (using experimentally approved parameter values) that decreases in the TF binding rate changes the type of transition between steady state and oscillation. As a result, this gives rise to the hysteresis region in the parameter space, where both the steady state and the oscillation coexist. We further show that the hysteresis is persistent over a considerable range of the parameter values, but the presence of the oscillations is limited by the low rate of TF dimer degradation. Finally, the stochastic simulation of the model confirms the hysteresis with switching between the two attractors, resulting in highly skewed period distributions. Moreover, intrinsic noise stipulates trains of large-amplitude modulations around the stable steady state outside the hysteresis region, which makes the period distributions bimodal.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact), Department of Theoretical Physics, Lebedev Physical Institution
Contributors: Potapov, I., Zhurov, B., Volkov, E.
Publication date: 6 Mar 2015
Peer-reviewed: Yes

Publication information

Journal: Journal of the Royal Society. Interface
Volume: 12
Issue number: 104
Article number: 20141315
ISSN (Print): 1742-5689
Ratings:

Scopus rating (2015): CiteScore 3.5 SJR 1.823 SNIP 1.537
Original language: English
ASJC Scopus subject areas: Biophysics, Biotechnology, Bioengineering, Biomedical Engineering, Biomaterials, Biochemistry
Keywords: Adiabatic, Bimodality, Genetic oscillator, Hysteresis, Multi-stability

DOIs:
10.1098/rsif.2014.1315
URLs:
http://www.scopus.com/inward/record.url?scp=84923240824&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84923240824
Research output: Contribution to journal › Article › Scientific › peer-review

Designing controllers with reduced order internal models

In this technical note we study robust output tracking for autonomous linear systems. We introduce a new approach to designing robust controllers using a recent observation that a full internal model is not always necessary for robustness. Especially this may be the case if the control law is only required to be robust with respect to a specific predetermined class of uncertainties in the parameters of the plant. The results are illustrated with an example on robust output tracking for coupled harmonic oscillators.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Contributors: Paunonen, L.
Number of pages: 6
Pages: 775-780
Publication date: 1 Mar 2015
Peer-reviewed: Yes

Publication information

Journal: IEEE Transactions on Automatic Control
Volume: 60
Issue number: 3
Article number: 6826480
ISSN (Print): 0018-9286
Ratings:
Scopus rating (2015): CiteScore 5.08 SJR 4.285 SNIP 3.218
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications
DOIs:
10.1109/TAC.2014.2329212
URLs:
http://www.scopus.com/inward/record.url?scp=84923355671&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84923355671
Research output: Contribution to journal › Article › Scientific › peer-review

Semantic Labeling of Places based on Phone Usage Features using Supervised Learning

Nowadays mobile applications demand higher context awareness. The applications aim to understand the user's context (e.g., home or at work) and provide services tailored to the users. The algorithms responsible for inferring the user's context are the so-called context inference algorithms, the place detection being a particular case. Our hypothesis is that people use mobile phones differently when they are located in different places (e.g. longer calls at home than at work). Therefore, the usage of the mobile phones could be an indicator of the users' current context. The objective of the work is to develop a system that can estimate the user's place label (home, work, etc.), based on phone usage. As training and validation set, we use a database containing phone usage information of 200 users over several months including phone call and SMS logs, multimedia usage, accelerometer, GPS, network information and system information. The data was split into visits, i.e., periods of uninterrupted time that the user has been in a certain place (Home, Work, Leisure, etc.). The data include information about the phone usage during the visits, and the semantic label of the place visited (Home, Work, etc.). We consider two approaches to represent this data: the first approach (so-called visits approach) saves each visit separately; the second approach (so-called places approach) combines all visits of one user to a certain place and creates place-specific information. For place detection, we used five popular classification methods, Naïve Bayes, Decision Tree, Bagged Tree, Neural Network and K-Nearest Neighbors, in both representation approaches. We evaluated their classification rates and found that: 1) Bagged Tree outperforms the other methods; 2) the places data-representation gives better results than the visits data-representation.

General information

Publication status: Published

MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Department of Automation Science and Engineering, Research area: Dynamic Systems, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Rivero Rodriguez, A., Leppäkoski, H., Piché, R.
Number of pages: 6
Pages: 97-102
Publication date: 5 Feb 2015

Host publication information
Title of host publication: 2014 Ubiquitous Positioning Indoor Navigation and Location Based Service, UPINLBS 2014 - Conference Proceedings
Place of publication: Piscataway, NJ, USA
Publisher: IEEE
Article number: 7033715
ISBN (Print): 9781479960040
ASJC Scopus subject areas: Computer Networks and Communications, Computer Science Applications
Keywords: Context Inference, Location and positioning services, Place detection, Semantic positioning
Electronic versions:

Context-Inference
DOIs:

10.1109/UPINLBS.2014.7033715
URLs:

http://urn.fi/URN:NBN:fi:tty-201603013584

Bibliographical note
ORG=mat,0.6
ORG=ase,0.4

Portfolio EDEND: 2015-01-14
 publication_forum:72750
Source: researchoutputwizard
Source ID: 30
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A general framework for island systems
The notion of an island defined on a rectangular board is an elementary combinatorial concept that occurred first in [3]. Results of [3] were starting points for investigations exploring several variations and various aspects of this notion. In this paper we introduce a general framework for islands that subsumes all earlier studied concepts of islands on finite boards, moreover we show that the prime implicants of a Boolean function, the formal concepts of a formal context, convex subgraphs of a simple graph, and some particular subsets of a projective plane also fit into this framework. We axiomatize those cases where islands have the property of being pairwise comparable or disjoint, or they are distant, introducing the notion of a connective island domain and of a proximity domain, respectively. In the general case the maximal systems of islands are characterised by using the concept of an admissible system. We also characterise all possible island systems in the case of connective island domains and proximity domains.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Bolyai Institute, University of Szeged, University of Miskolc
Contributors: Foldes, S., Horváth, E. K., Radeleczki, S., Waldhauser, T.
Number of pages: 22
Pages: 3-24
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Acta Universitatis Szegediensis: Acta Scientiarum Mathematicarum
Volume: 81
Issue number: 1-2
ISSN (Print): 0001-6969
Ratings:

Scopus rating (2015): CiteScore 0.34 SJR 0.309 SNIP 0.73
Original language: English
ASJC Scopus subject areas: Analysis, Applied Mathematics
Keywords: Admissible system, CD-independent and CDW-independent sets, Connected subgraph, Convex subgraph, Distant system, Formal concept, Height function, Island domain, Island system, Point-to-set proximity relation, Prime

implicant, Projective plane, Proximity domain
DOIs:
10.14232/actasm-013-279-7
URLs:
http://www.scopus.com/inward/record.url?scp=84938827353&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84938827353
Research output: Contribution to journal › Article › Scientific › peer-review

Analysis of geometric primitives in quantitative structure models of tree stems

One way to model a tree is to use a collection of geometric primitives to represent the surface and topology of the stem and branches of a tree. The circular cylinder is often used as the geometric primitive, but it is not the only possible choice. We investigate various geometric primitives and modelling schemes, discuss their properties and give practical estimates for expected modelling errors associated with the primitives. We find that the circular cylinder is the most robust primitive in the sense of a well-bounded volumetric modelling error, even with noise and gaps in the data. Its use does not cause errors significantly larger than those with more complex primitives, while the latter are much more sensitive to data quality. However, in some cases, a hybrid approach with more complex primitives for the stem is useful.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact), Centre for Sustainable Forestry and Climate Change, Forest Research
Contributors: Åkerblom, M., Raumonen, P., Kaasalainen, M., Casella, E.
Number of pages: 23
Pages: 4581-4603
Publication date: 2015
Peer-reviewed: Yes

Publication information

Journal: Remote Sensing
Volume: 7
Issue number: 4
ISSN (Print): 2072-4292
Ratings:
Scopus rating (2015): CiteScore 3.76 SJR 1.349 SNIP 1.682
Original language: English
ASJC Scopus subject areas: Earth and Planetary Sciences(all)
Keywords: Biomass estimation, Error analysis, Shape fitting, Terrestrial laser scanning, Tree modelling
DOIs:
10.3390/rs70404581
URLs:
http://www.scopus.com/inward/record.url?scp=84937899906&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84937899906
Research output: Contribution to journal › Article › Scientific › peer-review

Application and Theory of Petri Nets and Concurrency: 36th International Conference, PETRI NETS 2015 Brussels, Belgium, June 21-26, 2015 Proceedings

General information

Publication status: Published
MoE publication type: C2 Edited books
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics, Regulation of learning and active learning methods (REALMEE), Embedded Electronics research unit of the Bio Electro and Mechanical Systems (BEAMS) department of the Université Libre de Bruxelles
Contributors: Devillers, R. (ed.), Valmari, A. (ed.)
Publication date: 2015

Publication information

Publisher: Springer Verlag
Volume: 9115
ISBN (Print): 978-3-319-19487-5
ISBN (Electronic): 978-3-319-19488-2

Original language: English

Publication series
Name: Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)
Volume: 9115
ISSN (Print): 0302-9743
ISSN (Electronic): 1611-3349
ASJC Scopus subject areas: Computer Science(all), Theoretical Computer Science
DOIs:
10.1007/978-3-319-19488-2
URLs:
http://www.scopus.com/inward/record.url?scp=84937510301&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
JUFOID=62555
Source: Scopus
Source ID: 84937510301
Research output: Book/Report › Anthology › Scientific › peer-review

Application of terrestrial LiDAR and modelling of tree branching structure for plant- scaling models in tropical forest trees

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Wageningen University and the UNESCO-IHE Institute for Water Education, Delft, The Netherlands, 18.10.2013
Contributors: Lau Sarmiento, A., Bartholomeus, H., Herold, M., Martius, C., Malhi, Y., Patrick Bentley, L., Shenkin, A., Raumonen, P.
Number of pages: 3
Pages: 96-98
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SilviLaser 2015 : 14th conference on Lidar Applications for Assessing and Managing Forest Ecosystems
URLs:
https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Approach for Investigating Crowdfunding Campaigns with Platform Data: Case Indiegogo

Crowdfunding via the internet is a relatively new phenomenon in research and gaining momentum currently. While taking a data-driven approach into investigating the properties and dynamics of crowdfunding campaigns would allow the use of computational social science in investigations on crowdfunding, existing data-driven research on crowdfunding remains very limited. This is particularly true on the level of individual funder data. In this study, we contribute to the empirical body of knowledge on crowdfunding by introducing Indiegogo as a data source and, more specifically, the development and implementation of a crawler and scraper for accessing Indiegogo campaign data, and sharing this openly for other researchers. Due to the extremely dynamic and rapidly increasing amount of crowdfunding data in terms of the number of crowdfunding campaigns and the available investment and individual investor data, we believe our approach is useful for supporting public and open data-driven research, instead of providing merely a static data set.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Department of Information Management and Logistics, Research group: Novi, Managing digital industrial transformation (mDIT), Copenhagen Business School

Contributors: Huhtamäki, J., Lasrado, L., Menon, K., Kärkkäinen, H., Jussila, J.
Number of pages: 8
Publication date: 2015

Host publication information
Title of host publication: Academic MindTrek'15 : September 22-24, 2015, Tampere, Finland
Publisher: ACM
ISBN (Print): 978-1-4503-3948-3
Keywords: Crowdfunding, Data Extraction, Indiegogo, entrepreneur, crawling, scraping, computational social science
DOIs:
10.1145/2818187.2818289
URLs:
http://www.mindtrek.org/2015/

Bibliographical note
ORG=mat,0.5
ORG=tlo,0.5
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Assessing coupling dynamics from an ensemble of time series
Finding interdependency relations between time series provides valuable knowledge about the processes that generated the signals. Information theory sets a natural framework for important classes of statistical dependencies. However, a reliable estimation from information-theoretic functionals is hampered when the dependency to be assessed is brief or evolves in time. Here, we show that these limitations can be partly alleviated when we have access to an ensemble of independent repetitions of the time series. In particular, we gear a data-efficient estimator of probability densities to make use of the full structure of trial-based measures. By doing so, we can obtain time-resolved estimates for a family of entropy combinations (including mutual information, transfer entropy and their conditional counterparts), which are more accurate than the simple average of individual estimates over trials. We show with simulated and real data generated by coupled electronic circuits that the proposed approach allows one to recover the time-resolved dynamics of the coupling between different subsystems.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Electronic Science and Technology of China, Institute of Computer Science (ICS) of the Foundation for Research and Technology - Hellas (FORTH), Lab of Neurophysics and Neurophysiology, Hefei National Laboratory for Physical Sciences at the Microscale, Instituto de Fisica Interdisciplinar y Sistemas Complejos (CSIC-UIB), Campus Universitat de les Illes Balears, Institut für Kognitionswissenschaft, University of Osnabrück, University of Tartu, Netherlands Institute for Neuroscience
Contributors: Gómez-Herrero, G., Wu, W., Rutanen, K., Soriano, M. C., Pipa, G., Vicente, R.
Number of pages: 13
Pages: 1958-1970
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Entropy
Volume: 17
Issue number: 4
ISSN (Print): 1099-4300
Ratings:
Scopus rating (2015): CiteScore 1.99 SJR 0.551 SNIP 1.116
Original language: English
ASJC Scopus subject areas: Physics and Astronomy(all)
Keywords: Ensemble, Entropy, Estimator, Time series, Transfer entropy, Trial
DOIs:
10.3390/e17041958
URLs:
http://www.scopus.com/inward/record.url?scp=84930319366&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
EXT="Gómez-Herrero,Germán"
Source: Scopus
Source ID: 84930319366
Research output: Contribution to journal › Article › Scientific › peer-review

Asteroid Models from Multiple Data Sources

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Ďurech, J., Carry, B., Delbo, M., Kaasalainen, M., Viikinkoski, M.
Number of pages: 20
Pages: 183-202
Publication date: 2015

Host publication information
Title of host publication: Asteroids IV
Place of publication: Tucson
Publisher: UNIVERSITY OF ARIZONA PRESS
Editors: Michel, P., DeMeo, F. E., Bottke Jr., W. F.
ISBN (Print): 978-0-8165-3213-1
DOIs:

10.2458/azu_uapress_9780816532131-ch010
URLs:

http://www.uapress.arizona.edu/Books/bid2555.htm
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Engineering motif search for large graphs
In the graph motif problem, we are given as input a vertexcolored graph H (the host graph) and a multiset of colors M (the motif). Our task is to decide whether H has a connected set of vertices whose multiset of colors agrees with M. The graph motif problem is NP-complete but known to admit parameterized algorithms that run in linear time in the size of H. We demonstrate that algorithms based on constrained multilinear sieving are viable in practice, scaling to graphs with hundreds of millions of edges as long as M remains small. Furthermore, our implementation is topologyinvariant relative to the host graph H, meaning only the most crude graph parameters (number of edges and number of vertices) suffice in practice to determine the algorithm performance.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Aalto University, Lunds Universitet / Lunds Tekniska Högskola, Lund Univ, Lund University, University of Calgary, Institute for Biocomplexity and Informatics, Canada, Medical University of Warsaw, Helsinki Institute for Information Technology HIIT, Department of Computer Science and Information Systems
Contributors: Björklund, A., Kaski, P., Kowalik, Ł., Lauri, J.
Number of pages: 15
Pages: 104-118
Publication date: 2015

Host publication information
Title of host publication: 2015 Proceedings of the Seventeenth Workshop on Algorithm Engineering and Experiments (ALENEX)
ISBN (Electronic): 978-1-61197-375-4

Publication series
Name: Workshop on Algorithm Engineering and Experiments
ISSN (Print): 2164-0300
ASJC Scopus subject areas: Engineering(all), Applied Mathematics
DOIs:

10.1137/1.9781611973754.10
URLs:

http://www.scopus.com/inward/record.url?scp=84937777832&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84937777832
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Equal Opportunities in Education of Science, Mathematics and Technology
We are raising a question if our education system in Finland is still providing equal opportunities for everybody in education of Science and Mathematics and Technology. We are using as indicators recent results of three international

assessments: The Program for International Student Assessment, Trends in International Mathematics and Science Study and The learning curve in Science and Mathematics. There are a lot of research done internationally and nationally based on the results of these assessments and the background information connected to them. These assessments have also started rich discussions in news and in newspapers.
Basic Education Act 1998 in Finland gives every child a right to go to the close by neighborhood school, assigned by the local school authorities, and parents a freedom to choose some another school for their child. In addition, some local schools have a right to emphasize certain areas of education and to choose their students based on suitability tests. Connected to these issues, we are describing some research results concerning the status of schools and selection of schools in Helsinki area.

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Contributors: Eriksson, S. A.
Number of pages: 14
Publication date: 2015

Host publication information
Title of host publication: The Proceedings of International Symposium Justice and Solidarity : The European Utopia in a Globalising Era, Kuopio 2.-3. September 2014
Editors: Laurinkari, J., Tarvanen, M.
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Frequency domain robust regulation of signals generated by an infinite-dimensional exosystem
This paper deals with frequency domain robust regulation of signals generated by an infinite-dimensional exosystem. The problem is formulated and the stability types are chosen so that one can generalize the existing finite-dimensional theory to more general classes of infinite-dimensional systems and signals. The main results of this article are extensions of the internal model principle, of a necessary and sufficient solvability condition for the robust regulation problem, and of Davison's simple servo compensator for stable plants in the chosen algebraic framework.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Laakkonen, P., Pohjolainen, S.
Number of pages: 28
Pages: 139-166
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: SIAM Journal on Control and Optimization
Volume: 53
Issue number: 1
ISSN (Print): 0363-0129
Ratings:

Scopus rating (2015): CiteScore 1.92 SJR 2.017 SNIP 1.646
Original language: English
ASJC Scopus subject areas: Control and Optimization, Applied Mathematics
Keywords: Frequency domain, Infinite-dimensional exosystems, Infinite-dimensional systems, Internal model, Robust regulation
DOIs:

10.1137/130950057
URLs:

http://www.scopus.com/inward/record.url?scp=84923923144&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source ID: 84923923144
Research output: Contribution to journal › Article › Scientific › peer-review

Infinitesimals and Pavelka logic
Rational Pavelka Logic does not admit infinitesimals. We argue that infinitesimals are important in logic and we present an alternative approach which admits them. It is built up in a similar style, but based on the Chang's perfect MV-algebra. We prove a partial result towards the completeness of this logic. We also discuss a combined approach using more complex perfect MV-algebras.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics, Czech Tech Univ, Czech Technical University Prague
Contributors: Turunen, E., Navara, M.
Number of pages: 7
Pages: 1027-1033
Publication date: 2015

Host publication information
Title of host publication: PROCEEDINGS OF THE 2015 CONFERENCE OF THE INTERNATIONAL FUZZY SYSTEMS ASSOCIATION AND THE EUROPEAN SOCIETY FOR FUZZY LOGIC AND TECHNOLOGY
Place of publication: PARIS
Publisher: Atlantis Press
Editors: Alonso, J., Bustince, H., Reformat, M.
ISBN (Electronic): 978-94-62520-77-6

Publication series
Name: Advances in Intelligent Systems Research
Publisher: ATLANTIS PRESS
Volume: 89
ISSN (Print): 1951-6851
Keywords: Mathematical fuzzy logic, Rational Pavelka Logic, Lukasiewicz operations, MV-algebra, perfect MV-algebra, Chang's MV-algebra, FUZZY LOGIC, PROPOSITIONAL CALCULI, TRUTH-CONSTANTS, COMPLETENESS
DOIs:
10.2991/ifsa-eusflat-15.2015.145
Source: WOS
Source ID: 000358581100145
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Massive-Scale Tree Modelling from TLS Data
This paper presents a method for reconstructing automatically the quantitative structure model of every tree in a forest plot from terrestrial laser scanner data. A new feature is the automatic extraction of individual trees from the point cloud. The method is tested with a 30-m diameter English oak plot and a 80-m diameter Australian eucalyptus plot. For the oak plot the total biomass was overestimated by about 17 %, when compared to allometry (N = 15), and the modelling time was about 100 min with a laptop. For the eucalyptus plot the total biomass was overestimated by about 8.5 %, when compared to a destructive reference (N = 27), and the modelling time was about 160 min. The method provides accurate and fast tree modelling abilities for, e. g., biomass estimation and ground truth data for airborne measurements at a massive ground scale.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Forest Res, Wageningen Univ, Wageningen University & Research Center, Univ Melbourne, University of Melbourne, Melbourne Sch Land & Environm
Contributors: Raumonen, P., Casella, E., Calders, K., Murphy, S., Åkerblom, M., Kaasalainen, M.
Number of pages: 8
Pages: 189-196
Publication date: 2015

Host publication information
Title of host publication: ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences
Volume: II-3/W4
Place of publication: GOTTINGEN
Publisher: COPERNICUS GESELLSCHAFT MBH
Editors: Stilla, U., Heipke, C.

Publication series
Name: International Archives of the Photogrammetry Remote Sensing and Spatial Information Sciences
Publisher: COPERNICUS GESELLSCHAFT MBH
Volume: 43
ISSN (Print): 2194-9034
Keywords: quantitative structure model, automatic tree extraction, biomass, forest plot, ground truth, oak, eucalyptus, LiDAR, laser scanner data, terrestrial
DOIs:

10.5194/isprsannals-II-3-W4-189-2015

Bibliographical note
JUFOID=81104
Source: WOS
Source ID: 000352727000025
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Motion Model for Positioning with Graph-Based Indoor Map
This article presents a training-free probabilistic pedestrian motion model that uses indoor map information represented as a set of links that are connected by nodes. This kind of structure can be modelled as a graph. In the proposed model, as a position estimate reaches a link end, the choice probabilities of the next link are proportional to the total link lengths (TLL), the total lengths of the subgraphs accessible by choosing the considered link alternative. The TLLs can be computed off-line using only the graph, and they can be updated if training data are available. A particle filter in which all the particles move on the links following the TLL-based motion model is formulated. The TLL-based motion model has advantageous theoretical properties compared to the conventional models. Furthermore, the real-data WLAN positioning tests show that the positioning accuracy of the algorithm is similar or in many cases better than that of the conventional algorithms. The TLL-based model is found to be advantageous especially if position measurements are used infrequently, with 10-second or more time intervals.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems, Research group: Wireless Communications and Positioning, Department of Mathematics, Research group: MAT Positioning, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Nurminen, H., Koivisto, M., Ali-Löytty, S., Piche, R.
Number of pages: 10
Pages: 646-655
Publication date: 2015

Host publication information
Title of host publication: 2014 International Conference on Indoor Positioning and Indoor Navigation (IPIN), 27-30 Oct. 2014, Busan, South Korea
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Electronic): 978-1-4673-8054-6
Electronic versions:

IPIN2014_final
DOIs:

10.1109/IPIN.2014.7275539
URLs:

http://urn.fi/URN:NBN:fi:tty-201603013610

Bibliographical note
ORG=ase,0.8
ORG=mat,0.2
Source: researchoutputwizard
Source ID: 24
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

New Insights for Relational Capital
In this paper, we concentrate on relational capital, manifestation of the old adage ”it is not what you know but who you know”. We propose that in this networked world, the importance of relationships between multiple stakeholders created by key personnel and financing becomes fundamental, and hence understanding and measuring those becomes fundamental, too. Accordingly, we highlight a need to go beyond social, individual or personal relationships and organizational context, as well as beyond the limitations of the dyadic (one actor to one actor) view on relationships. Hence, we are introducing the ecosystem as the context for measuring relational capital. This paper builds on a construct of ecosystemic relational capital, created for understanding and measuring the importance of relationships in the context of ecosystems. It looks at the totality of relationships both at organizational level and at individual level, measuring the structures and characteristics related to individuals, organizations as well as the ecosystem as a whole (Still et al. 2014a). We acknowledge that the initial framework emphasizes the “networking capabilities” element of relational capital, with less attention to the element of “customer loyalty and reputation”, which is the motivation for building on the construct. The processes of ecosystemic relational capital are built on the possibilities afforded by the volumes of digital data, mostly from social media, providing details on the relationships between various actors related to various regions, sectors,

technologies and products. However, we propose enhancing the holistic integration for better understanding and measuring of relational capital with the application of methods of social network analysis (SNA), network visualizations and social media analytics. In this paper, we present concrete examples of the enhanced framework. At the same time, we acknowledge that there are many other avenues for obtaining novel insights for relational capital with these analytics, and we strongly encourage researchers and practitioners to do so.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory
Contributors: Still, K., Huhtamäki, J., Russell, M. G.
Number of pages: 16
Pages: 167-182
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Electronic Journal of Knowledge Management
Volume: 13
Issue number: 1
ISSN (Print): 1479-4411
Original language: English
URLs:

http://www.ejkm.com/issue/download.html?idArticle=617
Source: RIS
Source ID: urn:F9D7182C2BD28413A479A84749F380C0
Research output: Contribution to journal › Article › Scientific › peer-review

Nondestructive estimates of above-ground biomass using terrestrial laser scanning

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Calders, K., Newnhamn, G., Burt, A., Murphy, S., Raumonen, P., Herold, M., Culvenor, D., Avitable, V., Disney, M., Armston, J., Kaasalainen, M.
Number of pages: 11
Pages: 198-208
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Methods in Ecology and Evolution
Volume: 6
Issue number: 2
ISSN (Print): 2041-210X
Ratings:

Scopus rating (2015): CiteScore 7.61 SJR 5.436 SNIP 2.845
Original language: English
DOIs:

10.1111/2041-210X.12301

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-16
Publisher name: Wiley-Blackwell Publishing
Source: researchoutputwizard
Source ID: 199
Research output: Contribution to journal › Article › Scientific › peer-review

On constructibility and unconstructibility of LTS operators from other LTS operators
An LTS operator can be constructed from a set of LTS operators up to an equivalence if and only if there is an LTS expression that only contains operators from the set and whose result is equivalent to the result of the operator. In this publication this idea is made precise in the context where each LTS has an alphabet of its own and the operators may depend on the alphabets. Then the extent to which LTS operators are constructible is studied. Most, if not all, established

LTS operators have the property that each trace of the result arises from the execution of no more than one trace of each of its argument LTSs, and similarly for infinite traces. All LTS operators that have this property and satisfy some other rather weak regularity properties can be constructed from parallel composition and hiding up to the equivalence that compares the alphabets, traces, and infinite traces of the LTSs. Furthermore, a collection of other miscellaneous constructibility and unconstructibility results is presented.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Contributors: Valmari, A.
Number of pages: 28
Pages: 207-234
Publication date: 2015
Peer-reviewed: Yes

Publication information

Journal: Acta Informatica
Volume: 52
Issue number: 2-3
ISSN (Print): 0001-5903
Ratings:

Scopus rating (2015): CiteScore 0.76 SJR 0.421 SNIP 0.736
Original language: English
ASJC Scopus subject areas: Computer Networks and Communications, Information Systems, Software
Electronic versions:

AVActaInf2015
DOIs:

10.1007/s00236-015-0217-2
URLs:

http://urn.fi/URN:NBN:fi:tty-201606064226
Source: Scopus
Source ID: 84925463574
Research output: Contribution to journal › Article › Scientific › peer-review

On Robustness of Strongly Stable Semigroups with Spectrum on iR

We study the robustness properties of strong stability of a strongly continuous semigroup on a Hilbert space. We concentrate on a situation where the generator of the unperturbed semigroup has a finite spectral point on the imaginary axis and the resolvent operator is polynomially bounded elsewhere on the imaginary axis. As our main result we present conditions for preservation of the strong stability of the semigroup under bounded perturbations.

General information

Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Contributors: Paunonen, L.
Number of pages: 17
Pages: 105-121
Publication date: 2015

Host publication information

Title of host publication: Semigroups of Operators -Theory and Applications : Będlewo, Poland, October 2013
Publisher: Springer International Publishing
Editors: Banasiak, J., Bobrowski, A., Lachowicz, M.
ISBN (Print): 978-3-319-12144-4
ISBN (Electronic): 978-3-319-12145-1

Publication series

Name: Springer Proceedings in Mathematics & Statistics
Publisher: Springer International Publishing
Volume: 113
ISSN (Print): 2194-1009
ASJC Scopus subject areas: Analysis
Keywords: Strongly Continuous Semigroup, Functional Analysis
DOIs:

10.1007/978-3-319-12145-1
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

On Robust Output Regulation for Continuous-Time Periodic Systems

We construct a controller to solve robust output tracking problem for a stable linear continuous-time periodic system on a finite-dimensional space. We begin by transforming the time-dependent plant to a time-invariant discrete-time system using the ``lifting technique''. The controller is then designed to achieve robust output tracking for the lifted system. We show that an exact solution to the control problem for a continuous-time periodic system necessarily requires an error feedback controller with an infinite-dimensional internal model. The results are illustrated with an example where robust output tracking is considered for a stable periodic scalar system.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Contributors: Paunonen, L.
Number of pages: 7
Publication date: 2015

Host publication information

Title of host publication: 2015 Proceedings of the SIAM Conference on Control and its Applications
Publisher: SIAM, Society for Industrial and Applied Mathematics
ISBN (Electronic): 978-1-61197-407-2
ASJC Scopus subject areas: Control and Optimization, Analysis
Electronic versions:

Article
DOIs:

10.1137/1.9781611974072.7
URLs:

http://urn.fi/URN:NBN:fi:tty-201603013598
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Ostinato: The Exploration-Automation Cycle of User-Centric, Process-Automated Data-Driven Visual Network Analytics

General information

Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, MediaX, Stanford University, Graduate School of Information Systems, University of Electro-Communications, VTT Technical Research Centre of Finland
Contributors: Huhtamäki, J., Russell, M. G., Rubens, N., Still, K.
Pages: 197-222
Publication date: 2015

Host publication information

Title of host publication: Transparency in Social Media : Tools, Methods and Algorithms for Mediating Online Interactions
Publisher: Springer International Publishing
Editors: Matei, S. A., Russell, M. G., Bertino, E.
ISBN (Print): 978-3-319-18551-4
ISBN (Electronic): 978-3-319-18552-1

Publication series

Name: Computational Social Science
DOIs:

10.1007/978-3-319-18552-1
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Perfect Pavelka Logic

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics

Contributors: Turunen, E., Navara, M.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Fuzzy Sets and Systems
ISSN (Print): 0165-0114
Ratings:

Scopus rating (2015): CiteScore 2.34 SJR 1.354 SNIP 1.797
Original language: English
DOIs:

10.1016/j.fss.2014.06.011

Bibliographical note
In Press.Siirretään Portfolio15
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2015-01-08
Publisher name: Elsevier BV
Source: researchoutputwizard
Source ID: 35
Research output: Contribution to journal › Article › Scientific › peer-review

Practical Partial Order Reduction for CSP
FDR is an explicit-state refinement checker for the process algebra CSP and, as such, is vulnerable to the state-explosion problem. In this paper, we show how a form of partial-order reduction, an automatic state reduction mechanism, can be utilised to soundly reduce the number of states that must be visited. In particular, we develop a compositional method for partial-order reduction that takes advantage of FDR's internal, compositional, process representation. Further, we develop novel methods of preserving the traces of a process which allow partial-order reduction to be applied to arbitrary FDR refinement checks. We also provide details on how to efficiently implement the algorithms required for partial-order reduction.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics, University of Oxford
Contributors: Gibson-Robinson, T., Hansen, H., Roscoe, A. W., Wang, X.
Number of pages: 16
Pages: 188-203
Publication date: 2015

Host publication information
Title of host publication: Nasa Formal Methods : 7th International Symposium, NFM 2015, Pasadena, CA, USA, April 27-29, 2015, Proceedings
Volume: 9058
Publisher: Springer International Publishing
ISBN (Print): 978-3-319-17523-2
ISBN (Electronic): 978-3-319-17524-9

Publication series
Name: Lecture Notes in Computer Science
Volume: 9058
DOIs:

10.1007/978-3-319-17524-9_14
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Projektioppiminen yläkoulun matematiikassa

General information
Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Mathematics
Contributors: Viro, E., Eriksson, S.
Number of pages: 5
Pages: 1005-1009
Publication date: 2015

Peer-reviewed: Unknown

Publication information
Journal: Lumat
Volume: 3
Issue number: 7
ISSN (Print): 2323-7112
Original language: Finnish
URLs:
http://luma.fi/lumat/4273
Research output: Contribution to journal › Article › Professional

Quantitative structure tree models from terrestrial laser scanner data

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Raumonen, P. A.
Number of pages: 3
Pages: 32-34
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SilviLaser 2015 : 14th conference on Lidar Applications for Assessing and Managing Forest Ecosystems
URLs:
https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Reducing uncertainties in above-ground biomass estimates using terrestrial laser scanning

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Univ Melbourne, University of Melbourne, Melbourne Sch Land & Environm
Contributors: Calders, K., Burt, A., Newnham, G., Disney, M., Murphy, S., Raumonen, P., Herold, M., Culvenor, D., Armston, J., Avitabile, V., Kaasalainen, M.
Number of pages: 3
Pages: 197-199
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SilviLaser 2015 : 14th conference on Lidar Applications for Assessing and Managing Forest Ecosystems
URLs:
https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Robustness of strong stability of discrete semigroups

In this paper we study the robustness of strong stability of a discrete semigroup on a Hilbert space under bounded perturbations. As the main result we present classes of perturbations preserving the strong stability of the semigroup.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Contributors: Paunonen, L.
Number of pages: 6
Pages: 35-40
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Systems and Control Letters
Volume: 75
ISSN (Print): 0167-6911
Ratings:
Scopus rating (2015): CiteScore 3.11 SJR 2.277 SNIP 1.909
Original language: English
DOIs:
10.1016/j.sysconle.2014.11.004

Bibliographical note
Siirretään Portfolio15
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2015-01-08
Publisher name: Elsevier BV
Source: researchoutputwizard
Source ID: 26
Research output: Contribution to journal › Article › Scientific › peer-review

Robust Regulation of SISO Systems: The Fractional Ideal Approach

We solve the robust regulation problem for single-input single-output plants by using the fractional ideal approach and without assuming the existence of coprime factorizations. In particular, we are able to formulate the famous internal model principle for stabilizable plants which do not necessarily admit coprime factorizations. We are able to give a necessary and suffcient solvability condition for the robust regulation problem, which leads to a design method for a robustly regulating controller. The theory is illustrated by examples.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Inria Saclay-Ile-de-France
Contributors: Laakkonen, P., Quadrat, A.
Number of pages: 8
Pages: 311-318
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the SIAM Conference on Control and Its Applications (CT15)
Publisher: SIAM, Society for Industrial and Applied Mathematics
ISBN (Electronic): 978-1-611973-92-1
ASJC Scopus subject areas: Control and Optimization, Applied Mathematics
DOIs:
10.1137/1.9781611974072.43
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robust Regulation Theory for Transfer Functions With a Coprime Factorization

Classical frequency domain results of robust regulation are extended by requiring only a right or a left coprime factorization of a plant, but not both. The famous internal model principle is generalized first, which leads to a necessary and sufficient solvability condition of the robust regulation problem and to a parametrization of all robustly regulating controllers. In addition, a procedure for constructing robustly regulating controllers is proposed.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Laakkonen, P.
Number of pages: 6
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
ISSN (Print): 0018-9286
Ratings:
Scopus rating (2015): CiteScore 5.08 SJR 4.285 SNIP 3.218
Original language: English
Keywords: Frequency-domain analysis, Nickel, Robustness, Stability analysis, Topology, Transfer functions, Yttrium, Distributed parameter systems, linear systems, parametrization, robust control

DOIs:
10.1109/TAC.2015.2497898
Source: RIS
Source ID: urn:DFB614AB2FEDB0E10BED5F0BF1D53AF0
Research output: Contribution to journal › Article › Scientific › peer-review

Simulointi nopeuttaa käyttöiän määritystä

General information
Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Materials Science, Research group: Tribology and Machine Elements, Department of Mechanical Engineering and Industrial Systems, Research group: Kokeellinen virtaustekniikka, Research area: Applied Mechanics, Department of Intelligent Hydraulics and Automation, Research group: Fluid power automation in mobile machines, Department of Electrical Engineering, Research area: Reliability
Contributors: Ojala, P., Saarenrinne, P., Miettinen, J., Multanen, P., Kiilunen, J., Hietala, J., Kolu, A., Pippola, J., Mostofizadeh, M., Ylönen, M.
Number of pages: 4
Pages: 24-27
Publication date: 2015
Peer-reviewed: Unknown

Publication information
Journal: Promaint
Volume: 2
ISSN (Print): 1797-2000
Original language: Finnish

Bibliographical note
ORG=mol,0.25
ORG=mei,0.25
ORG=iha,0.25
ORG=dee,0.25
Research output: Contribution to journal › Article › Professional

Some Ring Theory from Jeno Szigeti
A selection of ring theory papers by Jeno Szigeti is reviewed with an emphasis on aspects related to matrix algebras.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Foldes, S.
Number of pages: 7
Pages: 115-121
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Miskolc Mathematical Notes
Volume: 16
Issue number: 1
ISSN (Print): 1787-2405
Ratings:
Scopus rating (2015): CiteScore 0.48 SJR 0.33 SNIP 0.63
Original language: English
Keywords: LIE NILPOTENT RINGS, MATRIX-RINGS, POLYNOMIAL-IDENTITIES, DETERMINANTS, ALGEBRAS
Source: WOS
Source ID: 000359454800011
Research output: Contribution to journal › Article › Scientific › peer-review

Terrestrial LiDAR and 3D tree Quantitative Structure Model for quantification of aboveground biomass loss from selective logging in a tropical rainforest of Peru

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Wageningen Univ, Wageningen University & Research Center, Wageningen University and the UNESCO-IHE Institute for Water Education, Delft, The Netherlands, 18.10.2013, Center for International Forestry Research
Contributors: Gonzalez de Tanago, J., Bartholomeus, H., Joseph, S., Herold, M., Avitabile, V., Goodman, R., Raumonen, P., Burt, A.
Number of pages: 3
Pages: 119-121
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SilviLaser 2015 : 14th conference on Lidar Applications for Assessing and Managing Forest Ecosystems
URLs:

https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Traceability of essential climate variables through forest stand reconstruction with terrestrial laser scanning

General information
Publication status: Published
MoE publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Calders, K., Disney, M., Nightingale, J., Origo, N., Barker, A., Raumonen, P. A., Lewis, P., Burt, A., Brennan, J., Fox, N.
Number of pages: 3
Pages: 122-124
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SilviLaser 2015 : 14th conference on Lidar Applications for Assessing and Managing Forest Ecosystems
URLs:

https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Professional

Using video games to combine learning and assessment in mathematics education

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Pori Department, Research group: TUT Game Lab, Stanford University
Contributors: Kiili, K., Devlin, K., Perttula, A., Tuomi, S., Lindstedt, A.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: International Journal of Serious Games
Volume: 2
Issue number: 4
ISSN (Print): 2384-8766
Original language: English
DOIs:

10.17083/ijsg.v2i4.98
URLs:

http://journal.seriousgamessociety.org/index.php?journal=IJSG&page=announcement&op=view&path%5B%5D=5
Research output: Contribution to journal › Article › Scientific › peer-review

Guard-based Partial Order Reduction
This paper aims at making partial-order reduction independent of the modeling language. To this end, we present a guard-based method which is a general-purpose implementation of the stubborn set method. We approach the implementation through so-called necessary enabling sets and do-not-accord sets, and give an algorithm suitable for an abstract model

checking interface. We also introduce necessary disabling sets and heuristics to produce smaller stubborn sets and thus better reduction at low costs. We explore the effect of these methods using an implementation in the model checker LTSmin. We experiment with partial-order reduction on a number of Promela models, on benchmarks from the BEEM database in the DVE language, and with several with LTL properties. The efficiency of the heuristic algorithm is established by a comparison to the subset-minimal Deletion algorithm and the simple closure algorithm. We also compare our results to the Spin model checker. While the reductions take longer, they are consistently better than Spin 's ample set and often surpass the upper bound for the process-based ample sets, established empirically earlier on BEEM models.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Contributors: Laarman, A., Pater, E., Van de Pol, J., Hansen, H.
Pages: 427-448
Publication date: Dec 2014
Peer-reviewed: Yes

Publication information

Journal: International Journal on Software Tools for Technology Transfer
Volume: 18
Issue number: 4
ISSN (Print): 1433-2779
Ratings:

Scopus rating (2014): CiteScore 1.5 SJR 0.569 SNIP 1.565
Original language: English
DOIs:

10.1007/s10009-014-0363-9
Research output: Contribution to journal › Article › Scientific › peer-review

UWB Positioning with Generalized Gaussian Mixture Filters

Low-complexity Bayesian filtering for nonlinear models is challenging. Approximative methods based on Gaussian mixtures (GM) and particle filters are able to capture multimodality, but suffer from high computational demand. In this paper, we provide an in-depth analysis of a generalized GM (GGM), which allows component weights to be negative, and requires significantly fewer components than the traditional GM for ranging models. Based on simulations and tests with real data from a network of UWB nodes, we show how the algorithm's accuracy depends on the uncertainty of the measurements. For nonlinear ranging the GGM filter outperforms the extended Kalman filter (EKF) in both positioning accuracy and consistency in environments with uncertain measurements, and requires only slightly higher computational effort when the number of measurement channels is small. In networks with highly reliable measurements, the GGM filter yields similar accuracy and better consistency than the EKF.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Muller, P., Wymeersch, H., Piche, R.
Number of pages: 9
Pages: 2406-2414
Publication date: Oct 2014
Peer-reviewed: Yes

Publication information

Journal: IEEE Transactions on Mobile Computing
Volume: 13
Issue number: 10
ISSN (Print): 1536-1233
Ratings:

Scopus rating (2014): CiteScore 4.92 SJR 1.192 SNIP 3.495
Original language: English
Keywords: Bayesian filtering, Gaussian Mixture, indoor positioning, UWB
Electronic versions:

muller_uwb_positioning_with_generalized_gaussian_mixture_filters
DOIs:

10.1109/TMC.2014.2307301

URLs:
http://urn.fi/URN:NBN:fi:tty-201404071141

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-08-30
Publisher name: Institute of Electrical and Electronics Engineers
Source: researchoutputwizard
Source ID: 1109
Research output: Contribution to journal › Article › Scientific › peer-review

Quantitative Analysis of Dynamic Association in Live Biological Fluorescent Samples
Determining vesicle localization and association in live microscopy may be challenging due to non-simultaneous imaging of rapidly moving objects with two excitation channels. Besides errors due to movement of objects, imaging may also introduce shifting between the image channels, and traditional colocalization methods cannot handle such situations. Our approach to quantifying the association between tagged proteins is to use an object-based method where the exact match of object locations is not assumed. Point-pattern matching provides a measure of correspondence between two point-sets under various changes between the sets. Thus, it can be used for robust quantitative analysis of vesicle association between image channels. Results for a large set of synthetic images shows that the novel association method based on point-pattern matching demonstrates robust capability to detect association of closely located vesicles in live cell-microscopy where traditional colocalization methods fail to produce results. In addition, the method outperforms compared Iterated Closest Points registration method. Results for fixed and live experimental data shows the association method to perform comparably to traditional methods in colocalization studies for fixed cells and to perform favorably in association studies for live cells.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Vision, Pori Department, Research group: Data-analytics and Optimization, Research group: Computational Systems Biology, Research Community on Data-to-Decision (D2D), Prostate cancer research center (PCRC), Univ Jyvaskyla, University of Jyvaskyla, Dept Biol & Environm Sci, Nanosci Ctr, Univ Jyvaskyla, University of Jyvaskyla, Dept Math Informat Technol
Contributors: Ruusuvuori, P., Paavolainen, L., Rutanen, K., Maki, A., Huttunen, H., Marjomaki, V.
Number of pages: 11
Publication date: 11 Apr 2014
Peer-reviewed: Yes

Publication information
Journal: PLoS ONE
Volume: 9
Issue number: 4
Article number: 94245
ISSN (Print): 1932-6203
Ratings:
Scopus rating (2014): CiteScore 3.54 SJR 1.559 SNIP 1.148
Original language: English
Keywords: COLOCALIZATION, IMAGES, MICROSCOPY, REGISTRATION, ALGORITHM, TRACKING, OBJECTS
DOIs:
10.1371/journal.pone.0094245

Bibliographical note
Contribution: organisation=sgn,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2014-11-25
Publisher name: Public Library of Science
 publication_forum: 65163
Source: researchoutputwizard
Source ID: 1412
Research output: Contribution to journal › Article › Scientific › peer-review

A Measurement-based Statistical Model to Evaluate Uncertainty in Long-range Noise Assessments
Carefully validated long-range sound propagation measurements with extensive meteorological instrumentation were continued for 612 days without interruption, around the clock, resulting in a database with millions of files, terabytes of sound and environmental data, and hundreds of pages of documentation. More than 100 environmental variables were analysed by statistical means, and many statistically highly significant dependencies linked to excess attenuation were found. At a distance of 3 km from the source, excess attenuation was spread over a dynamic range of 80 dB, with differences of 10 dB between individual quarters of the year; also, negative excess attenuation at frequencies below 400 Hz existed. The low frequencies were affected mainly by the stability characteristics of the atmosphere and the lapse rate. Humidity; lapse rate; sensible heat flux; and longitudinal, transverse, and vertical turbulence intensities explain excess

attenuation at higher frequencies to a statistically highly significant extent. Through application of a wide range of regression analyses, a set of criteria for frequency-dependent uncertainty in sound propagation was created. These criteria were incorporated into a software module, which, together with a state-of-the-art physical sound propagation calculation module, makes it possible to perform environmental noise assessments with known uncertainty. This approach can be applied to the short term measurements too and it was shown that some of the most complex meteorological variables, among them atmospheric turbulence, can be taken into account. Comparison with two standardized noise modelling methods showed that the statistical model covers well a range of uncertainty not matched with the standardized methods and the measured excess attenuation fit within the limits of predicted uncertainty.

General information
Publication status: Published
MoE publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Automation Science and Engineering
Contributors: Maijala, P.
Number of pages: 178
Publication date: 3 Jan 2014

Publication information
Publisher: VTT
ISBN (Print): 978-951-38-8109-2
ISBN (Electronic): 978-951-38-8110-8
Original language: English

Publication series
Name: VTT Science
Publisher: VTT
Volume: 48
ISSN (Print): 2242-119X
ISSN (Electronic): 2242-1203
Electronic versions:

maijala
URLs:

http://urn.fi/URN:NBN:fi:tty-201609134503

http://urn.fi/URN:ISBN:978-951-38-8110-8

http://www.vtt.fi/inf/pdf/science/2013/S48.pdf

Bibliographical note
Awarding institution:Tampereen teknillinen yliopisto - Tampere University of Technology
Submitter:Submitted by Kaisa Kulkki (kaisa.kulkki@tut.fi) on 2013-12-18T08:26:49Z
No. of bitstreams: 1
maijala.pdf: 8876096 bytes, checksum: a9348271868d9cc37d85ecf3800e67ff (MD5)
Submitter:Approved for entry into archive by Kaisa Kulkki (kaisa.kulkki@tut.fi) on 2013-12-18T09:39:44Z (GMT) No. of bitstreams: 1
maijala.pdf: 8876096 bytes, checksum: a9348271868d9cc37d85ecf3800e67ff (MD5)
Submitter:Made available in DSpace on 2013-12-18T09:39:44Z (GMT). No. of bitstreams: 1
maijala.pdf: 8876096 bytes, checksum: a9348271868d9cc37d85ecf3800e67ff (MD5)
Source: researchoutputwizard
Source ID: 123456789/21918
Research output: Book/Report › Doctoral thesis › Monograph

20th Inverse Days 2014, Tampere 9th-11th December 2014: Abstracts
Proceedings of the Inverse Days 2014 conference organized in Tampere 9th - 11th December 2014. This document contains the schedule of the conference, the list of participants and the abstracts of the talks given at the conference.

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Contributors: Åkerblom, M. (ed.)
Number of pages: 38
Publication date: 2014

Publication information
Publisher: Tampere University of Technology, Department of Mathematics
ISBN (Print): 978-952-15-3425-6
ISBN (Electronic): 978-952-15-3429-4

Original language: English

Publication series
Name: Tampere University of Technology. Department of Mathematics. Research Report
Publisher: Tampere University of Technology
Volume: 101
ISSN (Print): 1459-3750
Electronic versions:
inverse_days_2014
URLs:
http://URN.fi/URN:ISBN:978-952-15-3429-4

Bibliographical note
Versio ok 14.12.2015
Research output: Book/Report › Commissioned report › Professional

A comparison of confluence and ample sets in probabilistic and non-probabilistic branching time

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Hansen, H., Timmer, M.
Number of pages: 21
Pages: 103-123
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Theoretical Computer Science
Volume: 528
ISSN (Print): 0304-3975
Ratings:
Scopus rating (2014): CiteScore 1.08 SJR 0.669 SNIP 1.139
Original language: English
DOIs:
10.1016/j.tcs.2013.07.014

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-05-31
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 412
Research output: Contribution to journal › Article › Scientific › peer-review

Adaptive mobile tracking in unknown non-line-of-sight conditions with application to digital TV networks

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Chen, L., Piche, R., Kuusniemi, H., Chen, R.
Number of pages: 10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Eurasip Journal on Advances in Signal Processing
Volume: 2014
Article number: UNSP 22
ISSN (Print): 1687-6172
Ratings:
Scopus rating (2014): CiteScore 0.7 SJR 0.286 SNIP 0.918

Original language: English
DOIs:
10.1186/1687-6180-2014-22

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-05-25
Publisher name: Springer
Source: researchoutputwizard
Source ID: 219
Research output: Contribution to journal › Article › Scientific › peer-review

A field test of parametric WLAN-fingerprint-positioning methods

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Muller, P., Raitoharju, M., Piche, R.
Number of pages: 8
Pages: 1-8
Publication date: 2014

Host publication information
Title of host publication: 17th International Conference on Information Fusion (FUSION), 7-10 July 2014, Salamanca, Spain
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers
ISBN (Print): 978-84-9012-355-3
Electronic versions:
Field test
URLs:
http://urn.fi/URN:NBN:fi:tty-201603173640
http://confcats_isif.s3.amazonaws.com/web-files/event/proceedings/html/2014Proceedings/papers/fusion2014_submission_40/paper40.pdf
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6916170

Bibliographical note
The paper is available in ieeexplore, and will later also appear at http://isif.org/content/conference-proceedings
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-11-21
Source: researchoutputwizard
Source ID: 1108
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A method to enforce map constraints in a particle filter's position estimate

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Piche, R., Koivisto, M.
Number of pages: 4
Publication date: 2014

Host publication information
Title of host publication: 2014 11th Workshop on Positioning, Navigation and Communication (WPNC), 12-13 March 2014, Dresden, Germany
Publisher: IEEE
Electronic versions:
MapConstraints
DOIs:
10.1109/WPNC.2014.6843284
URLs:

http://urn.fi/URN:NBN:fi:tty-201603173645

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-09-05
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 1274
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

An algebraic study of Peterson´s Intermediate Syllogisms

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Turunen, E.
Number of pages: 14
Pages: 1-14
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Soft Computing
ISSN (Print): 1432-7643
Ratings:

Scopus rating (2014): CiteScore 2.01 SJR 0.744 SNIP 1.499
Original language: English
DOIs:

10.1007/s00500-013-1216-2

Bibliographical note
Published online: 21 January 2014
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-04-29
Publisher name: Springer
Source: researchoutputwizard
Source ID: 1660
Research output: Contribution to journal › Article › Scientific › peer-review

A New Controller Structure for Robust Output Regulation

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Number of pages: 6
Pages: 4721-4726
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 53rd IEEE Conference on Decision and Control, IEEE CDC 2014, 15-17 December, 2014, Los Angeles, CA, USA
Publisher: IEEE
ISBN (Print): 978-1-4673-6088-3

Publication series
Name: IEEE Conference on Decision and Control

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-18
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 1243
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Another paraconsistent algebraic semantics for Lukasiewicz-Pavelka logic

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Rodriguez, J. T., Turunen, E., Ruan, D., Montero, J.
Number of pages: 16
Pages: 132-147
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Fuzzy Sets and Systems
Volume: 242
ISSN (Print): 0165-0114
Ratings:

Scopus rating (2014): CiteScore 2.67 SJR 1.369 SNIP 2.194
Original language: English
DOIs:

10.1016/j.fss.2013.06.011

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-09-30
Publisher name: Elsevier BV
Source: researchoutputwizard
Source ID: 1390
Research output: Contribution to journal › Article › Scientific › peer-review

Application of Design Review to Probabilistic Risk Assessment in a Large Investment Project

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mechanical Engineering and Industrial Systems
Contributors: Virtanen, S., Penttinen, J., Kiiski, M., Jokinen, J.
Number of pages: 12
Pages: 1-12
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the Probabilistic Safety Assessment and Management PSAM12, June 2014, Honolulu, Hawaii
URLs:

http://psam12.org/proceedings/paper/paper_319_1.pdf

Bibliographical note
Contribution: organisation=mei,FACT1=1
Portfolio EDEND: 2014-12-13
Source: researchoutputwizard
Source ID: 1754
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Application of Hill-Clohessy-Wiltshire Equation in GNSS Orbit Prediction

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Research group: Positioning, Wireless Communications and Positioning (WICO), Automation and Hydraulic Engineering, Department of Automation Science and Engineering
Contributors: Zhang, X., Piche, R.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information

Title of host publication: Proceedings of 2014 International Conference on Localization and GNSS (ICL-GNSS), Helsinki, Finland, June 24-26, 2014
Place of publication: Piscataway
Publisher: IEEE
Editors: Nurmi, J., Ruotsalainen, L., Lohan, E., Salcedo, J., Thombre, S.
ISBN (Print): 978-1-4799-5122-2
Electronic versions:

Hill equation
DOIs:

10.1109/ICL-GNSS.2014.6934162
URLs:

http://urn.fi/URN:NBN:fi:tty-201603173647

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-10-30
Source: researchoutputwizard
Source ID: 1844
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A Simple Character String Proof of the "True but Unprovable" Version of Gödel's First Incompleteness Theorem

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Contributors: Valmari, A.
Number of pages: 15
Pages: 355-369
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Electronic Proceedings in Theoretical Computer Science
Volume: 151
Article number: 25
ISSN (Print): 2075-2180
Ratings:

Scopus rating (2014): SJR 0.36 SNIP 0.719
Original language: English
DOIs:

10.4204/EPTCS.151.25

Bibliographical note
Paper presented also in the Proceedings of the 14th International Conference Automata and Formal Languages (AFL 2014).
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-11-17
Publisher name: Open Publishing Association
Source: researchoutputwizard
Source ID: 1692
Research output: Contribution to journal › Article › Scientific › peer-review

Bagdad - matematiikkaa täältä ikuisuuteen matematiikkanäyttely

General information
Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Mathematics
Contributors: Eriksson, S., Vainio, J.
Number of pages: 30
Pages: 17-46
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Lumat

Volume: 2
Issue number: 1
ISSN (Print): 2323-7112
Original language: Finnish

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2015-01-14
Source: researchoutputwizard
Source ID: 288
Research output: Contribution to journal › Article › Professional

Bayesian Methods for Hybrid Indoor Positioning

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research group: Positioning
Contributors: Nurminen, H.
Number of pages: 2
Publication date: 2014

Host publication information
Title of host publication: IPIN 2014 - 5th International Conference on Indoor Positioning and Indoor Navigation, 27th - 30 th October, 2014, Busan, South Korea

Bibliographical note
siirretään 2015
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2015-01-14
xabstract
Source: researchoutputwizard
Source ID: 1166
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Change Detection of Tree Biomass with Terrestrial Laser Scanning and Quantitative Structure Modelling

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Kaasalainen, S., Krooks, A., Liski, J., Raumonen, P., Kaartinen, H., Kaasalainen, M., Puttonen, E., Anttila, K. , Mäkipää, R.
Number of pages: 25
Pages: 3906-3922
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Remote Sensing
Volume: 6
Issue number: 5
ISSN (Print): 2072-4292
Ratings:

Scopus rating (2014): CiteScore 3.23 SJR 1.275 SNIP 1.833
Original language: English
DOIs:

10.3390/rs6053906

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-09-30
Publisher name: MDPI AG
Source: researchoutputwizard
Source ID: 631
Research output: Contribution to journal › Article › Scientific › peer-review

Combinational Studies of Vectors and Sequences

General information
Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Contributors: Major, L.
Number of pages: 73
Publication date: 2014

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-3311-2
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1220
ISSN (Print): 1459-2045

Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source ID: 997
Research output: Book/Report › Doctoral thesis › Collection of Articles

Detection of anomalies in radio tomography of asteroids: source count and forward errors

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Pursiainen, S., Kaasalainen, M.
Number of pages: 12
Pages: 36-47
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Planetary and Space Science
Volume: 99
ISSN (Print): 0032-0633
Ratings:

Scopus rating (2014): CiteScore 1.96 SJR 1.118 SNIP 0.913
Original language: English
DOIs:

10.1016/j.pss.2014.04.017

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-17
Publisher name: Pergamon
Source: researchoutputwizard
Source ID: 1309
Research output: Contribution to journal › Article › Scientific › peer-review

Evaluating the Consistency of Estimation

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Ivanov, P., Ali-Löytty, S., Piche, R.
Number of pages: 5
Publication date: 2014

Host publication information
Title of host publication: Proceedings of 2014 International Conference on Localization and GNSS (ICL-GNSS), Helsinki, Finland, June 24-26, 2014
Place of publication: Piscataway
Publisher: IEEE
ISBN (Print): 978-1-4799-5122-2
Electronic versions:

Ivanov consistency
DOIs:

10.1109/ICL-GNSS.2014.6934171
URLs:

http://urn.fi/URN:NBN:fi:tty-201603173646

Bibliographical note
Contribution: organisation=ase,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2014-11-25
Source: researchoutputwizard
Source ID: 551
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Gaussian Scale Mixture Models For Robust Linear Multivariate Regression With Missing Data
We present an algorithm for multivariate robust Bayesian linear regression with missing data. The iterative algorithm computes an approximative posterior for the model parameters based on the variational Bayes (VB) method. Compared to the EM algorithm, the VB method has the advantage that the variance for the model parameters is also computed directly by the algorithm. We consider three families of Gaussian scale mixture models for the measurements, which include as special cases the multivariate t distribution, the multivariate Laplace distribution, and the contaminated normal model. The observations can contain missing values, assuming that the missing data mechanism can be ignored. A Matlab/Octave implementation of the algorithm is presented and applied to solve three
reference examples from the literature.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning
Contributors: Ala-Luhtala, J., Piche, R.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Communications in Statistics: Simulation and Computation
ISSN (Print): 0361-0918
Ratings:

Scopus rating (2014): CiteScore 0.54 SJR 0.466 SNIP 0.765
Original language: English
Electronic versions:

ala_luhtala_piche_gaussian_scale_mixture_models
DOIs:

10.1080/03610918.2013.875565
URLs:

http://urn.fi/URN:NBN:fi:tty-201603183666

Bibliographical note
Online first.Accepted author version posted online 19 Jun 2014
Contribution: organisation=mat,FACT1=0.25
Contribution: organisation=ase,FACT2=0.75
Portfolio EDEND: 2014-11-25
Publisher name: Taylor & Francis
Source: researchoutputwizard
Source ID: 79
Research output: Contribution to journal › Article › Scientific › peer-review

Indirect Emissions of Forest Bioenergy: Detailed Modelling of Stump-Root Systems

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Liski, J., Kaasalainen, S., Raumonen, P., Akujärvi, A., Krooks, A., Repo, A., Kaasalainen, M.
Number of pages: 8
Pages: 777-784
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Global Change Biology Bioenergy
Volume: 6
Issue number: 6
ISSN (Print): 1757-1693
Ratings:

Scopus rating (2014): CiteScore 4.81 SJR 2.367 SNIP 1.831
Original language: English
DOIs:

10.1111/gcbb.12091

Bibliographical note
Article first published online: 26 MAY 2013
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: Wiley-Blackwell
Source: researchoutputwizard
Source ID: 957
Research output: Contribution to journal › Article › Scientific › peer-review

Integral Formulas for k-hypermonogenic Functions in R3

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H., Nelson, V.
Number of pages: 14
Pages: 119-132
Publication date: 2014

Host publication information
Title of host publication: Hypercomplex Analysis: New Perspectives and Applications
Publisher: Springer
ISBN (Print): 978-3-319-08770-2
ISBN (Electronic): 978-3-319-08771-9

Publication series
Name: Trends in Mathematics
ISSN (Print): 2297-0215
DOIs:

10.1007/978-3-319-08771-9_8

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2015-01-14
Publisher name: Springer
Source: researchoutputwizard
Source ID: 287
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Minimal Solutions of Fuzzy Relation Equations with General Operators on the Unit Interval

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Medina, J., Turunen, E., Bartl, E., Diaz-Moreno, J. C.
Number of pages: 10

Pages: 81-90
Publication date: 2014

Host publication information
Title of host publication: Information Processing and Management of Uncertainty in Knowledge-Based Systems. 15th International Conference, IPMU 2014, Montpellier, France, July 15-19, 2014, Proceedings, Part III. Communications in Computer and Information Science
Publisher: Springer International Publishing
ISBN (Print): 978-3-319-08851-8
ISBN (Electronic): 978-3-319-08852-5

Publication series
Name: Communications in Computer and Information Science
Volume: 444
ISSN (Print): 1865-0929
DOIs:
10.1007/978-3-319-08852-5_9

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-10-03
Publisher name: Springer International Publishing
Source: researchoutputwizard
Source ID: 1062
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Modelling of Joule heating based self-alignment method for metal grid line passivation
A Joule heating based self-alignment method for solution-processable insulator structures has been modeled for the passivation of metal grid lines, for example for organic light emitting diodes or photovoltaic cells. To minimize overhang of the passivation layer from line edges, we have studied the Joule heating approach using solution-processable, cross-linkable polymer insulator films. Finite element simulations were performed to investigate the heating of the sample using glass and poly(ethylene terephthalate) (PET) substrates. The sample was at room temperature and the current was selected to induce a temperature of 410 K at the conductor. It was found that the selection of substrate material is crucial for the localization of cross-linking. For a PET substrate, the temperature gradient at the edge of the conductor is approximately twice the gradient for glass. As a result, using a glass substrate demands high selectivity from the polymer cross-linking, thus making PET a more suitable substrate material for our application. A flexible PET substrate is, in addition, compatible with roll-to-roll mass-manufacturing processes.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Department of Mathematics, Augmented Human Activities (AHA), Mathematical modelling with wide societal impact (MathImpact)
Contributors: Janka, M., Raumonen, P., Tuukkanen, S., Lupo, D.
Number of pages: 6
Publication date: 2014

Host publication information
Title of host publication: 2013 MRS Fall Meeting - Symposium M - Large-Area Processing and Patterning for Active Optical and Electronic Devices
Publisher: MATERIALS RESEARCH SOCIETY
Electronic versions:
Janka_2013_Modelling_Joule_heating_Self-archive
DOIs:
10.1557/opl.2014.127
URLs:
http://urn.fi/URN:NBN:fi:tty-201603183708

Bibliographical note
Contribution: organisation=elt,FACT1=0.8
Contribution: organisation=mat,FACT2=0.2
Portfolio EDEND: 2014-05-08
Publisher name: Materials Research Society
Source: researchoutputwizard
Source ID: 573
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

New era of Business Analytics - Making sense of business ecosystems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Department of Mathematics, Managing digital industrial transformation (mDIT)
Contributors: Jussila, J., Kärkkäinen, H., Kortelainen, S., Huhtamäki, J., Aho, T., Tebest, T.
Number of pages: 3
Pages: 276-278
Publication date: 2014

Host publication information
Title of host publication: Academic MindTrek Conference 2014, Tampere, Finland, November 4-6, 2014
Place of publication: New York, NY
Publisher: ACM
Editors: Lugmayr, A., Franssila, H., Paavilainen, J.
ISBN (Print): 978-1-4503-3006-0

Publication series
Name: MindTrek Conference
DOIs:

10.1145/2676467.2676517

Bibliographical note
Contribution: organisation=tlo,FACT1=0.67
Contribution: organisation=mat,FACT2=0.33
Portfolio EDEND: 2014-12-31
Publisher name: ACM
Source: researchoutputwizard
Source ID: 622
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Old and New Algorithms for Minimal Coverability Sets

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Contributors: Valmari, A., Hansen, H.
Number of pages: 25
Pages: 1-25
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Fundamenta Informaticae
Volume: 131
Issue number: 1
ISSN (Print): 0169-2968
Ratings:

Scopus rating (2014): CiteScore 1 SJR 0.48 SNIP 0.954
Original language: English
Electronic versions:

AV2014FI
DOIs:

10.3233/FI-2014-1002
URLs:

http://urn.fi/URN:NBN:fi:tty-201606064225

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-11-17
Publisher name: IOS Press
Source: researchoutputwizard
Source ID: 1694
Research output: Contribution to journal › Article › Scientific › peer-review

On Convergence and Accuracy of State-Space Approximations of Squared Exponential Covariance Functions

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Särkkä, S., Piche, R.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE International Workshop on Machine Learning for Signal Processing (MLSP), September 21-24, 2014, Reims, France
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers
ISBN (Print): 978-1-4799-3694-6
DOIs:

10.1109/MLSP.2014.6958890

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-11-21
Source: researchoutputwizard
Source ID: 1462
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On polynomial stability of linear systems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Paunonen, L., Laakkonen, P.
Number of pages: 6
Pages: 233-238
Publication date: 2014

Host publication information
Title of host publication: 21st International Symposium on Mathematical Theory of Networks and Systems, MTNS 2014, July 7-11, 2014, Groningen, the Netherlands
Place of publication: Groningen, the Netherlands
Publisher: University of Groningen
ISBN (Print): 978-90-367-6321-9

Publication series
Name: International Symposium on Mathematical Theory of Networks and Systems
URLs:

https://fwn06.housing.rug.nl/mtns2014/

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-31
Publisher name: University of Groningen
Source: researchoutputwizard
Source ID: 1242
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On the Structure of Robust Controllers for Infinite-Dimensional Systems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Hämäläinen, T., Pohjolainen, S.

Number of pages: 4
Pages: 938-941
Publication date: 2014

Host publication information
Title of host publication: 21st International Symposium on Mathematical Theory of Networks and Systems, MTNS 2014, July 7-11, 2014, Groningen, The Netherlands
Place of publication: Groningen, the Netherlands
Publisher: University of Groningen
ISBN (Print): 978-90-367-6321-9

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-30
Publisher name: University of Groningen
Source: researchoutputwizard
Source ID: 406
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On Vekua Systems and Their Connections to Hyperbolic Function Theory in the Plane

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Number of pages: 12
Pages: 1027-1038
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Advances in Applied Clifford Algebras
Volume: 24
Issue number: 4
ISSN (Print): 0188-7009
Ratings:

Scopus rating (2014): CiteScore 0.56 SJR 0.304 SNIP 0.687
Original language: English
DOIs:

10.1007/s00006-014-0507-8

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2015-01-14
Publisher name: Birkhaeuser Science
Source: researchoutputwizard
Source ID: 286
Research output: Contribution to journal › Article › Scientific › peer-review

Optimal storage scheme for access point coverage data

General information
Publication status: Published
MoE publication type: H1 Granted patent
Organisations: Department of Automation Science and Engineering, Research group: Positioning
Contributors: Wirola, L., Laine, T., Raitoharju, M., Sirola, N.
Publication date: 2014

Publication information
Patent number: Pat. US 8 816 908 B2
Priority date: 26/08/14
Priority number: US 2012/0139790 A1, Jun. 7, 2012
Original language: English

Bibliographical note
PCT/US2009/001433 : US 8816908 B2 (26.08.2014)
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-12-19
Source: researchoutputwizard

Source ID: 1799
Research output: Patent › Scientific

Optimization of large-area OLED current distribution grids with self-aligned passivation

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Electronics and Communications Engineering, Department of Physics, Department of Mathematics, Augmented Human Activities (AHA), Mathematical modelling with wide societal impact (MathImpact)
Contributors: Janka, M., Saukko, E., Raumonen, P., Lupo, D.
Number of pages: 8
Pages: 3431-3438
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Organic Electronics
Volume: 15
Issue number: 12
ISSN (Print): 1566-1199
Ratings:

Scopus rating (2014): CiteScore 3.85 SJR 1.346 SNIP 1.2
Original language: English
DOIs:

10.1016/j.orgel.2014.09.028

Bibliographical note
Contribution: organisation=elt,FACT1=0.8
Contribution: organisation=fys,FACT2=0.1
Contribution: organisation=mat,FACT3=0.1
Portfolio EDEND: 2014-11-11
Publisher name: Elsevier BV
Source: researchoutputwizard
Source ID: 571
Research output: Contribution to journal › Article › Scientific › peer-review

Polynomial stability of semigroups generated by operator matrices

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Number of pages: 27
Pages: 885-911
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Evolution Equations
Volume: 14
Issue number: 4
ISSN (Print): 1424-3199
Ratings:

Scopus rating (2014): CiteScore 0.81 SJR 1.499 SNIP 1.178
Original language: English
DOIs:

10.1007/s00028-014-0243-5
URLs:

http://link.springer.com/article/10.1007%2Fs00028-014-0243-5

Bibliographical note
Published online: 11 July 2014
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-10-20
Publisher name: Birkhaeuser Verlag AG
Source: researchoutputwizard
Source ID: 1239

Research output: Contribution to journal › Article › Scientific › peer-review

Predicting tree structure from tree height using terrestrial laser scanning and quantitative structure models

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Krooks, A., Kaasalainen, S., Kankare, V., Joensuu, M., Raumonen, P., Kaasalainen, M.
Number of pages: 11
Pages: 1-11
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Silva Fennica
Volume: 48
Issue number: 2
Article number: 1125
ISSN (Print): 0037-5330
Ratings:

Scopus rating (2014): CiteScore 1.44 SJR 0.612 SNIP 0.97
Original language: English
DOIs:

10.14214/sf.1125

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-09-30
Publisher name: The Finnish Society of Forest Science
Source: researchoutputwizard
Source ID: 813
Research output: Contribution to journal › Article › Scientific › peer-review

Robust controller design for infinite-dimensional exosystems

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Number of pages: 34
Pages: 825-858
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: International Journal of Robust and Nonlinear Control
Volume: 24
Issue number: 5
ISSN (Print): 1049-8923
Ratings:

Scopus rating (2014): CiteScore 3.51 SJR 2.037 SNIP 1.923
Original language: English
DOIs:

10.1002/rnc.2920

Bibliographical note
Online first
Contribution: organisation=mat,FACT1=1
Publisher name: John Wiley & Sons
Source: researchoutputwizard
Source ID: 1244
Research output: Contribution to journal › Article › Scientific › peer-review

Robustness of Controllers for SISO-Plants and Signals Generated by an Infinite-Dimensional Exosystem

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Laakkonen, P., Pohjolainen, S.
Number of pages: 6
Pages: 538-543
Publication date: 2014

Host publication information
Title of host publication: 19th International Conference on Methods and Models in Automation and Robotics, MMAR 2014, Miedzyzdroje, Poland, September 2-5, 2014
Publisher: IEEE
ISBN (Print): 978-1-4799-5082-9
ISBN (Electronic): 978-1-4799-5081-2

Publication series
Name: International conference on methods and models in automation and robotics
DOIs:

10.1109/MMAR.2014.6957411

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-16
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 845
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robustness of strong stability of semigroups

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Number of pages: 34
Pages: 4403-4436
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Differential Equations
Volume: 257
Issue number: 12
ISSN (Print): 0022-0396
Ratings:

Scopus rating (2014): CiteScore 1.78 SJR 2.993 SNIP 1.862
Original language: English
DOIs:

10.1016/j.jde.2014.08.011
URLs:

http://www.sciencedirect.com/science/article/pii/S0022039614003386

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-10-20
Publisher name: Academic Press
Source: researchoutputwizard
Source ID: 1240
Research output: Contribution to journal › Article › Scientific › peer-review

Shape reconstruction from images: Pixel fields and Fourier transform

General information
Publication status: Published

MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Viikinkoski, M., Kaasalainen, M.
Number of pages: 16
Pages: 885-900
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Inverse Problems and Imaging
Volume: 8
Issue number: 3
ISSN (Print): 1930-8337
Ratings:

Scopus rating (2014): CiteScore 1.34 SJR 1.069 SNIP 1.043
Original language: English
Electronic versions:

Shape_Reconstruction_from_Images
DOIs:

10.3934/ipi.2014.8.885
URLs:

http://URN.fi/URN:NBN:fi:tty-201603083628

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-17
Publisher name: American Institute of Mathematical Sciences
Source: researchoutputwizard
Source ID: 1732
Research output: Contribution to journal › Article › Scientific › peer-review

Sparse source travel-time tomography of a laboratory target: accuracy and robustness of anomaly detection

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Pursiainen, S., Kaasalainen, M.
Number of pages: 19
Pages: 1-19
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Inverse Problems
Volume: 30
Issue number: 11
Article number: 114016
ISSN (Print): 0266-5611
Ratings:

Scopus rating (2014): CiteScore 1.63 SJR 1.252 SNIP 1.395
Original language: English
DOIs:

10.1088/0266-5611/30/11/114016

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-17
Publisher name: Institute of Physics Publishing
Source: researchoutputwizard
Source ID: 1310
Research output: Contribution to journal › Article › Scientific › peer-review

Taivaalliset projektiot: terapiaa imversio-ongelmaisille

General information

Publication status: Published
MoE publication type: D1 Article in a trade journal
Organisations: Department of Mathematics
Contributors: Kaasalainen, M.
Number of pages: 7
Pages: 25-31
Publication date: 2014
Peer-reviewed: Unknown

Publication information
Journal: Arkhimedes
Issue number: 4
ISSN (Print): 0004-1920
Original language: Finnish

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-17
Publisher name: Suomen Fyysikkoseura
Source: researchoutputwizard
Source ID: 630
Research output: Contribution to journal › Article › Professional

The Cauchy-Schwarz inequality in Cayley graph and tournament structures on finite fields

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Foldes, S., Major, L.
Number of pages: 6
Pages: 153-158
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Miskolc Mathematical Notes
Volume: 15
Issue number: 1
ISSN (Print): 1787-2405
Ratings:
Scopus rating (2014): CiteScore 0.44 SJR 0.27 SNIP 0.574
Original language: English

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2015-01-21
Publisher name: Miskolci Egyetem
Source: researchoutputwizard
Source ID: 310
Research output: Contribution to journal › Article › Scientific › peer-review

The Internal Model Principle for Systems with Unbounded Control and Observation

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Number of pages: 34
Pages: 3967-4000
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: SIAM Journal on Control and Optimization
Volume: 52
Issue number: 6
ISSN (Print): 0363-0129

Ratings:

Scopus rating (2014): CiteScore 1.9 SJR 1.615 SNIP 1.765
Original language: English
DOIs:

10.1137/130921362

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-31
Publisher name: Society for Industrial and Applied Mathematics
Source: researchoutputwizard
Source ID: 1245
Research output: Contribution to journal › Article › Scientific › peer-review

The puzzling mutual orbit of the binary Trojan asteroid (624) Hektor

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Marchis, F., Durech, J., Castillo-Rogez, J., Vachier, F., Cuk, M., Berthier, J., Wong, M., Kalas, P., Duchene, G., Van Dam, M., Hamanowa, H., Viikinkoski, M.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Astrophysical Journal Letters
Volume: 783
Issue number: 2
ISSN (Print): 2041-8205
Ratings:

Scopus rating (2014): CiteScore 4.34 SJR 3.404 SNIP 1.336
Original language: English
DOIs:

10.1088/2041-8205/783/2/L37

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2015-01-13
Publisher name: Institute of Physics Publishing Ltd.
Source: researchoutputwizard
Source ID: 1030
Research output: Contribution to journal › Article › Scientific › peer-review

The Role of Exosystems in Output Regulation

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Number of pages: 5
Pages: 2301-2305
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 59
Issue number: 8
ISSN (Print): 0018-9286
Ratings:

Scopus rating (2014): CiteScore 5.14 SJR 3.8 SNIP 3.257
Original language: English
DOIs:

10.1109/TAC.2014.2303214

URLs:
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6727411

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-10-20
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 1241
Research output: Contribution to journal › Article › Scientific › peer-review

Tree Root System Characterization and Volume Estimation by Terrestrial Laser Scanning and Quantitative Structure Modeling

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Smith, A., Astrup, R., Raumonen, P., Liski, J., Krooks, A., Kaasalainen, S., Åkerblom, M., Kaasalainen, M.
Number of pages: 21
Pages: 3274-3294
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Forests: Open Access Journal
Volume: 5
ISSN (Print): 1999-4907
Ratings:
Scopus rating (2014): CiteScore 1.84 SJR 0.791 SNIP 0.963
Original language: English
DOIs:
10.3390/f5123274
URLs:
http://www.mdpi.com/journal/forests

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-17
Publisher name: MDPI AG
Source: researchoutputwizard
Source ID: 1525
Research output: Contribution to journal › Article › Scientific › peer-review

Visualizing informal learning behavior from conference participants Twitter data

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Pori Department, Department of Mathematics
Contributors: Aramo-Immonen, H., Jussila, J., Huhtamäki, J.
Number of pages: 8
Pages: 603-610
Publication date: 2014

Host publication information
Title of host publication: Second International Conference on Technological Ecosystems for Enhancing Multiculturality, TEEM 2014, Salamanca, Spain, October 1-3, 2014
Place of publication: New York, NY
Publisher: ACM
Editor: Francisco Jose, G.
ISBN (Print): 978-1-4503-2896-8

Publication series
Name: International Conference on Technological Ecosystems for Enhancing Multiculturality
DOIs:
10.1145/2669711.2669962

Bibliographical note
Contribution: organisation=pla,FACT1=0.34
Contribution: organisation=tlo,FACT2=0.33
Contribution: organisation=mat,FACT3=0.33
Portfolio EDEND: 2014-12-30
Publisher name: ACM
Source: researchoutputwizard
Source ID: 114
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Visual network analysis of Twitter data for co-organizing conferences: case CMAD 2013
The aim of this research is to explore what kinds of insights information visualization of social media data can provide for co-organizing conferences. Our paper focuses on Twitter use before, during and after conference. We present a case study based on an conference of Community Manager Appreciation Day (CMAD 2013). With the process of data-driven visual network analysis, we used Twitter data to analyse the network of conference participants and the conference's discussion topics. We were able to identify e.g. influential conference participants, most interesting presentations and discussions, similarities between interests of the conference participants. Hence, several development and information needs of conference co-organization were derived from the information visualizations, which have implications for improving the planning and co-organizing of conferences, as well as for Twitter use in conference communication.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Department of Mathematics, Managing digital industrial transformation (mDIT)
Contributors: Jussila, J., Huhtamäki, J., Henttonen, K., Kärkkäinen, H., Still, K.
Number of pages: 10
Pages: 1474-1483
Publication date: 2014

Host publication information
Title of host publication: 47th Hawaii International Conference on System Sciences, HICSS 2014, 6.-9.1.2014, Waikoloa, HI
Publisher: Computer Society Press

Publication series
Name: Annual Hawaii International Conference on System Sciences
ISSN (Print): 1530-1605
Electronic versions:

jussila_visual_network_analysis_of_twitter_data.pdf
DOIs:

10.1109/HICSS.2014.190
URLs:

http://urn.fi/URN:NBN:fi:tty-201401221053

Bibliographical note
Contribution: organisation=tlo,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2014-03-15
Publisher name: Computer Society Press
Source: researchoutputwizard
Source ID: 619
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robust Regulation for Infinite-Dimensional Systems and Signals in the Frequency Domain
In this thesis, the robust output regulation problem is studied both in the time domain and in the frequency domain. The problem to be addressed is to find a stabilizing controller for a given plant so that every signal generated by an exogenous system, or shortly exosystem, is asymptotically tracked despite perturbations in the plant or some external disturbances. The exosystem generating the reference and disturbance signals is assumed to be infinite-dimensional. The main contribution of this thesis is to develop the robust regulation theory for an infinite-dimensional exosystem in the frequency domain framework. In order to do that, the time domain theory is studied in some detail and new results that emphasize the smoothness requirement on the reference and disturbance signals due to infinite-dimensionality of the exosystem are presented. Two types of controllers are studied, the feedforward controllers and the error feedback controllers, the latter of which facilitate robust regulation. These results exploit the structure at infinity of tha plant transfer function. In this thesis, a new definition of the structure at infinity suitable for infinite-dimensional systems is developed and its properties are studied. The frequency domain theory developed is based on the insights into the corresponding time domain theory. By following some recent time domain ideas the type of robustness and stability types are chosen so that they facilitate the use of an infinite-dimensional exosystem. The robustness is understood in the sense that stability should imply regulation. The chosen stability types resemble the time domain polynomial and strong stabilities and allow robust regulation of signals that have an infinite number of unstable dynamics along with transfer functions vanishing at infinity. The main

contribution of this thesis is the formulation of the celebrated internal model principle in the frequency domain terms in a rather abstract algebraic setting. Unlike in the existing literature, no topological aspect of the problem is needed because of the adopted definition of robustness. The plant transfer function is only assumed to have a right or a left coprime factorization but not necessarily both. The internal model principle leads to a necessary and sufficient condition for the solvability of the robust regulation problem. The second main contribution of the thesis is to design frequency domain controllers for infinite-dimensional systems and exosystems. In this thesis, the Davison's simple controller design for stable plants is extended to infinite-dimensional systems and exosystems. Then a controller design procedure for unstable plants containing two phases is proposed. In the first phase, a stabilizing controller is constructed for a given plant. The second phase is to design a robustly regulating controller for a stable part of the plant. This design procedure nicely combines with the Davison's type controllers and is especially suitable for infinite-dimensional plants with transfer functions in the Callier-Desoer class of transfer functions.

General information
Publication status: Published
MoE publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Mathematics
Contributors: Laakkonen, P.
Number of pages: 146
Publication date: 25 Oct 2013

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-3169-9
ISBN (Electronic): 978-952-15-3178-1
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1166
ISSN (Print): 1459-2045
Electronic versions:

laakkonen.pdf
URLs:

http://urn.fi/URN:ISBN:978-952-15-3178-1

Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source ID: 2676
Research output: Book/Report › Doctoral thesis › Monograph

A Hyperbolic Dirac Operator and its Kernels

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Eriksson, S.
Number of pages: 15
Pages: 767-781
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Complex Variables and Elliptic Equations
Volume: 58
Issue number: 6
ISSN (Print): 1747-6933
Ratings:

Scopus rating (2013): CiteScore 0.67 SJR 0.744 SNIP 1.122
Original language: Finnish
DOIs:

10.1080/17476933.2011.620096

Bibliographical note
Taylor&Francis Online first: Forthcoming articles 12.10.2011.Poistettu Portfolio13:sta tupla r=1849.
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 2114
Research output: Contribution to journal › Article › Scientific › peer-review

A linear state model for PDR+WLAN positioning
Indoor positioning based on WLAN signals is often enhanced using pedestrian dead reckoning (PDR) based on an inertial measurement unit. The state evolution model in PDR is usually nonlinear. We present a new linear state evolution model for PDR. In simulated-data and real-data tests of tightly coupled WLAN-PDR positioning, we find that the positioning accuracy with this linear model is almost as good as with traditional models when the initial state is known, and better when the initial state is not known. The proposed method is computationally light and is also suitable for smoothing.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Raitoharju, M., Nurminen, H., Piche, R.
Number of pages: 6
Pages: 113-118
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the 2013 Conference on Design and Architectures for Signal and Image Processing DASIP Cagliari, Italy, October 8-10, 2013
Place of publication: Belmont France
Publisher: European Electronic Chips & Systems Design Initiative (ECSI)
Editors: Morawiec, A., Hinderscheit, J.
ISBN (Print): 979-10-92279-02-3
ISBN (Electronic): 979-10-92279-01-6

Publication series
Name: Conference on Design and Architectures for Signal and Image Processing
Publisher: European Electronic Chips & Systems Design Initiative (ECSI)
ISSN (Print): 1966-7116
Electronic versions:

raitoharju_a_linear_state_model.pdf
URLs:

http://www.ecsi.org/dasip2013/

http://urn.fi/URN:NBN:fi:tty-201403051119

Bibliographical note
to appear in IEEEXPLORE
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source ID: 3209
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A Lyapunov approach to strong stability of semigroups
In this paper we present Lyapunov based proofs for the well-known Arendt-Batty-Lyubich-Vu Theorem for strongly continuous and discrete semigroups. We also study the spectral properties of the limit isometric groups used in the proofs.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L., Zwart, H.
Number of pages: 6
Pages: 673-678
Publication date: 2013
Peer-reviewed: Yes

Publication information

Journal: Systems and Control Letters
Volume: 62
Issue number: 8
ISSN (Print): 0167-6911
Ratings:

Scopus rating (2013): CiteScore 3.46 SJR 2.019 SNIP 1.963
Original language: English
Electronic versions:

paunonen_zwart_a_lyapunov_approach.pdf
DOIs:

10.1016/j.sysconle.2013.05.001
URLs:

http://urn.fi/URN:NBN:fi:tty-201312161489

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 3114
Research output: Contribution to journal › Article › Scientific › peer-review

A note on compactness in a fuzzy metric space

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Kaleva, O., Kauhanen, J.
Number of pages: 5
Pages: 135-139
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Fuzzy Sets and Systems
Article number: 238
ISSN (Print): 0165-0114
Ratings:

Scopus rating (2013): CiteScore 2.55 SJR 1.342 SNIP 2.089
Original language: English
DOIs:

10.1016/j.fss.2013.05.014

Bibliographical note
In Press, Corrected Proof.Accepted 29 May 2013.
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source ID: 2467
Research output: Contribution to journal › Article › Scientific › peer-review

Antichain Cutsets of Strongly Connected Posets

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Foldes, S., Woodroofe, R.
Number of pages: 11
Pages: 351-361
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Order: A Journal on the Theory of Ordered Sets and Its Applications
Volume: 30

Issue number: 2
ISSN (Print): 0167-8094
Ratings:

Scopus rating (2013): CiteScore 0.59 SJR 0.666 SNIP 1.133
Original language: English
DOIs:

10.1007/s11083-012-9248-2

Bibliographical note
Online first.Poistettu Portfolio13:sta tupla r=2900.
Contribution: organisation=mat,FACT1=1
Publisher name: Springer Netherlands
Source: researchoutputwizard
Source ID: 2143
Research output: Contribution to journal › Article › Scientific › peer-review

Bandwidth and Storage Reduction of Radio Maps for Offline WLAN Positioning
Most of the existing mobile device positioning methods require data connectivity, i.e. they work in the mobile-assisted, or online mode. However, this consumes energy, induces transmission costs and results in unnecessarily long time-to-first-fix. These issues can be alleviated using mobile-based, or offline, mode. In this mode the device carries a subset of the global radio map in memory for fast positioning without data connection. The challenge of this approach is the large size of the offline radio map that needs to be downloaded, stored and updated periodically in the mobile device. This paper presents a method to find the significant APs in the global radio map and proposes using only those in offline positioning in order to compress the size of the required offline radio map. We also propose a method to further compress the size of the offline radio map by hashing the globally unique AP BSSIDs into locally unique shortened BSSIDs. We test the proposed methods with real-world data.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Wirola, L., Wirola, L., Piche, R.
Number of pages: 9
Pages: 665-673
Publication date: 2013

Host publication information
Title of host publication: International Conference on Indoor Positioning and Indoor Navigation, IPIN 2013, 28-31 Oct 2013, Montbéliard-Belfort, France
Place of publication: Piscataway, NJ
Publisher: IEEE

Publication series
Name: International Conference on Indoor Positioning and Indoor Navigation
Electronic versions:

wirola_bandwidth_and_storage_reduction.pdf
URLs:

http://urn.fi/URN:NBN:fi:tty-201403051120

Bibliographical note
to appear in IEEEXPLORE
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 3746
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Bayesian analysis of GUHA hypotheses

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning, Research Community on Data-to-Decision (D2D), Wireless Communications and Positioning (WICO)
Contributors: Piche, R., Järvenpää, M., Turunen, E., Simunek, M.

Number of pages: 28
Pages: 47-73
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Intelligent Information Systems
Volume: 42
Issue number: 1
ISSN (Print): 0925-9902
Ratings:

Scopus rating (2013): CiteScore 1.13 SJR 0.37 SNIP 0.891
Original language: English
Electronic versions:

GUHA
DOIs:

10.1007/s10844-013-0255-6
URLs:

http://urn.fi/URN:NBN:fi:tty-201603183675

Bibliographical note
Online first
Contribution: organisation=ase,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2013-07-29
Publisher name: Springer
Source: researchoutputwizard
Source ID: 3149
Research output: Contribution to journal › Article › Scientific › peer-review

Bayes trees and forests: combining precise empirical and theoretical tree models

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Kaasalainen, M., Potapov, I., Raumonen, P., Åkerblom, M., Sievänen, R., Kaasalainen, S.
Number of pages: 3
Pages: 61-63
Publication date: 2013

Host publication information
Title of host publication: 7th International Conference on Functional-Structural Plant Models, FSPM2013, FSPM2013, 9.-14.6.2013, Saariselkä, Finland
Place of publication: Vantaa
Publisher: Finnish Society of Forest Science; Finnish Forest Research Institute; University of Helsinki
Editors: Sievänen, R., Nikinmaa, E., Godin, C., Lintunen, A., Nygren, P.
ISBN (Print): 978-951-651-408-9

Publication series
Name: International Conference on Functional-Structural Plant Models
URLs:

http://www.metla.fi/fspm2013/FSPM2013_Proceedings_book_format.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Finnish Society of Forest Science; Finnish Forest Research Institute; University of Helsinki
Source: researchoutputwizard
Source ID: 2449
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Canonical methods of constructing invariant tori by phase-space sampling

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)

Contributors: Laakso, T., Kaasalainen, M.
Number of pages: 6
Pages: 14-19
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Physica D: Nonlinear Phenomena
Volume: 243
Issue number: 1
ISSN (Print): 0167-2789
Ratings:

Scopus rating (2013): CiteScore 1.76 SJR 1.071 SNIP 1.337
Original language: English
DOIs:

10.1016/j.physd.2012.09.010

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 2679
Research output: Contribution to journal › Article › Scientific › peer-review

Challenges in Heterogeneous Web Data Analytics - Case Finnish Growth Companies in Social Media
Diverse data about various phenomena are implicitly available in the modern web. In particular websites categorized as social media provide rich and heterogeneous data about various entities such as people, corporations, brands as well as their properties and relationships. An analyst who seeks to leverage this diverse data is faced with the challenge of integrating and making sense of a set of heterogeneous data sources. In this paper, we provide an introduction and a problem statement for heterogeneous web data analytics. To further highlight and discuss practical challenges, we introduce a case study of Finnish growth companies in social media. Instead of a purely data-driven approach, the presented approach is rooted in the idea that an analyst can actively participate in the data collection and integration process, while the process can still retain repeatability and transparency. The key contribution of this paper is the statement of the challenges related to heterogeneous web data analytics.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Salonen, J., Huhtamäki, J., Nykänen, O.
Number of pages: 8
Pages: 131-138
Publication date: 2013

Host publication information
Title of host publication: 17th International Academic MindTrek Conference, October 1-4, 2013, Tampere, Finland
Publisher: ACM
ISBN (Print): 978-1-4503-1992-8

Publication series
Name: MindTrek Conference
Electronic versions:

salonen_challenges_in_heterogeneous_web_data_analytics.pdf
DOIs:

10.1145/2523429.2523481
URLs:

http://urn.fi/URN:NBN:fi:tty-201312191527

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: ACM
Source: researchoutputwizard
Source ID: 3354
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Compact YORP formulation and stability analysis

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Kaasalainen, M., Nortunen, H.
Number of pages: 8
Pages: 1-8
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 558
Article number: A104
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2013): CiteScore 2.01 SJR 2.747 SNIP 1.203
Original language: English
DOIs:

10.1051/0004-6361/201322221

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: EDP Sciences
Source: researchoutputwizard
Source ID: 2447
Research output: Contribution to journal › Article › Scientific › peer-review

Datamap Visualization Technique for Interactively Visualizing Large Datasets

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Nykänen, O.
Number of pages: 7
Pages: 52-58
Publication date: 2013

Host publication information
Title of host publication: 17th International Academic MindTrek Conference, October 1-4, 2013, Tampere, Finland
Publisher: ACM
Editors: Lugmayr, A., Franssila, H., Kärkkäinen, H., Paavilainen, J.
ISBN (Print): 978-1-4503-1992-8

Publication series
Name: MindTrek Conference
DOIs:

10.1145/2523429.2523458

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: ACM
Source: researchoutputwizard
Source ID: 3027
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Device self-calibration in location systems using signal strength histograms

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)

Contributors: Laoudias, C., Piche, R., Panayiotou, C. G.
Number of pages: 17
Pages: 165-181
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Location Based Services
Volume: 7
Issue number: 3
ISSN (Print): 1748-9725
Ratings:

Scopus rating (2013): CiteScore 0.96 SJR 0.421 SNIP 0.923
Original language: English
Electronic versions:

Laoudias self-calibration JLBS
DOIs:

10.1080/17489725.2013.816792
URLs:

http://urn.fi/URN:NBN:fi:tty-201603173649

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: Taylor & Francis
Source: researchoutputwizard
Source ID: 2723
Research output: Contribution to journal › Article › Scientific › peer-review

Estimating Above Ground Biomass from Terrestrial Laser Scanning in Autralian Eucalypt Open Forest

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Calders, K., Newnham, G., Herold, M., Murphy, S., Culvenor, D., Raumonen, P., Burt, A., Armston, J., Avitabile, V., Disney, M.
Number of pages: 7
Pages: 1-7
Publication date: 2013

Host publication information
Title of host publication: 13th International Conference on LiDAR Applications for Assessing Forest Ecosystems, SilviLaser 2013, 9.-11.10.2013. Beijing, China
Place of publication: Beijing, China
Publisher: Silvilaser Beijing 2013

Publication series
Name: International Conference on LiDAR Applications for Assessing Forest Ecosystems
URLs:

http://www.silvilaser2013.com/SL2013-full_paper.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Silvilaser Beijing 2013
Source: researchoutputwizard
Source ID: 2023
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Estimation of initial state and model parameters for autonomous GNSS orbit prediction
In self-assisted GNSS the orbit of a satellite is predicted by solving the differential equation that models its motion. Our motion model includes the most important forces: Earth's gravity, lunar and solar gravity and solar radiation pressure. Unmodeled forces are taken into account by using Gaussian white noise term with covariance matrix estimated offline from historical orbital data. The estimation of model parameters (solar radiation pressure and Earth orientation parameters) and initial state for the prediction includes both offline and online stages. In the offline stage, priors for the solar radiation pressure parameters are estimated using precise orbits issued by the International GNSS service (IGS). In the online stage, the satellite’s broadcast ephemeris is used to estimate the initial state and model parameters. The estimation of the initial state is formulated as non-linear continuous-time filtering problem with discrete-time

measurements. The filtering equations are solved numerically and the performance of different numerical methods (Extended, Cubature and Unscented Kalman filters) is compared. Using the estimated initial state and model parameters, the satellite orbits are predicted 5 days into the future. The accuracy and consistency of the predicted orbits is analysed by comparing with the IGS precise ephemerides. In this paper only GPS satellites are considered, but the method can be extended to other satellite systems.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning
Contributors: Ala-Luhtala, J., Seppänen, M., Ali-Löytty, S., Piche, R., Nurminen, H.
Number of pages: 15
Pages: 1-15
Publication date: 2013

Host publication information
Title of host publication: International Global Navigation Satellite Systems Society IGNSS Symposium 2013, 16-18 July, 2013, Gold Coast, Queensland, Australia
Place of publication: Tweed Heads, NSW, Australia
Publisher: IGNSS Society
Electronic versions:

alaluhtala_estimation_of_initial_state_and_model.pdf
URLs:

http://www.ignss.org

http://urn.fi/URN:NBN:fi:tty-201402041071

Bibliographical note
Book of Abstracts: http://issuu.com/robhen7979/docs/2013bookofabstracts.doc
Contribution: organisation=mat,FACT1=0.5
Contribution: organisation=ase,FACT2=0.5
Portfolio EDEND: 2013-07-29
Publisher name: IGNSS Society
Source: researchoutputwizard
Source ID: 1897
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Estimation of Model Parameters

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning
Contributors: Piche, R.
Number of pages: 22
Pages: 169-190
Publication date: 2013

Host publication information
Title of host publication: Mathematical Modeling with Multidisciplinary Applications
Place of publication: Hoboken, NJ, USA
Publisher: John Wiley & Sons
Editor: Yang, X.
ISBN (Print): 978-1-1182-9441-3
ISBN (Electronic): 978-1-118-45862-4
URLs:

http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1118294416.html

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-05-29
Source: researchoutputwizard
Source ID: 3147
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Estimation of the Mechanical Power of a Kite Wind Generator

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Rautakorpi, P., Argatov, I., Silvennoinen, R.
Number of pages: 28
Pages: 1-28
Publication date: 2013

Host publication information
Title of host publication: Renewable Energy for Sustainable Future
Place of publication: Hong Kong
Publisher: ICONCEPT PRESS
Editor: Lohani, S. P.
ISBN (Print): 978-1-922227-10-2
URLs:
http://www.iconceptpress.com/books/renewable-energy-for-sustainable-future/

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Source: researchoutputwizard
Source ID: 3248
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Fast Automatic Method for Constructing Topologically and Geometrically Precise Tree Models from TLS Data

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Raumonen, P., Casella, E., Disney, M., Åkerblom, M., Kaasalainen, M.
Number of pages: 3
Pages: 89-91
Publication date: 2013

Host publication information
Title of host publication: 7th International Conference on Functional-Structural Plant Models, FSPM2013, 9.-14.6.2013, Saariselkä, Finland
Place of publication: Vantaa
Publisher: Finnish Society of Forest Science; Finnish Forest Research Institute; University of Helsinki
Editors: Sievänen, R., Nikinmaa, E., Godin, C., Lintunen, A., Nygren, P.
ISBN (Print): 978-951-651-408-9

Publication series
Name: International Conference on Functional-Structural Plant Models
URLs:
http://www.metla.fi/fspm2013/FSPM2013_Proceedings_book_format.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: Finnish Society of Forest Science; Finnish Forest Research Institute; University of Helsinki
Source: researchoutputwizard
Source ID: 3243
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Fast automatic precision tree models from terrestrial laser scanner data

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Raumonen, P., Kaasalainen, M., Åkerblom, M., Kaasalainen, S., Kaartinen, H., Vastaranta, M., Holopainen, M., Disney, M., Lewis, P.

Number of pages: 30
Pages: 491-520
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Remote Sensing
Volume: 5
Issue number: 2
ISSN (Print): 2072-4292
Ratings:

Scopus rating (2013): CiteScore 3.01 SJR 1.127 SNIP 1.944
Original language: English
DOIs:

10.3390/rs5020491

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: MDPI
Source: researchoutputwizard
Source ID: 3244
Research output: Contribution to journal › Article › Scientific › peer-review

Hyperbolic Laplace Operator and the Weinstein Equation in R^3

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Number of pages: 16
Pages: 1-16
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Advances in Applied Clifford Algebras
ISSN (Print): 0188-7009
Ratings:

Scopus rating (2013): CiteScore 0.66 SJR 0.427 SNIP 1.151
Original language: English
DOIs:

10.1007/s00006-013-0425-1

Bibliographical note
Online first; Published online: 22 October 2013
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: Springer
Source: researchoutputwizard
Source ID: 2115
Research output: Contribution to journal › Article › Scientific › peer-review

Improving engineering students' mathematics skills and analysing their behaviour using ICT - tools.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Pohjolainen, S., Nykänen, O., Venho, J., Kangas, J.
Number of pages: 8
Pages: 1-8
Publication date: 2013

Host publication information
Title of host publication: Proceedings of annual SEFI Conference, 16-20 September 2013, Leuven, Belgium
Place of publication: Brussels, Belgium

Publisher: European Society for Engineering Education SEFI
Article number: 163

Publication series
Name: Annual Conference of the European Society for Engineering Education
URLs:

http://www.sefi.be/conference-2013/images/163.pdf

Bibliographical note
Poistettu tupla r=2983
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: European Society for Engineering Education SEFI
Source: researchoutputwizard
Source ID: 3162
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Information visualization of Twitter data for co-organizing conferences
The aim of this research is to explore what kinds of insights information visualization of social media data can provide for co-organizing conferences. Our paper focuses on Twitter in ‘during-conference’ use. We present a case study based on CMAD2013 conference and on the tweet traffic during the conference day. We applied the process of data-driven visual network analysis for providing insights on Twitter use during CMAD2013 conference day. By analyzing the network of conference participants and the conference’s discussion topics, we were able to identify e.g. influential conference delegates, most interesting presentations and discussions, similarities between interests of the conference participants, and several development and information needs of conference co-organization derived from the information visualizations, which have implications for the planning and co-organizing of conferences, as well as for Twitter use in communicating during conferences.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Department of Mathematics, Managing digital industrial transformation (mDIT)
Contributors: Jussila, J., Huhtamäki, J., Kärkkäinen, H., Still, K.
Number of pages: 7
Pages: 139-145
Publication date: 2013

Host publication information
Title of host publication: 17th International Academic MindTrek Conference, October 1-4, 2013, Tampere, Finland
Place of publication: New York, NY
Publisher: ACM
ISBN (Print): 978-1-4503-1992-8

Publication series
Name: MindTrek Conference
Electronic versions:

jussila_information_visualization_of_twitter_data.pdf
DOIs:

10.1145/2523429.2523482
URLs:

http://urn.fi/URN:NBN:fi:tty-201401221052

Bibliographical note
Contribution: organisation=tlo,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2013-12-29
Publisher name: ACM
Source: researchoutputwizard
Source ID: 2438
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Introduction to Statistical Data Analysis for Engineers and Scientists

General information
Publication status: Published
MoE publication type: D5 Text book, professional manual or guide or a dictionary
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning

Contributors: Piche, R.
Number of pages: 136
Publication date: 2013

Publication information
Place of publication: Las Vegas, NV, USA
Publisher: CREATESPACE
Original language: English
URLs:

https://www.createspace.com/4292246

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-05-29
Source: researchoutputwizard
Source ID: 3148
Research output: Book/Report › Book › Professional

Iterative alternating sequential (IAS) method for radio tomography of asteroids in 3D

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Pursiainen, S., Kaasalainen, M.
Number of pages: 15
Pages: 84-98
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Planetary and Space Science
Volume: 82-83
ISSN (Print): 0032-0633
Ratings:

Scopus rating (2013): CiteScore 1.59 SJR 0.865 SNIP 0.798
Original language: English
DOIs:

10.1016/j.pss.2013.04.001

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Pergamon
Source: researchoutputwizard
Source ID: 3194
Research output: Contribution to journal › Article › Scientific › peer-review

Least-Squares Transformations between Point-Sets

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Computational Imaging-CI, Department of Mathematics , Signal Processing Research Community (SPRC)
Contributors: Rutanen, K., Gomez-Herrero, G., Eriksson, S., Egiazarian, K.
Number of pages: 11
Pages: 501-511
Publication date: 2013

Host publication information
Title of host publication: Image Analysis, 18th Scandinavian Conference, SCIA 2013, Espoo, Finland, June 17-20, 2013, Proceedings
Place of publication: Berlin
Publisher: Springer
Editors: Kämäräinen, J., Koskela, M.
ISBN (Print): 978-3-642-38885-9

ISBN (Electronic): 978-3-642-38886-6

Publication series
Name: Lecture Notes in Computer Science
Publisher: Springer
Volume: 7944
ISSN (Print): 0302-9743
DOIs:
10.1007/978-3-642-38886-6_47

Bibliographical note
Contribution: organisation=mat,FACT1=0.5
Contribution: organisation=sgn,FACT2=0.5
Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source ID: 3304
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Manifolds in electromagnetism and superconductor modelling: Using their properties to model critical current of twisted conductors in self-field with 2-D model

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Stenvall, A., Tarhasaari, T., Grilli, F., Raumonen, P., Vojenciak, M., Pellikka, M.
Number of pages: 7
Pages: 135-141
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Cryogenics
Volume: 53
ISSN (Print): 0011-2275
Ratings:
Scopus rating (2013): CiteScore 1.04 SJR 0.457 SNIP 1.127
Original language: English
DOIs:
10.1016/j.cryogenics.2012.06.005

Bibliographical note
Contribution: organisation=dee,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2013-04-29
Publisher name: Pergamon
Source: researchoutputwizard
Source ID: 3464
Research output: Contribution to journal › Article › Scientific › peer-review

Matematiikan kirjallinen kielentäminen yliopiston matematiikan opetuksessa

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Joutsenlahti, J., Sarikka, H., Kangas, J., Harjulehto, P.
Number of pages: 12
Pages: 59-70
Publication date: 2013

Host publication information
Title of host publication: Matematiikan ja luonnontieteiden opetuksen tutkimusseuran konferenssijulkaisu 2012. Tutkimuksia / Jyväskylän yliopisto, opettajankoulutuslaitos
Place of publication: Jyväskylä
Publisher: University of Jyväskylä

Editors: Hähkiöniemi, M., Leppäaho, H., Nieminen, P., Viiri, J.
ISBN (Print): 978-951-39-5390-4
ISBN (Electronic): 978-951-39-5393-5

Publication series
Name: The annual conference of Finnish Mathematics and Science Education Research Association, November 8-9, 2012, Jyväskylä, Finland
Publisher: University of Jyväskylä
Volume: 90
ISSN (Print): 0357-7562
URLs:

http://urn.fi/URN:ISBN:978-951-39-5393-5

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Source: researchoutputwizard
Source ID: 2426
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Mean Value Properties for the Weinstein Equation Using the Hyperbolic Metric

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Pages: 1609-1621
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Complex Analysis and Operator Theory
Volume: 7
Issue number: 5
ISSN (Print): 1661-8254
Ratings:

Scopus rating (2013): CiteScore 0.56 SJR 0.694 SNIP 0.98
Original language: English
DOIs:

10.1007/s11785-012-0280-4

Bibliographical note
Tallennettu Online first
Contribution: organisation=mat,FACT1=1
Publisher name: Birkhäuser
Source: researchoutputwizard
Source ID: 2116
Research output: Contribution to journal › Article › Scientific › peer-review

Networks of innovation relationships: multiscopic views on Finland

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Still, K., Huhtamäki, J., Russell, M. G., Basole, R. C., Salonen, J., Rubens, N.
Number of pages: 15
Pages: 1-15
Publication date: 2013

Host publication information
Title of host publication: XXIV ISPIM Conference, Innovating in Global Markets: Challenges for Sustainable Growth, 16-19 June 2013, Helsinki, Finland
Place of publication: Manchester, UK
Publisher: International Society for Professional Innovation Management ISPIM
Editors: Huizingh, K., Conn, S., Torkkeli, M., Schneider, S., Bitran, I.

ISBN (Print): 978-952-265-420-5
ISBN (Electronic): 978-952-265-421-2

Publication series
Name: International Society for Professional Innovation Management Conference
URLs:
http://conference.ispim.org/files/ISPIM2013/

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: International Society for Professional Innovation Management ISPIM
Source: researchoutputwizard
Source ID: 3471
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Normal Distributions Transform Occupancy Maps: Application to Large-Scale Online 3D Mapping

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Saarinen, J., Andreasson, H., Stoyanov, T., Ala-Luhtala, J., Lilienthal, A. J.
Number of pages: 6
Pages: 2233-2238
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE International conference on Robotics and Automation, ICRA, May 6-10, 2013, Karlsruhe, Germany
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4673-5641-1

Publication series
Name: IEEE International Conference on Robotics and Automation
ISSN (Print): 2152-4092
ISSN (Electronic): 1050-4729
DOIs:
10.1109/ICRA.2013.6630878
URLs:
http://asrobo.hut.fi/~jari/papers/Saarinen_etal_NDT-OM_ICRA2013.pdf
http://www.icra2013.org

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 3322
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On Hodge-de Rham systems in hyperbolic Clifford analysis

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Number of pages: 4
Pages: 492-495
Publication date: 2013

Host publication information
Title of host publication: 11th International Conference of Numerical Analysis and Applied Mathematics, ICNAAM 2013, 21-27 September 2013, Rhodes, Greece
Publisher: American Institute of Physics AIP

ISBN (Print): 978-0-7354-1184-5

Publication series
Name: AIP Conference Proceedings
Volume: 1558
ISSN (Print): 0094-243X
ISSN (Electronic): 1551-7616
DOIs:
10.1063/1.4825535
URLs:
http://scitation.aip.org/content/aip/proceeding/aipcp/1558

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: American Institute of Physics AIP
Source: researchoutputwizard
Source ID: 2117
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On hypermonogenic functions

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Number of pages: 16
Pages: 975-990
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Complex Variables and Elliptic Equations
Volume: 58
Issue number: 7
ISSN (Print): 1747-6933
Ratings:
Scopus rating (2013): CiteScore 0.67 SJR 0.744 SNIP 1.122
Original language: Finnish
DOIs:
10.1080/17476933.2011.613118

Bibliographical note
Taylor&Francis Online first: Forthcoming articles 14.9.2011.Poistettu Portfolio13:sta tuplat r=1850 ja r=1851.
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 2118
Research output: Contribution to journal › Article › Scientific › peer-review

On the Structure of Robust Controllers for Infinite-Dimensional Systems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Hämäläinen, T., Pohjolainen, S.
Number of pages: 4
Pages: 59-62
Publication date: 2013

Host publication information
Title of host publication: 12th European Control Conference, ECC 2013, Zürich, Switzerland, 17.-19.7.2013
Place of publication: Zürich, Sveitsi
Publisher: European Control Association EUCA

ISBN (Print): 978-3-9524173-4-8

Publication series
Name: European Control Conference
URLs:
http://www.nt.ntnu.no/users/skoge/prost/proceedings/ecc-2013/data/papers/1102.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: European Control Association EUCA
Source: researchoutputwizard
Source ID: 2231
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Output Regulation Theory for Distributed Parameter Systems with Unbounded Control and Observation

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Number of pages: 6
Pages: 1083-1088
Publication date: 2013

Host publication information
Title of host publication: 52nd IEEE Conference on Decision and Control, IEEE CDC 2013, December 10-13, 2013, Florence, Italy
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4673-5716-6

Publication series
Name: IEEE Conference on Decision and Control
ISSN (Print): 0743-1546

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 3110
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Particle filter and smoother for indoor localization

We present a real-time particle filter for 2D and 3D hybrid indoor positioning. It uses wireless local area network (WLAN) based position measurements, step and turn detection from a hand-held inertial sensor unit, floor plan restrictions, altitude change measurements from barometer and possibly other measurements such as occasional GNSS fixes. We also present a particle smoother, which uses future measurements to improve the position estimate for non-real-time applications. A lightweight fallback filter is run in the background for initialization, divergence monitoring and possibly re-initialization. In real-data tests the particle filter is more accurate and consistent than the methods that do not use floor plans. An example is shown on how smoothing helps to improve the filter estimate. Moreover, a floor change case is presented, in which the filter is capable of detecting the floor change and improving the 2D accuracy using the floor change information.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Nurminen, H., Ristimäki, A., Ali-Löytty, S., Piche, R.
Number of pages: 10
Pages: 137-146
Publication date: 2013

Host publication information
Title of host publication: International Conference on Indoor Positioning and Indoor Navigation, IPIN 2013, 28-31 Oct 2013, Montbéliard-Belfort, France

Place of publication: Piscataway, NJ
Publisher: IEEE

Publication series
Name: International Conference on Indoor Positioning and Indoor Navigation
Electronic versions:

nurminen_particle_filter_and_smoother_for_indoor_localization.pdf
DOIs:

http://dx.doi.org/10.1109/IPIN.2013.6817903
URLs:

http://urn.fi/URN:NBN:fi:tty-201403051121

Bibliographical note
to appear in IEEEXPLORE
Contribution: organisation=ase,FACT1=0.75
Contribution: organisation=mat,FACT2=0.25
Portfolio EDEND: 2013-11-29
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 3021
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Process for Measuring and Visualizing an Open Innovation Platform: Case Demola
Open innovation breaks the traditional pattern for developing new innovation leading to new business and the activities toward it. Consequently, new requirements are posed to innovation measurement. Demola is an open innovation platform that takes real-life problems from companies and other organizations and puts together and facilitates projects where students from different universities come together to solve the problems. This paper describes a set of network visualizations and animations that were developed in co-creation with the Demola operators to make visible the activity that Demola has initiated. Moreover, the development process used to design the visualizations and the technical process that was applied are described and discussed. We claim that static network visualizations and animations of an open innovation platform development are useful in presenting, describing, marketing and selling the platform for existing and new stakeholders. Our experience shows that in order to develop visualizations and animations that meet the requirements set by the different stakeholders, an iterative and incremental development process is needed. Moreover, we claim that taking a data-driven approach to visualization development is a key enabler in supporting the development.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Huhtamäki, J., Luotonen, V., Kairamo, V., Still, K., Russell, M. G.
Number of pages: 6
Pages: 166-171
Publication date: 2013

Host publication information
Title of host publication: 17th International Academic MindTrek Conference, October 1-4, 2013, Tampere, Finland
Publisher: ACM
ISBN (Print): 978-1-4503-1992-8

Publication series
Name: MindTrek Conference
Electronic versions:

huhtamaki_process_for_measuring_and_visualizing.pdf
DOIs:

10.1145/2523429.2523478
URLs:

http://urn.fi/URN:NBN:fi:tty-201312201533

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: ACM
Source: researchoutputwizard
Source ID: 2329
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Rapid Characterisation of Forest Structure from TLS and 3D Modelling

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Burt, A., Disney, M., Raumonen, P., Armston, J., Calders, K., Lewis, P.
Number of pages: 4
Pages: 1-4
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE International Geoscience & Remote Sensing Symposium, IGARSS 2013, Melbourne, Australia, July 21-26, 2013
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4799-1113-4

Publication series
Name: IEEE International Geoscience and Remote Sensing Symposium
ISSN (Print): 2153-6996

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 2022
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Reduced order internal models in robust output regulation
In this paper we consider robust output regulation and the internal model principle for infinite-dimensional linear systems. We concentrate on a problem where the control law is required to be robust with respect to a restricted class of perturbations. We show that depending on the class of admissible perturbations, it is often possible to construct a robust controller with a smaller internal model than the one given by the internal model principle. In addition, we also look for minimal classes of perturbations that make the full internal model necessary. We introduce a straightforward way of testing for robustness of the control law for a given set of perturbations. The test in particular shows that the robustness is only dependent on the way the perturbations affect the transfer function of the plant at the frequencies of the exosystem. The theoretic results are applied to designing controllers for a one-dimensional wave equation and for a system consisting of three independent shock absorber models.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Number of pages: 12
Pages: 2307-2318
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 58
Issue number: 9
ISSN (Print): 0018-9286
Ratings:

Scopus rating (2013): CiteScore 5.24 SJR 3.79 SNIP 3.033
Original language: English
Electronic versions:

paunonen_pohjolainen_reduced_order_internal_models_in robust.pdf
DOIs:

10.1109/TAC.2013.2257596
URLs:

http://urn.fi/URN:NBN:fi:tty-201312121487

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 3111

Research output: Contribution to journal › Article › Scientific › peer-review

Regional compensation for statistical maximum likelihood reconstruction error of PET image pixels

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics
Contributors: Forma, J., Niemi, J., Ruotsalainen, U.
Number of pages: 16
Pages: 4849-4864
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Physics in Medicine and Biology
Volume: 58
Issue number: 14
ISSN (Print): 0031-9155
Ratings:

Scopus rating (2013): CiteScore 3.4 SJR 1.971 SNIP 1.888
Original language: English
DOIs:

10.1088/0031-9155/58/14/4849

Bibliographical note
Contribution: organisation=sgn,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2013-07-29
Publisher name: IOP Publishing
Source: researchoutputwizard
Source ID: 2144
Research output: Contribution to journal › Article › Scientific › peer-review

Relational Capital and Social Capital: One or two Fields of Research?

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Still, K., Huhtamäki, J., Russell, M. G.
Number of pages: 9
Pages: 420-428
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the 10th International Conference on Intellectual Capital, Knowledge Management and Organisational Learning, ICICKM 2013, Washington, DC, USA, October 24-25, 2013
Place of publication: Reading, UK
Publisher: Academic Conferences and Publishing International Limited
Editor: Green, A.
ISBN (Print): 978-1-909507-77-7
ISBN (Electronic): 978-1-909507-79-1

Publication series
Name: International Conference on Intellectual Capital, Knowledge Management and Organisational Learning
Volume: 2
ISSN (Print): 2048-9803
ISSN (Electronic): 2048-9811

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Academic Conferences and Publishing International Limited
Source: researchoutputwizard
Source ID: 3470
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robustness of polynomial stability with respect to unbounded perturbations

In this paper we present conditions for the preservation of strong and polynomial stability of a strongly continuous semigroup under unbounded finite rank perturbations of its infinitesimal generator. In addition, we also improve recent perturbation results for bounded finite rank perturbations. The results are illustrated with two examples. In the first one we consider the preservation of stability of a one-dimensional wave equation that has been stabilized polynomially with boundary feedback. In the second example we find conditions for the preservation of polynomial stability of a multiplication semigroup under unbounded rank one perturbations.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Number of pages: 7
Pages: 331-337
Publication date: 2013
Peer-reviewed: Yes

Publication information

Journal: Systems and Control Letters
Volume: 62
Issue number: 4
ISSN (Print): 0167-6911
Ratings:

Scopus rating (2013): CiteScore 3.46 SJR 2.019 SNIP 1.963
Original language: English
Electronic versions:

paunonen_robustness_of_polynomial_stability.pdf
DOIs:

10.1016/j.sysconle.2013.01.005
URLs:

http://urn.fi/URN:NBN:fi:tty-201312161488

Bibliographical note

Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 3109
Research output: Contribution to journal › Article › Scientific › peer-review

Robustness properties of controllers with reduced order internal models

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Number of pages: 6
Pages: 578-583
Publication date: 2013

Host publication information

Title of host publication: 12th European Control Conference, ECC 2013, Zürich, Switzerland, 17.-19.7.2013
Place of publication: Zürich, Switzerland
Publisher: European Control Association EUCA
ISBN (Print): 978-3-952-41734-8

Publication series

Name: European Control Conference
Volume: 12
URLs:

http://www.ecc13.ch/

Bibliographical note

Preprint: http://math.tut.fi/sysgroup/preprintc/PauPohECC13.pdf
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-07-29
Publisher name: European Control Association EUCA
Source: researchoutputwizard
Source ID: 3113
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robust output regulation and the preservation of polynomial closed-loop stability

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Number of pages: 28
Pages: 1-28
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: International Journal of Robust and Nonlinear Control
ISSN (Print): 1049-8923
Ratings:

Scopus rating (2013): CiteScore 3.41 SJR 1.86 SNIP 1.916
Original language: English
DOIs:

10.1002/rnc.3064

Bibliographical note
Online first; Article first published online: 24 AUG 2013
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: John Wiley & Sons
Source: researchoutputwizard
Source ID: 3112
Research output: Contribution to journal › Article › Scientific › peer-review

SO-I: a surrogate model algorithm for expensive nonlinear integer programming problems including global optimization applications

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Müller, J., Shoemaker, C., Piche, R.
Number of pages: 25
Pages: 1-25
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Global Optimization
ISSN (Print): 0925-5001
Ratings:

Scopus rating (2013): CiteScore 1.43 SJR 0.838 SNIP 1.43
Original language: English
DOIs:

10.1007/s10898-013-0101-y

Bibliographical note
Online first
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-10-29
Publisher name: Springer US
Source: researchoutputwizard
Source ID: 2950
Research output: Contribution to journal › Article › Scientific › peer-review

Solvability of the output regulation problem with a feedforward controller

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Laakkonen, P., Pohjolainen, S.
Number of pages: 6
Pages: 560-565
Publication date: 2013

Host publication information
Title of host publication: 12th European Control Conference, ECC 2013, Zürich, Switzerland, 17.-19.7.2013
Place of publication: Zürich, Sveitsi
Publisher: European Control Association EUCA
ISBN (Print): 978-3-952-41734-8

Publication series
Name: European Control Conference
URLs:

http://www.nt.ntnu.no/users/skoge/prost/proceedings/ecc-2013/data/papers/0146.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: European Control Association EUCA
Source: researchoutputwizard
Source ID: 2677
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

SO-MI: A surrogate model algorithm for computationally expensive nonlinear mixed-integer black-box global optimization problems
This paper introduces a surrogate model based algorithm for computationally expensive mixed-integer black-box global optimization problems with both binary and non-binary integer variables that may have computationally expensive constraints. The goal is to find accurate solutions with relatively few function evaluations. A radial basis function surrogate model (response surface) is used to select candidates for integer and continuous decision variable points at which the computationally expensive objective and constraint functions are to be evaluated. In every iteration multiple new points are selected based on different methods, and the function evaluations are done in parallel. The algorithm converges to the global optimum almost surely. The performance of this new algorithm, SO-MI, is compared to a branch and bound algorithm for nonlinear problems, a genetic algorithm, and the NOMAD (Nonsmooth Optimization by Mesh Adaptive Direct Search) algorithm for mixed-integer problems on 16 test problems from the literature (constrained, unconstrained, unimodal and multimodal problems), as well as on two application problems arising from structural optimization, and three application problems from optimal reliability design. The numerical experiments show that SO-MI reaches significantly better results than the other algorithms when the number of function evaluations is very restricted (200–300 evaluations).

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Müller, J., Shoemaker, C., Piche, R.
Pages: 1383-1400
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Computers and Operations Research
Volume: 40
Issue number: 5
ISSN (Print): 0305-0548
Ratings:

Scopus rating (2013): CiteScore 3.62 SJR 2.527 SNIP 2.909
Original language: English
Electronic versions:

muller_so-mi_a_surrogate_model_algorithm.pdf
DOIs:
10.1016/j.cor.2012.08.022
URLs:
http://urn.fi/URN:NBN:fi:tty-201311061417

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Pergamon
Source: researchoutputwizard
Source ID: 2949
Research output: Contribution to journal › Article › Scientific › peer-review

Statistical Path Loss Parameter Estimation and Positioning using RSS Measurements

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning
Contributors: Nurminen, H., Talvitie, J., Ali-Löytty, S., Muller, P., Lohan, E., Piche, R., Renfors, M.
Number of pages: 15
Pages: 13-27
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Global Positioning Systems
Volume: 12
Issue number: 1
ISSN (Print): 1446-3156
Original language: English

Bibliographical note
Contribution: organisation=elt,FACT1=0.35
Contribution: organisation=ase,FACT2=0.5
Contribution: organisation=mat,FACT3=0.15
Portfolio EDEND: 2014-08-20
Publisher name: Scientific Research Publishing
Source: researchoutputwizard
Source ID: 3022
Research output: Contribution to journal › Article › Scientific › peer-review

Stock Price Dynamics and Option Valuations under Volatility Feedback Effect

According to the volatility feedback effect, an unexpected increase in squared volatility leads to an immediate decline in the price-dividend ratio. In this paper, we consider the properties of stock price dynamics and option valuations under the volatility feedback effect by modeling the joint dynamics of stock price, dividends, and volatility in continuous time. Most importantly, our model predicts the negative effect of an increase in squared return volatility on the value of deep-in-the-money call options and, furthermore, attempts to explain the volatility puzzle. We theoretically demonstrate a mechanism by which the market price of diffusion return risk, or an equity risk-premium, affects option prices and empirically illustrate how to identify that mechanism using forward-looking information on option contracts. Our theoretical and empirical results support the relevance of the volatility feedback effect. Overall, the results indicate that the prevailing practice of ignoring the time-varying dividend yield in option pricing can lead to oversimplification of the stock market dynamics.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Industrial Management, Department of Mathematics, Research group: Positioning, Research Community on Data-to-Decision (D2D), Wireless Communications and Positioning (WICO)
Contributors: Kanniainen, J., Piche, R.
Pages: 722-740
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Physica A: Statistical Mechanics and Its Applications
Volume: 392
Issue number: 4

ISSN (Print): 0378-4371
Ratings:
Scopus rating (2013): CiteScore 1.79 SJR 0.657 SNIP 1.15
Original language: English
Electronic versions:
kanniainen_piche_stock_price_dynamics_and_option_valuations.pdf
DOIs:
10.1016/j.physa.2012.10.004
URLs:
http://urn.fi/URN:NBN:fi:tty-201311061420

Bibliographical note

Tallennettu Online First 2012:na.Final version published online 22 Dec 2012
Contribution: organisation=tta,FACT1=0.8
Contribution: organisation=mat,FACT2=0.2
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 2490
Research output: Contribution to journal › Article › Scientific › peer-review

Structure-Dynamics Relationships in Bursting Neuronal Networks Revealed Using a Prediction Framework

The question of how the structure of a neuronal network affects its functionality has gained a lot of attention in neuroscience. However, the vast majority of the studies on structure-dynamics relationships consider few types of network structures and assess limited numbers of structural measures. In this in silico study, we employ a wide diversity of network topologies and search among many possibilities the aspects of structure that have the greatest effect on the network excitability. The network activity is simulated using two point-neuron models, where the neurons are activated by noisy fluctuation of the membrane potential and their connections are described by chemical synapse models, and statistics on the number and quality of the emergent network bursts are collected for each network type. We apply a prediction framework to the obtained data in order to find out the most relevant aspects of network structure. In this framework, predictors that use different sets of graph-theoretic measures are trained to estimate the activity properties, such as burst count or burst length, of the networks. The performances of these predictors are compared with each other. We show that the best performance in prediction of activity properties for networks with sharp in-degree distribution is obtained when the prediction is based on clustering coefficient. By contrast, for networks with broad in-degree distribution, the maximum eigenvalue of the connectivity graph gives the most accurate prediction. The results shown for small (N~100) networks hold with few exceptions when different neuron models, different choices of neuron population and different average degrees are applied. We confirm our conclusions using larger (N~900) networks as well. Our findings reveal the relevance of different aspects of network structure from the viewpoint of network excitability, and our integrative method could serve as a general framework for structure-dynamics studies in biosciences.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Research group: Computational Neuro Science-CNS, Department of Mathematics
Contributors: Mäki-Marttunen, T., Acimovic, J., Linne, M., Ruohonen, K.
Number of pages: 16
Pages: 1-16
Publication date: 2013
Peer-reviewed: Yes

Publication information

Journal: PLoS ONE
Volume: 8
Issue number: 7
Article number: e69373
ISSN (Print): 1932-6203
Ratings:
Scopus rating (2013): CiteScore 3.94 SJR 1.772 SNIP 1.162
Original language: English
Electronic versions:
maki_marttunen_structure_dynamics_relationships_in_bursting_neuronal_networks.pdf
DOIs:
10.1371/journal.pone.0069373
URLs:
http://urn.fi/URN:NBN:fi:tty-201401201044

Bibliographical note
Contribution: organisation=sgn,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Portfolio EDEND: 2013-12-29
Publisher name: Public Library of Science
Source: researchoutputwizard
Source ID: 2860
Research output: Contribution to journal › Article › Scientific › peer-review

The Asymptotic Behaviour of the Proportion of Hard Instances of the Halting Problem

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Contributors: Valmari, A.
Number of pages: 15
Pages: 170-184
Publication date: 2013

Host publication information
Title of host publication: SPLST '13, 13th Symposium on Programming Languages and Software Tools, August 26-27, 2013, Szeged, Hungary
Place of publication: Szeged, Hungary
Publisher: University of Szeged
Editor: Kiss, A.
ISBN (Print): 978-963-306-228-9

Publication series
Name: Symposium on Programming Languages and Software Tools
URLs:

http://www.inf.u-szeged.hu/splst13/splst13proc.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: University of Szeged
Source: researchoutputwizard
Source ID: 3641
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

The Kraft Sum as a Monotone Function of the Refinement-Ordered Set of Uniquely Decipherable Codes

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Foldes, S.
Number of pages: 4
Pages: 1-4
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Mathematics for Applications
Volume: 2
Issue number: 1
ISSN (Print): 1805-3610
Original language: English
URLs:

http://ma.fme.vutbr.cz/archiv/2_1/foldes_final.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: Institute of Mathematics. Brno University of Technology
Source: researchoutputwizard
Source ID: 2142
Research output: Contribution to journal › Article › Scientific › peer-review

The Resolved Asteroid Program – Size, shape, and pole of (52) Europa

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Merline, W., Drummond, J., Carry, B., Conrad, A., Tamblyn, P., Dumas, C., Kaasalainen, M., Erikson, A., Mottola, S., Durech, J., Rousseau, G., Behrend, R., Casalnuovo, G., Chinaglia, B., Christou, J., Chapman, C., Neyman, C.
Number of pages: 12
Pages: 794-805
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 225
Issue number: 1
ISSN (Print): 0019-1035
Ratings:

Scopus rating (2013): CiteScore 2.84 SJR 1.885 SNIP 1.056
Original language: English
DOIs:

10.1016/j.icarus.2013.01.010

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Academic Press
Source: researchoutputwizard
Source ID: 2915
Research output: Contribution to journal › Article › Scientific › peer-review

Tiedonlouhintaa tieliikenneonnettomuussatasta

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Turunen, E.
Number of pages: 2
Pages: 7-8
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Liikenne
Volume: 31
Issue number: 2
ISSN (Print): 0359-9345
Original language: Finnish

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-09-30
Publisher name: Liikennesuunnittelun Seura ry
Source: researchoutputwizard
Source ID: 3586
Research output: Contribution to journal › Article › Scientific › peer-review

Twiiteryhmiä ja uutispäivittelyä - toimittajana sosiaalisessa mediassa

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Mathematics
Contributors: Vainikka, E., Noppari, E., Heinonen, A., Huhtamäki, J.

Number of pages: 113
Publication date: 2013

Publication information
Publisher: Tampereen yliopisto. Viestinnän, median ja teatterin yksikkö. Journalismin, viestinnän ja median tutkimuskeskus, COMET
ISBN (Print): 978-951-44-9150-4
ISBN (Electronic): 978-951-44-9151-1
Original language: Finnish
URLs:

http://www.uta.fi/cmt/tutkimus/comet/index.html

http://urn.fi/URN:ISBN:978-951-44-9151-1

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Source: researchoutputwizard
Source ID: 3630
Research output: Book/Report › Commissioned report › Professional

Unimodality and log-concavity of f-vectors for cyclic and ordinary polytopes

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Major, L.
Number of pages: 4
Pages: 1669-1672
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Discrete Applied Mathematics
Volume: 161
Issue number: 10-11
ISSN (Print): 0166-218X
Ratings:

Scopus rating (2013): CiteScore 1.03 SJR 0.751 SNIP 1.429
Original language: English
DOIs:

10.1016/j.dam.2013.01.008

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 2853
Research output: Contribution to journal › Article › Scientific › peer-review

Verkostoanalyysi sosiaalisen median tutkimuksessa

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Huhtamäki, J., Parviainen, O.
Number of pages: 29
Pages: 245-273
Publication date: 2013

Host publication information
Title of host publication: Otteita verkosta - verkon ja sosiaalisen median tutkimusmenetelmät
Place of publication: Tampere
Publisher: Vastapaino
Editors: Laaksonen, S., Matikainen, J., Tikka, M.

Edition: 1
ISBN (Print): 978-951-768-410-1

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Source: researchoutputwizard
Source ID: 2330
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Virtuaalinen konelaboratorio ja semanttinen mallinnus konejärjestelmän suunnittelun tukena, Loppuraportti, Semogen II -hanke

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Contributors: Nykänen, O., Koskinen, K. T., Ranta, P., Salonen, J., Aaltonen, J., Nurmi, J., Helminen, M., Alarotu, V., Salomaa, T., Pohjolainen, S.
Number of pages: 50
Publication date: 2013

Publication information
Place of publication: Tampere
Publisher: Tampereen teknillinen yliopisto, Smart Simulators -tutkimusryhmä
Original language: Finnish
URLs:

http://wiki.tut.fi/pub/SmartSimulators/Semogen2/Semogen2-loppuraportti.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=0.6
Contribution: organisation=iha,FACT2=0.4
Portfolio EDEND: 2013-12-29
Source: researchoutputwizard
Source ID: 3028
Research output: Book/Report › Commissioned report › Professional

What's out there? Asteroid models for target selection and mission planning

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Kaasalainen, M., Durech, J.
Number of pages: 20
Pages: 131-150
Publication date: 2013

Host publication information
Title of host publication: Asteroids: prospective energy and material resources
Place of publication: Heidelberg
Publisher: Springer
Editor: Badescu, V.
ISBN (Print): 978-3-642-39243-6
ISBN (Electronic): 978-3-642-39244-3
DOIs:

10.1007/978-3-642-39244-3

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Source: researchoutputwizard
Source ID: 2448
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

A review on old and new results on robust regulation of DPS with infinite-dimensional exosystems
In this paper the robust regulation problem for infinite-dimensional systems
\begin{equation*}

$$
\dot x = Ax + Bu + F_s v, \qquad
y = Cx + Du + F_m v,
$$
with infinite-dimensional exosystems $\dot v = S v$ is discussed. The feedback controller is of the form
$$
\dot z = \mathcal{G}_1 z + \mathcal{G}_2 e, \qquad
u = K z.
$$
All the spaces involved are infinite-dimensional. The purpose of the feedback controller is to stabilize the closed loop system and to asymptotically track the reference and perturbation signal generated by the exosystem.

The first key idea is the existence of a dynamic (bounded) steady state operator, which gives the asymptotic state of the stabilized closed loop system as time goes to infinity. This operator satisfies an operator Sylvester equation. The controller $(\mathcal{G}_1, \mathcal{G}_2)$ is robustly regulating if the Sylvester equation decomposes so that a regulation constraint will be satisfied. In the presentation various definitions of Internal Model Principle, including an infinite-dimensional one, guaranteeing robust regulation, will be discussed.

The second important step is in stabilizing the closed loop system by a proper choice of the controller. As the robust controller contains a p-copy of the exosystem, the closed loop system cannot be stabilized exponentially; instead strong or weak stabilization must be used.

A necessary condition for the existence of bounded dynamic steady state operator is the nonexistence of system zeros on the spectrum of the exosystem. In the infinite-dimensional case, the behaviour of the system transfer function at infinity also plays an important role.

The presentation reviews and combines the recent results of T. Hämäläinen, L. Paunonen. P. Laakkonen and S. Pohjolainen.

General information
Publication status: Published
Organisations: Department of Mathematics
Contributors: Hämäläinen, T.
Publication date: 4 Jan 2012
Peer-reviewed: Unknown
Event: Paper presented at Matematiikan päivät, 4-5.1.2012, Lappeenrannan Teknillinen Yliopisto, .
Electronic versions:

hamalainen_review_on_old_and_new_results
URLs:

http://urn.fi/URN:NBN:fi:tty-201301021000
Research output: Other conference contribution › Paper, poster or abstract › Scientific

A characterization of level-continuous fuzzy numbers

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Kaleva, O.
Pages: 84-88
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Fuzzy Sets and Systems
Volume: 209
ISSN (Print): 0165-0114
Ratings:

Scopus rating (2012): CiteScore 2.97 SJR 1.472 SNIP 2.349
Original language: English
DOIs:

10.1016/j.fss.2012.07.002

Bibliographical note
Published 16 December 2012
Contribution: organisation=mat,FACT1=1
Publisher name: Elsevier BV North-Holland

Source: researchoutputwizard
Source ID: 4387
Research output: Contribution to journal › Article › Scientific › peer-review

A Molecular Camera Gyroscope

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Huttunen, V., Piche, R.
Pages: 69-81
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Giroskopiya I Navigatsiya
Volume: 77
ISSN (Print): 0869-7035
Original language: Russian
URLs:

http://www.elektropribor.spb.ru/gn/index.php

Bibliographical note
Ei UT-numeroa 14.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Tsentral'nyi Nauchno-Issledovatel'skii Institut Elektropribor
Source: researchoutputwizard
Source ID: 4270
Research output: Contribution to journal › Article › Scientific › peer-review

A Monocular Camera Gyroscope
We present a method for tracking the 3-axis orientation of a monocular camera using orthogonal vanishing points detected in individual frames of a sequence of images. Robust and real-time vanishing point detection is done using a standard line segment detection method and an adaptive RANSAC algorithm. Vanishing points and corresponding vanishing directions found in consecutive frames are associated with each other to produce a sequence of orientation quaternions, which is processed by an extended Kalman filter. Experiments with a consumer-level, handheld mobile device indicate that the accuracy of the proposed method is comparable with those of consumer-grade inertial motion sensors.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Huttunen, V., Piche, R.
Pages: 124-131
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Gyroscopy and Navigation
Volume: 3
Issue number: 2
ISSN (Print): 2075-1087
Ratings:

Scopus rating (2012): CiteScore 0.34 SJR 0.247 SNIP 0.357
Original language: English
Electronic versions:

huttunen_piche_a_monocular_camera_gyroscope.pdf
DOIs:

10.1134/S2075108712020046
URLs:

http://urn.fi/URN:NBN:fi:tty-201310311409

Bibliographical note

Ei UT-numeroa 14.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: MAIK Nauka/Interperiodica distributed exclusively by Springer Science+Business Media LLC
Source: researchoutputwizard
Source ID: 4271
Research output: Contribution to journal › Article › Scientific › peer-review

An Adaptive Derivative Free Method for Bayesian Posterior Approximation

In the Gaussian mixture approach a Bayesian posterior probability distribution function is approximated using a weighted sum of Gaussians. This work presents a novel method for generating a Gaussian mixture by splitting the prior taking the direction of maximum nonlinearity into account. The proposed method is computationally feasible and does not require analytical differentiation. Tests show that the method approximates the posterior better with fewer Gaussian components than existing methods.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Raitoharju, M., Ali-Löytty, S.
Pages: 87-90
Publication date: 2012
Peer-reviewed: Yes

Publication information

Journal: IEEE Signal Processing Letters
Volume: 19
Issue number: 2
Article number: 12436433
ISSN (Print): 1070-9908
Ratings:

Scopus rating (2012): CiteScore 2.59 SJR 0.91 SNIP 2.041
Original language: English
Electronic versions:

raitoharju_ali-loytty_an_adaptive_derivative_free_method.pdf
DOIs:

10.1109/LSP.2011.2179800
URLs:

http://urn.fi/URN:NBN:fi:tty-201205311164

Bibliographical note

Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 5135
Research output: Contribution to journal › Article › Scientific › peer-review

Analysis of the rotation period of asteroids (1865) Cerberus, (2100) Ra-Shalom, and (3103) Eger - search for the YORP effect

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Durech, J., Vokrouhlicky, D., Baransky, A., Breiter, S., Burkhonov, O., Cooney, W., Fuller, V., Gaftonyuk, N., Gross, J., Inasaridze, R., Kaasalainen, M., Krugly, Y., Kvaratshelia, O., Litvinenko, E., Macomber, B., Marchis, F., Molotov, I., Oey, J., Polishook, D., Pollock, J., Pravec, P., Sarneczky, K., Shevchenko, V., Slyusarev, I., Stephens, R., Szabo, G., Terrell, D., Vachier, F., Vanderplate, Z., Viikinkoski, M., Warner, B.
Pages: 9
Publication date: 2012
Peer-reviewed: Yes

Publication information

Journal: Astronomy and Astrophysics
Volume: 547
Article number: A10

ISSN (Print): 0004-6361
Ratings:

Scopus rating (2012): CiteScore 3.14 SJR 2.903 SNIP 1.425
Original language: English
DOIs:

10.1051/0004-6361/201219396

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: EDP Sciences
Source: researchoutputwizard
Source ID: 4017
Research output: Contribution to journal › Article › Scientific › peer-review

Analytics of the impact of user involvement in the innovation process and its outcomes. Case study: Media-Enhanced Learning (MEL) Service

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Still, K., Huhtamäki, J., Isomursu, M., Lahti, J., Koskela-Huotari, K.
Pages: 1740-1746
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Procedia: Social and Behavioral Sciences
Volume: 46
ISSN (Print): 1877-0428
Ratings:

Scopus rating (2012): SJR 0.222 SNIP 0.23
Original language: English
DOIs:

10.1016/j.sbspro.2012.05.370

Bibliographical note
4th World Conference on Educational Sciences, WCES 2012, 2-5 February 2012, Barcelona, Spain
Contribution: organisation=mat,FACT1=1
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 5355
Research output: Contribution to journal › Article › Scientific › peer-review

An empirical solar radiation pressure model for autonomous GNSS orbit prediction
GNSS satellite orbits can be predicted by integrating the satellites' equation of motion. If the prediction is done in a consumer grade positioning device, a simplified version of the equation of motion is required. The forces due to Earth's gravitation, solar gravitation and lunar gravitation should be included, but the models for the smaller non-gravitational forces can be fairly simple. This paper presents a simple empirical two parameter solar radiation pressure model for an orbit prediction application in a navigation device that does not have a network connection. The model is tested by predicting the orbits of GPS and GLONASS satellites up to 5 days into the future, using position and improved velocity from broadcast ephemerides as an initial state. The predicted orbits are compared to the precise orbits from International GNSS Service (IGS).

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Ala-Luhtala, J., Seppänen, M., Piche, R.
Pages: 568-575
Publication date: 2012

Host publication information
Title of host publication: 2012 IEEE/ION Position Location and Navigation Symposium PLANS, 23-26 April 2012, Myrtle Beach, SC, USA

Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
Article number: 12863831
ISBN (Print): 978-1-4673-0385-9

Publication series
Name: IEEE/ION Position Location and Navigation Symposium
ISSN (Print): 2153-358X
ISSN (Electronic): 2153-3598
Electronic versions:

ala-luhtala_an_empirical_solar_radiation_pressure_model.pdf
DOIs:

10.1109/PLANS.2012.6236929
URLs:

http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6230824

http://urn.fi/URN:NBN:fi:tty-201311011414

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 3836
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A New Characterization for n-Fold Positive Implicative BL-logics

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Turunen, E., Tchikapa, N., Lele, C.
Pages: 552-560
Publication date: 2012

Host publication information
Title of host publication: Advances on Computational Intelligence 14th International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems, IPMU 2012, Catania, Italy, July 9-13, 2012. Proceedings, Part I. Communications in Computer and Information Science
Place of publication: Berlin Heidelberg
Publisher: Springer
Editors: Greco, S., Bouchon-Meunier, B., Coletti, G., Fedrizzi, M., Matarazzo, B., Yager, R. R.
ISBN (Print): 978-3-642-31708-8
ISBN (Electronic): 978-3-642-31709-5

Publication series
Name: International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems
Volume: 297
ISSN (Print): 1865-0929
ISSN (Electronic): 1865-0937
DOIs:

10.1007/978-3-642-31709-5_56

Bibliographical note
ei ut-numeroa 21.9.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Springer
Source: researchoutputwizard
Source ID: 5463
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A New Method and Format for Describing CANopen System Topology

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Contributors: Helminen, M., Salonen, J., Saha, H., Nykänen, O., Koskinen, K. T., Ranta, P., Pohjolainen, S.

Number of pages: 8
Pages: 1-8
Publication date: 2012

Host publication information
Title of host publication: Proceedings of the 13th International CAN Conference, iCC 2012 in Hambach Castle, March 5 to March 6, Germany
Publisher: CAN in Automation e.V.

Publication series
Name: International CAN Conference
URLs:

http://www.can-cia.org/fileadmin/cia/files/icc/13/helminen.pdf

Bibliographical note
ei ut-numeroa 13.8.2013
Contribution: organisation=iha,FACT1=0.6
Contribution: organisation=mat,FACT2=0.4
Publisher name: CAN in Automation e.V.
Source: researchoutputwizard
Source ID: 4211
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Asteroid (2867) Steins: Shape, topography and global physical properties from OSIRIS observations

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Jorda, L., Lamy, P., Gaskell, R., Kaasalainen, M., Groussin, O., Besse, S., Faury, G.
Pages: 1089-1100
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 221
Issue number: 2
ISSN (Print): 0019-1035
Ratings:

Scopus rating (2012): CiteScore 3.08 SJR 2.32 SNIP 1.265
Original language: English
DOIs:

10.1016/j.icarus.2012.07.035

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Academic Press
Source: researchoutputwizard
Source ID: 4357
Research output: Contribution to journal › Article › Scientific › peer-review

A Stochastic Mixture Surrogate Model Algorithm for Computationally Expensive Black-Box Global Optimization Problems

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Müller, J., Shoemaker, C., Piche, R.
Number of pages: 4
Pages: 1-4
Publication date: 2012

Host publication information
Title of host publication: Proceedings of Global Optimization Workshop 2012, 26-29 June 2012, Natal, Brazil
Place of publication: Natal, Brazil
Publisher: Universidade Federal do Rio Grande do Norte

Publication series
Name: Global Optimization Workshop
URLs:
http://gow12.dca.ufrn.br

Bibliographical note
ei ut-numeroa 22.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Universidade Federal do Rio Grande do Norte
Source: researchoutputwizard
Source ID: 4881
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Asymptotic modeling of unconstrained control of a tethered power kite moving along a given closed-loop spherical trajectory

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Silvennoinen, R., Argatov, I.
Pages: 187-203
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Engineering Mathematics
Volume: 72
Issue number: 1
ISSN (Print): 0022-0833
Ratings:
Scopus rating (2012): CiteScore 1.06 SJR 0.572 SNIP 1.064
Original language: English
DOIs:
10.1007/s10665-011-9475-3

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Springer Netherlands
Source: researchoutputwizard
Source ID: 5328
Research output: Contribution to journal › Article › Scientific › peer-review

Autonomous Prediction of GPS and GLONASS Satellite Orbits

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Seppänen, M., Ala-Luhtala, J., Piche, R., Martikainen, S., Ali-Löytty, S.
Pages: 119-134
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Navigation
Volume: 59
Issue number: 2
ISSN (Print): 0028-1522
Ratings:
Scopus rating (2012): CiteScore 1.28 SJR 0.612 SNIP 1.484
Original language: English
DOIs:
10.1002/navi.10

URLs:
http://www.ion.org

Bibliographical note
ei ut-numeroa 29.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Navigation
Source: researchoutputwizard
Source ID: 5304
Research output: Contribution to journal › Article › Scientific › peer-review

Characterizing n-Fold Positive Implicative BL-logics

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Contributors: Turunen, E., Lele, C., Tchikapa, N.
Pages: 60-64
Publication date: 2012

Host publication information
Title of host publication: ManyVal'12 In Honour of Antonio Di Nola's 65th Birthday, Salerno, Italy, 4.7.7.2012

Publication series
Name: ManyVal

Bibliographical note
ei ut-numeroa 21.9.2013
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5462
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Comprehensive Quantitative Tree Models from TLS Data

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Åkerblom, M., Raumonen, P., Kaasalainen, M., Kaasalainen, S., Kaartinen, H.
Pages: 6507-6510
Publication date: 2012

Host publication information
Title of host publication: IEEE International Geoscience and Remote Sensing Symposium, IGARSS, 2012, 22.-27.7.2012, Munich, Germany
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
Article number: 13133382
ISBN (Print): 978-1-4673-1160-1
ISBN (Electronic): 978-1-4673-1158-8

Publication series
Name: IEEE International Geoscience and Remote Sensing Symposium
ISSN (Print): 2153-6996
DOIs:
10.1109/IGARSS.2012.6352751

Bibliographical note
Poistettu tupla r=3140
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 3825
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Dual Look at Robust Regulation: Frequency Domain and State Space Approaches

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Laakkonen, P., Paunonen, L., Pohjolainen, S.
Pages: 136-141
Publication date: 2012

Host publication information
Title of host publication: Proceedings of MMAR 2012. 17th International Conference on Methods and Models in Automation & Robotics, MMAR 2012, 27-30 August 2012, Miedzyzdroje, Poland
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
Article number: 13117991
ISBN (Print): 978-1-4673-2121-1
ISBN (Electronic): 978-1-4673-2123-5

Publication series
Name: International Conference on Methods and Models in Automation & Robotics
DOIs:
10.1109/MMAR.2012.6347929

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 4592
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Elementary Partial Differential Equations. Theory and Solved Problems.

General information
Publication status: Published
MoE publication type: C1 Separate scientific books
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Piche, R.
Number of pages: 131
Publication date: 2012

Publication information
Place of publication: Saarbrücken, Germany
Publisher: Lambert Academic Publishing
ISBN (Print): 978-3-659-23987-8
Original language: English

Bibliographical note
ei ut-numeroa 28.8.2013
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5062
Research output: Book/Report › Book › Scientific › peer-review

Estimation of Linear Systems with Abrupt Changes of the Noise Covariances Using Variational Bayes Algorithm
The variational Bayes method is applied to the state-space estimation problem with maneuvers or changes in the covariance of the observation noise. The resulting algorithm is an off-line batch method that can be used to provide a baseline performance estimation results for the recursive methods. In addition to batch methods we introduce a heuristic approach to make the algorithm on-line. Through simulations we show how the introduced method achieves the best accuracy out of all compared approximative estimation methods.

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Mathematics, Research group: Positioning
Contributors: Pesonen, H., Piche, R.
Number of pages: 4

Publication date: 2012

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology, Department of Mathematics
ISBN (Electronic): 978-952-15-2923-8
Original language: English

Publication series
Name: Tampereen teknillinen yliopisto. Matematiikan laitos. Tutkimusraportti
Publisher: Tampereen teknillinen yliopisto
Volume: 100
ISSN (Print): 1459-3750
Electronic versions:

pesonen_piche_estimation_of_linear_systems.pdf
URLs:

http://urn.fi/URN:ISBN:978-952-15-2923-8

Bibliographical note
Julkaistu DPubissa vuonna 2012.Tallennettu Portfolioon 2013.
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-04-29
Source: researchoutputwizard
Source ID: 5057
Research output: Book/Report › Commissioned report › Professional

Facilitating active participation in web-based co-development

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Friedrich, P., Huhtamäki, J., Koskela-Huotari, K., Karppinen, K., Still, K.
Pages: 16-23
Publication date: 2012

Host publication information
Title of host publication: Proceedings of Innovation through Social Media, ISM 2012 workshop proceedings, December 3, 2012, Oslo, Norway
Place of publication: Trondheim, Norway
Publisher: AKADEMIKA FORLAG
ISBN (Print): 978-82-321-0088-0

Publication series
Name: Innovation Through Social Media
URLs:

http://tapironline.no/last-ned/1086

Bibliographical note
ei ut-numeroa 12.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Akademika forlag
Source: researchoutputwizard
Source ID: 4069
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Feedforward Output Regulation for Distributed Parameter Systems with Infinite-Dimensional Exosystems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Pages: 1566-1571
Publication date: 2012

Host publication information
Title of host publication: Proceedings of the 51st IEEE Conference on Decision and Control, IEEE CDC 2012, December 10-13 2012, Maui, Hawaii, USA

Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4673-2065-8
ISBN (Electronic): 978-1-4673-2064-1

Publication series
Name: IEEE Conference on Decision and Control
ISSN (Print): 0743-1546
DOIs:
10.1109/CDC.2012.6426567
URLs:
http://control.disp.uniroma2.it/cdc2012/

Bibliographical note
ei ut-numeroa 27.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: IEEE
Source: researchoutputwizard
Source ID: 5027
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Gaussian mixture filter allowing negative weights and its application to positioning using signal strength measurements
This paper proposes a novel Gaussian Mixture Filter (GMF) that allows components with negative weights. In case of a ring-shaped likelihood function, the new filter keeps the number of components low by approximating the likelihood as a Gaussian mixture (GM) of two components, one with positive and the other with negative weight. In this article, the filter is applied to positioning with received signal strength (RSS) based range measurements. The filter is tested using simulated measurements, and the tests indicate that the new GMF outperforms the Extended Kalman Filter (EKF) in both accuracy and consistency.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Muller, P., Ali-Löytty, S., Dashti, M., Nurminen, H., Piche, R.
Pages: 71-76
Publication date: 2012

Host publication information
Title of host publication: Proceedings of WPNC 2012, 9th Workshop on Positioning, Navigation and Communication, March 15-16, 2012, Dresden, Germany
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-1437-4

Publication series
Name: Workshop on Positioning, Navigation and Communication
Electronic versions:
muller_gaussian_mixture_filter_allowing_negative_weights.pdf
DOIs:
10.1109/WPNC.2012.6268741
URLs:
http://urn.fi/URN:NBN:fi:tty-201311061423

Bibliographical note
ei ut-numeroa 22.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 4882
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Harmonic Forms on Conformal Euclidean Manifolds: The Clifford Multivector Approach

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed

Organisations: Department of Mathematics
Contributors: Orelma, H.
Pages: 143-158
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Advances in Applied Clifford Algebras
Volume: 22
Issue number: 1
ISSN (Print): 0188-7009
Ratings:

Scopus rating (2012): CiteScore 0.62 SJR 0.575 SNIP 0.991
Original language: English
DOIs:

10.1007/s00006-011-0297-1

Bibliographical note
Online first, Springer
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 4989
Research output: Contribution to journal › Article › Scientific › peer-review

Hierarchical Bayesian inference for the EEG inverse problem using realistic FE head models: Depth localization and source separation for focal primary currents

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Lucka, F., Pursiainen, S., Burger, M., Wolters, C. H.
Pages: 1364-1382
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: NeuroImage
Volume: 61
Issue number: 4
ISSN (Print): 1053-8119
Ratings:

Scopus rating (2012): CiteScore 6.86 SJR 4.026 SNIP 1.972
Original language: English
DOIs:

10.1016/j.neuroimage.2012.04.017

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Elsevier
Source: researchoutputwizard
Source ID: 4745
Research output: Contribution to journal › Article › Scientific › peer-review

Hyperbolic laplace operator and the Weinstein equation in R3

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Pages: 15
Publication date: 2012

Host publication information
Title of host publication: Proceedings in the 19th International Conference on the Applications of Computer Science and Mathematics in Architecture and Civil Engineering, IKM 2012, July 4-6 2012, Weimar, Germany

Place of publication: Weimar, Germany
Publisher: IKM
Editors: Gürlebeck, K., Lahmer, T., Werner, F.

Publication series
Name: International conference on the applications of computer science and mathematics in architecture and civil engineering
ISSN (Print): 1611-4086

Bibliographical note
ei ut-numeroa 12.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: IKM
Source: researchoutputwizard
Source ID: 4038
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Mathematics Remedial Instruction with Math-Bridge e-learning system

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Kangas, J., Miilumäki, T., Pohjolainen, S.
Publication date: 2012

Host publication information
Title of host publication: 16th SEFI MWG Seminar - Mathematical Education of Engineers, Salamanca, Spain, 28.-30.6.2012
Place of publication: Salamanca, Spain
Publisher: Universidad de Salamanca
Editors: Alpers, B., Robinson, C., Rodriguez, G., Martin, A., de la Villa, A.
ISBN (Print): 978-84-695-3960-6
ISBN (Electronic): 978-84-695-3960-6

Publication series
Name: SEFI MWG Seminar
URLs:
http://sefi.htw-aalen.de/Seminars/Salamanca2012/16thSEFIMWGSeminar/ficheros/lecturas/Documents_pdf/SoftwareDemonstrations/SEFIMWG12_Kangas.pdf

Bibliographical note
Poistetty tupla r=3459. ei ut-numeroa 19.8.2013
Contribution: organisation=mat hyplab,FACT1=1
Publisher name: Universidad de Salamanca
Source: researchoutputwizard
Source ID: 4408
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Method of tracking a state of a mobile electronic device

General information
Publication status: Published
MoE publication type: H1 Granted patent
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Sirola, N., Ali-Löytty, S.
Publication date: 2012

Publication information
Patent number: Pat. US 8213956 B2
Priority date: 3/07/12
Priority number: (21)12/224767 ;12/224,767
Original language: English

Bibliographical note
US008213956B2 : US 8,213,956 B2 : (45) Jul. 3, 2012 : (87) PCT/EP2006/002272 : (87) WO2007/101453 : (21) 12/224,767 : OKM 2012 tilasto : tuloss. tilasto 2013.
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-02-27

Source: researchoutputwizard
Source ID: 5330
Research output: Patent › Scientific

Mobile Tracking in Mixed Line-of-Sight/Non-Line-of-Sight Conditions: Algorithm and Theoretical Lower Bound

The paper investigates the problem of mobile tracking in mixed line-of-sight (LOS)/non-line-of-sight (NLOS) conditions. The motion of mobile station is modeled by a dynamic white noise acceleration model, while the measurements are time of arrival (TOA). A first-order Markov model is employed to describe the dynamic transition of LOS/NLOS conditions. An improved Rao-Blackwellized particle filter (RBPF) is proposed, in which the LOS/NLOS sight conditions are estimated by particle filtering using the optimal trial distribution, and the mobile state is computed by applying approximated analytical methods. The theoretical error lower bound is further studied in the described problem. A new method is presented to compute the posterior Cramer-Rao lower bound (CRLB): the mobile state is first estimated by decentralized extended Kalman filter (EKF) method, then sigma point set and unscented transformation are applied to calculate Fisher information matrix (FIM). Simulation results show that the improved RBPF is more accurate than current methods, and its performance approaches to the theoretical bound.

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Chen, L., Ali-Löytty, S., Piche, R., Wu, L.
Pages: 753-771
Publication date: 2012
Peer-reviewed: Yes

Publication information

Journal: WIRELESS PERSONAL COMMUNICATIONS
Volume: 65
Issue number: 4
ISSN (Print): 0929-6212
Ratings:

Scopus rating (2012): CiteScore 0.73 SJR 0.247 SNIP 0.755
Original language: English
Electronic versions:

chen_mobile_tracking_in_mixed_line_of_sight.pdf
DOIs:

10.1007/s11277-011-0294-7
URLs:

http://urn.fi/URN:NBN:fi:tty-201311061421

Bibliographical note

Contribution: organisation=mat,FACT1=1
Publisher name: Springer
Source: researchoutputwizard
Source ID: 3969
Research output: Contribution to journal › Article › Scientific › peer-review

Networks of Growth: Case Young Innovative Companies in Finland

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Huhtamäki, J., Still, K., Isomursu, M., Russell, M. G., Rubens, N.
Publication date: 2012

Host publication information

Title of host publication: Proceedings of the 7th European Conference on Innovation and Entrepreneurship, September 20-21, 2012, Santarem, Portugal
Place of publication: Reading, UK
Publisher: Academic Publishing International Limited
Editors: Vivas, C., Lucas, F.
ISBN (Print): 978-1-908272-68-3
ISBN (Electronic): 978-1-908272-66-9

Publication series
Name: European Conference on Innovation and Entrepreneurship
ISSN (Print): 2049-1050
ISSN (Electronic): 2049-1077

Bibliographical note
ei ut-numeroa 13.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Academic Publishing International Limited
Source: researchoutputwizard
Source ID: 4238
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

n-Fold implicative basic logic is Gödel logic

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Turunen, E., Tchikapa, N., Lele, C.
Pages: 177-181
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Soft Computing
Volume: 16
Issue number: 1
ISSN (Print): 1432-7643
Ratings:

Scopus rating (2012): CiteScore 1.94 SJR 0.747 SNIP 1.225
Original language: English
DOIs:

10.1007/s00500-011-0761-9

Bibliographical note
Online first
Contribution: organisation=mat,FACT1=1
Publisher name: Springer
Source: researchoutputwizard
Source ID: 5464
Research output: Contribution to journal › Article › Scientific › peer-review

Nonlinear iteration semigroups of fuzzy Cauchy problems

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Kaleva, O.
Number of pages: 7
Pages: 104-110
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Fuzzy Sets and Systems
Volume: 209
ISSN (Print): 0165-0114
Ratings:

Scopus rating (2012): CiteScore 2.97 SJR 1.472 SNIP 2.349
Original language: English
DOIs:

10.1016/j.fss.2012.04.016

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Elsevier BV North-Holland

Source: researchoutputwizard
Source ID: 4388
Research output: Contribution to journal › Article › Scientific › peer-review

On the Parametric Instability Caused by Step Size Variation in Runge-Kutta-Nyström Methods

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Research group: Positioning, Former organisation of the author
Contributors: Piche, R.
Number of pages: 11
Publication date: 2012

Publication information
Publisher: Unknown Publisher
Original language: English

Publication series
Name: arXiv
Volume: arXiv:1209.5173
URLs:

http://arxiv.org/abs/1209.5173

Bibliographical note
Kopio tietueesta r=15203.Ei tilastoida
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5064
Research output: Book/Report › Commissioned report › Professional

Optimal computation of brightness integrals parametrized on the unit sphere

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Kaasalainen, M., Lu, X., Vänttinen, A.
Pages: 7
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 539
Article number: A96
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2012): CiteScore 3.14 SJR 2.903 SNIP 1.425
Original language: English
DOIs:

10.1051/0004-6361/201117982

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: EDP Sciences
Source: researchoutputwizard
Source ID: 4377
Research output: Contribution to journal › Article › Scientific › peer-review

Outlier-robust estimation of GPS satellite clock offsets
A new method to predict a GPS satellite’s clock offset is presented. The motivation for this work is to improve the time to first fix and make the clock offset prediction less sensitive to outliers. The proposed method is tested with real data and it is shown to improve prediction accuracy compared to other known methods.

General information

Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Martikainen, S., Piche, R., Ali-Löytty, S.
Pages: 5 pp.
Publication date: 2012

Host publication information
Title of host publication: 2012 International Conference on Localization and GNSS ICL-GNSS, June 25-27, 2012, Starnberg, Germany
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
Article number: 12906184
ISBN (Print): 978-1-4673-2344-4
ISBN (Electronic): 978-1-4673-2342-0

Publication series
Name: 2012 International Conference on Localization and GNSS
Electronic versions:

martikainen_outlier_robust_estimation_of_gps_satellite_clock_offsets.pdf
DOIs:

10.1109/ICL-GNSS.2012.6253107
URLs:

http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6245525

http://urn.fi/URN:NBN:fi:tty-201310311406

Bibliographical note
Artikkelissa ISBN-numero 978-1-4673-2343-7. ei ut-numeroa 22.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 4813
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Output Regulation for General Infinite-Dimensional Exosystems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Pages: 162-167
Publication date: 2012

Host publication information
Title of host publication: Proceedings of the 7th IFAC Symposium on Robust Control Design, Rocond 2012, 20-22 June 2012, Aalborg, Denmark
Place of publication: Laxenburg, Austria
Publisher: International Federation of Automatic Control IFAC
ISBN (Print): 978-3-902823-03-8

Publication series
Name: IFAC Symposium on Robust Control Design
ISSN (Print): 1474-6670
DOIs:

10.3182/20120620-3-DK-2025.00113

Bibliographical note
ei ut-numeroa 27.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: International Federation of Automatic Control IFAC
Source: researchoutputwizard
Source ID: 5028
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Paradigm shift in innovation indicators - from analog to digital

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Still, K., Huhtamäki, J., Russell, M. G., Rubens, N.
Publication date: 2012

Host publication information
Title of host publication: Proceedings of the 5th ISPIM Innovation Forum, 9-12 December, 2012, Seoul, Korea
Place of publication: Manchester, UK
Publisher: International Society for Professional Innovation Management ISPIM
ISBN (Print): 978-952-265-317-8

Publication series
Name: ISPIM Innovation Symposium
URLs:

http://symposium.ispim.org/files/proceedings/commonfiles/files/437515856_Paper.pdf

http://symposium.ispim.org/files/proceedings/index.html

Bibliographical note
ei ut-numeroa 30.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: International Society for Professional Innovation Management ISPIM
Source: researchoutputwizard
Source ID: 5357
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Periodic Output Regulation for Distributed Parameter Systems
In this paper the output regulation of a linear distributed parameter system with a nonautonomous periodic exosystem is considered. It is shown that the solvability of the output regulation problem can be characterized by the solvability of a certain constrained infinite-dimensional Sylvester differential equation. Conditions are given for the existence of feedforward and feedback controllers solving the regulation problem along with a method for their construction. The theoretical results are applied to output regulation of a controlled delay equation.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L., Pohjolainen, S.
Pages: 403-441
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Mathematics of Control Signals and Systems
Volume: 24
Issue number: 4
ISSN (Print): 0932-4194
Ratings:

Scopus rating (2012): CiteScore 0.69 SJR 0.626 SNIP 0.849
Original language: Finnish
Electronic versions:

paunonen_pohjolainen_periodic_output_regulation.pdf
DOIs:

10.1007/s00498-012-0087-x
URLs:

http://urn.fi/URN:NBN:fi:tty-201401101034

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Springer UK
Source: researchoutputwizard
Source ID: 5029

Research output: Contribution to journal › Article › Scientific › peer-review

Prime filters on residuated lattices

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Kondo, M., Turunen, E.
Pages: 89-91
Publication date: 2012

Host publication information
Title of host publication: 2012 IEEE 42nd International Symposium on Multiple-Valued Logic ISMVL, 14-16 May, 2012, Victoria, British Columbia, Canada
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-0-7695-4673-5

Publication series
Name: IEEE International Symposium on Multiple-Valued Logic
ISSN (Print): 0195-623X
DOIs:

10.1109/ISMVL.2012.40

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 4520
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Raviart-Thomas-type sources adapted to applied EEG and MEG: Implementation and results

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Pursiainen, S.
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Inverse Problems
Volume: 28
Issue number: 6
Article number: 065013
ISSN (Print): 0266-5611
Ratings:

Scopus rating (2012): CiteScore 2.15 SJR 1.258 SNIP 1.838
Original language: English
DOIs:

10.1088/0266-5611/28/6/065013

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Physics Publishing
Source: researchoutputwizard
Source ID: 5115
Research output: Contribution to journal › Article › Scientific › peer-review

Robust Kalman filter for positioning with wireless BS coverage areas
A robust Kalman filter method for positioning using a database of wireless base station coverage areas is presented. In tests with simulated and real data, the proposed filter is found to be more accurate than static positioning or conventional Kalman filtering.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Dashti, M., Ali-Löytty, S., Wirola, L., Muller, P., Nurminen, H., Piche, R.
Pages: 83-88
Publication date: 2012

Host publication information
Title of host publication: Proceedings of WPNC 2012, 9th Workshop on Positioning, Navigation and Communication, March 15-16, 2012, Dresden, Germany
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-1439-8

Publication series
Name: Workshop on Positioning, Navigation and Communication
Electronic versions:

dashti_robust_kalman_filter_for_positioning.pdf
DOIs:

10.1109/WPNC.2012.6268743
URLs:

http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6261642

http://urn.fi/URN:NBN:fi:tty-201311061422

Bibliographical note
ei ut-numeroa 12.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 3993
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robustness of strongly and polynomially stable semigroups
In this paper we study the robustness properties of strong and polynomial stability of semigroups of operators. We show that polynomial stability of a semigroup is robust with respect to a large and easily identifiable class of perturbations to its infinitesimal generator. The presented results apply to general polynomially stable semigroups and bounded perturbations. The conditions on the perturbations generalize well-known criteria for the preservation of exponential stablity of semigroups. We also show that the general results can be improved if the perturbation is of finite rank or if the semigroup is generated by a Riesz-spectral operator. The theory is applied to deriving concrete conditions for the preservation of stability of a strongly stabilized one-dimensional wave equation.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Pages: 2555-2583
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Functional Analysis
Volume: 263
Issue number: 9
ISSN (Print): 0022-1236
Ratings:

Scopus rating (2012): CiteScore 1.33 SJR 2.45 SNIP 1.832
Original language: English
Electronic versions:

paunonen_robustness_of_strongly.pdf
DOIs:

10.1016/j.jfa.2012.08.023
URLs:

http://urn.fi/URN:NBN:fi:tty-201401101033

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Academic Press
Source: researchoutputwizard
Source ID: 5025
Research output: Contribution to journal › Article › Scientific › peer-review

Robust regulation: From state-space to frequency domain

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Contributors: Laakkonen, P.
Pages: 135-140
Publication date: 2012

Host publication information
Title of host publication: Digest of TISE Seminar 2012, Nokia, Finland, 14 June, 2012. TISE Publications
Place of publication: Tampere
Publisher: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology, University of Tampere
Editor: Niemistö, A.
ISBN (Print): 978-952-15-2845-3

Publication series
Name: TISE Seminar
Volume: 11
ISSN (Print): 1458-8463

Bibliographical note
ei ut-numeroa 20.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology, University of Tampere
Source: researchoutputwizard
Source ID: 4591
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Robust Regulation of Distributed Parameter Systems with Infinite-Dimensional Exosystems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Hämäläinen, T., Pohjolainen, S.
Pages: 3514-3519
Publication date: 2012

Host publication information
Title of host publication: The 51st IEEE Conference on Decision and Control, IEEE CDC 2012, December 10-13 2012, Maui, Hawaii, USA
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-2064-1
ISBN (Electronic): 978-1-4673-2065-8

Publication series
Name: IEEE Conference on Decision and Control
ISSN (Print): 0743-1546
DOIs:
10.1109/CDC.2012.6426076
URLs:
http://control.disp.uniroma2.it/cdc2012/

Bibliographical note

ei ut-numeroa 13.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 4136
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Shape modeling technique KOALA validated by ESA Rosetta at (21) Lutetia

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Carry, B., Kaasalainen, M., Merline, W., Muller, T., Jorda, L., Drummond, J., Berthier, J., O'Rourke, L., Durech, J., Küppers, M., Conrad, A., Tamblyn, P., Dumas, C., Sierks, H.
Pages: 200-212
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Planetary and Space Science
Volume: 66
Issue number: 1
ISSN (Print): 0032-0633
Ratings:

Scopus rating (2012): CiteScore 2.14 SJR 1.265 SNIP 0.982
Original language: English
DOIs:

10.1016/j.pss.2011.12.018

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Pergamon
Source: researchoutputwizard
Source ID: 3955
Research output: Contribution to journal › Article › Scientific › peer-review

Shape reconstruction of irregular bodies with multiple complementary data sources

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Kaasalainen, M., Viikinkoski, M.
Pages: 9
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 543
Article number: A97
ISSN (Print): 0004-6361
Ratings:

Scopus rating (2012): CiteScore 3.14 SJR 2.903 SNIP 1.425
Original language: English
DOIs:

10.1051/0004-6361/201219267

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: EDP Sciences
Source: researchoutputwizard
Source ID: 4378
Research output: Contribution to journal › Article › Scientific › peer-review

Sosiaalisesta mediasta dataa innovaatiotoiminnan ymmärtämiseen ja mittaamiseen

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Mathematics
Contributors: Still, K., Huhtamäki, J., Russell, M. G., Koskela-Huotari, K., Isomursu, M., Pohjolainen, S.
Number of pages: 7
Publication date: 2012

Publication information
Publisher: Tekes
Original language: Finnish

Publication series
Name: Tekes Policy Brief
Publisher: Tekes
Volume: 2
URLs:

http://www.tekes.fi/info/innovaatiotutkimus/Policy+briefs

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5356
Research output: Book/Report › Commissioned report › Professional

Stress-strain behavior of polyamide 6 staple fibers of punch-needled press felts under simulated wet-pressing conditions

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Department of Mathematics
Contributors: Hakala, T., Kaleva, O., Harlin, A.
Pages: 1280-1293
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of the Textile Institute
Volume: 103
Issue number: 12
ISSN (Print): 0040-5000
Ratings:

Scopus rating (2012): CiteScore 0.89 SJR 0.716 SNIP 1.165
Original language: English
DOIs:

10.1080/00405000.2012.677566

Bibliographical note
Contribution: organisation=mol,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Publisher name: Routledge
Source: researchoutputwizard
Source ID: 4124
Research output: Contribution to journal › Article › Scientific › peer-review

Suomessa 2004-2008 sattuneiden tieliikenneonnettomuuksien analysointia GUHA-tiedonlouhintamenetelmällä
The suitability of GUHA-data mining method for analyzing a data set containing more than 80.000 road accidents occurred in Finland in 2004 - 2008 is examined in this report. By GUHA-method, implemented to LISp-Miner software, more than 10.000 dependencies was found; about 100 easily understandable of them are presented here. Our conclusion is that GUHA-method is useful when one wants to explore relatively small size, but still significant dependencies between subsets of a given data.

General information

Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Mathematics
Contributors: Järvenpää, M., Turunen, E.
Number of pages: 32
Publication date: 2012

Publication information
Place of publication: Tampere
Publisher: Tampereen teknillinen yliopisto. Matematiikan laitos
ISBN (Electronic): 978-952-15-2800-2
Original language: Finnish

Publication series
Name: Tampereen teknillinen yliopisto. Matematiikan laitos. Tutkimusraportti
Publisher: Tampereen teknillinen yliopisto
Volume: 99
ISSN (Print): 1459-3750
Electronic versions:

jarvenpaa_turunen_suomessa_2004-2008_sattuneiden_tieliikenneonnettomuuksien_analysointia.pdf
URLs:

http://urn.fi/URN:ISBN:978-952-15-2800-2

Bibliographical note
Tallennettu DPubiin jo vuonna 2012.Portfolioon tiedot 2013.
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-04-29
Source: researchoutputwizard
Source ID: 4339
Research output: Book/Report › Commissioned report › Professional

Surrogate Model Optimization Toolbox: Matlab central file exchange

General information
Publication status: Published
MoE publication type: I2 ICT software
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Müller, J.
Publication date: 2012
Media of output: Online
Electronic versions:

SurrogateOptimizationModule - zip file
URLs:

http://www.mathworks.com/matlabcentral/fileexchange/38530-surrogate-model-optimization-toolbox

http://urn.fi/URN:NBN:fi:tty-201210051317

Bibliographical note
Contribution: organisation=mat,FACT1=1
Program code is licensed under GNU License 3.0
Source: researchoutputwizard
Source ID: 4879
Research output: Artistic and non-textual form › Software › Scientific

Testing a New Vegetation Structure Retrieval Algorithm from Terrestrial Lidar Scanner Data Using 3D Models

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Disney, M., Lewis, P., Raumonen, P.
Number of pages: 9
Pages: 1-9
Publication date: 2012

Host publication information

Title of host publication: Silvilaser 2012, 12th International Conference on LiDAR Applications for Assessing Forest Ecosystems, 16-19 September 2012, Vancouver, Canada
Place of publication: Vancouver, Canada
Publisher: Silvilaser Vancouver 2012

Publication series
Name: Silvilaser
URLs:
http://silvilaser2012.com/wp-content/uploads/2011/11/Silvilaser2012_Full_Proceedings.pdf

Bibliographical note
ei ut-numeroa 12.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Silvilaser Vancouver 2012
Source: researchoutputwizard
Source ID: 4010
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

The Infinite-Dimensional Sylvester Differential Equation and Periodic Output Regulation

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Pages: 515-531
Publication date: 2012

Host publication information
Title of host publication: Spectral Theory, Mathematical System Theory, Evolution Equations, Differential and Difference Equations. 21st International Workshop on Operator Theory and Applications, Berlin, July 2010. Operator Theory: Advances and Applications.
Place of publication: Basel, Switzerland
Publisher: Springer Basel
Editors: Arendt, W., Ball, J. A., Behrndt, J., Förster, K., Mehrmann, V., Trunk, C.
ISBN (Print): 978-3-0348-0296-3
ISBN (Electronic): 978-3-0348-0297-0

Publication series
Name: International Workshop on Operator Theory and Applications
Volume: 221
DOIs:
10.1007/978-3-0348-0297-0_31

Bibliographical note
ei ut-numeroa 27.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Springer Basel
Source: researchoutputwizard
Source ID: 5026
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Transforming Innovation Ecosystems Through Network Orchestration: Case EIT ICT Labs

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Still, K., Huhtamäki, J., Russell, M. G., Rubens, N.
Publication date: 2012

Host publication information
Title of host publication: Proceedings of the XXIII ISPIM Conference. Action for Innovation: Innovating from Experience, Barcelona, Spain, 17-20 June 2012
Place of publication: Manchester, UK
Publisher: International Society for Professional Innovation Management ISPIM
Editors: Huizingh, K., Conn, S., Torkkeli, M., Bitran, I.
ISBN (Print): 978-952-265-242-3
ISBN (Electronic): 978-952-265-242-0

Publication series
Name: International Society for Professional Innovation Conference
URLs:
http://www.ispim.org

Bibliographical note
Proceedings julkaistu verkossa, tarvitaan käyttäjätunnus ja salasana. ei ut-numeroa 30.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: International Society for Professional Innovation Management ISPIM
Source: researchoutputwizard
Source ID: 5358
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Understanding Mobile Ecosystem Dynamics: a Data-Driven Approach

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Basole, R. C., Russell, M. G., Huhtamäki, J., Rubens, N.
Pages: 17-28
Publication date: 2012

Host publication information
Title of host publication: Mobile Business in Everyday life: users' routines versus provider's turbulence. Proceedings of the 11th International Conference on Mobile Business, ICMB 2012, June 21-22, 2012, Delft, Netherlands
Place of publication: Delft, The Netherlands
Publisher: Delft University of Technology

Publication series
Name: International Conference on Mobile Business
ISSN (Print): 1935-4908
URLs:
http://aisel.aisnet.org/icmb2012/15

Bibliographical note
ei ut-numeroa 9.8.2013
Contribution: organisation=mat,FACT1=1
Publisher name: Delft University of Technology
Source: researchoutputwizard
Source ID: 3894
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

User Guide for Modularized Surrogate Model Toolbox
This user guide accompanies the surrogate model toolbox for global optimization problems. The toolbox is made for computationally expensive black-box global optimization problems with continuous, integer, or mixed-integer variables. Problems where several or all variables have to be integers may also have black-box constraints, whereas purely continuous problems may only have box constraints. For problems with computationally cheap function evaluations the toolbox may not be very efficient. Surrogate models are intended to be used when function evaluations take from several minutes to several hours or more. When reading this manual it is recommended to simultaneously take a look at the code. The code is set up such that the user only has to define his/her optimization problem in a Matlab file (see Section 6.1). Additional input such as the surrogate model to be used, the sampling strategy, or starting points are optional (see Section 6). This document is structured as follows. In Section 2 the general structure of a surrogate model algorithm is summarized. The installation is described in Section 3. The dependencies of the single functions in the code are shown in Section 4. Section 5 briefly summarizes how the surrogate model algorithm works in general. Section 6 describes the options for the input of the main function. In Section 7 the input and output of the single subfunctions of the algorithm are described. Examples for using the surrogate model algorithm are given in Section 8. In Section 9 it is explained how the user can define an own (mixture) surrogate model and an example is given. The elements of the saved results are described in Section 10.

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Müller, J.
Number of pages: 28
Publication date: 2012

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English

Publication series
Name: TUT DPub
Publisher: Tampere University of Technology
Electronic versions:

muller_user_guide_for_modularized_surrogate_model_toolbox.pdf
URLs:

http://urn.fi/URN:NBN:fi:tty-201610044581
URLs:

http://urn.fi/URN:NBN:fi:tty-201210051317

Bibliographical note
Osa opetusmateriaalia Surrogate Model Optimization Toolbox
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 4880
Research output: Book/Report › Commissioned report › Professional

Using unlocated fingerprints in generation of WLAN maps for indoor positioning
This paper presents five methods for generation of WLAN maps for indoor positioning using crowdsourced fingerprints. A fingerprint is assumed to contain identifiers of WLAN access points, received signal strength values and, if the fingerprint is collected outdoors, a GPS position. The proposed methods use the fingerprints' information to generate a WLAN map that contains estimated access point locations. Two of the proposed methods use RSS values in access point location estimation. In our evaluation with simulations and with real data, the Access Point Least Squares method, which does not use RSS information, is the fastest and its accuracy is as good as more complex methods that use RSS information.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Raitoharju, M., Fadjukoff, T., Ali-Löytty, S., Piche, R.
Pages: 576-583
Publication date: 2012

Host publication information
Title of host publication: 2012 IEEE/ION Position Location and Navigation Symposium PLANS, 23-26 April 2012, Myrtle Beach, SC, USA
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
Article number: 12863832
ISBN (Print): 978-1-4673-0385-9

Publication series
Name: IEEE/ION Position Location and Navigation Symposium
ISSN (Print): 2153-358X
ISSN (Electronic): 2153-3598
Electronic versions:

raitoharju_using_unlocated_fingerprints.pdf
DOIs:

10.1109/PLANS.2012.6236930
URLs:

http://urn.fi/URN:NBN:fi:tty-201311061418

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 5137
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Output Regulation Theory for Linear Systems with Infinite-Dimensional and Periodic Exosystems

In this thesis we consider the output regulation problem consisting of choosing a controller to asymptotically steer the output of a linear infinite-dimensional system to a given reference signal despite external disturbances. In particular we are interested in a situation where the considered reference and disturbance signals are nonsmooth polynomially bounded functions. The existing theory on this problem can only be used in the case where the signals to be tracked and rejected are smooth and polynomially bounded, or nonsmooth but uniformly bounded functions. The availability of more general reference and disturbance signals is useful in many applications such as the control of robot arms and disk drive systems. For generating our reference and disturbance signals we consider two separate methods, namely, a time-invariant infinite-dimensional exosystem and a periodically time-dependent finite-dimensional exosystem. We will see that the chosen method has a considerable effect on the properties of the resulting control law as well as on the behavior of the controlled closed-loop system. One of the main differences in these respective theories of output regulation is that the control law designed based on the infinite-dimensional exosystem is guaranteed to be robust with respect to a class of perturbations preserving the stability of the closed-loop system. The first main result of this thesis is the generalization of the well-known internal model principle of finite-dimensional control theory for distributed parameter systems with infinite-dimensional exosystems. On a general level this result states that in order for a controller to solve the robust output regulation problem related to a given signal generator, the controller must be able to reproduce the dynamics of this exosystem. In addition to its theoretical significance the internal model principle can also be applied in the construction of controllers solving the robust output regulation problem. Our proof of this result is based on a close connection between the behavior of the state of the closed-loop system and an associated Sylvester operator equation. In particular, the controllers achieving asymptotic tracking of the reference signals can be characterized using the solvability of certain constrained Sylvester equations, and the robustness of this property can be expressed as a condition involving equations of this type. The second main contribution of this thesis consists of the development of the theory of output regulation for infinite-dimensional systems with periodically time-dependent exosystems. In particular this also includes designing nonautonomous controllers achieving asymptotic output tracking and disturbance rejection. Our treatment shows that it is possible to study the output regulation problem for a distributed parameter system together with a nonautonomous exosystem using methods similar to the ones familiar from case of a time-invariant signal generator. In particular, the solvability of the problem related to a given periodic exosystem can be characterized using a periodically time-dependent version of the well-known regulator equations if the associated Sylvester operator equation is replaced with an infinite-dimensional Sylvester differential equation.

General information

Publication status: Published
MoE publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Publication date: 4 Nov 2011

Publication information

Place of publication: Tampere
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-2664-0
Original language: English

Publication series

Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 992
ISSN (Print): 1459-2045
Electronic versions:

paunonen.pdf
URLs:

http://urn.fi/URN:NBN:fi:tty-2011102414850

Bibliographical note

Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source ID: 6974
Research output: Book/Report › Doctoral thesis › Monograph

Absolute radiometric calibration of ALS intensity data: Effects on accuracy and target classification

General information

Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)

Contributors: Kaasalainen, S., Pyysalo, U., Krooks, A., Vain, A., Kukko, A., Hyyppä, J., Kaasalainen, M.
Pages: 10586-10602
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Sensors
Volume: 11
Issue number: 11
ISSN (Print): 1424-8220
Ratings:

Scopus rating (2011): CiteScore 2.44 SJR 0.641 SNIP 1.462
Original language: English
DOIs:

10.3390/s111110586

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6257
Research output: Contribution to journal › Article › Scientific › peer-review

A differential form approach to Dirac operators on surfaces

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Orelma, H., Sommen, F.
Pages: 213-232
Publication date: 2011

Host publication information
Title of host publication: Hypercomplex Analysis and Applications. Trends in Mathematics
Place of publication: Basel
Publisher: Birkhäuser
Editors: Sabadini, I., Sommen, F.
ISBN (Print): 978-3-0346-0245-7
DOIs:

10.1007/978-3-0346-0246-4_15

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6928
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Advances in Augmented Reality Technologies

General information
Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Contributors: Pylvänäinen, T.
Number of pages: 183
Publication date: 2011

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-2611-4
Original language: Finnish

Publication series

Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 975
ISSN (Print): 1459-2045

Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source ID: 7069
Research output: Book/Report › Doctoral thesis › Collection of Articles

A Framework for Bayesian Receiver Autonomous Integrity Monitoring in Urban Navigation

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Pesonen, H.
Pages: 229-240
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Navigation
Volume: 58
Issue number: 3
ISSN (Print): 0028-1522
Ratings:

Scopus rating (2011): CiteScore 0.97 SJR 0.453 SNIP 1.074
Original language: English
URLs:

http://www.ion.org/publications/journal.cfm

Bibliographical note
ei ut-numeroa 26.4.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7006
Research output: Contribution to journal › Article › Scientific › peer-review

A hyperbolic interpretation of Cauchy-type kernels in hyperbolic function theory in hypercomplex analysis

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Pages: 43-59
Publication date: 2011

Host publication information
Title of host publication: Hypercomplex Analysis and Applications. Trends in Mathematics
Place of publication: Basel
Publisher: Birkhäuser
Editors: Sabadini, I., Sommen, F.
ISBN (Print): 978-3-0346-0245-7
DOIs:

10.1007/978-3-0346-0246-4_4

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5919
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Alumni Network Analysis

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Rubens, N., Russell, M. G., Perez, R., Huhtamäki, J., Still, K., Kaplan, D., Okamoto, T.
Pages: 606-611
Publication date: 2011

Host publication information
Title of host publication: 2011 IEEE 2nd Global Engineering Education Conference EDUCON, 4-6 April 2011, Amman, Jordan
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-61284-642-2

Publication series
Name: IEEE Global Engineering Education Conference EDUCON
Publisher: IEEE
DOIs:
10.1109/EDUCON.2011.5773200
URLs:
http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5773200&tag=1

Bibliographical note
ei ut-numeroa 5.3.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 7152
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A Mean-Value Theorem for Some Eigenfunctions of the Laplace -Beltrami Operator on the Upper-Half Space

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Number of pages: 10
Pages: 101-110
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Annales Academiae Scientiarum Fennicae-Mathematica
Volume: 36
ISSN (Print): 1239-629X
Ratings:
Scopus rating (2011): CiteScore 0.79 SJR 1.467 SNIP 1.334
Original language: English
DOIs:
10.5186/aasfm.2011.3606

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5920
Research output: Contribution to journal › Article › Scientific › peer-review

A method of tracking a state of a mobile electronic device

General information

Publication status: Published
MoE publication type: H1 Granted patent
Organisations: Former organisation of the author
Contributors: Sirola, N., Ali-Löytty, S.
Publication date: 2011

Publication information
Patent number: Pat. KR 101106276
Priority date: 18/01/12
Priority number: 10-2008-7024373
Original language: Korean
URLs:

http://eng.kipris.or.kr/eng/main/main_eng.jsp#

Bibliographical note
h3tut > h1 : Pat.Appl.PCT/EP2006/002272(2006.03.07)
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7276
Research output: Patent › Scientific

A Monocular Camera Gyroscope
We present a method for tracking the 3-axis orientation of a monocular camera using orthogonal vanishing points detected in individual frames of a sequence of images. Robust and real-time vanishing point detection is done using a standard line segment detection method and an adaptive RANSAC algorithm. Vanishing points and corresponding vanishing directions found in consecutive frames are associated with each other to produce a sequence of orientation quaternions, which is processed by an extended Kalman filter. Experiments with a consumer-level, handheld mobile device indicate that the accuracy of the proposed method is comparable with those of consumer-grade inertial motion sensors.

General information
Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Huttunen, V., Piche, R.
Number of pages: 16
Publication date: 2011

Publication information
Place of publication: Tampere
Publisher: Tampereen teknillinen yliopisto
ISBN (Print): 978-952-15-2627-5
Original language: English

Publication series
Name: Tampereen teknillinen yliopisto. Matematiikan laitos. Tutkimusraportti
Publisher: Tampereen teknillinen yliopisto
Volume: 98
Electronic versions:

huttunen_piche_a_monocular_camera_gyroscope.pdf
URLs:

http://urn.fi/URN:NBN:fi:tty-2011081814758

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6150
Research output: Book/Report › Commissioned report › Professional

Analysis of Incidence Angle and Distance Effects on Terrestrial Laser Scanner Intensity: Search for Correction Methods

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Kaasalainen, S., Jaakkola, A., Kaasalainen, M., Krooks, A., Kukko, A.

Pages: 2207-2221
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Remote Sensing
Volume: 3
Issue number: 10
ISSN (Print): 2072-4292
Ratings:

Scopus rating (2011): CiteScore 1.3 SJR 0.533 SNIP 1.323
Original language: English
DOIs:

10.3390/rs3102207

Bibliographical note
Otsikko alunperin: Analysis of topographic and distance effects on TLS intensity: Search for correction methods
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6256
Research output: Contribution to journal › Article › Scientific › peer-review

A Network-Centric Snapshot of Value Co-Creation in Finnish Innovation Financing

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Huhtamäki, J., Russell, M. G., Still, K., Rubens, N.
Number of pages: 15
Pages: 1-15
Publication date: 2011

Host publication information
Title of host publication: EBRF 2010, Research Forum to Understand Business in Knowledge Society, September 15-17, 2010, Nokia, Finland
Place of publication: Nokia
Publisher: GVL Finland
Editors: Seppä, M., Helander, N., Ilvonen, I.
ISBN (Print): 978-952-15-2529-2

Publication series
Name: Research Forum to Understand Business in Knowledge Society EBRF
Publisher: GVL Finland
ISSN (Print): 1797-190X

Bibliographical note
ei ut-numeroa 8.3.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 6112
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A Network-Centric Snapshot of Value Co-Creation in Finnish Innovation Financing

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Huhtamäki, J., Russell, M. G., Still, K., Rubens, N.
Pages: 13-21
Publication date: 2011

Host publication information
Title of host publication: The Open Source Business Resource
Publisher: Talent First Network

Editors: McPhee, C., Seppä, M., Tanev, S.
URLs:
http://osbr.ca/ojs/index.php/osbr/article/view/1285/1231

Bibliographical note
ei ut-numeroa 8.3.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 6110
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

An implementation of a semantic, web-based virtual machine laboratory prototyping environment
Creation of virtual machine laboratories – simulated planning and learning environments demonstrating function and structure of working machines – often involve a lot of manual labor. A notable source of the labor is the programming required due to changes in structural and functional models of a system. As a result, rapid prototyping of a virtual machine laboratory becomes difficult, if not impossible. We argue that by using a combination of semantic modeling and prototyping with a web-based system, more rapid development of virtual machine laboratories can be achieved. In this paper, we present the design and implementation of a semantic, web-based virtual machine laboratory prototyping environment. Application of the environment to a case example is also described and discussed.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Contributors: Salonen, J., Nykänen, O., Ranta, P., Nurmi, J., Helminen, M., Rokala, M., Palonen, T., Alarotu, V., Koskinen, K., Pohjolainen, S.
Pages: 221-236
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Lecture Notes in Computer Science
Volume: 7032
ISSN (Print): 0302-9743
Ratings:
Scopus rating (2011): CiteScore 0.49 SJR 0.338 SNIP 0.765
Original language: English
Electronic versions:
salonen_an_implementation_of_a_semantic.pdf
DOIs:
10.1007/978-3-642-25093-4_15
URLs:
http://urn.fi/URN:NBN:fi:tty-2011111114875

Bibliographical note
Contribution: organisation=mat,FACT1=0.5
Contribution: organisation=iha,FACT2=0.5
Source: researchoutputwizard
Source ID: 7197
Research output: Contribution to journal › Article › Scientific › peer-review

Apparent wind load effects on the tether of a kite power generator

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Argatov, I., Rautakorpi, P., Silvennoinen, R.
Pages: 1079-1088
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Wind Engineering and Industrial Aerodynamics
Volume: 99
Issue number: 10

ISSN (Print): 0167-6105
Ratings:

Scopus rating (2011): CiteScore 2.3 SJR 0.902 SNIP 3.332
Original language: English
DOIs:

10.1016/j.jweia.2011.07.010

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5719
Research output: Contribution to journal › Article › Scientific › peer-review

Approximation of Volume and Branch Size Distribution of Trees from Laser Scanner Data

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Raumonen, P., Kaasalainen, S., Kaasalainen, M., Kaartinen, H.
Number of pages: 6
Pages: 1-6
Publication date: 2011

Host publication information
Title of host publication: International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, ISPRS Workshop Laser Scanning, 2011, 29.-31.8.2011, Calgary, Canada
Place of publication: Calgary
Publisher: ISPRS

Publication series
Name: ISPRS Workshop Laser Scanning
Publisher: ISPRS
Volume: 38-5/W12
ISSN (Print): 1682-1750

Bibliographical note
ei ut-numeroa 3.5.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7105
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

A Self-Tuning Robust Regulator for Infinite-Dimensional Systems

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Hämäläinen, T., Pohjolainen, S.
Pages: 2116-2127
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 56
Issue number: 9
ISSN (Print): 0018-9286
Ratings:

Scopus rating (2011): CiteScore 4.11 SJR 3.431 SNIP 2.858
Original language: English
DOIs:

10.1109/TAC.2011.2129310

Bibliographical note
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source ID: 6018
Research output: Contribution to journal › Article › Scientific › peer-review

Autonomous satellite orbit prediction
A method to predict satellite orbits in a GPS device without a network connection is presented. The motivation for this work was to improve the startup performance of a navigation device without Assisted GPS. Tests of our algorithm show that in 95% of the cases the error in satellite's predicted position stays under 21 meters for one day and under 94 meters for three days.

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Seppänen, M.
Pages: 5-10
Publication date: 2011

Host publication information
Title of host publication: Digest of TISE Seminar 2011. TISE publications
Place of publication: Tampere
Publisher: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology
Editor: Niemistö, A.
ISBN (Print): 978-952-15-2557-5

Publication series
Name: TISE Seminar
Publisher: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology
Volume: 10
ISSN (Print): 1458-8463
Electronic versions:

seppanen_autonomous_satellite_orbit.pdf
URLs:

http://urn.fi/URN:NBN:fi:tty-2011081114757

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7236
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Autonomous satellite orbit prediction
A method to predict satellite orbits in a GPS device without a network connection is presented. The motivation for this work was to reduce time to first fix when assistance data is not available. The orbit of a satellite is predicted by numerically integrating the differential equation that models its motion. The initial position and velocity values used in prediction correspond to those received from the broadcast when the device was last operated. These initial values are given in the Earth centered, Earth fixed reference frame and have to be transformed into an inertial reference frame prior to substitution into the equation of motion and subsequent integration. For this purpose, one needs to predict the movement of Earth's rotation axis with respect to both space (nutation and precession) and to the Earth's crust (polar motion). Using precise ephemeris as the initial condition, we found that this kind of model gave quite accurate prediction results. However, the results were worse when initial conditions were computed from the less accurate broadcast ephemeris which, unfortunately, is the only ephemeris available to the navigation device without a network connection. In addition, we were not able to find a model that would be able to predict Earth's polar motion with sufficient accuracy within the assumed lifetime of the device. Without the polar motion parameters, one cannot do the transformation from ECEF to an inertial reference frame. In this paper we will present a method to improve the accuracy of the initial velocity of the satellite computed from the broadcast and simultaneously solve the unknown polar motion parameters. Tests of our algorithm show that in 95%of the cases the error in satellite's predicted position stays under 21 meters for one day and under 94 meters for three days.

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)

Contributors: Seppänen, M., Perälä, T., Piche, R.
Pages: 554-564
Publication date: 2011

Host publication information
Title of host publication: Proceedings of The Institute of Navigation 2011 International Technical Meeting, January 24-26, 2011, San Diego, CA, USA
Place of publication: San Diego, CA
Publisher: The Institute of Navigation

Publication series
Name: Institute of Navigation International Technical Meeting
Publisher: The Institute of Navigation
Electronic versions:

seppanen_autonomous_satellite_orbit_prediction.pdf
URLs:

http://www.ion.org/meetings/#itm

http://urn.fi/URN:NBN:fi:tty-201311011412

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7237
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Axiomatic Extensions of Höhle's Monoidal Logic

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Turunen, E.
Pages: 163-168
Publication date: 2011

Host publication information
Title of host publication: Proceedings of the 7th conference of the European Society for Fuzzy Logic and Technology EUSFLAT-LFA 2011, Aix-Les-Bains, France, 18 - 22 July 2011
Place of publication: Amsterdam
Publisher: Atlantis Press
ISBN (Print): 978-90-7877-00-0

Publication series
Name: Conference of the European Society for Fuzzy Logic and Technology EUSFLAT-LFA
Publisher: Atlantis Press

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7426
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Bayesian Positioning Using Gaussian Mixture Models with Time-varying Component Weights
Gaussian mixture models are often used in target tracking applications to take into account maneuvers in state dynamics or changing levels of observation noise. In this study it is assumed that the measurement or the state transition model can have two plausible candidates, as for example in positioning with line-of-sight or non-line-sight-signals. The plausibility described by the mixture component weight is modeled as a time-dependent random variable and is formulated as a Markov process with a heuristic model based on the Beta distribution. The proposed system can be used to approximate some well-known multiple model systems by tuning the parameter of the state transition distribution for the component weight. The posterior distribution of the state can be solved approximately using a Rao-Blackwellized particle filter. Simulations of GPS pedestrian tracking are used to test the proposed method. The results indicate that the new system is able to find the true models and its root mean square error-performance is comparable to filters that know the true models.

General information

Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Pesonen, H., Piche, R.
Pages: 4516-4524
Publication date: 2011

Host publication information
Title of host publication: JSM 2011 Joint Statistical Meetings 2011, Miami Beach, Florida, USA, July 30-August 4, 2011
Place of publication: Miami Beach, FL
Publisher: American Statistical Association

Publication series
Name: Joint Statistical Meetings JSM
Publisher: American Statistical Association
Electronic versions:

pesonen_piche_bayesian_positioning_using_gaussian.pdf
URLs:

http://www.amstat.org/meetings/jsm/2011/

http://urn.fi/URN:NBN:fi:tty-201311011410

Bibliographical note
ei ut-numeroa 26.4.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7007
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Business Angels and Investment Organizations as Networked Co-creators of the Finnish Innovation Ecosystem

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Huhtamäki, J., Russell, M. G., Still, K., Rubens, N., Yu, J. (.
Number of pages: 15
Pages: 1-15
Publication date: 2011

Host publication information
Title of host publication: Proceedings of the Triple Helix IX International Conference: Silicon Valley: Global Model or Unique Anomaly? 11-14 July, 2011, Stanford, California, USA
Place of publication: Stanford, CA
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication

Publication series
Name: Triple Helix International Conference
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication
URLs:

http://www.leydesdorff.net/th9/THIX-FinnishInnovationEcosystemCo-creation-final.pdf

Bibliographical note
ei ut-numeroa 8.3.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 6111
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Combining asteroid models derived by lightcurve inversion with asteroidal occultation silhouettes

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Durech, J., Kaasalainen, M., Herald, D., Dunham, D., Timerson, B., Hanus, J., Frappa, E., Talbot, J., Hayamizu, T., Warener, B. D., Pilcher, F., Galad, A.

Pages: 652-670
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 214
Issue number: 2
ISSN (Print): 0019-1035
Ratings:

Scopus rating (2011): CiteScore 3.2 SJR 2.542 SNIP 1.22
Original language: English
DOIs:

10.1016/j.icarus.2011.03.016

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5899
Research output: Contribution to journal › Article › Scientific › peer-review

Commutative bounded integral residuated orthomodular lattices are Boolean algebras

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Contributors: Tladlec, J., Turunen, E.
Pages: 635-636
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Soft Computing
Volume: 15
Issue number: 4
ISSN (Print): 1432-7643
Ratings:

Scopus rating (2011): CiteScore 2.38 SJR 0.844 SNIP 1.804
Original language: English
DOIs:

10.1007/s00500-010-0572-4

Bibliographical note
online first March 10, 2010
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 9410
Research output: Contribution to journal › Article › Scientific › peer-review

Computational study of noise in a large signal transduction network

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics, Research group: Computational Neuro Science-CNS, Research group: Computational Systems Biology
Contributors: Intosalmi, J., Manninen, T., Ruohonen, K., Linne, M.
Number of pages: 8
Pages: 1-8
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: BMC Bioinformatics

Volume: 12
Article number: 252
ISSN (Print): 1471-2105
Ratings:

Scopus rating (2011): CiteScore 3.34 SJR 1.662 SNIP 1.196
Original language: English
DOIs:

10.1186/1471-2105-12-252

Bibliographical note
Contribution: organisation=sgn,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source ID: 6171
Research output: Contribution to journal › Article › Scientific › peer-review

Dimensional Reduction of Electromagnetic Boundary Value Problems

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Department of Electronics
Contributors: Raumonen, P., Suuriniemi, S., Kettunen, L.
Number of pages: 25
Pages: 1-25
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Boundary Value Problems
Volume: 2011
Article number: 9
ISSN (Print): 1687-2762
Ratings:

Scopus rating (2011): CiteScore 0.9 SJR 0.842 SNIP 0.639
Original language: English
DOIs:

10.1186/1687-2770-2011-9

Bibliographical note
50 % Matematiikka, 50 % Sähkömagnetiikka
Contribution: organisation=mat,FACT1=0.5
Contribution: organisation=ele smg,FACT2=0.5
Source: researchoutputwizard
Source ID: 7106
Research output: Contribution to journal › Article › Scientific › peer-review

Directed structure at infinity for infinite-dimensional systems

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Laakkonen, P., Pohjolainen, S.
Pages: 702-715
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: International Journal of Control
Volume: 84
Issue number: 4
ISSN (Print): 0020-7179
Ratings:

Scopus rating (2011): CiteScore 1.67 SJR 1.3 SNIP 1.326

Original language: English
DOIs:
10.1080/00207179.2011.572999

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6490
Research output: Contribution to journal › Article › Scientific › peer-review

Discrete maximum principles for FE solutions of nonstationary diffusion-reaction problems with mixed boundary conditions

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Farago, I., Horvath, R., Korotov, S.
Pages: 702-720
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Numerical Methods for Partial Differential Equations
Volume: 27
Issue number: 3
ISSN (Print): 0749-159X
Ratings:
Scopus rating (2011): CiteScore 1.54 SJR 1.167 SNIP 0.948
Original language: English
DOIs:
10.1002/num.20547

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5940
Research output: Contribution to journal › Article › Scientific › peer-review

Explaining innovation with indicators of mobility and networks: Insights into central innovation nodes in Europe

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Still, K., Russell, M. G., Huhtamäki, J., Turpeinen, M., Rubens, N.
Number of pages: 17
Pages: 1-17
Publication date: 2011

Host publication information
Title of host publication: Proceedings of the Triple Helix IX International Conference: Silicon Valley: Global Model or Unique Anomaly? 11-14 July, 2011, Stanford, California, USA
Place of publication: Stanford, CA
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication

Publication series
Name: Triple Helix International Conference
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication
URLs:
http://www.leydesdorff.net/th9/THIX-InnovationEcosystemMobility-final.pdf

Bibliographical note
ei ut-numeroa 17.5.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard

Source ID: 7311
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Forecasting the diffusion of innovation: A stochastic bass model with log-normal and mean-reverting error process

Forecasting the diffusion of innovations plays a major role in managing technology development and in engineering management overall. In this paper, we extend the conventional Bass model stochastically by specifying the error process of sales as log-normal and mean-reverting. Our model satisfies the following reasonable properties, which are generally ignored in the existing literature: sales cannot be negative, the error process can have a memory, and sales fluctuate more when they are high and less when they are low. The conventional and widely used model that assumes normally distributed error term does not have these properties. We address how to forecast properly under the log-normal and mean-reverting error process, and show analytically and numerically that in our extended model sales forecasts can substantially alter conventional Bass forecasts. We also analyze the model empirically, showing that our extension can improve the accuracy of future sales forecasts.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Industrial Management, Department of Mathematics, Research group: Positioning, Research Community on Data-to-Decision (D2D), Managing digital industrial transformation (mDIT), Wireless Communications and Positioning (WICO)
Contributors: Kanniainen, J., Mäkinen, S., Piche, R., Chakrabarti, A.
Number of pages: 22
Pages: 1-22
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Engineering Management
Volume: 99
ISSN (Print): 0018-9391
Ratings:

Scopus rating (2011): CiteScore 1.97 SJR 0.848 SNIP 1.361
Original language: English
Electronic versions:

kanniainen_forecasting_the_diffusion_of_innovation.pdf
DOIs:

10.1109/TEM.2010.2048912
URLs:

http://urn.fi/URN:NBN:fi:tty-201311081432

Bibliographical note
Contribution: organisation=tta,FACT1=0.75
Contribution: organisation=mat,FACT2=0.25
Source: researchoutputwizard
Source ID: 6284
Research output: Contribution to journal › Article › Scientific › peer-review

Gender and Innovation: Networks of Executive Women in Technology-Based Companies

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Still, K., Russell, M. G., Huhtamäki, J., Yu, J. (., Rubens, N.
Number of pages: 20
Pages: 1-20
Publication date: 2011

Host publication information
Title of host publication: Proceedings of the Triple Helix IX International Conference: Silicon Valley: Global Model or Unique Anomaly? 11-14 July, 2011, Stanford, California, USA
Place of publication: Stanford, CA
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication

Publication series

Name: Triple Helix International Conference
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication
URLs:

http://www.leydesdorff.net/th9/THIX_Women_final.pdf

Bibliographical note
ei ut-numeroa 17.5.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 7312
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Images of asteroid 21 Lutetia: A remnant planetesimal from the early solar system

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Sierks, H., Lamy, P., Barbieri, C., Koschny, D., Rickman, H., Rodrigo, R., A'Hearn, M., Angrilli, F., Barucci, M., Bertaux, J., Bertini, I., Besse, S., Carry, B., Cremonese, G., Da Deppo, V., Davidsson, B., Debei, S., De Cecco, M., De Leon, J., Ferri, F., Fornasier, S., Fulle, M., Hviid, S., Gaskell, R., Groussin, O., Gutierrez, P., Ip, W., Jorda, L., Kaasalainen, M., Keller, H., Knollenberg, J., Kramm, R., Kührt, E., Küppers, M., Lara, L., Lazzarin, M., Leyrat, C., Lopez Moreno, J., Magrin, S., Marchi, S., Marzari, F., Massironi, M., Michalik, H., Moissl, R., Naletto, G., Preusker, F., Sabau, L., Sabolo, W., Scholten, F., Snodgrass, C., Thomas, N., Tubiana, C., Vernazza, P., Vincent, J., Wenzel, K., Andert, T., Pätzold, M., Weiss, B.
Pages: 487-490
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Science
Volume: 334
Issue number: 6055
ISSN (Print): 0036-8075
Ratings:

Scopus rating (2011): CiteScore 11.97 SJR 14.238 SNIP 8.226
Original language: English
DOIs:

10.1126/science.1207325

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7251
Research output: Contribution to journal › Article › Scientific › peer-review

Information Diversity in Structure and Dynamics of Simulated Neuronal Networks

Neuronal networks exhibit a wide diversity of structures, which contributes to the diversity of the dynamics therein. The presented work applies an information theoretic framework to simultaneously analyze structure and dynamics in neuronal networks. Information diversity within the structure and dynamics of a neuronal network is studied using the normalized compression distance. To describe the structure, a scheme for generating distance-dependent networks with identical in-degree distribution but variable strength of dependence on distance is presented. The resulting network structure classes possess differing path length and clustering coefficient distributions. In parallel, comparable realistic neuronal networks are generated with NETMORPH simulator and similar analysis is done on them. To describe the dynamics, network spike trains are simulated using different network structures and their bursting behaviors are analyzed. For the simulation of the network activity the Izhikevich model of spiking neurons is used together with the Tsodyks model of dynamical synapses. We show that the structure of the simulated neuronal networks affects the spontaneous bursting activity when measured with bursting frequency and a set of intraburst measures: the more locally connected produce more and longer bursts than the more random networks. The information diversity of the structure of a network is greatest in the most locally connected, smallest in random networks, and somewhere in between in the networks between order and disorder. As for the dynamics, the most locally connected and some of the in-between networks produce the most complex intraburst spike trains. The same result also holds for sparser of the two considered network densities in the case of full spike trains.

General information
Publication status: Published

MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics, Research group: Computational Neuro Science-CNS, Research group: Algebraic and Algorithmic Methods in Signal Processing AAMSP, Research group: Computational Systems Biology, Multi-scaled biodata analysis and modelling (MultiBAM), Prostate cancer research center (PCRC)
Contributors: Mäki-Marttunen, T., Acimovic, J., Nykter, M., Kesseli, J., Ruohonen, K., Yli-Harja, O., Linne, M.
Number of pages: 17
Pages: 1-17
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Frontiers in Computational Neuroscience
Volume: 5
Article number: 26
ISSN (Print): 1662-5188
Ratings:

Scopus rating (2011): CiteScore 3 SJR 1.514 SNIP 0.732
Original language: English
Electronic versions:

maki_marttunen_information_diversity_in_structure_and_dynamics.pdf
DOIs:

10.3389/fncom.2011.00026
URLs:

http://urn.fi/URN:NBN:fi:tty-201401161042

Bibliographical note
Ei UT-numeroa 5.4.2014
Contribution: organisation=sgn,FACT1=0.7
Contribution: organisation=mat,FACT2=0.3
Source: researchoutputwizard
Source ID: 6702
Research output: Contribution to journal › Article › Scientific › peer-review

Invertibility and Dedekind finiteness in structural matrix rings

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Foldes, S., Szigeti, J., van Wyk, L.
Pages: 221-227
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Linear and Multilinear Algebra
Volume: 59
Issue number: 2
ISSN (Print): 0308-1087
Ratings:

Scopus rating (2011): CiteScore 0.85 SJR 0.819 SNIP 1.147
Original language: English
DOIs:

10.1080/03081080903357653
URLs:

http://www.tandfonline.com/toc/glma20/59/2

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5946
Research output: Contribution to journal › Article › Scientific › peer-review

Korkeakoulumatematiikka teekkarin kompastuskivenä?

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Silius, K., Pohjolainen, S., Miilumäki, T., Kangas, J., Joutsenlahti, J.
Pages: 242-265
Publication date: 2011

Host publication information
Title of host publication: Korkeajännityksiä - kohti osallisuutta luovaa korkeakoulutusta
Place of publication: Tampere
Publisher: Tampere University Press
Editors: Mäkinen, M., Korhonen, V., Annala, J., Kalli, P., Svärd, P., Värri, V.
ISBN (Print): 978-951-44-8610-4
URLs:
http://www.campusconexus.fi/Portals/conexus/dokumentit/Korkeaj%C3%A4nnityksi%C3%A4-Kohti_osallisuutta_luovaa_korkeakoulutusta_2011_20111021.pdf

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 7261
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Learner Control and Responsibility: Expanding the Concept of Self-direction in Hihger Education

General information
Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Contributors: Väljataga, T.
Number of pages: 167
Publication date: 2011

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-2512-4
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 946
ISSN (Print): 1459-2045

Bibliographical note
Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source ID: 7474
Research output: Book/Report › Doctoral thesis › Collection of Articles

Linear Equation Solvers: Comparison of LU Decomposition and a Robust ODE Solver

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Pohjolainen, S., Nortunen, H.
Pages: 77-80
Publication date: 2011

Host publication information

Title of host publication: Proceedings of CAO2011 ECCOMAS Thematic Conference on Computational Analysis and Optimization, Jyväskylä, Finland, 9.6.-11.6.2011. Reports of the Department of Mathematical Information Technology. Series A Collections
Place of publication: Jyväskylä
Publisher: University of Jyväskylä
Editors: Repin, S., Tiihonen, T., Tuovinen, T.
ISBN (Print): 978-951-39-4331-8

Publication series
Name: CAO ECCOMAS Thematic Conference on Computational Analysis and Optimization
Publisher: University of Jyväskylä
No.: 1/2011
ISSN (Print): 1456-4351

Bibliographical note
ei ut-numeroa 3.5.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7030
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Maaliskuun puheenaihe: Mielenkiintoista matematiikkaa opetukseen LUMA-sanomat

General information
Publication status: Published
MoE publication type: E1 Popularised article, newspaper article
Organisations: Department of Mathematics
Contributors: Eriksson, S.
Number of pages: 3
Pages: 1-3
Publication date: 2011
Peer-reviewed: Unknown

Publication information
Journal: LUMA-sanomat
Issue number: Maaliskuu
ISSN (Print): 1799-3385
Original language: Finnish
URLs:

http://www.luma.fi/uutiskirje/?q=Sirkka-Liisa+Eriksson

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5918
Research output: Contribution to journal › Article › General public

Matematiikkaklinikka

General information
Publication status: Published
MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material
Organisations: Department of Mathematics
Contributors: Kangas, J.
Pages: 56-60
Publication date: 2011

Host publication information
Title of host publication: Oppaiden opas - vinkkejä opetukseen opintopolun eri vaiheissa. Aalto-yliopiston julkaisusarja Tiede + Teknologia
Place of publication: Helsinki
Publisher: Aalto-yliopisto
Editor: Myller, E.
ISBN (Print): 978-952-60-4185-8
URLs:

http://lib.tkk.fi/TIEDE_TEKNOLOGIA/2011/isbn9789526041865.pdf

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 6282
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

Math-Bridge - Eurooppalainen silta lukio- ja korkeakoulumatematiikan välille

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Miilumäki, T., Pohjolainen, S., Silius, K., Nykänen, O., Kangas, J.
Pages: 70-71
Publication date: 2011

Host publication information
Title of host publication: ITK 2011, Interaktiivinen Tekniikka Koulutuksessa -konferenssi 2011 - Uutuuden viehätystä, ideoiden kierrätystä, Hämeenlinna, 6.-8.4.2011. Hämeen kesäyliopiston julkaisuja. Sarja B
Place of publication: Hämeenlinna
Publisher: Hämeen kesäyliopisto
Editors: Leinamo, S., Salo, H.

Publication series
Name: ITK Interaktiivinen Tekniikka Koulutuksessa -konferenssi
Publisher: Hämeen kesäyliopisto

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 6808
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Mean value properties for K-hypermonogenic functions

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Number of pages: 11
Pages: 1-11
Publication date: 2011

Host publication information
Title of host publication: 9th International Conference on Clifford Algebras and their Applications in Mathematical Physics 15 - 20 July 2011, Weimar, Germany
Place of publication: Weimar
Publisher: ICCA9
Editor: Gurlebeck, K.

Publication series
Name: International Conference on Clifford Algebras and their Applications in Mathematical Physics
Publisher: ICCA9

Bibliographical note
ei ut-numeroa 1.3.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5921
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Miten opiskella matematiikkaa yliopistossa - opas opiskelijoille

General information
Publication status: Published
MoE publication type: D2 Article in professional manuals or guides or professional information systems or text book material
Organisations: Department of Mathematics
Contributors: Kailanto, M.
Pages: 53-55
Publication date: 2011

Host publication information
Title of host publication: Oppaiden opas - vinkkejä opetukseen opintopolun eri vaiheissa. Aalto-yliopiston julkaisusarja Tiede + Teknologia
Place of publication: Helsinki
Publisher: Aalto-yliopisto
Editor: Myller, E.
ISBN (Print): 978-952-60-4185-8
URLs:

http://lib.tkk.fi/TIEDE_TEKNOLOGIA/2011/isbn9789526041865.pdf

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 6261
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Professional

Mixture surrogate models based on Dempster-Shafer theory for global optimization problems
Recent research in algorithms for solving global optimization problems using response surface methodology has shown that it is in general not possible to use one surrogate model for solving different kinds of problems. In this paper the approach of applying Dempster-Shafer theory to surrogate model selection and their combination is described. Various conflict redistribution rules have been examined with respect to their influence on the results. Furthermore, the implications of the surrogate model type, i.e. using combined, single or a hybrid of both, have been studied. The suggested algorithms were applied to several well-known global optimization test problems. The results indicate that the used approach leads for all problems to a thorough exploration of the variable domain, i.e. the vicinities of global optima could be detected, and that the global minima could in most cases be approximated with high accuracy.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Muller, J., Piche, R.
Number of pages: 26
Pages: 79-104
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Global Optimization
Volume: 51
Issue number: 1
ISSN (Print): 0925-5001
Ratings:

Scopus rating (2011): CiteScore 1.28 SJR 1.07 SNIP 1.388
Original language: English
Electronic versions:

muller_piche_mixture_surrogate_models.pdf
DOIs:

10.1007/s10898-010-9620-y
URLs:

http://urn.fi/URN:NBN:fi:tty-201311011411

Bibliographical note
Online first
Contribution: organisation=mat,FACT1=1

Source: researchoutputwizard
Source ID: 6831
Research output: Contribution to journal › Article › Scientific › peer-review

Mobile Tracking in Mixed Line-ofsight/Non-line-of-sight Conditions: Algorithms and Theoretical Lower Bound. Chapter 21

General information
Publication status: Published
MoE publication type: B2 Part of a book or another research book
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Liang, C., Ali-Löytty, S., Piche, R., Lenan, W.
Pages: 685-708
Publication date: 2011

Host publication information
Title of host publication: Handbook of Position Location: Theory, Practice and Advances
Place of publication: Hoboken, NJ
Publisher: WILEY-IEEE PRESS
Editors: Zekavat, R., Buehrer, R. M.
ISBN (Print): 978-0-470-94342-7

Bibliographical note
ei ut-numeroa 5.4.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6608
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific

Modeling of Neuronal Growth In Vitro: Comparison of Simulation Tools NETMORPH and CX3D
We simulate the growth of neuronal networks using the two recently published tools, NETMORPH and CX3D. The goals of the work are (1) to examine and compare the simulation tools, (2) to construct a model of growth of neocortical cultures, and (3) to characterize the changes in network connectivity during growth, using standard graph theoretic methods. Parameters for the neocortical culture are chosen after consulting both the experimental and the computational work presented in the literature. The first (three) weeks in culture are known to be a time of development of extensive dendritic and axonal arbors and establishment of synaptic connections between the neurons. We simulate the growth of networks from day 1 to day 21. It is shown that for the properly selected parameters, the simulators can reproduce the experimentally obtained connectivity. The selected graph theoretic methods can capture the structural changes during growth.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics, Research group: Computational Neuro Science-CNS, Research group: Algebraic and Algorithmic Methods in Signal Processing AAMSP, Research group: Computational Systems Biology
Contributors: Acimovic, J., Mäki-Marttunen, T., Havela, R., Teppola, H., Linne, M.
Number of pages: 13
Pages: 1-13
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Eurasip Journal on Bioinformatics and Systems Biology
Volume: 2011
Article number: 616382
ISSN (Print): 1687-4145
Ratings:

Scopus rating (2011): CiteScore 0.81 SJR 0.508 SNIP 0.728
Original language: English
Electronic versions:

acimovic_modeling_of_neuronal_growth_in_vitro.pdf
DOIs:

10.1155/2011/616382
URLs:

http://urn.fi/URN:NBN:fi:tty-201401161041

Bibliographical note
ei ut-numeroa 12.10.2013
Contribution: organisation=sgn,FACT1=0.9
Contribution: organisation=mat,FACT2=0.1
Source: researchoutputwizard
Source ID: 5647
Research output: Contribution to journal › Article › Scientific › peer-review

Modifications of the 85/85 test and the temperature cycling test for tantalum capacitors

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Electronics, Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact), Sensing Systems for Wireless Medicine (MediSense)
Contributors: Virkki, J., Sydänheimo, L., Raumonen, P.
Pages: 168-176
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Soldering and Surface Mount Technology
Volume: 23
Issue number: 3
ISSN (Print): 0954-0911
Ratings:
Scopus rating (2011): CiteScore 0.67 SJR 0.157 SNIP 0.57
Original language: English
DOIs:
10.1108/09540911111146926

Bibliographical note
Tulospisteet 90 % ELE / 10 % MAT
Contribution: organisation=ele,FACT1=0.9
Contribution: organisation=mat,FACT2=0.1
Source: researchoutputwizard
Source ID: 7523
Research output: Contribution to journal › Article › Scientific › peer-review

Motivating the Mathematics Studies by Real-life Examples of Signal Processing and Communications Engineering

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MMDM, Department of Signal Processing, Department of Communications Engineering, Department of Mathematics, Research group: Wireless Communications and Positioning, Research group: Vision, Research Community on Data-to-Decision (D2D), Wireless Communications and Positioning (WICO)
Contributors: Huttunen, H., Valkama, M., Talvitie, J., Laaksonen, M.
Number of pages: 6
Pages: 1-6
Publication date: 2011

Host publication information
Title of host publication: 2011 IEEE Digital Signal Processing Workshop and IEEE Signal Processing Education Workshop (DSP/SPE), Sedona, USA, 4-7 January 2011
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-61284-226-4

Publication series
Name: IEEE Digital Signal Processing Workshop and IEEE Signal Processing Education Workshop DSP/SPE
Publisher: IEEE
DOIs:
10.1109/DSP-SPE.2011.5739213

Bibliographical note
Contribution: organisation=sgn,FACT1=0.34
Contribution: organisation=tlt,FACT2=0.33
Contribution: organisation=mat,FACT3=0.33
Source: researchoutputwizard
Source ID: 6136
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Multimodal inverse problems: maximum compatibility estimate and shape reconstruction

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Contributors: Kaasalainen, M.
Pages: 37-57
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Inverse Problems and Imaging
Volume: 5
Issue number: 1
ISSN (Print): 1930-8337
Ratings:

Scopus rating (2011): CiteScore 0.96 SJR 0.647 SNIP 1.16
Original language: English
DOIs:

10.3934/ipi.2011.5.37

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6255
Research output: Contribution to journal › Article › Scientific › peer-review

Non-classical Logics with Real Life Applications

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Turunen, E.
Pages: 171-178
Publication date: 2011

Host publication information
Title of host publication: Proceedings of International Conference of Rough Sets, Fuzzy Sets and Soft Computing ICRSFSSC-2009, November 5-7 2009, Tripura University
Place of publication: New Delhi
Publisher: Serial Publications
ISBN (Print): 978-81-8387-417-5

Publication series
Name: International Conference of Rough Sets, Fuzzy Setsand Soft Computing ICRSFSSC
Publisher: Serial Publications

Bibliographical note
First published 2011
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7427
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

On Fractional Ornstein-Uhlenbeck Process

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Kaarakka, T., Salminen, P.
Pages: 121-133
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Communications on Stochastic Analysis
Volume: 5
Issue number: 1
ISSN (Print): 0973-9599
Original language: English

Bibliographical note
ei ut-numeroa 22.3.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6253
Research output: Contribution to journal › Article › Scientific › peer-review

On the distribution of coefficients of powers of positive polynomials

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Major, L.
Pages: 239-243
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Australasian Journal of Combinatorics
Volume: 49
ISSN (Print): 1034-4942
Ratings:

Scopus rating (2011): CiteScore 0.28 SJR 0.414 SNIP 0.685
Original language: English

Bibliographical note
ei ut-numeroa 5.4.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6694
Research output: Contribution to journal › Article › Scientific › peer-review

Perturbation of strongly and polynomially stable Riesz-spectral operators
In this paper we consider bounded and relatively bounded finite rank perturbations of a Riesz-spectral operator generating a polynomially stable semigroup of linear operators on a Hilbert space. We concentrate on a commonly encountered situation where the spectrum of the unperturbed operator is contained in the open left half-plane of the complex plane and approaches the imaginary axis asymptotically. We present conditions on the perturbing operator such that the spectrum of the perturbed operator is contained in the open left half-plane of the complex plane and additional conditions for the strong and polynomial stabilities of the perturbed semigroup. We consider two applications of the perturbation results. In the first example we apply the results to the perturbation of a polynomially stabilized one-dimensional wave equation. In the second example we consider perturbation of a closed-loop system consisting of a distributed parameter system and an observer-based feedback controller solving the robust output regulation problem related to an infinite-dimensional signal generator.

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Pages: 234-248

Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Systems and Control Letters
Volume: 60
Issue number: 4
ISSN (Print): 0167-6911
Ratings:

Scopus rating (2011): CiteScore 2.58 SJR 2.148 SNIP 1.943
Original language: English
Electronic versions:

paunonen_perturbation_of_strongly.pdf
DOIs:

10.1016/j.sysconle.2011.01.005
URLs:

http://urn.fi/URN:NBN:fi:tty-201401101032

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6975
Research output: Contribution to journal › Article › Scientific › peer-review

Plotting root-locus of infinite-dimensional systems

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Laakkonen, P.
Pages: 139-142
Publication date: 2011

Host publication information
Title of host publication: Proceedings of CAO2011 ECCOMAS Thematic Conference on Computational Analysis and Optimization, Jyväskylä, Finland, 9.6.-11.6.2011. Reports of the Department of Mathematical Information Technology. Series A Collections
Place of publication: Jyväskylä
Publisher: University of Jyväskylä
Editors: Repin, S., Tiihonen, T., Tuovinen, T.
ISBN (Print): 978-951-39-4331-8

Publication series
Name: CAO ECCOMAS Thematic Conference on Computational Analysis and Optimization
Publisher: University of Jyväskylä
No.: 1/2011
ISSN (Print): 1456-4351

Bibliographical note
ei ut-numeroa 29.3.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6488
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Properties of duration drift

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Industrial Management, Department of Mathematics
Contributors: Kanniainen, J., Ruohonen, K.
Pages: 176-191
Publication date: 2011

Peer-reviewed: Yes

Publication information
Journal: International Journal of Economics and Business Research
Volume: 3
Issue number: 2
ISSN (Print): 1756-9850
Original language: English

Bibliographical note
ei ut-numeroa 22.3.2014
Contribution: organisation=tta,FACT1=0.8
Contribution: organisation=mat,FACT2=0.2
Source: researchoutputwizard
Source ID: 6285
Research output: Contribution to journal › Article › Scientific › peer-review

Puuvirta-virtuaalinen ja simuloitu oppimisympäristö

General information
Publication status: Published
MoE publication type: I2 ICT software
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Contributors: Kortemaa, A., Moisio, M., Punki, J., Palonen, T., Ranta, P., Leino, T., Alarotu, V., Koskinen, K. T., Tohu, J.
Publication date: 2011
Media of output: Other
URLs:

https://wiki.tut.fi/SmartSimulators/

Bibliographical note
Yhteistyö TAMK:n, Hypermedialaboratorion sekä Hydrauliikan ja automatiikan laitoksen kanssa
Contribution: organisation=mat hyplab,FACT1=0.5
Contribution: organisation=iha,FACT2=0.5
Source: researchoutputwizard
Source ID: 6426
Research output: Artistic and non-textual form › Software › Scientific

Rank Based Fingerprinting Algorithm for Indoor Positioning
This paper describes a novel RSS rank based fingerprinting algorithm for indoor positioning. Because RSS rank is invariant to bias and scaling, the algorithm provides the same accuracy for any receiver device, without the need for calibration. Similarity metrics to compare ranked vectors are introduced and their impact on positioning accuracy is investigated in experiments. Experimental results shown that the algorithm can achieve better accuracy than some commonly used fingerprinting algorithms.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Machaj, J., Brida, P., Piche, R.
Number of pages: 6
Pages: 1-6
Publication date: 2011

Host publication information
Title of host publication: 2011 International Conference on Indoor Positioning and Indoor Navigation IPIN, 21-23 September 2011, Guimarães, Portugal
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4577-1805-2

Publication series
Name: International Conference on Indoor Positioning and Indoor Navigation IPIN
Publisher: IEEE
Electronic versions:

machaj_rank_based_fingerprinting_algorithm_for_indoor_positioning.pdf
DOIs:

10.1109/IPIN.2011.6071929
URLs:
http://urn.fi/URN:NBN:fi:tty-201406191310

Bibliographical note
ei ut-numeroa 5.4.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6680
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robust estimation of a reception region from location fingerprints

A method for fitting an ellipse-shaped reception region to a set of location-stamped radio signal reception reports, or location fingerprints, is presented. Reports are modelled as having a multivariate Student distribution. The method is less sensitive to outliers than existing smallest-enclosing ellipse and Normal-distribution based methods. A Gibbs sampling algorithm and an Expectation-Maximisation algorithm to compute ellipse parameters are presented.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Contributors: Piche, R.
Pages: 31-35
Publication date: 2011

Host publication information
Title of host publication: 2011 International Conference on Localization and GNSS ICL-GNSS June 29-30, 2011 Tampere, Finland
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4577-0186-3

Publication series
Name: International Conference on Localization and GNSS ICL-GNSS
Publisher: IEEE
Electronic versions:
piche_robust_estimation_of_a_reception_region_from_location_fingerprints.pdf
DOIs:
10.1109/ICL-GNSS.2011.5955261
URLs:
http://ieeexplore.ieee.org/
http://urn.fi/URN:NBN:fi:tty-201406191311

Bibliographical note
ei ut-numeroa 3.5.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7015
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Robust output regulation and the internal model principle

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Contributors: Paunonen, L.
Pages: 71-75
Publication date: 2011

Host publication information
Title of host publication: Digest of TISE Seminar 2011. TISE publications
Place of publication: Tampere
Publisher: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology
Editor: Niemistö, A.

ISBN (Print): 978-952-15-2557-5

Publication series
Name: TISE Seminar
Publisher: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology
Volume: 10
ISSN (Print): 1458-8463

Bibliographical note
ei ut-numeroa 26.4.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6976
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Social Media, Reputation And Branding Of Innovation Hubs: A Periscope Using Content Analysis Of Twitter

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Yu, J. (., Russell, M. G., Still, K., Rubens, N., Huhtamäki, J., Pöschko, J.
Number of pages: 20
Pages: 1-20
Publication date: 2011

Host publication information
Title of host publication: Proceedings of the Triple Helix IX International Conference: Silicon Valley: Global Model or Unique Anomaly? 11-14 July, 2011, Stanford, California, USA
Place of publication: Stanford, CA
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication

Publication series
Name: Triple Helix International Conference
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication
URLs:
http://www.leydesdorff.net/th9/Social%20media,%20reputation%20and%20branding%20of%20innovation%20hubs.pdf

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 7587
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Social media-supported indicators for user-driven service innovation

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Still, K., Isomursu, M., Koskela-Huotari, K., Huhtamäki, J.
Pages: 208-217
Publication date: 2011

Host publication information
Title of host publication: Proceedings of VTT Symposium on Service Innovation, August 18, 2011, Espoo, Finland. VTT Symposium
Place of publication: Espoo
Publisher: VTT Technical Research Centre of Finland
ISBN (Print): 978-951-38-7607-4

Publication series
Name: VTT Symposium on Service Innovation
Publisher: VTT Technical Research Centre of Finland
Volume: 271
ISSN (Print): 1455-0873

URLs:
http://www.vtt.fi/inf/pdf/symposiums/2011/S271.pdf

Bibliographical note
ei ut-numeroa 17.5.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 7310
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Some remarks on structural matrix rings and matrices with ideal entries

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Foldes, S., Meletiou, G.
Pages: 25-29
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Miskolc Mathematical Notes
Volume: 12
Issue number: 1
ISSN (Print): 1787-2405
Ratings:
Scopus rating (2011): CiteScore 0.15 SJR 0.107 SNIP 0.063
Original language: English
URLs:
http://mat76.mat.uni-miskolc.hu/~mnotes/contents.php?number=+1+&volume=12#number

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 5945
Research output: Contribution to journal › Article › Scientific › peer-review

Studying the quality of noise in a large biochemical reaction network as a function of the system volume

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Signal Processing, Department of Mathematics, Research group: Computational Neuro Science-CNS, Research group: Computational Systems Biology, Department of Signal Processing
Contributors: Intosalmi, J., Manninen, T., Ruohonen, K., Linne, M.
Pages: 409
Publication date: 2011

Host publication information
Title of host publication: The International Conference on Applied Mathematics, Modeling and Computational Science, AMMCS 2011, 25 - 29 July, Waterloo, Ontario, Canada
Place of publication: Waterloo, Ontario, Canada
Publisher: AMMCS 2011

Publication series
Name: International Conference on Applied Mathematics, Modeling and Computational Science AMMCS
Publisher: AMMCS 2011

Bibliographical note
ei ut-numeroa 15.3.2014
Contribution: organisation=sgn,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source ID: 6172
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Teleconsultation: Changes in technology and costs over a 12-year period

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics
Contributors: Lamminen, J., Forsvik, H. J., Voipio, V., Ruohonen, K.
Pages: 412-416
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Journal of Telemedicine and Telecare
Volume: 17
Issue number: 8
ISSN (Print): 1357-633X
Ratings:

Scopus rating (2011): CiteScore 1.61 SJR 0.605 SNIP 1.054
Original language: English
DOIs:

10.1258/jtt.2011.110211

Bibliographical note
Contribution: organisation=sgn,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source ID: 6542
Research output: Contribution to journal › Article › Scientific › peer-review

The root-locus analysis: An outline

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Contributors: Laakkonen, P.
Number of pages: 4
Pages: 1-4
Publication date: 2011

Host publication information
Title of host publication: TISE Seminar 2011, Tampere, 25.5.2011. Digest of TISE Seminar 2011
Place of publication: Tampere
Publisher: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology
Editor: Niemistö, A.
ISBN (Print): 978-952-15-2557-5

Publication series
Name: TISE Seminar
Publisher: Tampere Graduate School in Information Science and Engineering (TISE). Tampere University of Technology
Volume: 10
ISSN (Print): 1458-8463

Bibliographical note
ei ut-numeroa 29.3.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 6489
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Transforming Innovation Ecosystems through Shared Vision and Network Orchestration

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication

Organisations: Department of Mathematics
Contributors: Russell, M. G., Still, K., Huhtamäki, J., Yu, J. (., Rubens, N.
Number of pages: 21
Pages: 1-21
Publication date: 2011

Host publication information
Title of host publication: Proceedings of the Triple Helix IX International Conference: Silicon Valley: Global Model or Unique Anomaly? 11-14 July, 2011, Stanford, California, USA
Place of publication: Stanford, CA
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication

Publication series
Name: Triple Helix International Conference
Publisher: Stanford University, H-STAR Institute Center for Innovation and Communication
URLs:

http://www.leydesdorff.net/th9/3NWAFYZH9_Russell.pdf

Bibliographical note
ei ut-numeroa 3.5.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 7157
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Utilization of the hydraulic engineering design information for semi-automatic simulation model generation

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Contributors: Markkula, M., Rokala, M., Palonen, T., Alarotu, V., Helminen, M., Koskinen, K. T., Salonen, J., Nykänen, O., Ranta, P., Pohjolainen, S.
Pages: 443-458
Publication date: 2011

Host publication information
Title of host publication: The Twelfth Scandinavian International Conference on Fluid Power, SICFP'11, May 18-20, 2011, Tampere, Finland
Place of publication: Tampere
Publisher: Scandinavian International Conference on Fluid Power
Editors: Sairala, H., Koskinen, K. T.
ISBN (Print): 978-952-15-2520-9

Publication series
Name: Scandinavian International Conference on Fluid Power SICFP
Publisher: Scandinavian International Conference on Fluid Power
Volume: 12
No.: 3

Bibliographical note
ei ut-numeroa 9.4.2014
Contribution: organisation=iha,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source ID: 6748
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Virtual machine laboratory based on m1-technology

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Contributors: Helminen, M., Palonen, T., Rokala, M., Ranta, P., Mäkelä, T., Koskinen, K. T.
Pages: 321-334
Publication date: 2011

Host publication information
Title of host publication: The Twelfth Scandinavian International Conference on Fluid Power, SICFP'11, May 18-20, 2011, Tampere, Finland
Place of publication: Tampere
Publisher: Scandinavian International Conference on Fluid Power

Publication series
Name: Scandinavian International Conference on Fluid Power SICFP
Publisher: Scandinavian International Conference on Fluid Power
Volume: 12

Bibliographical note
ei ut-numeroa 8.3.2014
Contribution: organisation=iha,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source ID: 6077
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

VRTUOSI: Courses Data Mining and Many-valued Similarities: Universidad Rey Juan Carlos

General information
Publication status: Published
MoE publication type: I1 Audiovisual material
Organisations: Department of Mathematics
Contributors: Turunen, E.
Publication date: 2011
Media of output: Online
URLs:

http://www.vrtuosi.com/news-flash/vrtuosi-website-launch

Bibliographical note
Virtual Learning Courses
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7428
Research output: Artistic and non-textual form › Digital or Visual Products › Scientific

What can be done to bridge the competency gap between upper-secondary school and university mathematics?

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Contributors: Silius, K., Pohjolainen, S., Kangas, J., Miilumäki, T., Joutsenlahti, J.
Pages: 428-436
Publication date: 2011

Host publication information
Title of host publication: 2011 IEEE Global Engineering Education Conference EDUCON, 4-6 April 2011, Amman, Jordania
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-61284-642-2

Publication series
Name: IEEE Global Engineering Education Conference EDUCON
Publisher: IEEE
DOIs:

10.1109/EDUCON.2011.5773172

Bibliographical note
ei ut-numeroa 17.5.2014
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 7260
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

New perspectives in hyperbolic function theory

In this thesis we are working with a function theory on the hyperbolic upper-half space. The function theory is called the hyperbolic function theory and it is studied since 1990's by Heinz Leutwiler and Sirkka-Liisa Eriksson. The advantage of the hyperbolic function theory is that positive and negative powers of hypercomplex variables are included to the theory. Thus the hyperbolic function theory offers a natural generalization of classical complex analysis.

General information

Publication status: Published
MoE publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Contributors: Orelma, H.
Number of pages: 37
Publication date: 28 Apr 2010

Publication information

Place of publication: Tampere
Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-2365-6
ISBN (Electronic): 978-952-15-2390-8
Original language: English

Publication series

Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 892
ISSN (Print): 1459-2045
Electronic versions:

orelma.pdf
URLs:

http://urn.fi/URN:NBN:fi:tty-201006031139

Bibliographical note

Awarding institution:Tampere University of Technology
Source: researchoutputwizard
Source ID: 8907
Research output: Book/Report › Doctoral thesis › Collection of Articles

A hyperbolic interpretation of Cauchy type kernels in hyperbolic function theory

General information

Publication status: Published
MoE publication type: D4 Published development or research report or study
Organisations: Department of Mathematics
Contributors: Eriksson, S., Orelma, H.
Publication date: 2010

Publication information

Place of publication: Tampere
Publisher: Unknown Publisher
ISBN (Print): 978-952-15-2334-2
Original language: English

Publication series

Name: Tampereen teknillinen yliopisto. Matematiikan laitos. Tutkimusraportti
Volume: 96
ISSN (Print): 1459-3750

Bibliographical note

Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7883
Research output: Book/Report › Commissioned report › Professional

Akustinen mallinnus

General information
Publication status: Published
MoE publication type: B2 Part of a book or another research book
Organisations: Department of Mathematics
Contributors: Pohjolainen, S., Suutala, A.
Pages: 238-259
Publication date: 2010

Host publication information
Title of host publication: Matemaattinen mallinnus
Place of publication: Helsinki
Publisher: WSOYpro
Editor: Pohjolainen, S.
ISBN (Print): 978-951-0-35408-7

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 9008
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific

A motion model for articulated vehicles and a distributed acceleration measurement system

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Sirola, N., Rouhe, J.
Pages: 164-167
Publication date: 2010

Host publication information
Title of host publication: Proceedings of the 7th Workshop on Positioning, Navigation and Communication 2010 WPNC'10, 11-12 March 2010, Dresden, Germany
ISBN (Print): 978-1-4244-7157-7
DOIs:
10.1109/WPNC.2010.5650556

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 9290
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Approximative solutions to the bicriterion Vechile Routing Problem with Time Windows

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Muller, J.
Pages: 223-231
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: European Journal of Operational Research
Volume: 202
Issue number: 1
ISSN (Print): 0377-2217
Ratings:

Scopus rating (2010): SJR 2.383 SNIP 2.445
Original language: English
DOIs:

10.1016/j.ejor.2009.04.029

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 8814
Research output: Contribution to journal › Article › Scientific › peer-review

Bayesian assaying of GUHA nuggets

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: Positioning
Contributors: Piche, R., Turunen, E.
Pages: 348-355
Publication date: 2010

Host publication information
Title of host publication: Information Processing and Management of Uncertainty in Knowledge-Based Systems. Theory and Methods, 13th International Conference, IPMU 2010, Dortmund, Germany, June 28 - July 2, 2010. Communications in Computer and Information Science
Editors: Hüllermeier, E., Kruse, R., Hoffmann, F.
ISBN (Print): 978-3-642-14054-9
DOIs:

10.1007/978-3-642-14055-6_36

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 8997
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Bayesian Methods
Bayesian statistical methods are widely used in many science and engineering areas including machine intelligence, expert systems, medical imaging, pattern recognition, decision theory, data compression and coding, estimation and prediction, bioinformatics, and data mining. These course notes present the basic principles of Bayesian statistics. The first sections explain how to estimate parameters for simple standard statistical models (normal, binomial, Poisson, exponential), using both analytical formulas and the free WinBUGS data modelling software. This software is then used to explore multivariate hierarchical problems that arise in real applications. Advanced topics include decision theory, missing data, change point detection, model selection, and MCMC computational algorithms. Students are assumed to have knowledge of basic probability. A standard introductory course in statistics is useful but not necessary. Additional course materials (exercises, recorded lectures, model exams) are available at http://math.tut.fi/~piche/bayes

General information
Publication status: Published
MoE publication type: D5 Text book, professional manual or guide or a dictionary
Organisations: Department of Mathematics, Research group: Positioning
Contributors: Penttinen, A., Piche, R.
Number of pages: 82
Publication date: 2010

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
Original language: English
Electronic versions:

bayesian_methods.pdf
URLs:

http://urn.fi/URN:NBN:fi:tty-201012161393

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 8978
Research output: Book/Report › Book › Professional

Box Gaussian mixture filter

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Ali-Löytty, S.
Pages: 2165-2169
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 55
Issue number: 9
ISSN (Print): 0018-9286
Ratings:

Scopus rating (2010): SJR 2.752 SNIP 2.832
Original language: English
DOIs:

10.1109/TAC.2010.2051486

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7672
Research output: Contribution to journal › Article › Scientific › peer-review

Briefly about the root-locus of linear systems

General information
Publication status: Published
MoE publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Contributors: Laakkonen, P.
Number of pages: 6
Pages: 101-106
Publication date: 2010

Host publication information
Title of host publication: Digest of TISE Seminar 2010, Ylöjärvi, Finland, 26.5.2010. TISE Publications
Editor: Koivisto, P.
ISBN (Print): 978-952-15-2368-7

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 8513
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific

Closed classes of functions, generalized constraints, and clusters

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Lehtonen, E.
Pages: 203-234

Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Algebra Universalis
Volume: 63
Issue number: 2-3
ISSN (Print): 0002-5240
Ratings:

Scopus rating (2010): SJR 0.638 SNIP 1.103
Original language: English
DOIs:

10.1007/s00012-010-0071-6

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 8597
Research output: Contribution to journal › Article › Scientific › peer-review

Closed-form algorithms in mobile positioning: Myths and misconceptions

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Contributors: Sirola, N.
Pages: 38-44
Publication date: 2010

Host publication information
Title of host publication: Proceedings of the 7th Workshop on Positioning, Navigation and Communication 2010 WPNC'10, 11-12 March 2010, Dresden, Germany
ISBN (Print): 978-1-4244-7157-7
DOIs:

10.1109/WPNC.2010.5653789
URLs:

http://www.wpnc.net/fileadmin/WPNC10/Papers/printed.pdf

Bibliographical note
poistettu tupla r=3045, esitelmä http://math.tut.fi/posgroup/sirola-wpnc2010-slides.ppt
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 9289
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Column-partitioned matrices over rings without invertible transversal submatrices

General information
Publication status: Published
MoE publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Contributors: Foldes, S., Lehtonen, E.
Pages: 33-39
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Ars Combinatoria
Volume: 97
ISSN (Print): 0381-7032
Ratings:

Scopus rating (2010): SJR 0.322 SNIP 0.529

Original language: English

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 7914
Research output: Contribution to journal › Article › Scientific › peer-review

Comparing two stochastic differential equation models for protein kinase C activation pathway

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Department of Mathematics, Research group: Computational Systems Biology, Research group: Computational Neuro Science-CNS
Contributors: Intosalmi, J., Manninen, T., Ruohonen, K., Linne, M.
Pages: 139
Publication date: 2010

Host publication information
Title of host publication: Abstracts of Papers, Posters and Talks presented at the 2010 Joint RECOMB Satellite Conference on Systems Biology - Regulatory Genomics - DREAM5, New York, USA, 16-20 November 2010

Bibliographical note
Yhteisjulkaisu MAT kanssa
Contribution: organisation=sgn,FACT1=0.5
Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source ID: 8160
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review

Considering learners' perspectives to personal learning environments in course design

General information
Publication status: Published
MoE publication type: A3 Part of a book or another research book
Organisations: Former organisation of the author
Contributors: Väljataga, T., Pata, K., Tammets, K.
Number of pages: 24
Pages: 85-108
Publication date: 2010

Host publication information
Title of host publication: WEB 2.0 Based E-Learning: Applying Social Informatics for Tertiary Teaching
Place of publication: Hershey
Publisher: IGI Global
Editor: Lee, M.

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source ID: 9503
Research output: Chapter in Book/Report/Conference proceeding › Chapter › Scientific › peer-review

Context-Driven Social Network Visualisation: Case Wiki Co-Creation
Along social media and Web 2.0, the amount of data sources potentially available for social network visualisation has snowballed. Recent development on information visualisation technologies contribute to the availability of tools enabling visualisation of social media data. Yet, applying the tools in diff erent usage contexts is often diffcult. The data formats vary and many of the tools are platform-specific. Potential tools each have their strengths but often a single tool is not suffcient for covering all the aspects of analysis. In this paper, we describe the means of applying component-based information visualisation to streamline social network visualisation. Further, through our approach, we seek to narrow the gap between everyday knowledge work and visual social network analysis of the data that knowledge workers process. We acknowledge the need of programming skills in introducing the visualisations to different usage contexts but yet we see that teams of analysts can apply the approach when conducting network analysis in varying contexts. The main contributions of this article are the following: a description and an analysis of a streamlined social network visual analysis process and a brief review of the related applications and tools, based on the idea of conceptual integration of visual social

network analysis and augmented browsing.

General information
Publication status: Published
MoE publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Contributors: Huhtamäki, J., Salonen, J., Marttila, J., Nykänen, O.
Number of pages: 13
Pages: 1-13
Publication date: 2010

Host publication information
Title of host publication: Proceedings of the Knowledge Federation 2010: Self-Organizing Collective Mind, October 3-6, 2010, Dubrovnik, Croatia
Editors: Karabeg, D., Park, J.
Electronic versions:
huhtamaki_context_driven_social_network_visualisation.pdf
URLs:
http://ceur-ws.org/Vol-822/JH.pdf
http://urn.fi/URN:NBN:fi:tty-201201161008

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source ID: 8103
Research output: Chapter in Book/Report/Conference proceeding › Conference contribution › Scientific › peer-review