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.

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Scopus rating (2014): 2.105 1.911
Web of Science (2014): 2.059 2.448 9.5 0.147 0.01305 1.207
Publication Forum (2014): 2
Scopus rating (2013): 2.182 2.037
Publication Forum (2013): 2
Scopus rating (2012): 2.042 1.706
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Scopus rating (2011): 2.339 2.016
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Scopus rating (2008): 3.224 2.206
Scopus rating (2007): 2.49 1.754
Scopus rating (2006): 1.919 1.682
Scopus rating (2005): 1.214 1.515
Scopus rating (2004): 1.946 1.467
Scopus rating (2003): 2.546 1.748
Scopus rating (2002): 3.998 1.812
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Scopus rating (2000): 2.933 1.676
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Source: Scopus
Source-ID: 85016517305
Research output: Scientific - peer-review » Article
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 $S^kx_0$, $k \geq 0$, 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
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Web of Science (2015): 3.635 4.387 7.4 0.573 0.05102 1.834
Publication Forum (2015): 2
Web of Science (2014): 3.02 4.363 7.2 0.482 0.05195 1.751
Publication Forum (2014): 3
Publication Forum (2013): 3
Scopus rating (2012): 3.738 3.728
Publication Forum (2012): 3
Scopus rating (2011): 3.774 3.661
Scopus rating (2010): 2.734 2.921
Scopus rating (2008): 3.834 4.041
Scopus rating (2007): 3.401 2.957
Scopus rating (2006): 3.0 2.794
Scopus rating (2005): 1.847 2.505
Scopus rating (2004): 2.54 2.612
Scopus rating (2003): 2.753 2.445
Scopus rating (2002): 4.199 2.479
Scopus rating (2001): 3.545 2.833
Scopus rating (1999): 1.319 1.695
Original language: English
DOIs: 10.1016/j.automatica.2017.02.015
Source: Scopus
Source-ID: 85014150245
Research output: Scientific - peer-review › Article
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
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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 Information Network, International Occultation Timing Association (IOTA), RASNZ Occultation Section
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Scopus rating (2016): 2.246 1.16
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Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Scopus rating (2001): 1.555 0.727
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.

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.
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.

**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.
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.
Integral kernels for k-hypermonogenic functions

We consider the modified Cauchy–Riemann operator \((\partial_k)\) in the universal Clifford algebra \((\mathbb{C}^n)\) with the basis \((e_1, \ldots, e_n)\). The null-solutions of this operator are called k-hypermonogenic functions. We calculate the k-hyperbolic harmonic fundamental solutions, i.e., solutions to \((\partial_k)\), and use these solutions to find k-hypermonogenic kernels for a Cauchy-type integral formula in the upper half-space.
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.

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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.

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.
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 for meeting 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.
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.

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Web of Science (2015): 1.491 1.793 >10.0 0.147 0.01424 1.381
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Scopus rating (2014): 1.765 1.761
Web of Science (2014): 1.463 1.776 >10.0 0.11 0.01533 1.443
Publication Forum (2014): 2
Scopus rating (2013): 1.866 2.018
Publication Forum (2013): 2
Scopus rating (2012): 2.1 1.94
Publication Forum (2012): 2
Scopus rating (2011): 2.776 2.2
Scopus rating (2010): 1.836 2.06
Scopus rating (2009): 2.093 1.942
Scopus rating (2008): 2.228 1.83
Scopus rating (2007): 1.938 1.654
Scopus rating (2006): 1.95 2.088
Scopus rating (2005): 1.53 1.829
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.

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Source-ID: urn:2f5582c69455f55e5551e9f220081242
Research output: Scientific - peer-review › Chapter

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 \( \mathbb{R}^{n+1}=(x0,\ldots,xn)|x0\in\mathbb{R},x0>0 \). 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 \( x^m \) (\( m\in\mathbb{N}_0 \)), 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.

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Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Authors: Eriksson, S., Orelma, H.
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Peer-reviewed: Yes
Early online date: 22 Dec 2015
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.
Modelling anisotropy in non-oriented electrical steel sheet using vector Jiles-Atherton model

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Authors: Upadhaya, B., Martin, F., Rasilo, P., Handgruber, P., Belahcen, A., Arkkio, A.
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Scopus rating (2016): 0.212 0.429
Publication Forum (2016): 1
Scopus rating (2015): 0.237 0.549
Web of Science (2015): 0.43 0.4 6.2 0.038 0.00128 0.121
Publication Forum (2015): 1
Scopus rating (2014): 0.29 0.693
Web of Science (2014): 0.371 0.332 6.2 0.075 0.00117 0.109
Publication Forum (2014): 1
Scopus rating (2013): 0.202 0.53
Publication Forum (2013): 1
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 $\kappa$-hypermonogenic functions. In order to do that we will solve a Vekua-type system in terms of Bessel functions.

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Organisations: Department of Mathematics, Research group: MAT Clifford analysis, Department of Mathematics, CIDMA, Center for Research and Development in Mathematics and Applications
Authors: Eriksson, S., Orelma, H., Vieira, N.
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Scopus rating (2016): 0.353 1.199
Publication Forum (2016): 1
Scopus rating (2015): 0.313 1.091
Web of Science (2015): 0.905 0.675 4.3 0.226 6.9E-4 0.149
Publication Forum (2015): 1
Scopus rating (2014): 0.332 0.743
Web of Science (2014): 0.568 0.491 5.6 0.104 6.8E-4 0.149
Publication Forum (2014): 1
Scopus rating (2013): 0.433 1.215
Publication Forum (2013): 1
Scopus rating (2012): 0.593 0.96
Publication Forum (2012): 1
Scopus rating (2011): 0.4 0.95
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 $k \geq 3$. 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.

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Authors: Lauri, J.
Publication date: 15 Dec 2016
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RS-BL-algebras are MV-algebras
We prove that RS-BL-algebras are MV-algebras.
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 ds^2=x−2k^2(∑_i=0^2dx_i^2). 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 e_{12}=e_1e_2 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 \{x_0+x_1e_1+x_2e_2\}, where Qf is given by the decomposition f(x) = Pf(x) + Qf(x)e_{12} with Pf(x) and Qf(x) in C and Qf 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 (x_0 + x_1e_1 + x_2e_2) 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.

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.
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.

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Scopus rating (2015): 2.207 1.077
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

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
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 \((2 - \varepsilon)kN^{O(1)}\) 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 number.
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
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Authors: Lauri, J.
Number of pages: 67
Publication date: 3 Nov 2016

Publication information
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ISBN (Print): 978-952-15-3836-0
Original language: English

Publication series
Name: Tampere University of Technology. Publication
Volume: 1428
ISSN (Print): 1459-2045
Electronic versions:
lauri 1428
Links:
Research output: Collection of articles › Doctoral Thesis

Projektipankki yläkoulun matematiikkaan

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Mathematics
Authors: 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
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: Finnish
Research output: Professional › Article

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.
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.
Students’ Use of Learning Tools and Tool Types: Solving Self-Study Assignments on an Online Platform

Since 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.
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.
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

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Miskolc
Authors: Foldes, S., Radeleczki, S.
Keywords: (Balanced lattice, Closure system, Interval decomposition, Join-irreducible element, Semimodular lattice, Strong set)
Number of pages: 11
Pages: 271-281
MathCheck: a tool for checking math solutions in detail

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Authors: 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: Scientific - peer-review › Conference contribution

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 347:455–476, 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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling, St Giles
Authors: Batty, C., Paunonen, L., Seifert, D.
Keywords: (C-semigroups, Coupled, Energy, Heat equation, Rates of decay, Resolvent estimates, Wave equation)
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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Authors: Hansen, H., Valmari, A.
Number of pages: 14
Pages: 90-103
Publication date: Sep 2016
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.
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.
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.

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.
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.

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
State: Published
Ministry of Education 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
Authors: Raitoharju, M., Piché, R., Ala-Luhtala, J., Ali-Löytty, S.
Keywords: (math.OC, math.PR)
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:
Publication Forum (2017): 1
Scopus rating (2016): 0.187 1.321
Publication Forum (2016): 1
Scopus rating (2015): 0.149 0.452
Publication Forum (2014): 1
Scopus rating (2014): 0.27 1.953
Publication Forum (2013): 1
Original language: English
Links:

Bibliographical note
ORG=ase,0.75 ORG=mat,0.25
Source: ArXiv
Source-ID: http://arxiv.org/abs/1503.02857v1
Research output: Scientific - peer-review › Article

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
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Research area: Electromagnetics
Authors: Niemimäki, O., Kurz, S., Kettunen, L.
Publication date: 17 May 2016
Peer-reviewed: Yes

Publication information
Journal: Mathematics of Computation
ISSN (Print): 0025-5718
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 1.881 1.71
Publication Forum (2016): 3
Scopus rating (2015): 1.599 1.428
Two Consistent Many-Valued Logics for Paraconsistent Phenomena

General information
State: Published
Ministry of Education 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)
Authors: 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

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: Scientific - peer-review › Article
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 $\omega$, and the manipulation of the set $A$ of maximal $\omega$-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

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Authors: Piipponen, A., Valmari, A.
Keywords: (antichain data structure, coverability set, Tarjan's algorithm)
Number of pages: 22
Pages: 393-414
Publication date: 4 Mar 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Information Systems, Computational Theory and Mathematics, Theoretical Computer Science, Algebra and Number Theory

Publication information

Journal: Fundamenta Informaticae
Volume: 143
Issue number: 3-4
ISSN (Print): 0169-2968
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.396 0.77
Publication Forum (2016): 1
Scopus rating (2015): 0.419 0.847
Web of Science (2015): 0.658 0.674 7.6 0.27 0.00302 0.25
Publication Forum (2015): 1
Scopus rating (2014): 0.499 1.044
Web of Science (2014): 0.717 0.712 7.0 0.11 0.00344 0.264
Publication Forum (2014): 2
Scopus rating (2013): 0.528 1.174
Publication Forum (2013): 2
Scopus rating (2012): 0.494 1.047
Publication Forum (2012): 2
Scopus rating (2011): 0.398 1.006
Scopus rating (2010): 0.428 0.945
Scopus rating (2009): 0.472 0.99
Scopus rating (2008): 0.673 1.022
Scopus rating (2007): 0.587 1.145
Scopus rating (2006): 0.573 1.165
Scopus rating (2005): 0.544 1.14
Scopus rating (2004): 0.574 1.293
Scopus rating (2003): 0.532 1.397
Scopus rating (2002): 0.6 0.987
Scopus rating (2001): 0.484 0.99
Scopus rating (2000): 0.339 0.698
Scopus rating (1999): 0.335 0.873
Original language: English
Electronic versions:
Constructing Minimal Coverability Sets
DOIs: 10.3233/FI-2016-1319
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.
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.
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**
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: Viikinkoski, M.
Number of pages: 53
Publication date: 8 Jan 2016

**Publication information**
Publisher: Tampere University of Technology
Original language: English

**Publication series**
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1358
ISSN (Print): 1459-2045
Electronic versions:
viiinkoski_1358
Links:

**Bibliographical note**
Awarding institution: Tampere University of Technology
viikinkoski_1358 ok 8.1.2016 KK
Research output: Collection of articles › Doctoral Thesis

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Let \( T = \{z_1, z_2, \ldots, z_n\} \) be a finite multiset of real numbers, where \( z_1 \leq z_2 \leq \cdots \leq z_n \). The purpose of this article is to study the different properties of MIN and MAX matrices of the set \( T \) with \( \min(z_i, z_j) \) and \( \max(z_i, z_j) \) 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**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Tampere, School of Information Sciences
Authors: Mattila, M., Haukkanen, P.
Keywords: (MIN matrix, MAX matrix, meet matrix, join matrix)
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:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Original language: English
Electronic versions:
spma-2016-0010
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.

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.
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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Authors: Paunonen, L.
Keywords: (Aerospace electronics, Eigenvalues and eigenfunctions, Linear systems, Mathematical model, Robustness, Xenon, Yttrium, Robust output regulation, controller design, feedback, regular linear systems)
Pages: 2974-2986
Publication date: 2016
Peer-reviewed: Yes
Early online date: 1 Jan 2015

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 61
Issue number: 10
ISSN (Print): 0018-9286
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 4.174 3.159
Publication Forum (2016): 3
Scopus rating (2015): 3.926 2.884
Web of Science (2015): 2.777 3.747 >10.0 0.453 0.04901 1.807
Web of Science (2014): 2.779 3.713 >10.0 0.358 0.05045 1.769
Publication Forum (2014): 3
Scopus rating (2013): 4.096 3.13
Publication Forum (2013): 3
Scopus rating (2012): 4.143 3.292
Publication Forum (2012): 3
Scopus rating (2011): 3.749 2.961
Scopus rating (2010): 2.939 2.917
Scopus rating (2006): 3.67 2.917
Scopus rating (2005): 1.968 2.566
Scopus rating (2004): 2.959 2.708
Scopus rating (2003): 3.359 2.589
Scopus rating (2002): 3.982 2.349
Scopus rating (2001): 4.161 2.777
Scopus rating (2000): 3.887 2.772
Scopus rating (1999): 1.93 2.438
Original language: English
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.
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.
Fuzzy Logic of Quasi-Truth: An Algebraic Treatment

General information
State: Published
Ministry of Education publication type: C1 Separate scientific books
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Authors: Di Nola, A., Grigolia, R., Turunen, E.
Keywords: (MV-algebra)
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
ASJC Scopus subject areas: Mathematics(all)

Publication series
Name: Studies in Fuzziness and Soft Computing
Publisher: Springer
Volume: 338
ISSN (Print): 1434-9922
ISSN (Electronic): 1860-0808
DOIs:
10.1007/978-3-319-30406-9
Research output: Scientific - peer-review › Book

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
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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
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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory
Authors: Rivero-Rodriguez, A., Pileggi, P., Nykänen, O. A.
Keywords: (Context-aware Services, Context Awareness, Context Management, Mobile Computing)
Number of pages: 6
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: 
Publication Forum (2017): 1
Scopus rating (2016): 0.139 0.087
Publication Forum (2016): 1
Scopus rating (2015): 0.111 0.433
Publication Forum (2015): 1
Publication Forum (2014): 1
Scopus rating (2013): 0.352 1.319
Publication Forum (2013): 1
Scopus rating (2012): 0.103 0.0
Publication Forum (2012): 1
Scopus rating (2011): 0.103 0.0
Original language: English
Electronic versions:
Mobile Context-Aware Systems
DOIs: 
10.3991/ijim.v10i2.5367
Links: 
http://urn.fi/URN:NBN:fi:ttv-201604293895
Source: Bibtex
Source-ID: urn:416cbddcc24982dbb51c9c6e1123e281
Research output: Scientific - peer-review › Article

Moodlen työpaja: Vertaisarviointi osana opetusta yliopistematematiikan ensimmäisellä peruskurssilla

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Positioning
Authors: Mäkelä, A., Ali-Löytty, S., Joutsenlahti, J., Kauhanen, J.
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
State: Accepted/In press
Ministry of Education 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
Authors: Humaloja, J., Hämäläinen, T., Pohjolainen, S.
Keywords: (free boundary problem, industrial mathematics)
Publication date: 2016

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 $c:V\rightarrow \{k\}$. 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 $(2-\epsilon)knO(1)$, then Set Cover admits a $(2-\epsilon')(n^m)O(1)$-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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Warsaw
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 0.569 1.006
Publication Forum (2016): 2
Scopus rating (2015): 0.623 1.212
Web of Science (2015): 0.643 0.827 >10.0 0.103 0.01696 0.526
Publication Forum (2015): 2
Scopus rating (2014): 0.708 1.228
Web of Science (2014): 0.657 0.747 9.5 0.138 0.01699 0.497
Publication Forum (2014): 2
Scopus rating (2013): 0.739 1.38
Publication Forum (2013): 2
Scopus rating (2012): 0.844 1.288
Publication Forum (2012): 2
Scopus rating (2011): 0.81 1.289
Scopus rating (2010): 0.91 1.329
Scopus rating (2009): 0.948 1.475
Scopus rating (2008): 1.188 1.638
Scopus rating (2007): 0.997 1.65
Scopus rating (2006): 0.911 1.49
Scopus rating (2005): 0.821 1.486
Scopus rating (2004): 0.804 1.366
Scopus rating (2003): 0.936 1.523
Scopus rating (2002): 0.837 1.358
Scopus rating (2001): 0.934 1.514
Scopus rating (2000): 0.61 1.343
Scopus rating (1999): 0.519 1.166
Original language: English
DOIs:
10.1016/j.tcs.2016.03.017
Research output: Scientific - peer-review » Article

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.

**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**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Positioning
Authors: Piché, R.
Keywords: (Kalman filter, Model consistency, Normalised innovations squared, Predictive distribution)
Pages: 115–124
Publication date: 2016
Let $A$ be a finite set and $B$ an arbitrary set with at least two elements. The arity gap of a function $f : A^n \rightarrow B$ 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.
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 $\text{NP}$-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.
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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, University of Warsaw
Authors: Kowalik, L., Lauri, J., Socala, A.
Keywords: (graph coloring, computational complexity, lower bounds, exponential time hypothesis, FPT algorithms)
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
DOIs:
10.4230/LIPIcs.ESA.2016.58

Bibliographical note
JUFOID=79091
Research output: Scientific - peer-review » Conference contribution

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 0.85 1.916
Publication Forum (2016): 2
Scopus rating (2015): 1.121 2.758
Web of Science (2015): 1.672 2.053 >10.0 0.105 0.01087 0.682
Publication Forum (2015): 2
Scopus rating (2014): 1.259 2.833
Web of Science (2014): 1.757 2.053 >10.0 0.098 0.01025 0.692
Publication Forum (2014): 2
Scopus rating (2013): 1.148 2.622
Publication Forum (2013): 2
Scopus rating (2012): 0.999 2.584
Publication Forum (2012): 2
Scopus rating (2011): 0.901 2.573
Scopus rating (2010): 0.937 2.51
Scopus rating (2009): 0.996 2.716
Scopus rating (2008): 0.84 2.352
Scopus rating (2007): 0.79 2.279
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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: Laakso, T., Kaasalainen, M.
Keywords: (Near integrability, Invariant torus, Torus construction, Surface construction in N dimensions, Poincare inverse problem, Geometric inverse problems)
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:
Publication Forum (2017): 1
Scopus rating (2016): 0.845 1.266
Publication Forum (2016): 1
Scopus rating (2015): 1.035 1.312
Web of Science (2015): 1.579 1.805 >10.0 0.317 0.01231 0.975
Publication Forum (2015): 1
Scopus rating (2014): 1.067 1.204
Web of Science (2014): 1.636 1.748 >10.0 0.781 0.01448 0.998
Publication Forum (2014): 2
Scopus rating (2013): 1.029 1.364
Publication Forum (2013): 2
Scopus rating (2012): 1.067 1.234
Publication Forum (2012): 2
Scopus rating (2011): 0.959 1.144
Scopus rating (2010): 1.037 1.11
Scopus rating (2009): 1.009 1.133
Scopus rating (2008): 1.275 1.224
Scopus rating (2006): 1.058 1.147
Scopus rating (2005): 1.271 1.261
Scopus rating (2004): 0.975 1.117
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

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Pori Department, Research group: Data-analytics and Optimization, EnviroCase, Ltd
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.955 1.476
Publication Forum (2016): 1
Scopus rating (2015): 1.158 1.578
Web of Science (2015): 2.047 2.35 6.6 0.605 0.00838 0.578
Publication Forum (2015): 1
Scopus rating (2014): 1.103 1.737
Web of Science (2014): 2.483 2.322 6.9 0.309 0.00756 0.562
Publication Forum (2014): 1
Scopus rating (2013): 1.607 2.058
Publication Forum (2013): 1
Scopus rating (2012): 1.089 1.683
Publication Forum (2012): 1
Scopus rating (2011): 1.103 1.639
Scopus rating (2010): 0.917 1.276
Scopus rating (2009): 0.909 1.519
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 $4500 \pm 1400$ kgm$^{-3}$. Psyche’s mean radar albedo of $0.37 \pm 0.09$ 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
State: Published
Ministry of Education 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
Keywords: (Asteroids, Asteroids Composition, Radar, Surfaces Asteroids)
Number of pages: 16
Pages: 388-403
Publication date: 2016
Peer-reviewed: Yes
ASJC Scopus subject areas: Astronomy and Astrophysics, Space and Planetary Science

Publication information
Journal: Icarus
Volume: 281
ISSN (Print): 0019-1035
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.04456 1.428
Publication Forum (2015): 1
Scopus rating (2014): 2.191 1.233
Web of Science (2014): 3.038 3.217 8.6 1.242 0.0444 1.438
Risk-averse path planning with observation options

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Automation Science and Engineering
Authors: 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: Workshop on Planning and Robotics
Research output: Professional » Conference contribution

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
State: Published
Ministry of Education 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
Authors: Humaloja, J., Paunonen, L., Pohjolainen, S.
Keywords: (Robust output regulation, port-Hamiltonian systems)
Number of pages: 6
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
State: Published
Ministry of Education 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
Authors: Humaloja, J., Paunonen, L., Pohjolainen, S.
Keywords: (Robust output regulation, port-Hamiltonian systems)
Number of pages: 5
Pages: 152-156
Publication date: 2016

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
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Authors: Turunen, E., Raivio, K., Mantere, T.
Number of pages: 34
Pages: 79-112
Publication date: 2016
Spectral density function of the Doob transformation of fractional Brownian motion (i.e. the fractional Ornstein-Uhlenbeck process)

General information
State: Published
Organisations: Department of Mathematics
Authors: Kaarakka, T.
Number of pages: 2
Pages: 30-31
Publication date: 2016
Peer-reviewed: Unknown
Research output: Scientific › Paper, poster or abstract

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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Authors: Valmari, A., Hansen, H.
Number of pages: 20
Pages: 213-232
Publication date: 2016

Host publication information
Publisher: CEUR-WS
Editors: Cabac, L., Kristensen, L. M., Rölke, H.
ASJC Scopus subject areas: Computer Science(all)

Publication series
Name: CEUR Workshop Proceedings
Publisher: CEUR-WS
Volume: 1591
ISSN (Electronic): 1613-0073
Links:
http://www.scopus.com/inward/record.url?scp=84977557005&partnerID=8YFLogxK (Link to publication in Scopus)

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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.
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.
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.

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.
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.

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Fractional Ornstein-Uhlenbeck Processes

In this monograph, we are mainly studying Gaussian processes, in particular three different types of fractional Ornstein–Uhlenbeck processes. Pioneers in this field may be mentioned, e.g. Kolmogorov (1903-1987) and Mandelbrot (1924-2010). The Ornstein–Uhlenbeck diffusion can be constructed from Brownian motion via a Doob transformation 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 fractional Brownian motion and a Doob transformation of fractional Brownian motion do not have the same finite dimensional distributions. Indeed we verify, that the covariance of the fractional Ornstein–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 $Y^\alpha(t) = e^{-\alpha t} x_{\alpha t}$, where $\alpha = \frac{\alpha}{\alpha}$ and $(Z_t, t \geq 0)$ is fractional Brownian motion. We find out that the process $Y^\alpha((\alpha)) := \{Y^\alpha((\alpha)) : t \geq 0\}$, if scaled properly, has the same finite dimensional distributions as the process $Y^1((\alpha)) := \{Y^1((\alpha)) : t \geq 0\}$. 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 $\{Y^\alpha((\alpha)) : t \in \mathbb{R}\}$ 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 represent these processes as stochastic integrals with respect to Brownian motion and prove that the sample paths of the process $Y^\alpha((\alpha))$ are Hölder continuous of any order $\beta < H$. In the case $H \in (1/2, 1)$, we find out the covariance kernel of increment process of $Y^\alpha((\alpha))$, and using that we investigate the covariance of $Y^\alpha((\alpha))$ and the variance of $Y^\alpha((\alpha))$, when $t$ tends to infinity. One of our main results is that the increment process of $Y^\alpha((\alpha))$ is short-range dependent. We also study weak convergence and tightness and then finally prove that $1/\sqrt{\alpha} Y_\alpha t^\alpha((\alpha))$ converges weakly to scaled Brownian motion. In the case $H \in (1/2, 1)$, 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.
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.
**Moodlen työpaja: Vertaisarviointi osana opetusta matematiikan ensimmäisellä peruskurssilla**

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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 partially 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.
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.

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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.
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.
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.

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.
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.
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.
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.

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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.
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.

Generalized hyperbolic harmonic functions in the plane
We consider solutions of the equation \( y \Delta h (x,y) - k ah/ay = 0 \) 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.
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.
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.
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.
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.

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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.

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Authors: Devillers, R. (ed.), Valmari, A. (ed.)
Application of terrestrial LiDAR and modelling of tree branching structure for plant-scaling models in tropical forest trees

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Research output: Professional › Conference contribution

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.
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.
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**

State: Published
Ministry of Education 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
Authors: 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
ASJC Scopus subject areas: Engineering(all), Applied Mathematics

**Publication series**

Name: Workshop on Algorithm Engineering and Experiments
ISSN (Print): 2164-0300
DOIs:
10.1137/1.9781611973754.10
Links:
http://www.scopus.com/inward/record.url?scp=84937777832&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 84937777832
Research output: Scientific - peer-review › Conference contribution

**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 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**

State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Clifford analysis
Authors: Eriksson, S. A.
Number of pages: 14
Publication date: 2015

**Host publication information**

Editors: Laurinkari, J., Tarvanen, M.
Research output: Professional › Conference contribution

**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**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
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.
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.
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 offline 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.

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.

**Nondestructive estimates of above-ground biomass using terrestrial laser scanning**

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact)
Authors: Calders, K., Newnham, 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:
Publication Forum (2017): 1
Scopus rating (2016): 4.733 2.621
Publication Forum (2016): 1
Scopus rating (2015): 5.382 2.842
Web of Science (2015): 6.344 8.121 3.2 1.143 0.02609 3.307
Publication Forum (2015): 1
Scopus rating (2014): 4.112 2.452
Web of Science (2014): 6.554 7.393 2.6 0.806 0.0175 2.924
Publication Forum (2014): 1
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.
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.

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.
Ostinato: The Exploration-Automation Cycle of User-Centric, Process-Automated Data-Driven Visual Network Analytics

Perfect Pavelka Logic
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.

Bibliographical note
In Press. Siirretään Portfolio15<br/>Contribution: organisation=mat, FACT1=1<br/>Portfolio EDEND: 2015-01-08<br/>Publisher name: Elsevier BV
Source: researchoutputwizard
Source-ID: 35
Research output: Scientific - peer-review › Article

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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics, University of Oxford
Authors: 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
Projektioppiminen yläkoulun matematiikassa

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Mathematics
Authors: 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
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: Finnish
Links:
http://luma.fi/lumat/4273
Research output: Professional › Article

Quantitative structure tree models from terrestrial laser scanner data

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: 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
Links:
https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Professional › Conference contribution

Reducing uncertainties in above-ground biomass estimates using terrestrial laser scanning

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: 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
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.
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 sufficient 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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Inria Saclay-Ile-de-France
Authors: Laakkonen, P., Quadrat, A.
Number of pages: 8
Pages: 311-318
Publication date: 2015

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Laakkonen, P.
Keywords: (Frequency-domain analysis, Nickel, Robustness, Stability analysis, Topology, Transfer functions, Yttrium, Distributed parameter systems, linear systems, parametrization, robust control)
Number of pages: 6
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
ISSN (Print): 0018-9286
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 4.174 3.159
Publication Forum (2016): 3
Scopus rating (2015): 3.926 2.884
Web of Science (2015): 2.777 3.747 >10.0 0.453 0.04901 1.807
Web of Science (2014): 2.779 3.713 >10.0 0.358 0.05045 1.769
Publication Forum (2014): 3
Scopus rating (2013): 4.096 3.13
Publication Forum (2013): 3
Scopus rating (2012): 4.143 3.292
Simulointi nopeuttaa käyttöiän määräystä

General information
State: Published
Ministry of Education 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
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: Professional Article

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Foldes, S.
Keywords: (LIE NILPOTENT RINGS, MATRIX-RINGS, POLYNOMIAL-IDENTITIES, DETERMINANTS, ALGEBRAS)
Number of pages: 7
Pages: 115-121
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
State: Published
Ministry of Education 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
Authors: 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
Links: https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Professional › Conference contribution

Traceability of essential climate variables through forest stand reconstruction with terrestrial laser scanning

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
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
Using video games to combine learning and assessment in mathematics education

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Pori Department, Research group: TUT Game Lab, Stanford University
Authors: 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
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Original language: English
DOIs:
10.17083/ijsg.v2i4.98
Links:
http://journal.seriousgamessociety.org/index.php?journal=IJSG&page=announcement&op=view&path%5B%5D=5
Research output: Scientific - peer-review › Article

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.574 1.642
Publication Forum (2016): 1
Scopus rating (2015): 0.587 1.587
Publication Forum (2015): 1
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.
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.
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.
A comparison of confluence and ample sets in probabilistic and non-probabilistic branching time
Adaptive mobile tracking in unknown non-line-of-sight conditions with application to digital TV networks

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 0.569 1.006
Publication Forum (2016): 2
Scopus rating (2015): 0.623 1.212
Web of Science (2015): 0.643 0.827 >10.0 0.103 0.01696 0.526
Publication Forum (2015): 2
Scopus rating (2014): 0.708 1.228
Web of Science (2014): 0.657 0.747 9.5 0.138 0.01699 0.497
Publication Forum (2014): 2
Scopus rating (2013): 0.739 1.38
Publication Forum (2013): 2
Scopus rating (2012): 0.844 1.288
Publication Forum (2012): 2
Scopus rating (2011): 0.81 1.289
Scopus rating (2010): 0.91 1.329
Scopus rating (2009): 0.948 1.475
Scopus rating (2008): 1.188 1.638
Scopus rating (2007): 0.997 1.65
Scopus rating (2006): 0.911 1.49
Scopus rating (2005): 0.821 1.486
Scopus rating (2004): 0.804 1.366
Scopus rating (2003): 0.936 1.523
Scopus rating (2002): 0.837 1.358
Scopus rating (2001): 0.934 1.514
Scopus rating (2000): 0.61 1.343
Scopus rating (1999): 0.519 1.166
Original language: English
DOIs:
10.1016/j.tcs.2013.07.014

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-05-31<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 412
Research output: Scientific - peer-review › Article

Adaptive mobile tracking in unknown non-line-of-sight conditions with application to digital TV networks

General information
State: Published
Ministry of Education 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)
Authors: Chen, L., Piche, R., Kuusniemi, H., Chen, R.
A field test of parametric WLAN-fingerprint-positioning methods

General information
State: Published
Ministry of Education 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)
Authors: Muller, P., Raitoharju, M., Piche, R.
Number of pages: 8
Pages: 1-8
Publication date: 2014
A method to enforce map constraints in a particle filter's position estimate

General information
State: Published
Ministry of Education 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)
Authors: 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

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2014-09-05<br/>Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 1274
Research output: Scientific - peer-review › Conference contribution

An algebraic study of Peterson's Intermediate Syllogisms

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Authors: Turunen, E.
Number of pages: 14
Pages: 1-14
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Soft Computing
ISSN (Print): 1432-7643
A New Controller Structure for Robust Output Regulation

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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<br/>Portfolio EDEND: 2014-12-18<br/>Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 1243
Application of Hill-Clohessy-Wiltshire Equation in GNSS Orbit Prediction

General information
State: Published
Ministry of Education 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)
Authors: 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.
Electronic versions:
Hill equation
DOI:
10.1109/ICL-GNSS.2014.6934162
Links:
http://urn.fi/URN:NBN:fi:ttty-201603173647
Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2014-10-30
Source: researchoutputwizard
Source-ID: 1844
Research output: Scientific - peer-review › Conference contribution

A Simple Character String Proof of the "True but Unprovable" Version of Gödel's First Incompleteness Theorem

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Authors: Valmari, A.
Number of pages: 15
Pages: 355-369
Publication date: 2014
Peer-reviewed: Yes
Bagdad - matematiikkaa täällä ikuisuuteen matematiikkanäyttely

Bayesian Methods for Hybrid Indoor Positioning
Change Detection of Tree Biomass with Terrestrial Laser Scanning and Quantitative Structure Modelling

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.31 1.661
Publication Forum (2016): 1
Web of Science (2015): 3.036 3.278 2.5 0.528 0.01552 0.759
Publication Forum (2015): 1
Scopus rating (2014): 1.28 1.886
Web of Science (2014): 3.18 3.257 2.5 0.505 0.01044 0.772
Publication Forum (2014): 1
Scopus rating (2013): 1.167 1.981
Publication Forum (2013): 1
Scopus rating (2012): 0.999 1.645
Publication Forum (2012): 1
Scopus rating (2011): 0.498 1.268
Scopus rating (2010): 0.315 0.531
Original language: English
DOI:
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: Scientific - peer-review › Article

Combinational Studies of Vectors and Sequences

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Authors: Major, L.
Number of pages: 73
Publication date: 2014
Detection of anomalies in radio tomography of asteroids: source count and forward errors

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.248 0.917
Publication Forum (2016): 1
Scopus rating (2015): 1.038 1.052
Web of Science (2015): 1.942 1.941 9.2 0.82 0.01465 0.913
Publication Forum (2015): 1
Scopus rating (2014): 1.119 0.926
Web of Science (2014): 1.875 1.907 8.9 0.626 0.01469 0.884
Publication Forum (2014): 1
Scopus rating (2013): 0.869 0.819
Publication Forum (2013): 1
Scopus rating (2012): 1.29 1.011
Publication Forum (2012): 1
Scopus rating (2011): 1.249 0.911
Scopus rating (2010): 1.353 0.965
Scopus rating (2009): 1.387 1.128
Scopus rating (2008): 1.484 1.243
Scopus rating (2007): 1.112 1.056
Scopus rating (2006): 1.045 1.038
Scopus rating (2005): 1.052 1.051
Scopus rating (2004): 1.054 1.28
Scopus rating (2003): 0.864 0.963
Scopus rating (2002): 0.838 0.938
Scopus rating (2001): 0.733 0.67
Evaluating the Consistency of Estimation

General information
State: Published
Ministry of Education 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)
Authors: 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
Electronic versions:
Ivanov consistency DOIs: 10.1109/ICL-GNSS.2014.6934171

Bibliographical note
Contribution: organisation=mat,FACT1=0.5<br/>Portfolio EDEND: 2014-11-25
Source: researchoutputwizard
Source-ID: 551
Research output: Scientific - peer-review › Conference contribution

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Department of Mathematics, Research group: Positioning
Authors: Ala-Luhtala, J., Piche, R.
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Communications in Statistics: Simulation and Computation
Indirect Emissions of Forest Bioenergy: Detailed Modelling of Stump-Root Systems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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
Integral Formulas for k-hypermonogenic Functions in R3

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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-ID: 287
Research output: Scientific - peer-review » Chapter

Minimal Solutions of Fuzzy Relation Equations with General Operators on the Unit Interval

General information
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.
New era of Business Analytics - Making sense of business ecosystems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Department of Mathematics, Managing digital industrial transformation (mDIT)
Authors: 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<br/>Contribution: organisation=mat,FACT2=0.33<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: ACM
Source: researchoutputwizard
Source-ID: 622
Research output: Scientific - peer-review › Conference contribution

Old and New Algorithms for Minimal Coverability Sets

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.396 0.77
Publication Forum (2016): 1
Scopus rating (2015): 0.419 0.847
Web of Science (2015): 0.658 0.674 7.6 0.27 0.00302 0.25
Publication Forum (2015): 1
Scopus rating (2014): 0.499 1.044
Web of Science (2014): 0.717 0.712 7.0 0.11 0.00344 0.264
Publication Forum (2014): 2
On Convergence and Accuracy of State-Space Approximations of Squared Exponential Covariance Functions

General information
State: Published
Ministry of Education 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)
Authors: 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): 978-1-4799-3699-6
DOIs: 10.1109/MLSP.2014.6958890

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2014-11-21
Publisher name: IOS Press
Source: researchoutputwizard
Source-ID: 1462
Research output: Scientific - peer-review › Conference contribution

On polynomial stability of linear systems
On the Structure of Robust Controllers for Infinite-Dimensional Systems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Hämäläinen, T., Pohjolainen, S.
Number of pages: 4
Pages: 938-941
Publication date: 2014

Host publication information
Place of publication: Groningen, the Netherlands
Publisher: University of Groningen

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-12-30<br/>Publisher name: University of Groningen
Source: researchoutputwizard
Source-ID: 406
Research output: Scientific - peer-review › Conference contribution

On Vekua Systems and Their Connections to Hyperbolic Function Theory in the Plane

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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
Optimal storage scheme for access point coverage data

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Automation Science and Engineering, Research group: Positioning
Authors: 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
Original language: English

Bibliographical note
Source: researchoutputwizard
Source-ID: 1799
Research output: Scientific › Patent

Optimization of large-area OLED current distribution grids with self-aligned passivation

General information
State: Published
Polynomial stability of semigroups generated by operator matrices

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Paunonen, L.
Number of pages: 27
Pages: 885-911
Publication date: 2014
Predicting tree structure from tree height using terrestrial laser scanning and quantitative structure models

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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
Robust controller design for infinite-dimensional exosystems

**General information**
State: Published  
Ministry of Education publication type: A1 Journal article-refereed  
Organisations: Department of Mathematics  
Authors: 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:
Publication Forum (2017): 2
Robustness of Controllers for SISO-Plants and Signals Generated by an Infinite-Dimensional Exosystem

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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

Publication series
Name: International conference on methods and models in automation and robotics
DOIs:
10.1109/MMAR.2014.6957411

Bibliographical note
Online first<br/>Contribution: organisation=mat,FACT1=1<br/>Publisher name: John Wiley & Sons
Source: researchoutputwizard
Source-ID: 1244
Research output: Scientific - peer-review › Article
Robustness of strong stability of semigroups

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 2.454 1.844
Publication Forum (2016): 2
Scopus rating (2015): 2.752 1.931
Web of Science (2015): 1.821 2.134 9.6 0.272 0.03722 1.565
Publication Forum (2015): 2
Scopus rating (2014): 3.042 1.891
Web of Science (2014): 1.68 1.846 9.5 0.268 0.04056 1.575
Publication Forum (2014): 3
Scopus rating (2013): 2.715 1.726
Publication Forum (2013): 3
Scopus rating (2012): 2.655 1.778
Publication Forum (2012): 3
Scopus rating (2011): 2.188 1.41
Scopus rating (2010): 2.354 1.58
Scopus rating (2009): 2.417 1.751
Scopus rating (2008): 2.32 1.606
Scopus rating (2007): 2.018 1.766
Scopus rating (2006): 2.05 1.74
Scopus rating (2005): 1.892 1.601
Scopus rating (2004): 2.035 1.547
Scopus rating (2003): 1.928 1.691
Scopus rating (2002): 2.345 1.775
Scopus rating (2001): 1.884 1.835
Scopus rating (2000): 2.583 1.758
Scopus rating (1999): 2.523 1.473
Original language: English

DOI:
10.1016/j.jde.2014.08.011

Links:

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-16
Publisher name: Academic Press
Source: researchoutputwizard
Source-ID: 1240
Shape reconstruction from images: Pixel fields and Fourier transform

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 0.771 1.053
Publication Forum (2016): 2
Scopus rating (2015): 0.872 0.852
Web of Science (2015): 0.951 1.215 4.8 0.333 0.00327 0.879
Publication Forum (2015): 2
Scopus rating (2014): 1.103 1.054
Web of Science (2014): 1.131 1.28 4.6 0.173 0.00371 1.007
Publication Forum (2014): 2
Scopus rating (2013): 0.835 1.307
Publication Forum (2013): 2
Scopus rating (2012): 0.772 1.15
Publication Forum (2012): 2
Scopus rating (2011): 0.437 1.026
Scopus rating (2010): 0.392 2.137
Original language: English
Electronic versions:
Shape_Reconstruction_from_Images
DOIs:
10.3934/ipi.2014.8.885
Links:

**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: Scientific - peer-review › Article

Sparse source travel-time tomography of a laboratory target: accuracy and robustness of anomaly detection

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: Pursiainen, S., Kaasalainen, M.
Number of pages: 19
Pages: 1-19
Publication date: 2014

Electronic versions:
Sparse_source_travel-time_tomography_of_a_laboratory_target:_accuracy_and_robustness_of_anomaly_detection
DOIs:
10.3934/ipi.2014.8.1
Links:

**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: Scientific - peer-review › Article
The Cauchy-Schwarz inequality in Cayley graph and tournament structures on finite fields

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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 (2016): 0.284 0.484
Scopus rating (2015): 0.33 0.661
Web of Science (2015): 0.335 0.362 2.9 0.038 5.6E-4 0.144
Publication Forum (2015): 1
Scopus rating (2014): 0.273 0.586
Web of Science (2014): 0.229 0.266 Not Available 0.015 1.8E-4 0.054
Publication Forum (2014): 1
Scopus rating (2013): 0.241 0.487
Publication Forum (2013): 1
Scopus rating (2012): 0.213 0.388
Publication Forum (2012): 1
Scopus rating (2011): 0.105 0.063
Original language: English

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2015-01-21<br/>Publisher name: Miskolci Egyetem
Source: researchoutputwizard
Source-ID: 310
Research output: Scientific - peer-review › Article

The Internal Model Principle for Systems with Unbounded Control and Observation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Paunonen, L., Pohjolainen, S.
Number of pages: 34
The puzzling mutual orbit of the binary Trojan asteroid (624) Hektor

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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: SIAM Journal on Control and Optimization
Volume: 52
Issue number: 6
ISSN (Print): 0363-0129
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.933 1.89
Publication Forum (2016): 2
Scopus rating (2015): 1.872 1.554
Web of Science (2015): 1.491 1.793 >10.0 0.147 0.01424 1.381
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Scopus rating (2014): 1.765 1.761
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Scopus rating (2000): 3.247 2.61
Scopus rating (1999): 2.377 1.889
Original language: English
DOIs:
10.1137/130921362

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: Society for Industrial and Applied Mathematics
Source: researchoutputwizard
Source-ID: 1245
Research output: Scientific - peer-review › Article
The Role of Exosystems in Output Regulation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
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Original language: English

DOIs:
10.1109/TAC.2014.2303214

Links:
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6727411

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-10-20<br/>Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 1241
Research output: Scientific - peer-review › Article

Tree Root System Characterization and Volume Estimation by Terrestrial Laser Scanning and Quantitative Structure Modeling

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Visualizing informal learning behavior from conference participants Twitter data

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Pori Department, Department of Mathematics
Authors: 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

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**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Department of Mathematics, Managing digital industrial transformation (mDIT)
Authors: 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

**Bibliographical note**
Contribution: organisation=tlo,FACT1=0.5<br/>Contribution: organisation=mat,FACT2=0.5<br/>Portfolio EDEND: 2014-03-15<br/>Publisher name: Computer Society Press
Source: researchoutputwizard
Source-ID: 619
Research output: Scientific - peer-review > Conference contribution

**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 the 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**
A Hyperbolic Dirac Operator and its Kernels

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.467 0.864
Publication Forum (2016): 1
Scopus rating (2015): 0.599 0.871
Web of Science (2015): 0.466 0.558 4.5 0.148 0.00315 0.429
Publication Forum (2015): 1
Scopus rating (2014): 0.776 1.22
Web of Science (2014): 0.61 0.652 4.2 0.09 0.00351 0.501
Publication Forum (2014): 1
Scopus rating (2013): 0.774 1.117
Publication Forum (2013): 1
Scopus rating (2012): 0.604 0.804
Publication Forum (2012): 1
Scopus rating (2011): 0.753 1.496
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.

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.
A note on compactness in a fuzzy metric space

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics

Publication information
Journal: Systems and Control Letters
Volume: 62
Issue number: 8
ISSN (Print): 0167-6911

Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 2.711 2.087
Publication Forum (2016): 2
Scopus rating (2015): 2.116 1.765
Web of Science (2015): 1.908 2.448 9.9 0.242 0.01284 1.184
Publication Forum (2015): 2
Scopus rating (2014): 2.105 1.911
Web of Science (2014): 2.059 2.448 9.5 0.147 0.01305 1.207
Publication Forum (2014): 2
Scopus rating (2013): 2.182 2.037
Publication Forum (2013): 2
Scopus rating (2012): 2.042 1.706
Publication Forum (2012): 2
Scopus rating (2011): 2.339 2.016
Scopus rating (2010): 1.904 2.029
Scopus rating (2009): 2.815 2.444
Scopus rating (2008): 3.224 2.206
Scopus rating (2007): 2.49 1.754
Scopus rating (2006): 1.919 1.682
Scopus rating (2005): 1.214 1.515
Scopus rating (2004): 1.946 1.467
Scopus rating (2003): 2.546 1.748
Scopus rating (2002): 3.998 1.812
Scopus rating (2001): 3.615 1.762
Scopus rating (2000): 2.933 1.676
Scopus rating (1999): 1.353 1.286
Original language: English

Electronic versions:
paunonen_zwart_a_lyapunov_approach.pdf

DOIs:
10.1016/j.sysconle.2013.05.001

Links:
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: Scientific - peer-review › Article

A note on compactness in a fuzzy metric space
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
State: Published
Ministry of Education 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)
Authors: Wirola, L., Wirola, L., Piche, R.
Scopus rating (2006): 0.53 1.83
Scopus rating (2005): 0.454 2.026
Scopus rating (2004): 0.62 2.303
Scopus rating (2003): 0.68 1.764
Scopus rating (2002): 0.346 1.176
Scopus rating (2001): 0.969 2.192
Scopus rating (2000): 0.679 2.17
Scopus rating (1999): 0.696 1.872
Original language: English
Electronic versions:
GUHA
DOIs:
10.1007/s10844-013-0255-6
Links:
http://urn.fi/URN:NBN:fi:tty-201603183675

Bibliographical note
Online first<br/>Contribution: organisation=ase,FACT1=0.5<br/>Contribution: organisation=mat,FACT2=0.5<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: Springer
Source: researchoutputwizard
Source-ID: 3149
Research output: Scientific - peer-review › Article

Bayes trees and forests: combining precise empirical and theoretical tree models

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Links:

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Finnish Society of Forest Science; Finnish Forest Research Institute; University of Helsinki
Source: researchoutputwizard
Source-ID: 2449
Research output: Scientific - peer-review › Conference contribution

Canonical methods of constructing invariant tori by phase-space sampling

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: Laakso, T., Kaasalainen, M.
Number of pages: 6
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.
Compact YORP formulation and stability analysis

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: Kaasalainen, M., Nortunen, H.
Number of pages: 8
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 558
Article number: A104
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Datamap Visualization Technique for Interactively Visualizing Large Datasets

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: EDP Sciences
Source: researchoutputwizard
Source-ID: 2447
Research output: Scientific - peer-review » Article

Device self-calibration in location systems using signal strength histograms

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: 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
Estimating Above Ground Biomass from Terrestrial Laser Scanning in Australian Eucalypt Open Forest

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Silvilaser Beijing 2013
Source: researchoutputwizard
Source-ID: 2023
Research output: Scientific - peer-review › Conference contribution
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
State: Published
Ministry of Education 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
Authors: 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
Place of publication: Tweed Heads, NSW, Australia
Publisher: IGNSS Society
Electronic versions:
alaluhtala_estimation_of_initial_state_and_model.pdf
Links:
http://www.ignss.org

Bibliographical note
Book of Abstracts: http://issuu.com/robhen7979/docs/2013bookofabstracts.doc<br/>Contribution: organisation=mat,FACT1=0.5<br/>Contribution: organisation=ase,FACT2=0.5<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: IGNSS Society
Source: researchoutputwizard
Source-ID: 1897
Research output: Scientific - peer-review › Conference contribution

Estimation of Model Parameters

General information
State: Published
Ministry of Education 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
Authors: 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
Estimation of the Mechanical Power of a Kite Wind Generator

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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
Links:
http://www.iconceptpress.com/books/renewable-energy-for-sustainable-future/

Fast Automatic Method for Constructing Topologically and Geometrically Precise Tree Models from TLS Data

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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, Saarise...
Fast automatic precision tree models from terrestrial laser scanner data

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Inverse Problems, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.31 1.661
Publication Forum (2016): 1
Web of Science (2015): 3.036 3.278 2.5 0.528 0.01552 0.759
Publication Forum (2015): 1
Scopus rating (2014): 1.28 1.886
Web of Science (2014): 3.18 3.257 2.5 0.505 0.01044 0.772
Publication Forum (2014): 1
Scopus rating (2013): 1.167 1.981
Publication Forum (2013): 1
Scopus rating (2012): 0.999 1.645
Publication Forum (2012): 1
Scopus rating (2011): 0.498 1.268
Scopus rating (2010): 0.315 0.531
Original language: English
DOIs:
10.3390/rs5020491

Bibliographical note
Contribution: organisation=mat, FACT1=1<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: MDPI
Source: researchoutputwizard
Source-ID: 3244
Research output: Scientific - peer-review › Article

Hyperbolic Laplace Operator and the Weinstein Equation in R^3

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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
Improving engineering students' mathematics skills and analysing their behaviour using ICT - tools.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Links:

Bibliographical note
Poistettu tupla r=2983
Contribuion: organisation=mat,FACT1=1
Portfolio EDEND: 2013-11-29
Publisher name: European Society for Engineering Education SEFI
Source: researchoutputwizard
Source-ID: 3162
Research output: Scientific - peer-review › Conference contribution
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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Information Management and Logistics, Department of Mathematics, Managing digital industrial transformation (mDIT)
Authors: 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
DOI:
10.1145/2523429.2523482
Links:
http://urn.fi/URN:NBN:fi:tty-201401221052

Bibliographical note
Contribution: organisation=tlo,FACT1=0.5<br/>Contribution: organisation=mat,FACT2=0.5<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: ACM
Source: researchoutputwizard
Source-ID: 2438
Research output: Scientific - peer-review › Conference contribution

Introduction to Statistical Data Analysis for Engineers and Scientists

General information
State: Published
Ministry of Education 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
Authors: Piche, R.
Number of pages: 136
Publication date: 2013

Publication information
Place of publication: Las Vegas, NV, USA
Publisher: CREATESPACE
Original language: English
Links:
https://www.createspace.com/4292246

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-05-29
Iterative alternating sequential (IAS) method for radio tomography of asteroids in 3D

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.248 0.917
Publication Forum (2016): 1
Scopus rating (2015): 1.038 1.052
Web of Science (2015): 1.942 1.941 9.2 0.82 0.01465 0.913
Publication Forum (2015): 1
Scopus rating (2014): 1.119 0.926
Web of Science (2014): 1.875 1.907 8.9 0.626 0.01469 0.884
Publication Forum (2014): 1
Scopus rating (2013): 0.869 0.819
Publication Forum (2013): 1
Scopus rating (2012): 1.29 1.011
Publication Forum (2012): 1
Scopus rating (2011): 1.249 0.911
Scopus rating (2010): 1.353 0.965
Scopus rating (2009): 1.387 1.128
Scopus rating (2008): 1.484 1.243
Scopus rating (2007): 1.112 1.056
Scopus rating (2006): 1.045 1.038
Scopus rating (2005): 1.052 1.051
Scopus rating (2004): 1.054 1.28
Scopus rating (2003): 0.864 0.963
Scopus rating (2002): 0.838 0.938
Scopus rating (2001): 0.733 0.67
Scopus rating (2000): 0.676 0.606
Scopus rating (1999): 0.746 0.563
Original language: English
DOIs:
10.1016/j.pss.2013.04.001

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Pergamon

Source: researchoutputwizard
Source-ID: 3148
Research output: Scientific - peer-review › Article
Least-Squares Transformations between Point-Sets

General information
State: Published
Ministry of Education 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)
Authors: 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<br/>
Contribution: organisation=sgn,FACT2=0.5<br/>
Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source-ID: 3304
Research output: Scientific - peer-review › Conference contribution

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.573 1.282
Publication Forum (2016): 1
Scopus rating (2015): 0.477 1.533
Web of Science (2015): 1.026 1.012 >10.0 0.385 0.00201 0.23
Publication Forum (2015): 1
Scopus rating (2014): 0.482 1.396
Web of Science (2014): 1.168 1.119 >10.0 0.147 0.00242 0.279
Mean Value Properties for the Weinstein Equation Using the Hyperbolic Metric

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.564 0.795
Publication Forum (2016): 1
Scopus rating (2015): 0.553 0.78
Web of Science (2015): 0.663 0.581 3.2 0.079 0.00244 0.458
Publication Forum (2015): 1
Scopus rating (2014): 0.793 0.974
Web of Science (2014): 0.545 0.596 3.2 0.173 0.00245 0.511
Publication Forum (2014): 1
Scopus rating (2013): 0.71 0.841
Publication Forum (2013): 1
Scopus rating (2012): 0.591 0.728
Publication Forum (2012): 1
Scopus rating (2011): 0.805 1.049
Scopus rating (2010): 0.637 0.968
Scopus rating (2009): 0.604 1.232
Scopus rating (2008): 0.402 1.743
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: Scientific - peer-review › Article

Networks of innovation relationships: multiscopic views on Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Normal Distributions Transform Occupancy Maps: Application to Large-Scale Online 3D Mapping

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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
http://www.icra2013.org

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: IEEE
Source-ID: 3322
Research output: Scientific - peer-review › Conference contribution

On Hodge-de Rham systems in hyperbolic Clifford analysis

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Eriksson, S., Orelma, H.
Number of pages: 4
Pages: 492-495
Publication date: 2013

Host publication information
On hypermonogenic functions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.467 0.864
Publication Forum (2016): 1
Scopus rating (2015): 0.599 0.871
Web of Science (2015): 0.466 0.558 4.5 0.148 0.00315 0.429
Publication Forum (2015): 1
Scopus rating (2014): 0.776 1.22
Web of Science (2014): 0.61 0.652 4.2 0.09 0.00351 0.501
Publication Forum (2014): 1
Scopus rating (2013): 0.774 1.117
Publication Forum (2013): 1
Scopus rating (2012): 0.604 0.804
Publication Forum (2012): 1
Scopus rating (2011): 0.753 1.496
Scopus rating (2010): 0.432 0.533
Scopus rating (2009): 0.103 0.0
Scopus rating (2008): 0.736 0.369
Original language: Finnish
DOIs:
10.1080/17476933.2011.613118
On the Structure of Robust Controllers for Infinite-Dimensional Systems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Links:

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: Scientific - peer-review › Conference contribution

Output Regulation Theory for Distributed Parameter Systems with Unbounded Control and Observation

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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: Scientific - peer-review › Conference contribution
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
State: Published
Ministry of Education 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)
Authors: 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
Links:
http://urn.fi/URN:NBN:fi:tty-201403051121

Bibliographical note
to appear in IEEEEXPLORE<br/>
Contribution: organisation=ase,FACT1=0.75<br/>
Contribution: organisation=mat,FACT2=0.25<br/>
Portfolio EDEND: 2013-11-29<br/>
Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 3021
Research output: Scientific - peer-review › Conference contribution

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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Huhtamäki, J., Luotonen, V., Kairamo, V., Still, K., Russell, M. G.
Number of pages: 6
Pages: 166-171
Publication date: 2013
Rapid Characterisation of Forest Structure from TLS and 3D Modelling

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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: 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

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: ACM
Source: researchoutputwizard
Source-ID: 2329
Research output: Scientific - peer-review › Conference contribution

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.

Reduced order internal models in robust output regulation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Paunonen, L., Pohjolainen, S.
Regional compensation for statistical maximum likelihood reconstruction error of PET image pixels

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics
Authors: Forma, J., Niemi, J., Ruotsalainen, U.
Number of pages: 16
Relational Capital and Social Capital: One or two Fields of Research?

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Still, K., Huhtamäki, J., Russell, M. G.
Number of pages: 9
Pages: 420-428
Publication date: 2013

Host publication information
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.
Robust output regulation and the preservation of polynomial closed-loop stability

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Paunonen, L., Pohjolainen, S.
Number of pages: 28

Robustness properties of controllers with reduced order internal models

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Links:
http://www.ecc13.ch/

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 3109
Research output: Scientific - peer-review › Article

Robust output regulation and the preservation of polynomial closed-loop stability

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Paunonen, L., Pohjolainen, S.
Number of pages: 28
SO-I: a surrogate model algorithm for expensive nonlinear integer programming problems including global optimization applications

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: Müller, J., Shoemaker, C., Piche, R.
Number of pages: 25
Pages: 1-25
Publication date: 2013
Peer-reviewed: Yes
Solvability of the output regulation problem with a feedforward controller

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
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).
Statistical Path Loss Parameter Estimation and Positioning using RSS Measurements

General information
State: Published
Ministry of Education 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
Authors: 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
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: English
DOIs:
http://dx.doi.org/10.5081/jgps.12.1.13
Links:

Bibliographical note
Contribution: organisation=elt,FACT1=0.35<br/>
Contribution: organisation=ase,FACT2=0.5<br/>
Contribution: organisation=mat,FACT3=0.15<br/>
Portfolio EDEND: 2014-08-20<br/>
Publisher name: Scientific Research Publishing
Source: researchoutputwizard
Source-ID: 3022
Research output: Scientific - peer-review › Article
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
State: Published
Ministry of Education 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)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.782 1.324
Publication Forum (2016): 1
Scopus rating (2015): 0.695 1.131
Web of Science (2015): 1.785 1.738 8.8 0.554 0.02092 0.42
Publication Forum (2015): 1
Scopus rating (2014): 0.657 1.253
Web of Science (2014): 1.732 1.731 8.5 0.51 0.02112 0.449
Publication Forum (2014): 1
Scopus rating (2013): 0.651 1.168
Publication Forum (2013): 1
Scopus rating (2012): 0.667 1.228
Publication Forum (2012): 1
Scopus rating (2011): 0.792 1.066
Scopus rating (2010): 0.881 0.936
Scopus rating (2009): 0.827 1.037
Scopus rating (2008): 0.817 0.837
Scopus rating (2007): 0.855 0.992
Scopus rating (2006): 0.804 0.841
Scopus rating (2005): 0.831 0.818
Scopus rating (2004): 0.811 0.859
Scopus rating (2003): 0.674 0.714
Scopus rating (2002): 0.714 0.816
Scopus rating (2001): 0.605 0.801
Scopus rating (2000): 0.929 0.781
Scopus rating (1999): 0.932 0.721
Original language: English
Electronic versions:
kanniainen_piche_stock_price_dynamics_and_option_valuations.pdf
DOIs:
10.1016/j.physa.2012.10.004
Links:
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.
The Asymptotic Behaviour of the Proportion of Hard Instances of the Halting Problem

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Authors: 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
Links:
http://www.inf.u-szeged.hu/splst13/splst13proc.pdf

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-11-29<br/>Publisher name: University of Szeged
Source: researchoutputwizard
Source-ID: 3641
Research output: Scientific - peer-review › Conference contribution

The Kraft Sum as a Monotone Function of the Refinement-Ordered Set of Uniquely Decipherable Codes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Foldes, S.
Number of pages: 4
Pages: 1-4
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Mathematics for Applications
Volume: 2
The Resolved Asteroid Program – Size, shape, and pole of (52) Europa

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
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:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.04456 1.428
Publication Forum (2015): 1
Scopus rating (2014): 2.191 1.233
Web of Science (2014): 3.038 3.217 8.6 1.242 0.0444 1.438
Publication Forum (2014): 2
Scopus rating (2013): 1.947 1.09
Publication Forum (2013): 2
Scopus rating (2012): 2.342 1.301
Publication Forum (2012): 2
Scopus rating (2011): 2.601 1.224
Scopus rating (2010): 2.722 1.3
Scopus rating (2009): 2.61 1.371
Scopus rating (2008): 2.54 1.241
Scopus rating (2007): 2.578 1.352
Scopus rating (2005): 3.67 1.728
Scopus rating (2004): 2.641 1.558
Scopus rating (2003): 2.182 1.46
Scopus rating (2002): 2.038 1.463
Tiedonlouhintaa tieliikenneonnettomuussatasta

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: Finnish

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Academic Press
Source: researchoutputwizard
Source-ID: 2915
Research output: Scientific - peer-review › Article

Twiiteryhmiä ja uutispäivittelyä - toimittajana sosiaalisessa mediassa

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Mathematics
Authors: 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
Links:
Unimodality and log-concavity of f-vectors for cyclic and ordinary polytopes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 0.823 1.17
Publication Forum (2016): 2
Scopus rating (2015): 0.795 1.164
Web of Science (2015): 0.722 0.802 9.7 0.226 0.01196 0.543
Publication Forum (2015): 2
Scopus rating (2014): 0.902 1.396
Web of Science (2014): 0.802 0.862 9.9 0.191 0.01383 0.618
Publication Forum (2014): 2
Scopus rating (2013): 0.762 1.451
Publication Forum (2013): 2
Scopus rating (2012): 0.8 1.35
Publication Forum (2012): 2
Scopus rating (2011): 0.846 1.206
Scopus rating (2010): 0.794 1.163
Scopus rating (2009): 0.82 1.375
Scopus rating (2008): 0.911 1.573
Scopus rating (2007): 0.819 1.117
Scopus rating (2006): 0.779 1.186
Scopus rating (2005): 0.767 1.337
Scopus rating (2004): 0.677 1.251
Scopus rating (2003): 0.71 1.219
Scopus rating (2002): 0.674 1.085
Scopus rating (2001): 0.635 0.998
Scopus rating (2000): 0.439 0.776
Scopus rating (1999): 0.413 0.737
Original language: English
DOIs:
10.1016/j.dam.2013.01.008

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Elsevier
Verkostoanalyysi sosiaalisen median tutkimuksessa

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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

Virtuaalinen konelaboratorio ja semanttinen maailmus konejärjestelmän suunnittelun tukena, Loppuraportti, Semogen II -hanke

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Number of pages: 50
Publication date: 2013

Publication information
Place of publication: Tampere
Publisher: Tampereen teknillinen yliopisto, Smart Simulators -tutkimusryhmä
Original language: Finnish
Links:

Bibliographical note
Contribution: organisation=mat,FACT1=0.6
Contribution: organisation=iha,FACT2=0.4
Portfolio EDEND: 2013-12-29

What’s out there? Asteroid models for target selection and mission planning

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: Kaasalainen, M., Durech, J.
Number of pages: 20
Pages: 131-150
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, \quad y = Cx + Du + F_m v,
\end{equation*}
with infinite-dimensional exosystems $\dot{v} = S v$ is discussed. The feedback controller is of the form
\begin{equation*}
\dot{z} = \mathcal{G}_1 z + \mathcal{G}_2 e, \quad u = K z
\end{equation*}
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
State: Published
Organisations: Department of Mathematics
Authors: Hämäläinen, T.
Publication date: 4 Jan 2012
Peer-reviewed: Unknown
Electronic versions:
hamalainen_review_on_old_and_new_results
Links:
Research output: Scientific › Paper, poster or abstract

A characterization of level-continuous fuzzy numbers
**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.506 1.977
Publication Forum (2016): 1
Scopus rating (2015): 1.43 1.816
Web of Science (2015): 2.098 2.376 >10.0 0.729 0.00772 0.555
Publication Forum (2015): 1
Scopus rating (2014): 1.461 2.278
Web of Science (2014): 1.986 2.496 >10.0 0.423 0.00874 0.582
Publication Forum (2014): 1
Scopus rating (2013): 1.439 2.189
Publication Forum (2013): 1
Scopus rating (2012): 1.617 2.468
Publication Forum (2012): 1
Scopus rating (2011): 1.518 2.017
Scopus rating (2010): 1.381 2.189
Scopus rating (2008): 1.635 2.139
Scopus rating (2007): 1.554 2.23
Scopus rating (2006): 1.166 2.306
Scopus rating (2005): 0.846 1.898
Scopus rating (2004): 0.943 1.773
Scopus rating (2003): 0.789 1.399
Scopus rating (2002): 1.012 1.127
Scopus rating (2001): 0.944 1.134
Scopus rating (2000): 0.457 1.275
Scopus rating (1999): 0.458 1.346
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: Scientific - peer-review › Article

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**A Molecular Camera Gyroscope**

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: Huttunen, V., Piche, R.
Pages: 69-81
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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.27 0.825
Publication Forum (2016): 1
Scopus rating (2015): 0.269 1.206
Publication Forum (2015): 1
Scopus rating (2014): 0.279 1.006
Publication Forum (2014): 1
Scopus rating (2013): 0.292 0.65
Publication Forum (2013): 1
Scopus rating (2012): 0.248 0.366
Publication Forum (2012): 1
Scopus rating (2011): 0.163 0.135
Original language: English
Electronic versions:
huttunen_piche_a_monocular_camera_gyroscope.pdf
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

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: Raitoharju, M., Ali-Löytty, S.
Pages: 87-90
Publication date: 2012
Peer-reviewed: Yes

Publication information

Volume: 19
Issue number: 2
Article number: 12436433
ISSN (Print): 1070-9908
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.942 1.805
Publication Forum (2016): 2
Scopus rating (2015): 0.872 1.887
Web of Science (2015): 1.661 1.852 6.3 0.449 0.01578 0.862
Publication Forum (2015): 2
Scopus rating (2014): 0.902 1.993
Web of Science (2014): 1.751 1.926 6.7 0.234 0.01523 0.827
Publication Forum (2014): 2
Scopus rating (2013): 0.876 2.111
Publication Forum (2013): 2
Scopus rating (2012): 0.97 1.883
Publication Forum (2012): 2
Scopus rating (2011): 0.774 1.604
Scopus rating (2010): 0.981 1.728
Scopus rating (2009): 0.926 1.75
Scopus rating (2008): 1.048 1.951
Scopus rating (2007): 1.0 2.006
Scopus rating (2006): 0.84 1.895
Scopus rating (2005): 0.921 1.965
Scopus rating (2004): 1.029 2.606
Scopus rating (2003): 1.214 1.888
Scopus rating (2002): 1.145 1.652
Analysis of the rotation period of asteroids (1865) Cerberus, (2100) Ra-Shalom, and (3103) Eger - search for the YORP effect

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
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 (2017): 3
Scopus rating (2016): 2.246 1.16
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Web of Science (2013): 3
Web of Science (2012): 2.858 1.295
Web of Science (2011): 2.373 1.231
Web of Science (2010): 2.74 1.444
Web of Science (2009): 2.879 1.404
Web of Science (2008): 2.923 1.297
Web of Science (2007): 2.816 1.34
Web of Science (2005): 2.891 1.355
Web of Science (2004): 2.633 1.462
Web of Science (2003): 1.967 1.373
Analytics of the impact of user involvement in the innovation process and its outcomes. Case study: Media-Enhanced Learning (MEL) Service

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Publication Forum (2016): 1
Scopus rating (2015): 0.159 0.703
Publication Forum (2015): 1
Scopus rating (2014): 0.156 0.471
Publication Forum (2014): 1
Scopus rating (2013): 0.153 0.437
Publication Forum (2013): 1
Scopus rating (2012): 0.225 0.228
Publication Forum (2012): 1
Scopus rating (2011): 0.169 0.169
Scopus rating (2010): 0.144 0.128
Original language: English
DOI:
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: Scientific - peer-review › Article

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 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).

A New Characterization for n-Fold Positive Implicative BL-logics

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Authors: 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
A New Method and Format for Describing CANopen System Topology

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Authors: 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
Links:

Asteroid (2867) Steins: Shape, topography and global physical properties from OSIRIS observations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.04456 1.428
Publication Forum (2015): 1
Scopus rating (2014): 2.191 1.233
Web of Science (2014): 3.038 3.217 8.6 1.242 0.0444 1.438
Publication Forum (2014): 2
Scopus rating (2013): 1.947 1.09
Publication Forum (2013): 2
A Stochastic Mixture Surrogate Model Algorithm for Computationally Expensive Black-Box Global Optimization Problems

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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
Links:
http://gow12.dca.ufrn.br

Bibliographical note
ei ut-numeroa 22.8.2013<br/>Contribution: organisation=mat,FACT1=1<br/>Publisher name: Universidade Federal do Rio Grande do Norte
Source: researchoutputwizard
Source-ID: 4881
Research output: Scientific › Conference contribution

Asymptotic modeling of unconstrained control of a tethered power kite moving along a given closed-loop spherical trajectory

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Silvennoinen, R., Argatov, I.
Autonomous Prediction of GPS and GLONASS Satellite Orbits

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: Seppänen, M., Ala-Luhtala, J., Piche, R., Martikainen, S., Ali-Löytty, S.
Pages: 119-134
Publication date: 2012
Peer-reviewed: Yes
Characterizing n-Fold Positive Implicative BL-logics

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Authors: 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<br/>Contribution: organisation=mat,FACT1=1
Comprehensive Quantitative Tree Models from TLS Data

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: Åkerblom, M., Raumonen, P., Kaasalainen, M., Kaasalainen, S., Kaartinen, H.
Pages: 6507-6510
Publication date: 2012

Host publication information
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
Contribution: organisation=mat,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 5462
Research output: Scientific › Conference contribution

Dual Look at Robust Regulation: Frequency Domain and State Space Approaches

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Laakkonen, P., Paunonen, L., Pohjolainen, S.
Pages: 136-141
Publication date: 2012

Host publication information
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
Article number: 13117991
ISBN (Print): 978-1-4673-2121-1

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: 3825
Research output: Scientific - peer-review › Conference contribution
**Elementary Partial Differential Equations. Theory and Solved Problems.**

**General information**
State: Published
Ministry of Education publication type: C1 Separate scientific books
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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 <br/>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 5062
Research output: Scientific - peer-review › Book

**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**
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Mathematics, Research group: Positioning
Authors: 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
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
Links:

**Bibliographical note**
Julkaisu DPubissa vuonna 2012.Tallennettu Portfolioon 2013.<br/>Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-04-29
Source: researchoutputwizard
Source-ID: 5057
Research output: Professional › Commissioned report

**Facilitating active participation in web-based co-development**

**General information**
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.
Hierarchical Bayesian inference for the EEG inverse problem using realistic FE head models: Depth localization and source separation for focal primary currents

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 3.823 1.752
Publication Forum (2016): 2
Scopus rating (2015): 4.48 1.84
Web of Science (2015): 5.463 6.797 6.7 1.16 0.18031 2.325
Publication Forum (2015): 2
Scopus rating (2014): 4.201 2.029
Web of Science (2014): 6.357 7.289 6.5 1.5 0.17239 2.257
Publication Forum (2014): 3
Scopus rating (2013): 4.376 2.026
Publication Forum (2013): 3
Scopus rating (2012): 3.922 1.937
Publication Forum (2012): 3
Scopus rating (2011): 3.626 1.81
Scopus rating (2010): 3.573 1.866
Scopus rating (2009): 3.859 1.897
Scopus rating (2008): 4.094 1.765
Scopus rating (2007): 3.7 1.981
Scopus rating (2006): 3.41 1.924
Scopus rating (2005): 3.703 1.918
Scopus rating (2004): 3.401 1.794
Scopus rating (2003): 1.974 1.003
Scopus rating (2002): 0.885 0.403
Hyperbolic Laplace Operator and the Weinstein Equation in $\mathbb{R}^3$

**General information**
- **State:** Published
- **Ministry of Education publication type:** A4 Article in a conference publication
- **Organisations:** Department of Mathematics
- **Authors:** 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<br>Contribution: organisation=mat,FACT1=1<br>Publisher name: IKM**
- **Source: researchoutputwizard**
- **Source-ID: 4038**
- **Research output: Scientific - peer-review › Conference contribution**

Mathematics Remedial Instruction with Math-Bridge e-learning system

**General information**
- **State:** Published
- **Ministry of Education publication type:** A4 Article in a conference publication
- **Organisations:** Department of Mathematics
- **Authors:** Kangas, J., Milumäki, 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
- **Links:**
Method of tracking a state of a mobile electronic device

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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
Source: researchoutputwizard
Source-ID: 5330
Research output: Scientific › Patent

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.313 0.726
Publication Forum (2016): 1
Scopus rating (2015): 0.272 0.781
Networks of Growth: Case Young Innovative Companies in Finland

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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

Publication series
Name: European Conference on Innovation and Entrepreneurship
ISSN (Print): 2049-1050
ISSN (Electronic): 2049-1077

Bibliographical note
**n-Fold implicative basic logic is Gödel logic**

**General information**
- State: Published
- Ministry of Education publication type: A1 Journal article-refereed
- Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
- Authors: 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:
  - Publication Forum (2017): 1
  - Scopus rating (2016): 0.75 1.204
  - Publication Forum (2016): 1
  - Scopus rating (2015): 0.724 1.179
  - Web of Science (2015): 1.63 1.732 5.0 0.352 0.00643 0.52
  - Publication Forum (2015): 1
  - Scopus rating (2014): 0.793 1.518
  - Web of Science (2014): 1.271 1.635 4.8 0.285 0.00478 0.413
  - Publication Forum (2014): 1
  - Scopus rating (2013): 0.857 1.454
  - Publication Forum (2013): 1
  - Scopus rating (2012): 0.805 1.232
  - Publication Forum (2012): 1
  - Scopus rating (2011): 0.892 1.817
  - Scopus rating (2010): 0.736 1.303
  - Scopus rating (2009): 0.744 1.417
  - Scopus rating (2008): 0.776 1.228
  - Scopus rating (2007): 0.459 0.742
  - Scopus rating (2006): 0.466 0.968
  - Scopus rating (2005): 0.382 0.876
  - Scopus rating (2004): 0.227 0.63
  - Scopus rating (2003): 0.275 0.297
  - Scopus rating (2002): 0.235 0.585
  - Scopus rating (2001): 0.131 0.783
- Original language: English
- DOIs: 10.1007/s00500-011-0761-9

**Bibliographical note**
- Online first
- Scopus rating (2016): 0.75 1.204
- Publication Forum (2016): 1
- Scopus rating (2015): 0.724 1.179
- Web of Science (2015): 1.63 1.732 5.0 0.352 0.00643 0.52
- Publication Forum (2015): 1
- Scopus rating (2014): 0.793 1.518
- Web of Science (2014): 1.271 1.635 4.8 0.285 0.00478 0.413
- Publication Forum (2014): 1
- Scopus rating (2013): 0.857 1.454
- Publication Forum (2013): 1
- Scopus rating (2012): 0.805 1.232
- Publication Forum (2012): 1
- Scopus rating (2011): 0.892 1.817
- Scopus rating (2010): 0.736 1.303
- Scopus rating (2009): 0.744 1.417
- Scopus rating (2008): 0.776 1.228
- Scopus rating (2007): 0.459 0.742
- Scopus rating (2006): 0.466 0.968
- Scopus rating (2005): 0.382 0.876
- Scopus rating (2004): 0.227 0.63
- Scopus rating (2003): 0.275 0.297
- Scopus rating (2002): 0.235 0.585
- Scopus rating (2001): 0.131 0.783

**Nonlinear iteration semigroups of fuzzy Cauchy problems**
On the Parametric Instability Caused by Step Size Variation in Runge-Kutta-Nyström Methods

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Research group: Positioning, Former organisation of the author
Authors: Piche, R.
Number of pages: 11
Optimal computation of brightness integrals parametrized on the unit sphere

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Scopus rating (2001): 1.555 0.727
Scopus rating (2000): 2.178 1.039
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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: 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
Links:
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6245525
http://urn.fi/URN:NBN:fi:tty-2013103111406

Bibliographical note
Artikkelissa ISBN-numero 978-1-4673-2343-7. ei ut-numeroa 22.8.2013<br/>Contribution: organisation=mat,FACT1=1<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 4813
Research output: Scientific - peer-review › Conference contribution

Output Regulation for General Infinite-Dimensional Exosystems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Paradigm shift in innovation indicators - from analog to digital

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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

Bibliographical note
ei ut-numeroa 27.8.2013<br/>Contribution: organisation=mat,FACT1=1<br/>Publisher name: International Federation of Automatic Control IFAC
Source: researchoutputwizard
Source-ID: 5028
Research output: Scientific - peer-review › Conference contribution

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Paunonen, L., Pohjolainen, S.
Pages: 403-441
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Mathematics of Control Signals and Systems
Volume: 24
Prime filters on residuated lattices

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Authors: 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
Raviart-Thomas-type sources adapted to applied EEG and MEG: Implementation and results

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 1.502 1.386
Publication Forum (2016): 2
Web of Science (2015): 1.651 1.926 9.1 0.273 0.01483 1.166
Publication Forum (2015): 2
Scopus rating (2014): 1.257 1.346
Web of Science (2014): 1.323 1.95 8.4 0.444 0.01483 1.105
Publication Forum (2014): 2
Scopus rating (2013): 1.19 1.566
Publication Forum (2013): 2
Scopus rating (2012): 1.239 1.838
Publication Forum (2012): 2
Scopus rating (2011): 1.127 1.6
Scopus rating (2010): 1.365 1.587
Scopus rating (2009): 1.33 1.759
Scopus rating (2008): 1.211 1.884
Scopus rating (2007): 1.0 1.984
Scopus rating (2006): 0.893 1.763
Scopus rating (2005): 1.129 1.954
Scopus rating (2004): 0.795 1.615
Scopus rating (2003): 0.723 1.389
Scopus rating (2002): 1.114 1.457
Scopus rating (2001): 0.987 1.502
Scopus rating (2000): 0.896 1.52
Scopus rating (1999): 0.815 1.347
Original language: English
DOIs:
10.1088/0266-5611/28/6/065013
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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: Dashti, M., Ali-Löytty, S., Wirola, L., Muller, P., Nurminen, H., Piche, R.
Pages: 83-88
Publication date: 2012

Host publication information
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
Links:
http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=6261642
http://urn.fi/URN:NBN:fi:tty-201311061422

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 stability 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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Paunonen, L.
Pages: 2555-2583
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: Journal of Functional Analysis
Robust regulation: From state-space to frequency domain

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Authors: 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
Robust Regulation of Distributed Parameter Systems with Infinite-Dimensional Exosystems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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

Shape modeling technique KOALA validated by ESA Rosetta at (21) Lutetia

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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
Shape reconstruction of irregular bodies with multiple complementary data sources

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Stress-strain behavior of polyamide 6 staple fibers of punch-needled press felts under simulated wet-pressing conditions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Materials Science, Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.418 0.81
Publication Forum (2016): 1
Scopus rating (2015): 0.656 0.998
Web of Science (2015): 1.128 1.132 6.9 0.121 0.00252 0.244
Publication Forum (2015): 1
Scopus rating (2014): 0.509 0.955
Web of Science (2014): 0.722 0.876 8.7 0.138 0.00189 0.192
Publication Forum (2014): 1
Scopus rating (2013): 0.572 1.005
Publication Forum (2013): 1
Scopus rating (2012): 0.712 1.243
Publication Forum (2012): 1
Scopus rating (2011): 0.759 1.176
Scopus rating (2010): 0.426 1.089
Scopus rating (2009): 0.835 1.098
Scopus rating (2008): 0.897 1.003
Scopus rating (2007): 0.312 0.434
Scopus rating (2006): 0.2 0.274
Scopus rating (2005): 0.123 0.109
Scopus rating (2004): 0.127 0.456
Scopus rating (2003): 0.474 0.821
Scopus rating (2002): 0.311 0.613
Scopus rating (2001): 0.388 0.686
Scopus rating (2000): 0.374 0.788
Scopus rating (1999): 0.26 1.264
Original language: English
DOIs:
10.1080/00405000.2012.677566

Bibliographical note
Contribution: organisation=mol,FACT1=0.5<br/>
Contribution: organisation=mat,FACT2=0.5<br/>
Publisher name: Routledge
Source: researchoutputwizard
Source-ID: 4124
Research output: Scientific - peer-review › Article

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.
The Infinite-Dimensional Sylvester Differential Equation and Periodic Output Regulation

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Paunonen, L.
Pages: 515-531
Publication date: 2012

Host publication information
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<br/>Contribution: organisation=mat,FACT1=1<br/>Publisher name: Springer Basel
Source: researchoutputwizard
Source-ID: 5026
Research output: Scientific - peer-review › Conference contribution

Transforming Innovation Ecosystems Through Network Orchestration: Case EIT ICT Labs

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Understanding Mobile Ecosystem Dynamics: a Data-Driven Approach

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Basole, R. C., Russell, M. G., Huhtamäki, J., Rubens, N.
Pages: 17-28
Publication date: 2012

Host publication information
Place of publication: Delft, The Netherlands
Publisher: Delft University of Technology

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
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: 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
Links:
http://urn.fi/URN:NBN:fi: tty-201311061418

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 5137
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
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Mathematics
Authors: 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
Links:
http://urn.fi/URN:NBN:fi:tty-2011102414850

Bibliographical note
Awarding institution: Tampere University of Technology
Source: researchoutputwizard
Source-ID: 6974
Research output: Monograph › Doctoral Thesis

Absolute radiometric calibration of ALS intensity data: Effects on accuracy and target classification

General information
State: Published
A differential form approach to Dirac operators on surfaces

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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
Advances in Augmented Reality Technologies

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Authors: Pylvänäinen, T.
Number of pages: 183
Publication date: 2011

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
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: Collection of articles » Doctoral Thesis

A Framework for Bayesian Receiver Autonomous Integrity Monitoring in Urban Navigation

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.981 1.843
Publication Forum (2016): 1
Scopus rating (2015): 0.466 1.571
Publication Forum (2015): 1
Scopus rating (2014): 0.392 1.553
Publication Forum (2014): 2
A hyperbolic interpretation of Cauchy-type kernels in hyperbolic function theory in hypercomplex analysis

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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: 7006
Research output: Scientific - peer-review › Article

Alumni Network Analysis

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Rubens, N., Russell, M. G., Perez, R., Huhtamäki, J., Still, K., Kaplan, D., Okamoto, T.
Pages: 606-611
A Mean-Value Theorem for Some Eigenfunctions of the Laplace-Beltrami Operator on the Upper-Half Space
A method of tracking a state of a mobile electronic device

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Former organisation of the author
Authors: 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
Links:
http://eng.kipris.or.kr/eng/main/main_eng.jsp#

Bibliographical note
h3tut > h1 : Pat.Appl.PCT/EP2006/002272(2006.03.07)<br/>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7276
Research output: Scientific › Patent

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
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: Huttunen, V., Piche, R.
Number of pages: 16
Publication date: 2011

Publication information
Place of publication: Tampere
Publisher: Tampereen Teknillinen Yliopisto
Original language: English

Publication series
Name: Tampereen teknillinen yliopisto. Matematiikan laitos. Tutkimusraportti
Analysis of Incidence Angle and Distance Effects on Terrestrial Laser Scanner Intensity: Search for Correction Methods

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.31 1.661
Publication Forum (2016): 1
Web of Science (2015): 3.036 3.278 2.5 0.528 0.01552 0.759
Publication Forum (2015): 1
Scopus rating (2014): 1.28 1.886
Web of Science (2014): 3.18 3.257 2.5 0.505 0.01044 0.772
Publication Forum (2014): 1
Scopus rating (2013): 1.167 1.981
Publication Forum (2013): 1
Scopus rating (2012): 0.999 1.645
Publication Forum (2012): 1
Scopus rating (2011): 0.498 1.268
Scopus rating (2010): 0.315 0.531
Original language: English
DOIs:
10.3390/rs3102207

Bibliographical note
Otsikko alunperin: Analysis of topographic and distance effects on TLS intensity: Search for correction methods<br>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 6256
Research output: Scientific - peer-review › Article

A Network-Centric Snapshot of Value Co-Creation in Finnish Innovation Financing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
A Network-Centric Snapshot of Value Co-Creation in Finnish Innovation Financing

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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.
Links:

Bibliographical note
ei ut-numeroa 8.3.2014<br/>Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 6110
Research output: Scientific - peer-review › Chapter

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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Authors: 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
Apparent wind load effects on the tether of a kite power generator

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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
Approximation of Volume and Branch Size Distribution of Trees from Laser Scanner Data

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Authors: 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
A Self-Tuning Robust Regulator for Infinite-Dimensional Systems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 3
Scopus rating (2016): 4.174 3.159
Publication Forum (2016): 3
Scopus rating (2015): 3.926 2.884
Web of Science (2015): 2.777 3.747 >10.0 0.453 0.04901 1.807
Web of Science (2014): 2.779 3.713 >10.0 0.358 0.05045 1.769
Publication Forum (2014): 3
Scopus rating (2013): 4.096 3.13
Publication Forum (2013): 3
Scopus rating (2012): 4.143 3.292
Publication Forum (2012): 3
Scopus rating (2011): 3.749 2.961
Scopus rating (2010): 2.939 2.917
Scopus rating (2006): 3.67 2.917
Scopus rating (2005): 1.968 2.566
Scopus rating (2004): 2.959 2.708
Scopus rating (2003): 3.359 2.589
Scopus rating (2002): 3.982 2.349
Scopus rating (2001): 4.161 2.777
Scopus rating (2000): 3.887 2.772
Scopus rating (1999): 1.93 2.438
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
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
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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.

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
Links:
http://urn.fi/URN:NBN:fi:ttty-2011081114757

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7236
Research output: Scientific › Conference contribution

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
State: Published
Ministry of Education 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)
Authors: Seppänen, M., Perälä, T., Piche, R.
Pages: 554-564
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.
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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
Links:
http://www.amstat.org/meetings/jsm/2011/
http://urn.fi/URN:NBN:fi:tty-201311011410

Bibliographical note
ei ut-numeroa 26.4.2014<br/>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7007
Research output: Scientific › Conference contribution

Business Angels and Investment Organizations as Networked Co-creators of the Finnish Innovation Ecosystem

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Links:

Bibliographical note
ei ut-numeroa 8.3.2014<br/>Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 6111
Research output: Scientific - peer-review › Conference contribution

Combining asteroid models derived by lightcurve inversion with asteroidal occultation silhouettes

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Pages: 652-670
Publication date: 2011
Commutative bounded integral residuated orthomodular lattices are Boolean algebras

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research Community on Data-to-Decision (D2D)
Authors: Tladiéc, J., Turunen, E.
Pages: 635-636
Publication date: 2011
Peer-reviewed: Yes

Publication information
Journal: Soft Computing
Volume: 15
Issue number: 4
Computational study of noise in a large signal transduction network

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics, Research group: Computational Neuroscience, CNS, Research group: Computational Systems Biology
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.467 0.946
Publication Forum (2016): 1
Dimensional Reduction of Electromagnetic Boundary Value Problems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Department of Electronics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.556 0.754
Publication Forum (2016): 1
Scopus rating (2015): 0.498 0.708
Publication Forum (2015): 1
Scopus rating (2014): 0.615 0.993
Publication Forum (2014): 1
Scopus rating (2013): 0.689 0.867
Publication Forum (2013): 1

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: Scientific - peer-review › Article
Directed structure at infinity for infinite-dimensional systems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.498 1.413
Publication Forum (2016): 1
Web of Science (2015): 1.88 1.838 >10.0 0.174 0.00961 0.695
Publication Forum (2015): 1
Scopus rating (2014): 1.322 1.422
Web of Science (2014): 1.654 1.666 >10.0 0.322 0.00924 0.651
Publication Forum (2014): 1
Scopus rating (2013): 1.191 1.279
Publication Forum (2013): 1
Scopus rating (2012): 1.424 1.434
Publication Forum (2012): 1
Scopus rating (2010): 1.154 1.409
Scopus rating (2009): 1.398 1.557
Scopus rating (2008): 1.251 1.392
Scopus rating (2007): 1.408 1.473
Scopus rating (2006): 1.221 1.395
Scopus rating (2005): 0.894 1.301
Scopus rating (2004): 1.434 1.549
Scopus rating (2003): 1.608 1.466
Scopus rating (2002): 1.976 1.514
Discrete maximum principles for FE solutions of nonstationary diffusion-reaction problems with mixed boundary conditions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 1.055 0.836
Publication Forum (2016): 1
Scopus rating (2015): 1.163 1.015
Web of Science (2015): 0.964 1.144 7.8 0.172 0.00472 0.633
Publication Forum (2015): 1
Scopus rating (2014): 1.018 0.863
Web of Science (2014): 0.859 1.145 7.2 0.125 0.00483 0.637
Publication Forum (2014): 1
Scopus rating (2013): 1.243 1.116
Publication Forum (2013): 1
Scopus rating (2012): 1.118 1.072
Publication Forum (2012): 1
Scopus rating (2011): 1.193 0.88
Scopus rating (2010): 0.966 1.543
Scopus rating (2009): 0.8 0.432
Scopus rating (2008): 0.651 0.097
Scopus rating (2007): 0.809 0.843
Scopus rating (2006): 0.646 2.143
Scopus rating (2005): 0.44 0.782
Scopus rating (2004): 0.518 1.055
Scopus rating (2003): 0.745 1.944
Scopus rating (2002): 1.191 0.976
Scopus rating (2001): 1.382 0.969
Scopus rating (2000): 1.148 1.018
Scopus rating (1999): 1.001 0.858
Original language: English
DOIs:
Explaining innovation with indicators of mobility and networks: Insights into central innovation nodes in Europe

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Links:

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 7311
Research output: Scientific - peer-review » Conference contribution

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
State: Published
Ministry of Education 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)
Authors: Kanniainen, J., Mäkinen, S., Piche, R., Chakrabarti, A.
Number of pages: 22
Pages: 1-22
Publication date: 2011
Peer-reviewed: Yes

Publication information
Volume: 99
ISSN (Print): 0018-9391
Ratings:
Gender and Innovation: Networks of Executive Women in Technology-Based Companies

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Images of asteroid 21 Lutetia: A remnant planetesimal from the early solar system

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Mathematical modelling with wide societal impact (MathImpact)
Pages: 487-490
Publication date: 2011
 Peer-reviewed: Yes

Publication information
Journal: Science
Volume: 334
Issue number: 6055
ISSN (Print): 0036-8075
Ratings:
Publication Forum (2017): 3
Publication Forum (2016): 3
Scopus rating (2015): 12.906 7.826
Web of Science (2015): 34.661 34.921 >10.0 8.961 1.15726 18.048
Scopus rating (2014): 12.012 8.269
Web of Science (2014): 33.611 35.263 >10.0 7.221 1.22204 17.885
Publication Forum (2014): 3
Scopus rating (2013): 12.305 7.87
Publication Forum (2013): 3
Scopus rating (2012): 13.159 8.124
Publication Forum (2012): 3
Scopus rating (2010): 13.216 7.91
Scopus rating (2009): 11.644 7.033
Scopus rating (2008): 10.996 6.09
Scopus rating (2004): 11.249 7.255
Scopus rating (2002): 10.5 7.071
Scopus rating (2000): 12.983 7.088
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.
Invertibility and Dedekind finiteness in structural matrix rings

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.903 1.139
Publication Forum (2016): 1
Scopus rating (2015): 0.59 0.88
Web of Science (2015): 0.761 0.73 6.6 0.37 0.00397 0.486
Publication Forum (2015): 1
Scopus rating (2014): 0.721 0.969
Web of Science (2014): 0.738 0.686 >10.0 0.092 0.00351 0.46
Publication Forum (2014): 1
Scopus rating (2013): 0.616 0.893
Publication Forum (2013): 1
Scopus rating (2012): 0.596 0.911
Publication Forum (2012): 1
Scopus rating (2011): 0.841 1.142
Scopus rating (2010): 0.703 0.95
Scopus rating (2009): 0.841 0.861
Scopus rating (2008): 0.41 0.729
Scopus rating (2007): 0.525 0.762
Scopus rating (2006): 0.376 0.724
Scopus rating (2005): 0.548 0.88
Scopus rating (2004): 0.307 0.803
Scopus rating (2003): 0.628 1.221
Scopus rating (2002): 0.505 0.882
Scopus rating (2001): 0.759 0.895
Scopus rating (2000): 0.653 0.816
Scopus rating (1999): 0.754 0.738
Original language: English
DOIs:
10.1080/03081080903357653
Links:
http://www.tandfonline.com/toc/glma20/59/2

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 5946
Research output: Scientific - peer-review › Article

Korkeakoulumatematilka teekkarin kompastuskivenä?

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics
Authors: 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
Links:
http://www.campusconexus.fi/Portals/conexus/dokumentit/Korkeaj%C3%A4nnityksi%C3%A4-%C3%A4nnytysta-2011_20111021.pdf

Bibliographical note
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 7261
Research output: Scientific - peer-review › Chapter

Learner Control and Responsibility: Expanding the Concept of Self-direction in Higher Education

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Authors: Väljataga, T.
Number of pages: 167
Publication date: 2011

Publication information
Place of publication: Tampere
Publisher: Tampere University of Technology
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
Linear Equation Solvers: Comparison of LU Decomposition and a Robust ODE Solver

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Pohjolainen, S., Nortunen, H.
Pages: 77-80
Publication date: 2011

Host publication information
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<br/>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7030
Research output: Scientific › peer-review › Conference contribution

Maaliskuun puheenaihe: Mielenkiintoista matematiikkaa opetukseen LUMA-sanomat

General information
State: Published
Ministry of Education publication type: E1 Popularised article, newspaper article
Organisations: Department of Mathematics
Authors: 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
Links:
http://www.luma.fi/uutiskirje/?q=Sirkka-Liisa+Eriksson

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 5918
Research output: General public › Article

Matematiikkaklinikka

General information
State: Published
Ministry of Education publication type: D2 Article in professional manuals or guides or professional information systems or text book material
Organisations: Department of Mathematics
Authors: Kangas, J.
Pages: 56-60
Publication date: 2011

**Host publication information**
Title of host publication: Oppaiden opas - vinkkejä opetuksen 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

**Bibliographical note**
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 6282
Research output: Professional › Chapter

Math-Bridge - Eurooppalainen silta lukio- ja korkeakoulumatematikkojen välille

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Miilumäki, T., Pohjolainen, S., Silius, K., Nykänen, O., Kangas, J.
Pages: 70-71
Publication date: 2011

**Host publication information**
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: Scientific - peer-review › Conference contribution

Mean value properties for K-hypermonogenic functions

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
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
State: Published
Ministry of Education 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)
Authors: 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
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.
Modifications of the 85/85 test and the temperature cycling test for tantalum capacitors

General information
State: Published
Ministry of Education 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)
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.311 0.863
Publication Forum (2016): 1
Scopus rating (2015): 0.244 0.608
Web of Science (2015): 0.913 0.842 6.3 0.038 3.5E-4 0.19
Publication Forum (2015): 1
Scopus rating (2014): 0.228 0.859
Web of Science (2014): 0.872 0.727 5.7 0.167 3.2E-4 0.166
Publication Forum (2014): 1
Scopus rating (2013): 0.196 0.523
Publication Forum (2013): 1
Scopus rating (2012): 0.277 0.67
Publication Forum (2012): 1
Scopus rating (2011): 0.158 0.651
Scopus rating (2010): 0.181 0.511
Scopus rating (2009): 0.287 1.006
Scopus rating (2008): 0.207 0.604
Scopus rating (2007): 0.321 0.865
Scopus rating (2006): 0.259 0.743
Scopus rating (2005): 0.411 1.056
Scopus rating (2004): 0.419 0.893
Scopus rating (2003): 0.206 0.798
Scopus rating (2002): 0.197 0.856
Scopus rating (2001): 0.188 0.831
Scopus rating (2000): 0.195 0.261
Scopus rating (1999): 0.263 0.549
Original language: English
DOIs:
10.1108/09540911111146926

Bibliographical note
Tulospisteet 90 % ELE / 10 % MAT<br/>&lt;br&gt;Contribution: organisation=ele,FACT1=0.9&lt;br&gt;Contribution: organisation=mat,FACT2=0.1
Source: researchoutputwizard
Source-ID: 7523
Research output: Scientific - peer-review › Article
Non-classical Logics with Real Life Applications

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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

Publication series
Name: International Conference of Rough Sets, Fuzzy Sets and Soft Computing ICRSFSSC
Publisher: Serial Publications

Bibliographical note
First published 2011
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 6255
Research output: Scientific - peer-review › Article

On Fractional Ornstein-Uhlenbeck Process

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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
Ratings:
Publications Forum (2017): 1
Publications Forum (2016): 1
Publications Forum (2015): 1
Publications Forum (2014): 1
On the distribution of coefficients of powers of positive polynomials

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.463 0.681
Publication Forum (2016): 1
Scopus rating (2015): 0.559 0.897
Publication Forum (2015): 1
Scopus rating (2014): 0.332 0.5
Publication Forum (2014): 1
Scopus rating (2013): 0.402 0.499
Publication Forum (2013): 1
Scopus rating (2012): 0.598 0.687
Publication Forum (2012): 1
Scopus rating (2011): 0.428 0.674
Scopus rating (2010): 0.524 0.632
Scopus rating (2009): 0.661 0.689
Scopus rating (2008): 0.607 0.767
Scopus rating (2007): 0.919 1.013
Scopus rating (2006): 0.671 0.914
Scopus rating (2005): 0.568 0.799
Scopus rating (2004): 0.708 1.038
Scopus rating (2003): 0.788 0.643
Scopus rating (2002): 0.661 0.682
Scopus rating (2001): 0.812 0.68
Scopus rating (2000): 0.48 0.806
Scopus rating (1999): 0.62 0.83
Original language: English

Bibliographical note
ei ut-numeroa 22.3.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 6253
Research output: Scientific - peer-review › Article

Bibliographical note
ei ut-numeroa 5.4.2014
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 6694
Research output: Scientific - peer-review › Article
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
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 2.711 2.087
Publication Forum (2016): 2
Scopus rating (2015): 2.116 1.765
Web of Science (2015): 1.908 2.448 9.9 0.242 0.01284 1.184
Publication Forum (2015): 2
Scopus rating (2014): 2.105 1.911
Web of Science (2014): 2.059 2.448 9.5 0.147 0.01305 1.207
Publication Forum (2014): 2
Scopus rating (2013): 2.182 2.037
Publication Forum (2013): 2
Scopus rating (2012): 2.042 1.706
Publication Forum (2012): 2
Scopus rating (2011): 2.339 2.016
Scopus rating (2010): 1.904 2.029
Scopus rating (2009): 2.815 2.444
Scopus rating (2008): 3.224 2.206
Scopus rating (2007): 2.49 1.754
Scopus rating (2006): 1.919 1.682
Scopus rating (2005): 1.214 1.515
Scopus rating (2004): 1.946 1.467
Scopus rating (2003): 2.546 1.748
Scopus rating (2002): 3.998 1.812
Scopus rating (2001): 3.615 1.762
Scopus rating (2000): 2.933 1.676
Scopus rating (1999): 1.353 1.286
Original language: English
Electronic versions:
apaunonen_perturbation_of_strongly.pdf
DOIs:
10.1016/j.sysconle.2011.01.005
Links:
Plotting root-locus of infinite-dimensional systems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Laakkonen, P.
Pages: 139-142
Publication date: 2011

Host publication information
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

Properties of duration drift

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Industrial Management, Department of Mathematics
Authors: Kanniainen, J., Ruohonen, K.
Pages: 176-191
Publication date: 2011
Peer-reviewed: Yes

Publication information
Volume: 3
Issue number: 2
ISSN (Print): 1756-9850
Ratings:
Publication Forum (2017): 0
Scopus rating (2016): 0.113 0.084
Publication Forum (2016): 0
Scopus rating (2015): 0.101 0.159
Publication Forum (2015): 0
Original language: English

Bibliographical note
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
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: 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

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
Links:
http://urn.fi/URN:NBN:fi:tty-201406191310

Bibliographical note
ei ut-numeroa 5.4.2014<br/>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 6680
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.

Robust output regulation and the internal model principle

Bibliographical note

ei ut-numeroa 3.5.2014
Social Media, Reputation And Branding Of Innovation Hubs: A Periscope Using Content Analysis Of Twitter

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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

Social media-supported indicators for user-driven service innovation

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: 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
Some remarks on structural matrix rings and matrices with ideal entries

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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 (2016): 0.284 0.484
Scopus rating (2015): 0.33 0.661
Web of Science (2015): 0.335 0.362 2.9 0.038 5.6E-4 0.144
Publication Forum (2015): 1
Scopus rating (2014): 0.273 0.586
Web of Science (2014): 0.229 0.266 Not Available 0.015 1.8E-4 0.054
Publication Forum (2014): 1
Scopus rating (2013): 0.241 0.487
Publication Forum (2013): 1
Scopus rating (2012): 0.213 0.388
Publication Forum (2012): 1
Scopus rating (2011): 0.105 0.063
Original language: English
Links:
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: Scientific - peer-review › Article

Studying the quality of noise in a large biochemical reaction network as a function of the system volume

General information
State: Published
Ministry of Education 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
Authors: 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
Teleconsultation: Changes in technology and costs over a 12-year period

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Signal Processing, Department of Mathematics
Authors: Lamminen, J., Forsvik, H. J., Vopio, 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.694 0.921
Publication Forum (2016): 1
Scopus rating (2015): 0.835 1.19
Web of Science (2015): 1.377 1.986 7.4 0.516 0.00362 0.574
Publication Forum (2015): 1
Scopus rating (2014): 0.905 1.156
Web of Science (2014): 1.542 1.78 6.9 0.186 0.00379 0.558
Publication Forum (2014): 1
Scopus rating (2013): 1.095 1.213
Publication Forum (2013): 1
Scopus rating (2012): 0.618 1.028
Publication Forum (2012): 1
Scopus rating (2011): 0.624 1.082
Scopus rating (2010): 0.668 0.864
Scopus rating (2009): 0.52 0.811
Scopus rating (2008): 0.467 0.648
Scopus rating (2007): 0.506 0.809
Scopus rating (2006): 0.447 0.895
Scopus rating (2005): 0.399 0.99
Scopus rating (2004): 0.422 0.941
Scopus rating (2003): 0.492 0.836
Scopus rating (2002): 0.362 1.018
Scopus rating (2001): 0.534 1.369
Scopus rating (2000): 0.543 1.444
Scopus rating (1999): 0.496 1.402
Original language: English
DOIs:
10.1258/jtt.2011.110211

Bibliographical note
Contribution: organisation=sgn,FACT1=0.5<br/>Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source-ID: 6542
Research output: Scientific - peer-review › Article
Virtual machine laboratory based on m1-technology

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Authors: 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
No.: 3

Bibliographical note
ei ut-numeroa 9.4.2014<br/>Contribution: organisation=iha,FACT1=0.5<br/>Contribution: organisation=mat,FACT2=0.5
Source: researchoutputwizard
Source-ID: 6748
Research output: Scientific - peer-review » Conference contribution

VRTUOSI: Courses Data Mining and Many-valued Similarities: Universidad Rey Juan Carlos

General information
State: Published
Ministry of Education publication type: I1 Audiovisual material
Organisations: Department of Mathematics
Authors: Turunen, E.
Publication date: 2011

Event Information
Media of output: Online
Links:
What can be done to bridge the competency gap between upper-secondary school and university mathematics?

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Regulation of learning and active learning methods (REALMEE)
Authors: 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<br/>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7260
Research output: Scientific - peer-review › Conference contribution

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**
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Mathematics
Authors: Orelma, H.
Number of pages: 37
Publication date: 28 Apr 2010

**Publication information**
Place of publication: Tampere
Publisher: Tampere University of Technology
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
Links:
A hyperbolic interpretation of Cauchy type kernels in hyperbolic function theory

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Mathematics
Authors: Eriksson, S., Orelma, H.
Publication date: 2010

Publication information
Place of publication: Tampere
Publisher: Unknown Publisher
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: Professional › Commissioned report

A motion model for articulated vehicles and a distributed acceleration measurement system

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: Sirola, N., Rouhe, J.
Approximative solutions to the bicriterion Vehicle Routing Problem with Time Windows

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 2
Scopus rating (2016): 2.505 2.339
Publication Forum (2016): 2
Scopus rating (2015): 2.334 2.412
Web of Science (2015): 2.679 3.109 8.8 0.575 0.04722 1.08
Publication Forum (2015): 2
Scopus rating (2014): 2.186 2.485
Web of Science (2014): 2.358 2.911 8.5 0.514 0.0469 0.99
Publication Forum (2014): 2
Scopus rating (2013): 2.346 2.735
Publication Forum (2013): 2
Scopus rating (2012): 2.418 2.588
Publication Forum (2012): 2
Scopus rating (2011): 2.401 2.441
Scopus rating (2010): 2.477 2.435
Scopus rating (2009): 2.326 2.577
Scopus rating (2008): 1.739 1.984
Scopus rating (2007): 1.679 2.041
Scopus rating (2006): 1.299 2.023
Scopus rating (2005): 1.194 1.913
Scopus rating (2004): 1.24 1.882
Scopus rating (2003): 0.991 1.507
Scopus rating (2002): 0.97 1.279
Scopus rating (2001): 1.078 1.183
Scopus rating (2000): 1.046 1.135
Scopus rating (1999): 1.104 1.059
Bayesian assaying of GUHA nuggets

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: Positioning
Authors: Piche, R., Turunen, E.
Pages: 348-355
Publication date: 2010

Host publication information
Editors: Hüllermeier, E., Kruse, R., Hoffmann, F.
ISBN (Print): 978-3-642-14054-9
DOIs:
10.1007/978-3-642-14055-6_36

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
State: Published
Ministry of Education publication type: D5 Text book, professional manual or guide or a dictionary
Organisations: Department of Mathematics, Research group: Positioning
Authors: 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
Links:
http://urn.fi/URN:NBN:fi:tty-201012161393

Bibliographical note
Box Gaussian mixture filter

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: Ali-Löytty, S.
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
Volume: 55
Issue number: 9
ISSN (Print): 0018-9286
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 4.174 3.159
Publication Forum (2016): 3
Scopus rating (2015): 3.926 2.884
Web of Science (2015): 2.777 3.747 >10.0 0.453 0.04901 1.807
Web of Science (2014): 2.779 3.713 >10.0 0.358 0.05045 1.769
Publication Forum (2014): 3
Scopus rating (2013): 4.096 3.13
Publication Forum (2013): 3
Scopus rating (2012): 4.143 3.292
Publication Forum (2012): 3
Scopus rating (2011): 3.749 2.961
Scopus rating (2010): 2.939 2.917
Scopus rating (2006): 3.67 2.917
Scopus rating (2005): 1.968 2.566
Scopus rating (2004): 2.959 2.708
Scopus rating (2003): 3.359 2.589
Scopus rating (2002): 3.982 2.349
Scopus rating (2001): 4.161 2.777
Scopus rating (2000): 3.887 2.772
Scopus rating (1999): 1.93 2.438
Original language: English
DOIs:
10.1109/TAC.2010.2051486

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7672
Research output: Scientific - peer-review › Article
Briefly about the root-locus of linear systems

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Authors: 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.

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 8513
Research output: Scientific › Conference contribution

Closed classes of functions, generalized constraints, and clusters

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.496 0.884
Publication Forum (2016): 1
Scopus rating (2015): 0.375 1.0
Web of Science (2015): 0.344 0.38 >10.0 0.17 8.7E-4 0.235
Publication Forum (2015): 1
Scopus rating (2014): 0.694 1.209
Web of Science (2014): 0.442 0.4 >10.0 0.184 0.00141 0.317
Publication Forum (2014): 1
Scopus rating (2013): 0.548 1.244
Publication Forum (2013): 1
Scopus rating (2012): 0.684 1.033
Publication Forum (2012): 1
Scopus rating (2011): 0.518 0.938
Scopus rating (2010): 0.621 1.048
Scopus rating (2009): 0.668 1.049
Scopus rating (2008): 0.777 1.051
Scopus rating (2007): 0.835 1.427
Scopus rating (2006): 0.593 0.971
Scopus rating (2005): 0.739 1.292
Scopus rating (2004): 0.629 0.554
Scopus rating (2003): 0.474 0.784
Scopus rating (2002): 0.587 1.001
Scopus rating (2001): 0.229 0.459
Scopus rating (2000): 0.322 0.626
Scopus rating (1999): 0.413 0.905
Original language: English
DOIs: 10.1007/s00012-010-0071-6

**Bibliographical note**
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 8597
Research output: Scientific - peer-review › Article

**Closed-form algorithms in mobile positioning: Myths and misconceptions**

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: 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
Links:
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<br/>
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 9289
Research output: Scientific - peer-review › Conference contribution

**Column-partitioned matrices over rings without invertible transversal submatrices**

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: 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:
Publication Forum (2017): 1
Scopus rating (2016): 0.255 0.646
Publication Forum (2016): 1
Scopus rating (2015): 0.239 0.388
Web of Science (2015): 0.265 0.278 >10.0 0.009 0.00289 0.17
Comparing two stochastic differential equation models for protein kinase C activation pathway

General information
State: Published
Ministry of Education 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
Authors: 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=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7914
Research output: Scientific - peer-review › Article

Considering learners' perspectives to personal learning environments in course design

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Former organisation of the author
Authors: Väljataga, T., Pata, K., Tammets, K.
Number of pages: 24
Pages: 85-108
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 different usage contexts is often difficult. 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 sufficient 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.

Cubature-based Kalman filters for positioning

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: Pesonen, H., Piche, R.
Pages: 45-49
Publication date: 2010
Datapohjaiset mallit

General information
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Organisations: Department of Mathematics
Authors: Merikoski, J., Turunen, E., Raivio, K., Mantere, T.
Pages: 77-146
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

Energy conversion efficiency of the pumping kite wind generator

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Argatov, I., Silvennoinen, R.
Pages: 1052-1060
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Renewable Energy
Volume: 35
ISSN (Print): 0960-1481
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.697 2.044
Publication Forum (2016): 1
Scopus rating (2015): 1.845 2.118
Web of Science (2015): 3.404 4.068 5.0 1.149 0.03734 0.94
Publication Forum (2015): 1
Scopus rating (2014): 1.983 2.687
Web of Science (2014): 3.476 3.982 5.0 0.954 0.0329 0.884
Publication Forum (2014): 2
Scopus rating (2013): 2.066 2.767
Publication Forum (2013): 2
Scopus rating (2012): 1.852 2.745
Publication Forum (2012): 2
Scopus rating (2011): 1.688 2.404
Scopus rating (2009): 1.305 1.945
Estimation of base station position using timing advance measurements

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: Raitoharju, M., Ali-Löytty, S., Wirola, L.
Pages: 182-186
Publication date: 2010

Host publication information
Title of host publication: 2010 International Conference on Signal and Information Processing ICSIP 2010, Changsha, China, 15.12.2010
Links:
http://www.icsip.org

E-type asteroid Steins as imaged by OSIRIS on board Rosetta

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Pages: 190-193
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Science
Volume: 327
Hyperbolic extensions of integral formulas

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Eriksson, S.
Pages: 575-586
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Advances in Applied Clifford Algebras
Volume: 20
Issue number: 3-4
ISSN (Print): 0188-7009
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.353 1.199
Indoor positioning using WLAN coverage area estimates

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: Koski, L., Perälä, T., Piche, R.
Number of pages: 7
Pages: 1-7
Publication date: 2010

Host publication information
Title of host publication: International Conference on Indoor Positioning and Indoor Navigation IPIN 2010, 15-17 September 2010, Zurich, Switzerland
Electronic versions:
Koski IPIN 2010
DOIs:
10.1109/IPIN.2010.5648284
Links:
http://urn.fi/URN:NBN:fi:ttty-201603173638

Bibliographical note
Poistettu tupla r=2937 (esitelmä-tietue)<br/>Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7881
Research output: Scientific - peer-review » Article

Infinite structure for infinite-dimensional systems: A directional approach

General information
State: Published
Internal model theory for distributed parameter systems

In this paper we consider robust output regulation of distributed parameter systems and the internal model principle. The main purpose is to generalize the internal model principle by Francis and Wonham for infinite-dimensional systems and clarify the relationships between different generalizations of the internal model. We also construct a signal generator capable of generating infinite-dimensional polynomially increasing signals.
Interventions for second-order change in higher education: challenges and barriers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Fiedler, S., Väljataga, T.
Pages: 85-92
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Electronic Journal of e-Learning
Volume: 8
Issue number: 2
ISSN (Print): 1479-4403
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.424 1.008
Publication Forum (2016): 1
Scopus rating (2015): 0.548 0.893
Publication Forum (2015): 1
Scopus rating (2014): 0.279 0.746
Publication Forum (2014): 1
Scopus rating (2013): 0.15 0.196
Publication Forum (2013): 1
Scopus rating (2012): 0.104 0.326
Publication Forum (2012): 1
Original language: English

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 8952
Research output: Scientific - peer-review › Article

Kokonaislukumallit

General information
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Learner control and personal learning environment: a challenge for instructional design

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Väljataga, T., Laanpere, M.
Pages: 277-291
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Interactive Learning Environments
Volume: 18
Issue number: 3
ISSN (Print): 1049-4820
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.848 1.325
Publication Forum (2016): 1
Scopus rating (2015): 0.813 0.964
Web of Science (2015): 1.175 1.418 5.5 0.267 0.00119 0.478
Publication Forum (2015): 1
Scopus rating (2014): 0.902 1.148
Web of Science (2014): 1.323 1.643 4.7 0.149 0.00135 0.607
Publication Forum (2014): 1
Scopus rating (2013): 0.976 1.314
Publication Forum (2013): 1
Scopus rating (2012): 1.411 1.349
Publication Forum (2012): 1
Scopus rating (2011): 0.964 1.106
Scopus rating (2010): 0.603 1.304
Scopus rating (2009): 0.534 0.927
Scopus rating (2008): 0.667 1.452
Scopus rating (2007): 0.26 0.647
Scopus rating (2006): 0.292 0.928
Scopus rating (2005): 0.102 0.0
Original language: English
DOIs:
10.1080/10494820.2010.500546

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 9504
Research output: Scientific - peer-review › Article

M1-teknologialla voidaan rakentaa virtuaalisia oppimisympäristöjä ja konelaboratorioita

General information
State: Published
Ministry of Education publication type: B1 Article in a scientific magazine
Organisations: Department of Intelligent Hydraulics and Automation, Department of Mathematics
Authors: Koskinen, K. T., Leino, T., Palonen, T., Ranta, P.
Pages: 18-20
Publication date: 2010
Peer-reviewed: No
MAT-45800 Paikannuksen matematiikka 2010


General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Research group: MAT Positioning, Department of Computer Systems, Department of Mathematics, Research group: Positioning
Authors: Ali-Löytty, S., Collin, J., Sirola, N.
Number of pages: 64
Publication date: 2010

Publication information
Publisher: Unknown Publisher
Original language: Finnish

Publication series
Name: Tampereen teknillinen yliopisto. Matematiikka
Electronic versions:

paikannuksen_matematiikka.pdf

Links:
http://urn.fi/URN:NBN:fi: tty-201012101379

Bibliographical note
yhteisjulkaisu tietokonetekniikka laitoksen kanssa</br>

MAT-45806 Mathematics for positioning & MAT-45807 Mathematics for positioning

Positioning techniques and algorithms have been studied for some years at the Tampere University of Technology within several research groups. The objective of this course hand-out has been to collect together the most important algorithms and mathematical tools used in positioning including examples and starting from the basics. We do not go into details of...
specialized techniques and equipment, but after this course student should be able to solve application dependent problems without having to "re-invent the wheel" again and again. This hand-out and course provide a strong basis for the course TKT-2546 Methods for Positioning. During the previous years courses MAT-45806 Mathematics for Positioning and TKT-2546 Methods for Positioning had a common hand-out. For practical reasons, the earlier hand-out has been divided into two parts so that both courses now have their own hand-out. Still the courses in question are tightly connected and it is strongly recommended to take both courses the same school year. Prerequisites are first-year engineering mathematics and basics of probability. Additionally, the course TKT-2536 Introduction to Satellite Positioning is a useful but not compulsory prerequisite. There is no official course text book in addition to this hand-out, mostly because the authors have not managed to find a single book to cover all the material on the level of abstraction we need. The arsenal of positioning computation methods is collected from different areas of mathematics and engineering sciences, and there are often discipline and interpretation differences between them, so we have tried to use common notations and represent connections between different ways of thinking as best as we could. The homepage of the course is http://math.tut.fi/courses/MAT-45806/ which contains additional information about the course and if necessary errata of this hand-out. The authors would like to thank Sami Tiainen for the initial translation of the manuscript, and professor Robert Piché, Helena Leppäkoski, Henri Pesonen, Hanna Sairo, Martti Kirkko-Jaakkola and others who have contributed to the hand-out. The sections excluded from this year's implementation have been marked with an asterisk (*).
Method and a system for positioning of an electronic, and an electronic device

Minors of Boolean functions with respect to clique functions and hypergraph homomorphisms
Mobile tracking and parameter learning in unknown non-line-of-sight conditions

This paper studies the mobile tracking problem in mixed line-of-sight (LOS) and non-line-of-sight (NLOS) conditions, where the statistics of NLOS error is Gaussian with fixed but unknown mean and variance. A Rao-Blackwellized particle filtering and parameter learning method (RBPF-PL) is proposed, in which the particle filtering with optimal trial distribution is first applied to estimate the posterior density of sight conditions, then the decentralized extended Kalman filter (EKF) is used to estimate the mobile state. In the parameter learning step, using the conjugate prior distribution on the unknown parameters, the posterior distribution of unknown parameters is further updated according to the sufficient statistics. Simulation results show the RBPF-PL method is effective to infer the unknown NLOS parameter and could achieve good tracking performance using small number of particles.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organizations: Research group: MAT Positioning, Department of Mathematics, Research group: Positioning
Authors: Liang, C., Piche, R.
Number of pages: 6
Pages: 1-6
Publication date: 2010

Host publication information
Title of host publication: 13th International Conference on Information Fusion, 26-29 July 2010, EICC, Edinburgh, UK
ISBN (Print): 978-0-9824438-1-1
Mobile tracking in unknown non-line-of-sight conditions
This paper studies the mobile tracking problem in mixed line-of-sight (LOS) and non-line-of-sight (NLOS) conditions, where the statistics of NLOS error are assumed unknown. Three different models are used to describe the NLOS errors. A Rao-Blackwellized particle filtering with parameter learning (RBPF-PL) is presented, in which the posterior of sight conditions is estimated by particle filtering while the mobile state and NLOS parameters are analytically computed. Simulation results are provided to evaluate the performance of RBPF-PL variants in different situations. Simulation show that unless it is known that NLOS noise has the same bias and variance in all the observations, the more complicated models should be employed as they work correctly even in NLOS model mismatch, with only slightly more computational complexity.

Modeling growth in neuronal cell cultures: network properties in different phases of growth studied using two growth simulators
In this work we study the structural changes in neuronal networks emerging during network maturation. We analyze two computational models proposed in the literature that describe the growth of neurons. The models have planar geometry and the density of cells is chosen to correspond to the 'dense' and 'sparse' cultures reported in the experimental studies. The growth of the model neurons and networks is simulated using two novel publicly available simulators. A graph representation of the networks is obtained from the simulation results and examined at days 7, 14, and 21. The two models are clearly different in nature. The first can model large networks phenomenologically, while the second describes some of the relevant biophysical processes in smaller networks. The difference in modeling approach is evident in the graph properties.
Multicolor, rotationally resolved photometry of asteroid 21 Lutetia from Osiris/Rosetta observations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Lamy, P., Faury, G., Jorda, L., Kaasalainen, M., Hviid, S.
Number of pages: 10
Pages: 1-10
Publication date: 2010
Peer-reviewed: Yes

Publication Information
Journal: Astronomy and Astrophysics
Volume: 521
Issue number: A19
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Output regulation of distributed parameter systems with time-periodic exosystems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Paunonen, L., Pohjolainen, S.
Pages: 1637-1644
Publication date: 2010

Host publication information
Title of host publication: Proceedings of the 19th International Symposium on Mathematical Theory of Networks and Systems, Budapest, Hungary, July 5-9, 2010
Editor: Edelmayer, A.
ISBN (Print): 978-963-311-370-7

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 8953
Research output: Scientific - peer-review › Conference contribution

Paraconsistent fuzzy logic - A review

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Turunen, E.
Pages: 158-162
Publication date: 2010

Host publication information
Title of host publication: Logic, Algebra and Truth Degrees 2010, Second Conference of the Working Group on Mathematical Fuzzy Logic, 7-11 September 2010, Prague, Czech Republic

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 9450
Research output: Scientific - peer-review › Conference contribution

Paraconsistent semantics for Pavelka style fuzzy sentential logic

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Partial differential equations

Partial differential equations (PDEs) are used to model physical phenomena involving continua, such as fluid dynamics, electromagnetic fields, acoustics, gravitation, and quantum mechanics. They also arise as mathematical models of other multivariate phenomena, for example in mathematical finance. These course notes present derivations of the basic linear PDEs (transport, heat/diffusion, wave, Laplace) and explain how they model physical phenomena. Standard analytical solution methods (separation of variables, Dirichlet's principle, Green's functions) and general theorems about solution properties are presented. Numerical PDE solution packages in Matlab and Maple are briefly introduced. Additional course materials (including exercises and recorded lectures) are available at the author's home page http://math.tut.fi/~piche/pde
Periodic output regulation of infinite-dimensional systems

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Mathematics
Authors: Paunonen, L.
Pages: 113-118
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.

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 8951
Research output: Scientific › Conference contribution

Physical properties of 2 Pallas

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Carry, B., Dumas, C., Kaasalainen, M., Berthier, J., Merline, W. J., Erard, S., Conrad, A., Drummondg, J. D., Hestroffer, D., Fulchignoni, M., Fusco, T.
Pages: 460-472
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 205
Issue number: 2
ISSN (Print): 0019-1035
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Physical properties of the ESA ROsetta target asteroid (21) Lutetia. II. Shape and flyby geometry

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Number of pages: 19
Pages: 1-19
Publication date: 2010
Peer-reviewed: Yes

Publication Information
Journal: Astronomy and Astrophysics
Volume: 523
Issue number: A94
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
### Positioning with coverage area estimates generated from location fingerprints

**General information**
- **State**: Published
- **Ministry of Education publication type**: A4 Article in a conference publication
- **Organisations**: Research group: MAT Positioning, Department of Computer Systems, Department of Mathematics, Research group: Positioning
- **Authors**: Koski, L., Piche, R., Kaseva, V., Ali-Löytty, S., Hännikäinen, M.
- **Number of pages**: 8
- **Pages**: 99-106
- **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.2010.5653409

**Bibliographical note**
- yhteisjulkaisu tietokonetekniikka laitoksen kanssa<br/>
- Contribution: organisation=mat,FACT1=0.5<br/>
- Contribution: organisation=tkt,FACT2=0.5
- Source: researchoutputwizard
- Source-ID: 8448
- Research output: Scientific - peer-review › Conference contribution

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**Robust Kalman-type filtering in positioning applications**
Robust regulation of distributed parameter systems with infinite-dimensional exosystems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Hämäläinen, T., Pohjolainen, S.
Pages: 4846-4873
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: SIAM Journal on Control and Optimization
Volume: 48
Issue number: 8
ISSN (Print): 0363-0129
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.933 1.89
Publication Forum (2016): 2
Scopus rating (2015): 1.872 1.554
Web of Science (2015): 1.491 1.793 >10.0 0.147 0.01424 1.381
Publication Forum (2015): 2
Scopus rating (2014): 1.765 1.761
Web of Science (2014): 1.463 1.776 >10.0 0.11 0.01533 1.443
Publication Forum (2014): 2
Scopus rating (2013): 1.866 2.018
Publication Forum (2013): 2
Scopus rating (2012): 2.1 1.94
Publication Forum (2012): 2
Scopus rating (2011): 2.776 2.2
Scopus rating (2010): 1.836 2.06
Scopus rating (2009): 2.093 1.942
Scopus rating (2008): 2.228 1.83
Scopus rating (2007): 1.938 1.654
Scopus rating (2006): 1.95 2.088
Scopus rating (2005): 1.53 1.829
Stochastic processes
Stochastic processes are probabilistic models of data streams such as speech, audio and video signals, stock market prices, and measurements of physical phenomena by digital sensors such as medical instruments, GPS receivers, or seismographs. A solid understanding of the mathematical basis of these models is essential for understanding phenomena and processing information in many branches of science and engineering including physics, communications, signal processing, automation, and structural dynamics. These course notes introduce the theory of discrete-time multivariate stochastic processes (i.e. sequences of random vectors) that is needed for estimation and prediction. Students are assumed to have knowledge of basic probability and of matrix algebra. The course starts with a succinct review of the theory of discrete and continuous random variables and random vectors. Bayesian estimation of linear functions of multivariate normal (Gaussian) random vectors is introduced. There follows a presentation of random sequences, including discussions of convergence, ergodicity, and power spectral density. State space models of linear discrete-time dynamic systems are introduced, and their response to transient and stationary random inputs is studied. The estimation problem for linear discrete-time systems with normal (i.e. Gaussian) signals is introduced and the Kalman filter algorithm is derived. Additional course materials, including exercise problems and recorded lectures, are available at the author’s home page http://www.tut.fi/~piche/stochastic
Students' motivations for social media enhanced studying and learning

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Silius, K., Miilumäki, T., Huhtamäki, J., Tebest, T., Meriläinen, J., Pohjolainen, S.
Pages: 51-67
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Knowledge Management & E-Learning: An International Journal (KM&EL)
Volume: 2
Issue number: 1
ISSN (Print): 2073-7904
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.302 0.752
Publication Forum (2016): 1
Scopus rating (2015): 0.288 0.543
Publication Forum (2015): 1
Scopus rating (2014): 0.36 0.839
Scopus rating (2013): 0.448 1.052
Scopus rating (2012): 0.259 0.648
Scopus rating (2011): 0.227 0.833
Thermal properties of asteroid 21 Lutetia from Spitzer Space Telescope observations

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Lamy, P., Groussin, O., Fornasier, S., Jorda, L., Kaasalainen, M., Barucci, M.
Number of pages: 10
Pages: 1-10
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 516
Issue number: A74
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Scopus rating (2001): 1.555 0.727
Scopus rating (2000): 2.178 1.039
Scopus rating (1999): 2.489 1.076
Original language: English
DOIs:
10.1051/0004-6361/201014361

Bibliographical note
The shape and rotation of asteroid 2008 TC3

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Pages: 1804-1811
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Meteoritics and Planetary Science
Volume: 45
Issue number: 10-11
ISSN (Print): 1086-9379
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.278 0.855
Publication Forum (2016): 1
Scopus rating (2015): 1.744 0.927
Web of Science (2015): 2.819 2.707 8.2 0.653 0.01038 1.031
Publication Forum (2015): 1
Scopus rating (2014): 1.868 0.937
Web of Science (2014): 3.104 3.058 7.5 1.366 0.01249 1.203
Publication Forum (2014): 2
Scopus rating (2013): 1.472 1.026
Publication Forum (2013): 2
Scopus rating (2012): 1.251 0.9
Publication Forum (2012): 2
Scopus rating (2011): 1.508 0.981
Scopus rating (2010): 1.406 0.909
Scopus rating (2009): 1.52 0.988
Scopus rating (2008): 1.299 0.825
Scopus rating (2007): 1.01 0.628
Scopus rating (2006): 1.154 0.711
Scopus rating (2005): 1.412 0.747
Scopus rating (2004): 1.981 1.631
Scopus rating (2003): 2.284 1.189
Scopus rating (2002): 1.578 1.198
Scopus rating (2001): 1.624 1.057
Scopus rating (2000): 2.041 1.124
Scopus rating (1999): 1.363 0.875
Original language: English
DOIs:
10.1111/j.1945-5100.2010.01146.x

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 9243
Research output: Scientific - peer-review › Article
Tilastollinen vastepintamallinnus: kokeiden suunnittelu, regressiomallin analyysi ja vasteen optimointi


General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Mathematics, Research group: Positioning
Authors: Piche, R., Ruohonen, K.
Number of pages: 87
Publication date: 2010

Publication information
Place of publication: Tampere
Publisher: Unknown Publisher
Original language: Finnish

Publication series
Name: Tampereen teknillinen yliopisto. Matematiikka
Electronic versions: tilastollinen_vastepintamallinnus.pdf
Links:
http://urn.fi/URN:NBN:fi:tty-201012131382

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 8996
Research output: Professional › Commissioned report

Topics on hyperbolic function theory in geometric algebra with a positive signature

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Eriksson, S., Orelma, H.
Pages: 249-263
Publication date: 2010
Peer-reviewed: Yes

Publication information
Journal: Computational Methods in Function Theory
Volume: 10
Issue number: 1
ISSN (Print): 1617-9447
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.54 0.852
Publication Forum (2016): 1
Scopus rating (2015): 0.332 0.746
Web of Science (2015): 0.362 0.444 6.6 0.184 0.00115 0.388
Publication Forum (2015): 1
Scopus rating (2014): 0.232 0.77
Publication Forum (2014): 1
Scopus rating (2013): 0.541 1.026
Publication Forum (2013): 1
Scopus rating (2012): 0.409 0.917
Publication Forum (2012): 1
**Ubildki, mobili ja konstekstuaalinen oppiminen - hyöty opiskelijalle?**

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Silius, K., Tervakari, A.
Pages: 36-37
Publication date: 2010

**Host publication information**
Place of publication: Hämeenlinna
Publisher: Hämeen kesäyliopisto
Editor: Mielty, M.

**Bibliographical note**
Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 9275
Research output: Scientific - peer-review › Conference contribution

**Uusi koulukohtainen syventävä kurssi ja oppikirja lukioihin**

**General information**
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Mathematics
Authors: Eriksson, S., Kaarakka, T.
Pages: 29-30
Publication date: 2010
Peer-reviewed: Unknown

**Publication information**
Journal: Solmu Matematiikkalehti
Volume: 1
ISSN (Print): 1458-8048
Ratings:
Publication Forum (2017): 0
Publication Forum (2016): 0
Publication Forum (2015): 0
Original language: Finnish

**Bibliographical note**
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 7882
Research output: Professional › Article

**A simulator for infinite-dimensional systems with a self-tuning controller**

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Asteroid models from combined sparse and dense photometric data

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Durech, J., Kaasalainen, M., Warner, B., Fauerbach, M., Mark, S., Fauvaud, S., Fauvaud, M., Vugnon, J., Pilcher, F., Bernasconi, L., Behrend, R.
Pages: 291-297
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 493
Issue number: 1
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Scopus rating (2001): 1.555 0.727
Scopus rating (2000): 2.178 1.039
Scopus rating (1999): 2.489 1.076
Original language: English
DOIs:
Equivalence of Set- and Bag-Valued Orbits

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Ruohonen, K.
Pages: 247-253
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Journal of Automata, Languages and Combinatorics
Volume: 14
Issue number: 3/4
ISSN (Print): 1430-189X
Ratings:
Publication Forum (2017): 1
Publication Forum (2016): 1
Publication Forum (2015): 1
Publication Forum (2014): 1
Publication Forum (2013): 1
Publication Forum (2012): 1
Original language: English
Links:
http://www.jalc.de/search/j14_i.html

Function classes and relational constraints stable under compositions with clones

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Couceiro, M., Foldes, S.
Number of pages: 13
Pages: 109-121
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Discussiones Mathematicae - General Algebra and Applications
Volume: 29
Original language: English
If a student takes control: facilitators' tasks and responsibilities

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Väljataga, T.
Pages: 390-399
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Lecture Notes in Computer Science
Volume: 5686
ISSN (Print): 0302-9743
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.315 0.552
Publication Forum (2016): 1
Scopus rating (2015): 0.328 0.618
Publication Forum (2015): 0
Scopus rating (2014): 0.325 0.678
Publication Forum (2014): 1
Scopus rating (2013): 0.329 0.699
Publication Forum (2013): 1
Scopus rating (2012): 0.323 0.708
Publication Forum (2012): 1
Scopus rating (2011): 0.325 0.721
Scopus rating (2010): 0.314 0.634
Scopus rating (2009): 0.305 0.548
Scopus rating (2008): 0.281 0.447
Scopus rating (2007): 0.294 0.494
Scopus rating (2006): 0.315 0.615
Scopus rating (2005): 0.333 0.712
Scopus rating (2004): 0.346 0.756
Scopus rating (2003): 0.412 0.812
Scopus rating (2002): 0.377 0.708
Scopus rating (2001): 0.388 0.692
Scopus rating (2000): 0.31 0.643
Scopus rating (1999): 0.301 0.653
Original language: English
DOIs:
10.1007/978-3-642-03426-8_47

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 11603
Research output: Scientific - peer-review › Article

New insights on the binary asteroid 121 Hermione

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Publication series
Name: Open Philosophies for Associative Autopoietic digital ecosystemS (OPAALS), Network of Excellence

Bibliographical note
OPAALS NoE (Project Contract n° IST-034824)<br/>Contribution: organisation=mat hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 9903
Research output: Professional › Commissioned report

Radiometric calibration of LIDAR intensity with commercially available reference targets

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Pages: 588-598
Publication date: 2009
Peer-reviewed: Yes

Publication information
Volume: 47
Issue number: 2
ISSN (Print): 0196-2892
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.461 3.102
Publication Forum (2016): 1
Web of Science (2015): 3.36 3.863 8.7 0.992 0.03766 1.1
Publication Forum (2015): 1
Scopus rating (2014): 2.486 3.582
Web of Science (2014): 3.514 4.112 8.7 0.858 0.03513 1.107
Publication Forum (2014): 3
Scopus rating (2013): 2.467 3.355
Publication Forum (2013): 3
Scopus rating (2012): 2.382 3.806
Publication Forum (2012): 3
Scopus rating (2011): 2.29 3.049
Scopus rating (2010): 2.082 2.893
Scopus rating (2009): 2.563 3.064
Scopus rating (2008): 2.38 3.141
Scopus rating (2007): 2.476 3.858
Scopus rating (2006): 2.188 2.986
Scopus rating (2005): 2.032 3.156
Scopus rating (2003): 2.029 3.545
Scopus rating (2002): 2.058 3.301
Scopus rating (2001): 2.112 1.91
Scopus rating (2000): 2.584 1.588
Scopus rating (1999): 1.342 1.572
Original language: English
DOIs:
10.1109/TGRS.2008.2003351

Bibliographical note
Contribution: organisation=mat,FACT1=1
Selecting tools and services: an expression of self-direction in higher education?

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Former organisation of the author
Authors: Väljataga, T.
Pages: 665-671
Publication date: 2009

Host publication information
Title of host publication: The proceeding of the 8th European Conference on e-Learning, Univ Bari, Bari, Italy, Oct 29-30, 2009
ISBN (Print): 978-1-906638-52-8

Bibliographical note
Contribution: organisation=mat,FACT1=1

Spin vectors in the Koronis family. II

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Slivan, S., Binzel, R., Kaasalainen, M., Hock, A., Klesman, A., Eckelman, L., Stephens, R.
Pages: 514-530
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 200
ISSN (Print): 0019-1035
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.0456 1.428
Publication Forum (2015): 1
Scopus rating (2014): 2.191 1.233
Web of Science (2014): 3.038 3.217 8.6 1.242 0.0444 1.438
Publication Forum (2014): 2
Scopus rating (2013): 1.947 1.09
Publication Forum (2013): 2
Scopus rating (2012): 2.342 1.301
Publication Forum (2012): 2
Scopus rating (2011): 2.601 1.224
Scopus rating (2010): 2.722 1.3
Scopus rating (2009): 2.61 1.371
Scopus rating (2008): 2.54 1.241
Scopus rating (2007): 2.578 1.352
Supporting students to self-direct intentional learning projects with social media

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Väljataga, T., Fiedler, S.
Pages: 58-69
Publication date: 2009
Peer-reviewed: Yes

Publication information
Journal: Journal of Educational Technology and Society
Volume: 12
Issue number: 3
ISSN (Print): 1436-4522
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 1.103 1.719
Publication Forum (2016): 1
Web of Science (2015): 1.104 1.472 6.0 0.052 0.00312 0.412
Publication Forum (2015): 1
Scopus rating (2014): 0.937 1.506
Web of Science (2014): 1.018 1.376 5.5 0.073 0.00302 0.389
Scopus rating (2013): 0.982 1.835
Scopus rating (2012): 1.311 1.912
Scopus rating (2011): 1.259 1.582
Scopus rating (2010): 0.835 1.156
Scopus rating (2009): 0.624 1.351
Scopus rating (2008): 0.413 1.473
Scopus rating (2007): 0.429 1.329
Scopus rating (2006): 0.297 1.034
Scopus rating (2005): 0.241 0.842
Scopus rating (2004): 0.227 0.759
Scopus rating (2003): 0.33 0.757
Scopus rating (2002): 0.287 0.76
Scopus rating (2001): 0.247 0.655
Scopus rating (2000): 0.16 0.0
Scopus rating (1999): 0.143 0.0
Original language: English
The complementarity of astrometric and radial velocity exoplanet observations. Determining exoplanet mass with astrometric snapshots.
Aperture size effects on backscatter intensity measurements in Earth and space remote sensing

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Kaasalainen, M., Kaasalainen, S.
Pages: 1142-1146
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Journal of the Optical Society of America A: Optics Image Science and Vision
Volume: 25
Issue number: 5
ISSN (Print): 1084-7529
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 0.621 1.02
Publication Forum (2016): 1
Scopus rating (2015): 0.951 1.156
Web of Science (2015): 1.457 1.417 >10.0 0.39 0.01263 0.496
Publication Forum (2015): 1
Scopus rating (2014): 0.906 1.339
Web of Science (2014): 1.558 1.498 >10.0 0.438 0.01248 0.49
Publication Forum (2014): 2
Scopus rating (2013): 1.04 1.336
Publication Forum (2013): 2
Scopus rating (2012): 1.062 1.217
Publication Forum (2012): 2
Scopus rating (2011): 1.098 1.486
Scopus rating (2010): 1.254 1.578
Scopus rating (2008): 1.469 1.526
Scopus rating (2006): 1.562 1.959
Scopus rating (2005): 1.361 1.806
Scopus rating (2004): 1.381 1.832
Scopus rating (2003): 1.436 1.742
Scopus rating (2001): 1.496 1.661
Scopus rating (2000): 1.279 1.236
Scopus rating (1999): 2.159 1.225
Original language: English
DOIs:
10.1364/JOSAA.25.001142

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 12424
Research output: Scientific - peer-review › Article

Asteroid 2867 Steins - II. Multi-telescope visible observations, shape reconstruction, and rotational state

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Clustering and achievement of engineering students based on their attitudes, orientations, motivations and intentions

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics
Authors: Huikkola, M., Silius, K., Pohjolainen, S.
Pages: 342-354
Publication date: 2008
Peer-reviewed: Yes
Competence advancement supported by social media

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Former organisation of the author
Authors: Väljataga, T., Fielder, S.
Pages: 54-66
Publication date: 2008

Host publication information
Title of host publication: Proceedings of the TEN Competence Special Technology Track on Technology Support for Self-Organised Learners
Place of publication: Salzburg

Detection of the YORP effect in asteroid (1620) Geographos

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Pages: pp. L25-L28
Publication date: 2008
Peer-reviewed: Yes
Dynamical tomography of gravitationally bound systems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Kaasalainen, M.
Pages: 527-546
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Inverse Problems and Imaging
Volume: 2
Issue number: 4
ISSN (Print): 1930-8337
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 0.771 1.053
Publication Forum (2016): 2
Scopus rating (2015): 0.872 0.852
Web of Science (2015): 0.951 1.215 4.8 0.333 0.00327 0.879
Publication Forum (2015): 2
Scopus rating (2014): 1.103 1.054
Web of Science (2014): 1.131 1.28 4.6 0.173 0.00371 1.007
Publication Forum (2014): 2
Scopus rating (2013): 0.835 1.307
Publication Forum (2013): 2
Main-belt binary asteroidal systems with circular orbits

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Marchis, F., Descamps, P., Baek, M., Harris, A., Kaasalainen, M., Berthier, J., Hestroffer, D., Vachier, F.
Pages: 97-118
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 196
ISSN (Print): 0019-1035
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.04456 1.428
Publication Forum (2015): 1
Scopus rating (2014): 2.191 1.233
Web of Science (2014): 3.038 3.217 8.6 1.242 0.0444 1.438
Publication Forum (2014): 2
Scopus rating (2013): 1.947 1.09
Publication Forum (2013): 2
Scopus rating (2012): 2.342 1.301
Publication Forum (2012): 2
Scopus rating (2011): 2.601 1.224
Scopus rating (2010): 2.722 1.3
Scopus rating (2009): 2.61 1.371
Scopus rating (2008): 2.54 1.241
Scopus rating (2007): 2.578 1.352
Scopus rating (2005): 3.67 1.728
Scopus rating (2004): 2.641 1.558
Scopus rating (2003): 2.182 1.46
Scopus rating (2002): 2.038 1.463
Scopus rating (2001): 2.487 1.199
Scopus rating (2000): 2.316 1.211
Scopus rating (1999): 2.965 1.259
Original language: English
DOIs:
New determination of the size and bulk density of binary asteroid 22 Kalliope from observations of mutual eclipses

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Descamps, P., Marchis, F., Pollock, J., Berthier, J., Vachier, F., Birlan, M., Kaasalainen, M., Harris, A., Wong, M., Romanishin, W., Cooper, E., Kettner, K., Wiggins, P., Kryszczynska, A., Polinska, M., Coliac, J., Devyatkin, A., Verestchagina, I., Gorshanov, D.
Pages: 578-600
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 196
ISSN (Print): 0019-1035
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.04456 1.428
Publication Forum (2015): 1
Scopus rating (2014): 2.191 1.233
Web of Science (2014): 3.038 3.217 8.6 1.242 0.0444 1.438
Publication Forum (2014): 2
Scopus rating (2013): 1.947 1.09
Publication Forum (2013): 2
Scopus rating (2012): 2.342 1.301
Publication Forum (2012): 2
Scopus rating (2011): 2.601 1.224
Scopus rating (2010): 2.722 1.3
Scopus rating (2009): 2.61 1.371
Scopus rating (2008): 2.54 1.241
Scopus rating (2007): 2.578 1.352
Scopus rating (2005): 3.67 1.728
Scopus rating (2004): 2.641 1.558
Scopus rating (2003): 2.182 1.46
Scopus rating (2002): 2.038 1.463
Scopus rating (2001): 2.487 1.199
Scopus rating (2000): 2.316 1.211
Scopus rating (1999): 2.965 1.259
Original language: English
DOIs:
10.1016/j.icarus.2008.10.001

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
New photometric observations of asteroids (1862) Apollo and (25143) Itokawa - analysis of YORP effect

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Pages: 345-350
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 488
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Scopus rating (2001): 1.555 0.727
Scopus rating (2000): 2.178 1.039
Scopus rating (1999): 2.489 1.076
Original language: English
DOIs:
10.1051/0004-6361:200809663

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 12022
Research output: Scientific - peer-review › Article

OPAALS WP1: Automata theory and autopoiesis: D1.2 - Foundations of the theory of associative autopoietic digital ecosystems: Part 1
Photometry and models of selected main-belt asteroids. V.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Marciniak, A., Michalowski, T., Kaasalainen, M., Kryszczynska, A., Kwiatkowski, T., Hirsch, R., Kaminski, K., Fagas, M., Polinska, M., Velichko, F., Michalowski, M., Snodgrass, C., Behrend, R., Bernasconi, L.
Pages: 559-565
Publication date: 2008
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 478
Issue number: 2
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Acceleration of the rotation of asteroid 1862 Apollo by radiation torques

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Kaasalainen, M., Durech, J., Warner, B., Krugky, Y., Gaftonyuk, N.
Pages: 420-422
Publication date: 2007
Peer-reviewed: Yes

Publication information
Journal: Nature
Volume: 446
ISSN (Print): 0028-0836
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 18.134 8.039
Publication Forum (2016): 3
Scopus rating (2014): 18.64 8.033
 Publication Forum (2014): 3
Publication Forum (2013): 3
Scopus rating (2012): 17.353 8.53
Publication Forum (2012): 3
Scopus rating (2011): 17.348 8.809
Scopus rating (2008): 12.826 7.368
Scopus rating (2007): 10.169 7.115
Scopus rating (2005): 10.023 7.283
Scopus rating (2004): 10.844 7.518
Scopus rating (2003): 11.09 7.419
Scopus rating (1999): 15.011 7.278
Original language: English
DOIs:
10.1038/nature05614
Gaussian mixture filter in hybrid navigation

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Research group: MAT Positioning, Matematiikka, Research group: Positioning
Authors: Ali-Löytty, S.
Number of pages: 5
Pages: 1-5
Publication date: 2007

Host publication information
Title of host publication: Digest of TISE Seminar 2007, Nokia, Finland, 5 June 2007
Editor: Koivisto, P.

Photometry and models of selected main-belt asteroids. IV

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Marciniak, A., Michalowski, T., Kaasalainen, M., Durech, J., Polinska, M., Kwiatkowski, T., Kryszczynska, A., Hirsch, R., Kaminski, K., Fagas, M., Colas, F., Fauvaud, S., Santacana, G., Behrend, R., Ro, R.
Pages: 633-639
Publication date: 2007
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 473
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
A portrait of the nucleus of comet 67P

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Lamy, P., Toth, I., Davidsson, B., Groussin, O., Gutierrez, P., Jorda, L., Kaasalainen, M., Lowry, S.
Pages: 23-66
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Space Science Reviews
Volume: 128
Issue number: 1-4
ISSN (Print): 0038-6308
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.982 2.688
Publication Forum (2016): 1
Scopus rating (2015): 2.952 3.005
Web of Science (2015): 7.242 6.316 7.9 2.141 0.02446 3.574
Publication Forum (2015): 1
Scopus rating (2014): 3.386 2.78
Web of Science (2014): 6.283 5.087 7.1 1.085 0.0275 3.28
Publication Forum (2014): 2
Scopus rating (2013): 2.483 2.366
Publication Forum (2013): 2
Scopus rating (2012): 2.102 2.06
Publication Forum (2012): 2
Scopus rating (2011): 2.253 1.85
Scopus rating (2010): 2.171 1.76
Scopus rating (2009): 2.098 1.762
Scopus rating (2008): 1.715 1.341
Scopus rating (2007): 2.177 1.492
Scopus rating (2006): 2.101 1.394
Scopus rating (2005): 1.622 1.335
Scopus rating (2004): 1.142 0.962
Scopus rating (2003): 1.414 1.324
Scopus rating (2002): 0.856 0.911
Gravitational scattering by giant planets

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Laakso, T., Rantala, J., Kaasalainen, M.
Pages: 373-378
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 456
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Scopus rating (2001): 1.555 0.727
Scopus rating (2000): 2.178 1.039
Scopus rating (1999): 2.489 1.076
Original language: English
DOIs:
10.1051/0004-6361:20065121
Hubble Space Telescope observations of the nucleus and inner coma of comet 67P

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Lamy, P., Toth, I., Weaver, H., Jorda, L., Kaasalainen, M., Gutierrez, P.
Pages: 669-678
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 458
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Publication Forum (2012): 3
Scopus rating (2011): 2.373 1.231
Scopus rating (2010): 2.74 1.444
Scopus rating (2009): 2.879 1.404
Scopus rating (2008): 2.923 1.297
Scopus rating (2007): 2.816 1.34
Scopus rating (2005): 2.891 1.355
Scopus rating (2004): 2.633 1.462
Scopus rating (2003): 1.967 1.373
Scopus rating (2002): 1.742 1.346
Scopus rating (2001): 1.555 0.727
Scopus rating (2000): 2.178 1.039
Scopus rating (1999): 2.489 1.076
Original language: English
DOIs: 10.1051/0004-6361:20065253
Inverse problems of generalized projection operators

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Kaasalainen, M., Lamberg, L.
Pages: 749-769
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Inverse Problems
Volume: 22
Issue number: 3
ISSN (Print): 0266-5611
Ratings:
Publication Forum (2017): 2
Scopus rating (2016): 1.502 1.386
Publication Forum (2016): 2
Web of Science (2015): 1.651 1.926 9.1 0.273 0.01483 1.166
Publication Forum (2015): 2
Scopus rating (2014): 1.257 1.346
Web of Science (2014): 1.323 1.95 8.4 0.444 0.01483 1.105
Publication Forum (2014): 2
Scopus rating (2013): 1.19 1.566
Publication Forum (2013): 2
Scopus rating (2012): 1.239 1.838
Publication Forum (2012): 2
Scopus rating (2011): 1.127 1.6
Scopus rating (2010): 1.365 1.587
Scopus rating (2009): 1.33 1.759
Scopus rating (2008): 1.211 1.884
Scopus rating (2007): 1.0 1.984
Scopus rating (2006): 0.893 1.763
Scopus rating (2005): 1.129 1.954
Scopus rating (2004): 0.795 1.615
Scopus rating (2003): 0.723 1.389
Scopus rating (2002): 1.114 1.457
Scopus rating (2001): 0.987 1.502
Scopus rating (2000): 0.896 1.52
Scopus rating (1999): 0.815 1.347
Original language: English
DOIs:
10.1088/0266-5611/22/3/002

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 16573
Research output: Scientific - peer-review › Article

Optical properties of snow in backscatter

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Physical models of ten asteroids from an observers' collaboration network

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Durech, J., Kaasalainen, M., Marciniak, A., Allen, W., Behrend, R., Bembrick, C., Bennett, T., Bernasconi, L., Berthier, J., Bolt, G., Boroumand, S., Crespo da Silva, L., Crippa, R., Crow, M., Durkee, R., Dymock, R., Fagas, M., Faurerbach, M., Fauvad, S., Frey, M.
Pages: 331-337
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 465
Issue number: 1
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 17117
Research output: Scientific - peer-review › Article
Shape, size and multiplicity of main-belt asteroids. I. Keck adaptive optics survey

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Marchis, F., Kaasalainen, M., Hom, E., Berthier, J., Enriquez, J., Hestroffer, D., Le Mignant, D., de Pater, I.
Pages: 39-63
Publication date: 2006
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 185
Issue number: 1
ISSN (Print): 0019-1035
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.04456 1.428
Publication Forum (2015): 1
Scopus rating (2014): 2.191 1.233
Web of Science (2014): 3.038 3.217 8.6 1.242 0.0444 1.438
Asteroid models from the Pan-STARRS photometry

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Durech, J., Grav, T., Jedicke, R., Kaasalainen, M., Denneau, L.
Pages: 179-187
Publication date: 2005
Peer-reviewed: Yes

Publication information
Journal: Earth, Moon, and Planets
Volume: 97
Issue number: 3-4
Original language: English
DOIs: 10.1007/s11038-006-9084-8

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 17072
Research output: Scientific - peer-review › Article

Photometry and models of selected main-belt asteroids (II)

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Michalowski, T., Kaasalainen, M., Marciniak, A., Denchev, P., Kwiatkowski, T., Kryszczynska, A., Hirsch, R., Velichko, F., Erikson, A., Szabo, G., Kowalski, R.
Radar observations of Itokawa in 2004 and improved shape estimation.
Small-angle goniometry for backscattering measurements in the broadband spectrum

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Kaasalainen, S., Peltoniemi, J., Näränen, J., Suomalainen, J., Kaasalainen, M., Stenman, F.
Pages: 1485-1490
Publication date: 2005
Peer-reviewed: Yes

Publication information
Journal: Applied Optics
Volume: 44
Issue number: 8
ISSN (Print): 1559-128X
Ratings:
Publication Forum (2017): 1

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 19606
Research output: Scientific - peer-review › Article
Spectral study of the Eunomia family. I: Eunomia

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Nathues, A., Mottola, S., Kaasalainen, M., Neukum, G.
Pages: 452-463
Publication date: 2005
Peer-reviewed: Yes

Publication information
Journal: Icarus
Volume: 175
ISSN (Print): 0019-1035
Ratings:
Publication Forum (2017): 1
Scopus rating (2016): 2.462 1.288
Publication Forum (2016): 1
Scopus rating (2015): 2.396 1.335
Web of Science (2015): 3.383 3.291 8.7 1.404 0.04456 1.428
Publication Forum (2015): 1
Thermal infrared observations of the Hayabusa spacecraft target asteroid 25143 Itokawa

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Former organisation of the author
Authors: Mueller, T., Sekiguchi, T., Kaasalainen, M., Abe, M., Hasegawa, S.
Pages: 347-355
Publication date: 2005
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 443
ISSN (Print): 0004-6361
Ratings:
Publication Forum (2017): 3
Scopus rating (2016): 2.246 1.16
Publication Forum (2016): 3
Scopus rating (2015): 2.543 1.189
Scopus rating (2014): 2.823 1.219
Web of Science (2014): 4.378 4.158 7.5 2.041 0.28018 1.889
Publication Forum (2014): 3
Scopus rating (2013): 2.544 1.058
Publication Forum (2013): 3
Scopus rating (2012): 2.585 1.295
Scopus rating (2010): 2.722 1.3
Scopus rating (2009): 2.611 1.371
Scopus rating (2008): 2.541 2.41
Scopus rating (2007): 2.578 1.352
Scopus rating (2005): 3.671 1.728
Scopus rating (2004): 2.641 1.558
Scopus rating (2003): 2.182 1.46
Scopus rating (2002): 2.038 1.463
Scopus rating (2001): 2.487 1.199
Scopus rating (2000): 2.316 1.211
Scopus rating (1999): 2.965 1.259
Original language: English
DOIs:
10.1016/j.icarus.2004.07.021

Bibliographical note
Contribution: organisation=mat,FACT1=1
Source: researchoutputwizard
Source-ID: 19378
Research output: Scientific › peer-review › Article

Victor-videokomentointiyöväline (Web video annotation system)

General information
State: Published
Ministry of Education publication type: I2 ICT software
Organisations: Matematiikka
Authors: Häkkinen, P., Mäkelä, T., Mäkinen, R., Ranta, P., Salonen, J.
Publication date: 2005

Event information
Media of output: Other
Links:
http://victor.ee.tut.fi/

Bibliographical note
hyplab,FACT1=1
Source: researchoutputwizard
Source-ID: 18294
Research output: Scientific › Software

A Lukasiewicz-style Many-Valued Similarity Reasoning: Review

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Matematiikka
Authors: Turunen, E.
Number of pages: 34
Pages: 315-348
Publication date: 2003

Host publication information
Title of host publication: Beyond Two: Theory and Applications of Multiple-Valued Logic
Place of publication: Heidelberg
Publisher: Physica-Verlag
Editors: Fitting, M., Orlowska, E.
ISBN (Print): 3-7908-1541-1

Publication series
A Feedforward Controller for Distributed Parameter Systems

A feedforward controller is introduced for an important class of distributed parameter systems. The purpose of the control is to regulate the outputs of the system in spite of some perturbations. The theory presented is clarified with an example.

On the Discrete-Time Regulator Problem in Infinite-Dimensional Spaces

The linear, discrete-time regulator problem is considered in infinite-dimensional spaces without posing in advance any positivity conditions on quadratic criterion. The convergence of the finite-time optimum solution is studied, when time increases to infinity with a stable, stabilizable, and detectable system.