Semantic Labeling of User Location Context Based on Phone Usage Features

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

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Leppäkoski, H., Rivero-Rodriguez, A., Rautalin, S., Muñoz Martinez, D., Käppi, J., Ali-Löytty, S., Piche, R.
Number of pages: 21
Pages: 1-21
Publication date: 24 Aug 2017
Peer-reviewed: Yes

Publication information
Journal: Mobile Information Systems
Volume: 2017
ISSN (Print): 1574-017X
Ratings:
Scopus rating (2016): CiteScore 1.03 SJR 0.219 SNIP 0.509
Scopus rating (2015): SJR 0.375 SNIP 1.301 CiteScore 2.19
Scopus rating (2014): SJR 0.431 SNIP 1.186 CiteScore 2
Scopus rating (2013): SJR 0.595 SNIP 1.723 CiteScore 2.28
Scopus rating (2012): SJR 0.273 SNIP 1.315 CiteScore 2.13
Scopus rating (2011): SJR 0.423 SNIP 1.044 CiteScore 3.05
Scopus rating (2010): SJR 0.239 SNIP 0.671
Scopus rating (2009): SJR 0.1 SNIP 0
Scopus rating (2008): SJR 0.23 SNIP 0.737
Scopus rating (2007): SJR 0.182 SNIP 0.228
Scopus rating (2006): SJR 0.156 SNIP 0.073
Original language: English
Electronic versions:
SemanticLabeling_3876906
DOIs:
10.1155/2017/3876906
Links:
http://urn.fi/URN:NBN:fi:tty-201708281833

Bibliographical note
INT="Rautalin, Sakari"
Research output: Scientific - peer-review › Article

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

General information
Conclusions

Navigation and localization are nowadays an intrinsic part of the majority of wireless communication devices. They are also likely to play crucial roles in the new generations of communication devices, such as Device-to-Device (D2D), Internet of Things (IoT) and 5G.

Independent Loops Search in Flow Networks Aiming for Well-Conditioned System of Equations

We approach the problem of choosing linearly independent loops in a pipeflow network as choosing the best-conditioned submatrix of a given larger matrix. We present some existing results of graph theory and submatrix selection problems, based on which we construct three heuristic algorithms for choosing the loops. The heuristics are tested on two pipeflow networks that differ significantly on the distribution of pipes and nodes in the network.
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.
MULTI-POS: Lessons Learnt from Fellows and Supervisors
The path to a successful and cooperative network is not always smooth. Marie Curie networks are, by definition, networks of people with various technical and cultural backgrounds and with different personalities, individual work and life targets, and personal ways of solving the challenges that each has to cope with. The larger a network is, the more likely it is that some conflicts or personality mismatches appear, but this is not necessarily a bad thing, and it can be used as a learning and growth lesson. This chapter addresses the various challenges that were encountered during the MULTI-POS implementation and it summarizes the lessons learnt by both the fellows and the supervisors. The goal of this chapter is to offer some generic guidelines in forming and running large international networks, such as the Marie Curie training networks, and to enable the people interested in such collaborations to pro-actively identify and tackle some of the inherent challenges in such networks.

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Research group: System-on-Chip for GNSS, Wireless Communications and Cyber-Physical Embedded Computing, Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Chalmers University of Technology
Authors: Lohan, E., Nurmi, J., Seco-Granados, G., Wymeersch, H., Nykänen, O.
Pages: 323-329
Publication date: 2017

Host publication information
Title of host publication: Multi-Technology Positioning
Publisher: Springer
ISBN (Electronic): 978-3-319-50427-8
ASJC Scopus subject areas: Electrical and Electronic Engineering
DOIs: 10.1007/978-3-319-50427-8_16
Research output: Scientific - peer-review › Chapter

MULTI-POS: Multi-Technology Positioning Professionals Training Network
This chapter presents an overview of the Marie Curie Initial Training Network MULTI-POS, whose fellows are the main authors of the rest of the book chapters. The motivation of creating this network is first presented, and then the network structure and some of its main realizations are overviewed.

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Electronics and Communications Engineering, Research group: Wireless Communications and Positioning, Research group: System-on-Chip for GNSS, Wireless Communications and Cyber-Physical Embedded Computing, Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Chalmers University of Technology
Authors: Lohan, E., Nurmi, J., Wymeersch, H., Nykänen, O., Seco-Granados, G.
Pages: 5-11
Publication date: 2017

Host publication information
Title of host publication: Multi-Technology Positioning
Publisher: Springer
Multi-Technology Positioning

General information
State: Published
Ministry of Education publication type: C2 Edited books
Organisations: Department of Electronics and Communications Engineering, Research group: System-on-Chip for GNSS, Wireless Communications and Cyber-Physical Embedded Computing, Research group: Wireless Communications and Positioning, Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory, Chalmers University of Technology
Publication date: 2017

Publication information
Publisher: Springer
ISBN (Print): 978-3-319-50426-1
ISBN (Electronic): 978-3-319-50427-8
Original language: English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Aerospace Engineering
DOIs: 10.1007/978-3-319-50427-8
Research output: Scientific - peer-review › Anthology

Teollinen internet ja semanttinen mallinnus

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

Host publication Information
Title of host publication: Teollinen internet uudistaa palveluliiketoimintaa ja kunnossapitaa
Place of publication: Kerava
Publisher: Kunnossapitoyhdistys ProMaint
Editors: Martinsuo, M., Kärrt, T.
ISBN (Print): 978-952-68687-0-7
ISBN (Electronic): 978-952-68687-1-4
Research output: Scientific - peer-review › Chapter

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

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: Cibulkova, H., Durech, J., Vokrouhlicky, D., Kaasalainen, M., Oszkiewicz, D. A.
Number of pages: 10
Publication date: 30 Nov 2016
Peer-reviewed: Yes
Planning for robotic exploration based on forward simulation

We address the problem of controlling a mobile robot to explore a partially known environment. The robot's objective is the maximization of the amount of information collected about the environment. We formulate the problem as a partially observable Markov decision process (POMDP) with an information-theoretic objective function, and solve it applying forward simulation algorithms with an open-loop approximation. We present a new sample-based approximation for mutual information useful in mobile robotics. The approximation can be seamlessly integrated with forward simulation planning algorithms. We investigate the usefulness of POMDP based planning for exploration, and to alleviate some of its weaknesses propose a combination with frontier based exploration. Experimental results in simulated and real environments show that, depending on the environment, applying POMDP based planning for exploration can improve performance over frontier exploration.
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.

**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 Intelligent Information Systems Laboratory, Research group: MAT Mathematical and semantic modelling, Tampere Univ Technol, Tampere University of Technology
Authors: Pohjolainen, S., Suutala, A.
Number of pages: 21
Pages: 185-205
Publication date: 30 Jun 2016

**Host publication information**

Title of host publication: Mathematical Modelling
Place of publication: Switzerland
Publisher: Springer
Editor: Pohjolainen, S.
ISBN (Print): 978-3-319-27834-6
ISBN (Electronic): 978-3-319-27836-0
ASJC Scopus subject areas: Applied Mathematics, Modelling and Simulation, Acoustics and Ultrasonics
DOIs:
10.1007/978-3-319-27836-0_11

**Bibliographical note**

INT=mat,"Suutala, Antti"
Research output: Scientific - peer-review › Chapter

**Geometric solution strategy of Laplace problems with free boundary**

This paper introduces a geometric solution strategy for Laplace problems. Our main interest and emphasis is on efficient solution of the inverse problem with a boundary with Cauchy condition and with a free boundary. This type of problem is known to be sensitive to small errors. We start from the standard Laplace problem and establish the geometric solution strategy on the idea of deforming equipotential layers continuously along the field lines from one layer to another. This results in exploiting ordinary differential equations to solve any boundary value problem that belongs to the class of Laplace’s problem. Interpretation in terms of a geometric flow will provide us with stability considerations. The approach is demonstrated with several examples.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research area: Electromagnetics, Department of Electrical Engineering
Authors: Poutala, A., Tarhasaari, T., Kettunen, L.
Number of pages: 24
Pages: 723-746
Publication date: 9 Mar 2016
Peer-reviewed: Yes

**Publication information**

Volume: 105
Issue number: 10
ISSN (Print): 0029-5981
Ratings:
Scopus rating (2016): SJR 1.743 SNIP 1.566 CiteScore 2.64
Scopus rating (2015): SJR 1.912 SNIP 1.689 CiteScore 2.67
Scopus rating (2014): SJR 1.935 SNIP 1.927 CiteScore 2.73
Scopus rating (2013): SJR 2.415 SNIP 1.894 CiteScore 2.8
Scopus rating (2012): SJR 2.47 SNIP 2.103 CiteScore 2.7
Scopus rating (2011): SJR 2.193 SNIP 1.935 CiteScore 2.47
Scopus rating (2010): SJR 2.177 SNIP 1.717
Scopus rating (2009): SJR 1.983 SNIP 1.601
Scopus rating (2008): SJR 2.122 SNIP 1.74
Scopus rating (2007): SJR 2.023 SNIP 1.775
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.
Scopus rating (2001): SJR 0.629 SNIP 0.785
Scopus rating (2000): SJR 0.958 SNIP 0.981
Scopus rating (1999): SJR 0.676 SNIP 0.774
Original language: English
ASJC Scopus subject areas: Ecological Modelling, Forestry
Keywords: Data fitting, Form diversity, Morphological plasticity, Plant model, Quantitative structure models, Stochastic functional-structural, Terrestrial lidar
DOI:
10.14214/sf.1413
Source: Scopus
Source-ID: 84947104855
Research output: Scientific - peer-review › Article

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.
Publication date: 2016

Host publication information
Title of host publication: Progress in Industrial Mathematics at ECMI 2014
Publisher: Springer International Publishing
Editors: Russo, G., Capasso, V., Nicosia, G., Romano, V.
ISBN (Print): 978-3-319-23412-0
ISBN (Electronic): 978-3-319-23413-7

Publication series
Name: Mathematics in Industry
Publisher: Springer-Verlag
Volume: 22
ISSN (Electronic): 1612-3956
Keywords: free boundary problem, industrial mathematics
DOI:
10.1007/978-3-319-23413-7
Links:
http://urn.fi/URN:NBN:fi:ttty-201606014205. No embargo end date input

Bibliographical note
Embargo avoinna, koska ei vielä julkaistu (Due May 3, 2017)
HO / 2.5.2016
Research output: Scientific - peer-review › Conference contribution

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.
Binomial Gaussian mixture filter

In this work, we present a novel method for approximating a normal distribution with a weighted sum of normal distributions. The approximation is used for splitting normally distributed components in a Gaussian mixture filter, such that components have smaller covariances and cause smaller linearization errors when nonlinear measurements are used for the state update. Our splitting method uses weights from the binomial distribution as component weights. The method preserves the mean and covariance of the original normal distribution, and in addition, the resulting probability density and cumulative distribution functions converge to the original normal distribution when the number of components is increased. Furthermore, an algorithm is presented to do the splitting such as to keep the linearization error below a given threshold with a minimum number of components. The accuracy of the estimate provided by the proposed method is evaluated in four simulated single-update cases and one time series tracking case. In these tests, it is found that the proposed method is more accurate than other Gaussian mixture filters found in the literature when the same number of components is used and that the proposed method is faster and more accurate than particle filters.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Department of Mathematics, Research group: MAT Positioning, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: Raitoharju, M., Ali-Löytty, S., Piché, R.
Publication date: 2 Dec 2015
Peer-reviewed: Yes

Publication information
Journal: Eurasip Journal on Advances in Signal Processing
Volume: 2015
Issue number: 1
Article number: 36
ISSN (Print): 1687-6172
Ratings:
Scopus rating (2016): SJR 0.313 SNIP 0.78 CiteScore 1.21
Scopus rating (2015): SJR 0.279 SNIP 0.592 CiteScore 0.83
Scopus rating (2014): SJR 0.229 SNIP 0.54 CiteScore 0.7
Scopus rating (2013): SJR 0.267 SNIP 0.506 CiteScore 0.63
Scopus rating (2012): SJR 0.278 SNIP 0.582 CiteScore 0.72
Scopus rating (2011): SJR 0.371 SNIP 0.724 CiteScore 0.91
Scopus rating (2010): SJR 0.403 SNIP 0.982
Scopus rating (2009): SJR 0.474 SNIP 0.823
Scopus rating (2008): SJR 0.468 SNIP 0.897
Scopus rating (2007): SJR 0.386 SNIP 0.913
Scopus rating (2006): SJR 0.362 SNIP 0.92
Scopus rating (2005): SJR 0.519 SNIP 0.968
Scopus rating (2004): SJR 0.603 SNIP 1.155
Scopus rating (2003): SJR 0.63 SNIP 1.023
Scopus rating (2002): SJR 0.14 SNIP 0.329
Scopus rating (2001): SJR 0.118 SNIP 0.372
Scopus rating (2000): SJR 0.115 SNIP 0.236
Scopus rating (1999): SJR 0.194 SNIP 0.381
Original language: English
ASJC Scopus subject areas: Hardware and Architecture, Signal Processing, Electrical and Electronic Engineering
Keywords: Estimation, Gaussian mixture filter, Nonlinear filtering
Electronic versions:
s13634-015-0221-2
DoIs:
Links:
http://urn.fi/URN:NBN:fi:tty-201706051582
Links:
http://www.scopus.com/inward/record.url?scp=84934283964&partnerID=8YFLogxK (Link to publication in Scopus)
Graph-Based Map Matching for Indoor Positioning
This article presents a probabilistic motion model that is based on an economical graph-based indoor map representation, such that the motion of the user is constrained according to the floor plan of a building. The floor plan is modeled as a combination of links and open space polygons that are connected by nodes. In the authors’ earlier work the link transition probabilities in this graph are proportional to the total link lengths that are the total lengths of the subgraphs accessible by choosing the considered link option, and this article extends this model to include open space polygons as well. A particle filter using the extended motion model in which all particles are constrained according to the map structure is presented. Furthermore, wireless local area network and Bluetooth Low Energy positioning tests show that the proposed algorithm outperforms comparison methods especially if the measurement rate is low.

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.
SimpleTree: An Efficient Open Source Tool to Build Tree Models from TLS Clouds

An open source tool named SimpleTree, capable of modelling highly accurate cylindrical tree models from terrestrial laser scan point clouds, is presented and evaluated. All important functionalities, accessible in the software via buttons and dialogues, are described including the explanation of all necessary input parameters. The method is validated utilizing 101 point clouds of six different tree species, in the main evergreen and coniferous trees. All scanned trees have been destructively harvested to get accurate estimates of above ground biomass with which we assess the accuracy of the SimpleTree-reconstructed cylinder models. The trees were grouped into four data sets and for each one a Concordance Correlation Coefficient of at least 0.92 (0.92, 0.97, 0.92, 0.94) and an total relative error at most ~8 % (2.42%, 3.59%, –4.59%, 8.27%) was achieved in the comparison of the model results to the ground truth data. A global statistical improvement of derived cylinder radii is presented as well as an efficient optimization approach to automatically improve user given input parameters. An additional check of the SimpleTree results is presented via comparison to the results of trees reconstructed using an alternative, published method.

General information
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: Hackenberg, J., Spiecker, H., Calders, K., Disney, M., Raumonen, P.
Number of pages: 50
Comparison Study for Whitney (Raviart-Thomas) Type Source Models in Finite Element Method Based EEG Forward Modeling

This study concentrates on finite element method (FEM) based electroencephalography (EEG) forward simulation in which the electric potential evoked by neural activity in the brain is to be calculated at the surface of the head. The main advantage of the FEM is that it allows realistic modeling of tissue conductivity inhomogeneity. However, it is not straightforward to apply the classical model of a dipolar source with the FEM, due to its strong singularity and the resulting irregularity. The focus of this study is on comparing different methods to cope with this problem. In particular, we evaluate the accuracy of Whitney (Raviart-Thomas) type dipole-like source currents compared to two reference dipole modeling methods: the St. Venant and partial integration approach. Common to all these methods is that they enable direct approximation of the potential field utilizing linear basis functions. In the present context, Whitney elements are particularly interesting, as they provide a simple means to model a divergence-conforming primary current vector field satisfying the square integrability condition. Our results show that a Whitney type source model can provide simulation accuracy comparable to the present reference methods. It can lead to superior accuracy under optimized conditions with respect to both source location and orientation in a tetrahedral mesh. For random source orientations, the St. Venant approach turns out to be the method of choice over the interpolated version of the Whitney model. The overall moderate differences obtained suggest that practical aspects, such as the focality, should be prioritized when choosing a source model.

General information
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., Bauer, M., Vorwerk, J., Köstler, H., Wolters, C. H.
Number of pages: 9
Pages: 2648-2656
Publication date: Nov 2015
Peer-reviewed: Yes
CytoSpectre: A tool for spectral analysis of oriented structures on cellular and subcellular levels

Background: Orientation and the degree of isotropy are important in many biological systems such as the sarcomeres of cardiomyocytes and other fibrillar structures of the cytoskeleton. Image-based analysis of such structures is often limited to qualitative evaluation by human experts, hampering the throughput, repeatability and reliability of the analyses. Software tools are not readily available for this purpose and the existing methods typically rely at least partly on manual operation.

Results: We developed CytoSpectre, an automated tool based on spectral analysis, allowing the quantification of orientation and also size distributions of structures in microscopy images. CytoSpectre utilizes the Fourier transform to estimate the power spectrum of an image and based on the spectrum, computes parameter values describing, among others, the mean orientation, isotropy and size of target structures. The analysis can be further tuned to focus on targets of particular size at cellular or subcellular scales. The software can be operated via a graphical user interface without any programming expertise. We analyzed the performance of CytoSpectre by extensive simulations using artificial images, by benchmarking against FibrilTool and by comparisons with manual measurements performed for real images by a panel of human experts. The software was found to be tolerant against noise and blurring and superior to FibrilTool when analyzing realistic targets with degraded image quality. The analysis of real images indicated general good agreement between computational and manual results while also revealing notable expert-to-expert variation. Moreover, the experiment showed that CytoSpectre can handle images obtained of different cell types using different microscopy techniques. Finally, we studied the effect of mechanical stretching on cardiomyocytes to demonstrate the software in an actual experiment and observed changes in cellular orientation in response to stretching.

Conclusions: CytoSpectre, a versatile, easy-to-use software tool for spectral analysis of microscopy images was developed. The tool is compatible with most 2D images and can be used to analyze targets at different scales. We expect the tool to be useful in diverse applications dealing with structures whose orientation and size distributions are of interest. While designed for the biological field, the software could also be useful in non-biological applications.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Kartasalo, K., Polonen, R., Ojala, M., Rasku, J., Lekkala, J., Aalto-Setälä, K., Kallio, P.
Number of pages: 23
Publication date: 26 Oct 2015
Peer-reviewed: Yes
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.
Polynomial Input-Output Stability for Linear Systems

We introduce the concept of polynomial input-output stability for infinite-dimensional linear systems. We show that this stability type corresponds exactly to the recent notion of P-stability in the frequency domain. In addition, we show that on a Hilbert space a regular linear system whose system operator generates a polynomially stable semigroup is always polynomially input-output stable, and present additional conditions under which the system is input-output stable. The results are illustrated with an example of a polynomially input-output stable one-dimensional wave system.

General information

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., Laakkonen, P.
Number of pages: 6
Pages: 2797-2802
Publication date: 1 Oct 2015
Peer-reviewed: Yes

Publication information

Journal: IEEE Transactions on Automatic Control
Volume: 60
Issue number: 10
ISSN (Print): 0018-9286
Ratings:
Scopus rating (2016): CiteScore 6.06 SJR 4.174 SNIP 3.159
Scopus rating (2015): SJR 3.926 SNIP 2.884 CiteScore 5.08
Scopus rating (2014): SJR 4.196 SNIP 3.347 CiteScore 5.14
Scopus rating (2013): SJR 4.096 SNIP 3.13 CiteScore 5.24
Scopus rating (2012): SJR 4.143 SNIP 3.292 CiteScore 5.11
Scopus rating (2011): SJR 3.749 SNIP 2.961 CiteScore 4.11
Scopus rating (2010): SJR 2.939 SNIP 2.917
Scopus rating (2009): SJR 3.945 SNIP 3.449
Scopus rating (2006): SJR 3.67 SNIP 2.917
Scopus rating (2005): SJR 1.968 SNIP 2.566
Scopus rating (2004): SJR 2.959 SNIP 2.708
Scopus rating (2003): SJR 3.359 SNIP 2.589
Scopus rating (2002): SJR 3.982 SNIP 2.349
Scopus rating (2001): SJR 4.161 SNIP 2.777
Scopus rating (2000): SJR 3.887 SNIP 2.772
Scopus rating (1999): SJR 1.93 SNIP 2.438
Original language: English
Keywords: Distributed parameter system, Stability
ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications
DOIs:
10.1109/TAC.2015.2398890
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.
Modelling and control of vertical oscillation in overhead cranes

Overhead cranes are widely used in industry for lifting and moving various loads. Right before lifting a heavy load from the ground the crane bridge slightly bends, which makes the load oscillate vertically during the lifting. Vertical oscillations may introduce unnecessary stress to the crane metal structures and hoisting machinery, and thus reduce the lifetime of the crane. Furthermore, vertical oscillations make the load handling and positioning more difficult, thus decreasing the performance of operations. Nevertheless, study of vertical oscillations in overhead cranes has been neglected in literature. In this paper, a model for analyzing vertical oscillations and for control design is developed. Oscillation control, based on rope force measurement, is developed to decrease maximal forces and to reduce the time of oscillation. The resulting controller is tested with a real overhead crane having nominal load of five tons.

From artificial cognitive systems and open architectures to cognitive manufacturing systems

Considering constantly increasing demand for shift from mass production to mass customization and the need to maintain high level of automation despite permanent changes in manufacturing technologies and tools new approaches and solutions have to be provided in manufacturing. Cyber-Physical Systems and Industrial Internet of Things are enabling smart manufacturing to tackle the challenge of data processing, integration and interpretation, but beyond uniformed data collection and visualization. The cognitive approach is argued to introduce brain and biologically-inspired algorithms capable to better adapt industrial systems for unforeseen conditions. Such approach should provide flexible and robust solution for manufacturing systems, enabling new level of adaptability and re-configurability in the system by self-X capabilities. In this paper contemporary solutions applicable for introduction of cognitive capabilities in manufacturing systems are studied and the architecture for cognitive manufacturing system employing benefits of Industrial Internet and Cognitive Control is proposed.
Received Signal Strength models for WLAN and BLE-based indoor positioning in multi-floor buildings

This paper investigates the similarities and differences of the signal strength fluctuations and positioning accuracy in indoor scenarios for three types of wireless area networks: two Wireless Local Area Networks (WLANs) at 2.4 GHz and 5 GHz frequency, respectively, and one Wireless Personal Area Network (WPAN), namely the Bluetooth Low Energy (BLE).

Two path-loss models based on weighted centroids and non-negative least squares estimation are presented: one including a floor loss factor, and the other one ignoring the floor losses, and the three signal types are compared in terms of the path-loss parameters, channel fluctuations and positioning accuracy, namely the distance errors and floor detection probabilities. The comparison is done based on real-field measurement data collected from a university building in Tampere, Finland. It is shown that all these three signal types have similar shadowing variances and close path-loss parameter values, and that a path-loss model considering floor losses gives the best floor detection probability, but not necessarily the smallest distance error.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Lohan, E., Talvitie, J., Figueiredo e Silva, P., Nurminen, H., Ali-Löytty, S., Piche, R.
Number of pages: 6
Publication date: 23 Jun 2015

Host publication information
Title of host publication: International Conference on Localization and GNSS (ICL-GNSS)
Publisher: IEEE
ISBN (Print): 9781479998593
Electronic versions:
BLE_WLAN_v05camready_emb
DOIs:
10.1109/ICL-GNSS.2015.7217154
Links:

Bibliographical note
ORG=elt,0.7
ORG=ase,0.2
ORG=mat,0.1
Research output: Scientific - peer-review » Conference contribution

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.
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.
This paper studies the generalization of composite nonlinear feedback (CNF) control using arbitrary order set point filters, which focus on the initial stage of the transient response. The set point filters can be used to provide more performance by shortening the rise and settling times of the control system. Furthermore, the filters operate outside the feedback loop, and hence, they do not sacrifice loop robustness. The new method is illustrated by a benchmark problem found in an open literature. The simulation results show that the proposed method improves the set point response more than 10% in terms of settling time.

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
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.

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 model based analysis of the measurement errors in inductively coupled passive resonance sensors

A lumped element model was used to predict the measurement results of an inductively coupled resonance sensor. Errors related to the inductive coupling and the reader coil self-resonance were studied. The model was compared with measurements made with a physical circuit.

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.
An Initial Homophily Indicator to Reinforce Context-Aware Semantic Computing

The vast increase of personal sensor information is driving the rise in popularity of context-aware applications. Users crave and very often expect tailored services that are based on the users' context or personal preferences. The users themselves, using forms, often provide such information. An inference solution typically addresses this problem. In this paper, we present and show by way of a real-world example, the first step towards incorporating information of the user's social networking behavior in the inference task. We define an initial indicator of a particular social phenomenon, called Homophily, and describe how the indicator measures the presence of homophily at certain moments, also capturing the degree to which it is present. Different from existing indicators, ours lends itself to indicating the presence of homophily in a way that is easier to comprehend, so that it may be easily integrated into and reinforce context-aware semantic computing.

General information
State: Published
Ministry of Education publication type: C2 Edited books
Organisations: Department of Mathematics, Research group: MAT Computer Science and Applied Logics, Regulation of learning and active learning methods (REALMEE), Embedded Electronics research unit of the Bio Electro and Mechanical Systems (BEAMS) department of the Université Libre de Bruxelles
Authors: Devillers, R. (ed.), Valmari, A. (ed.)
Publication date: 2015

Publication information
Publisher: Springer Verlag
Volume: 9115
ISBN (Print): 978-3-319-19487-5
ISBN (Electronic): 978-3-319-19488-2
Original language: English

Publication series
Name: Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)
Volume: 9115
ISSN (Print): 0302-9743
ISSN (Electronic): 1611-3349
ASJC Scopus subject areas: Computer Science(all), Theoretical Computer Science
DOIs: 10.1007/978-3-319-19488-2
Links: http://www.scopus.com/inward/record.url?scp=84937510301&partnerID=8YFLLogxK (Link to publication in Scopus)

Bibliographical note
JUFOID=62555
Source: Scopus
Source-ID: 84937510301
Research output: Scientific - peer-review › Anthology

Application of terrestrial LiDAR and modelling of tree branching structure for plant- scaling models in tropical forest trees

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: Lau Sarmiento, A., Bartholomeus, H., Herold, M., Martius, C., Malhi, Y., Patrick Bentley, L., Shenkin, A., Raumonen, P.
Number of pages: 3
Pages: 96-98
Publication date: 2015

Host publication information
Title of host publication: Proceedings of SilviLaser 2015 : 14th conference on Lidar Applications for Assessing and Managing Forest Ecosystems
Links: https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Professional › Conference contribution

Assessing coupling dynamics from an ensemble of time series
Finding interdependency relations between time series provides valuable knowledge about the processes that generated the signals. Information theory sets a natural framework for important classes of statistical dependencies. However, a reliable estimation from information-theoretic functionals is hampered when the dependency to be assessed is brief or evolves in time. Here, we show that these limitations can be partly alleviated when we have access to an ensemble of independent repetitions of the time series. In particular, we gear a data-efficient estimator of probability densities to make use of the full structure of trial-based measures. By doing so, we can obtain time-resolved estimates for a family of entropy
combinations (including mutual information, transfer entropy and their conditional counterparts), which are more accurate than the simple average of individual estimates over trials. We show with simulated and real data generated by coupled electronic circuits that the proposed approach allows one to recover the time-resolved dynamics of the coupling between different subsystems.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, University of Electronic Science and Technology of China, Institute of Computer Science (ICS) of the Foundation for Research and Technology - Hellas (FORTH), Lab of Neurophysics and Neurophysiology, Hefei National Laboratory for Physical Sciences at the Microscale, Instituto de Fisica Interdisciplinar y Sistemas Complejos (CSIC-UIB), Campus Universitat de les Illes Balears, Institut für Kognitionswissenschaft, University of Osnabrück, University of Tartu, Netherlands Institute for Neuroscience
Authors: Gómez-Herrero, G., Wu, W., Rutanen, K., Soriano, M. C., Pipa, G., Vicente, R.
Number of pages: 13
Pages: 1958-1970
Publication date: 2015
Peer-reviewed: Yes

**Publication information**

Journal: Entropy
Volume: 17
Issue number: 4
ISSN (Print): 1099-4300
Ratings:
Scopus rating (2016): SJR 0.584 SNIP 1.065 CiteScore 1.87
Scopus rating (2015): SJR 0.557 SNIP 1.166 CiteScore 1.99
Scopus rating (2014): SJR 0.51 SNIP 1.169 CiteScore 1.69
Scopus rating (2013): SJR 0.488 SNIP 1.347 CiteScore 1.8
Scopus rating (2012): SJR 0.409 SNIP 1.04 CiteScore 1.41
Scopus rating (2011): SJR 0.47 SNIP 1.109 CiteScore 1.29
Scopus rating (2010): SJR 0.394 SNIP 1.056
Scopus rating (2009): SJR 0.358 SNIP 0.612
Scopus rating (2008): SJR 0.325 SNIP 0.604
Scopus rating (2007): SJR 0.574 SNIP 0.925
Scopus rating (2006): SJR 0.35 SNIP 0.644
Scopus rating (2005): SJR 0.299 SNIP 0.382
Scopus rating (2004): SJR 0.244 SNIP 0.543
Scopus rating (2003): SJR 0.209 SNIP 0.351
Scopus rating (2002): SJR 0.178 SNIP 0.461
Scopus rating (2001): SJR 0.12 SNIP 0.292
Scopus rating (2000): SJR 0.141 SNIP 2.3
Original language: English
Keywords: Ensemble, Entropy, Estimator, Time series, Transfer entropy, Trial
ASJC Scopus subject areas: Physics and Astronomy(all)
DOIs: 10.3390/e17041958
Links:
http://www.scopus.com/inward/record.url?scp=84930319366&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 84930319366
Research output: Scientific - peer-review Article

**Asteroid Models from Multiple Data Sources**

**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 Inverse Problems
Authors: Ďurech, J., Carry, B., Delbo, M., Kaasalainen, M., Viikinkoski, M.
Number of pages: 20
Engineering motif search for large graphs

In the graph motif problem, we are given as input a vertex-colored 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 topology-invariant 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.
GNSS orbit prediction with enhanced force model

Orbit prediction algorithms can be used in a portable positioning device to reduce the Time to First Fix and to augment the received broadcast ephemeris. In this work, we study the two-week prediction accuracy improvement that can be obtained when adding some smaller forces to our previously developed algorithm. These forces arise from solid earth tides, relativity effect, and the gravitational pull of Venus and Jupiter. Also, a box-wing model of solar radiation pressure is considered. The new model with aforementioned extra forces is tested for GPS, GLONASS and Beidou satellites using initial conditions computed from precise ephemerides. It is found that the enhancements give small but not negligible improvement, with more accurate Sun and Moon coordinates having the most effect and relativity correction for Earth's gravity the least. However, the improvements come at the cost of noticeable increase in computational load.
Massive-Scale Tree Modelling from TLS Data
This paper presents a method for reconstructing automatically the quantitative structure model of every tree in a forest plot from terrestrial laser scanner data. A new feature is the automatic extraction of individual trees from the point cloud. The method is tested with a 30-m diameter English oak plot and a 80-m diameter Australian eucalyptus plot. For the oak plot the total biomass was overestimated by about 17 %, when compared to allometry (N = 15), and the modelling time was about 100 min with a laptop. For the eucalyptus plot the total biomass was overestimated by about 8.5 %, when compared to a destructive reference (N = 27), and the modelling time was about 160 min. The method provides accurate and fast tree modelling abilities for, e. g., biomass estimation and ground truth data for airborne measurements at a massive ground scale.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Inverse Problems, Forest Res, Wageningen Univ, Wageningen University & Research Center, Univ Melbourne, University of Melbourne, Melbourne Sch Land & Environm
Authors: Raumonen, P., Casella, E., Calders, K., Murphy, S., Åkerblom, M., Kaasalainen, M.
Number of pages: 8
Pages: 189-196
Publication date: 2015

Motion Model for Positioning with Graph-Based Indoor Map
This article presents a training-free probabilistic pedestrian motion model that uses indoor map information represented as a set of links that are connected by nodes. This kind of structure can be modelled as a graph. In the proposed model, as a position estimate reaches a link end, the choice probabilities of the next link are proportional to the total link lengths (TLL), the total lengths of the subgraphs accessible by choosing the considered link alternative. The TLLs can be computed off-line using only the graph, and they can be updated if training data are available. A particle filter in which all the particles
move on the links following the TLL-based motion model is formulated. The TLL-based motion model has advantageous theoretical properties compared to the conventional models. Furthermore, the real-data WLAN positioning tests show that the positioning accuracy of the algorithm is similar or in many cases better than that of the conventional algorithms. The TLL-based model is found to be advantageous especially if position measurements are used infrequently, with 10-second or more time intervals.

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Nurminen, H., Koivisto, M., Ali-Löytty, S., Piche, R.
Number of pages: 10
Pages: 646-655
Publication date: 2015

**Host publication information**
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Electronic): 978-1-4673-8054-6
Electronic versions:
IPIN2014_final
DOIs:
10.1109/IPIN.2014.7275539
Links:
http://urn.fi/URN:NBN:fi:tty-201603013610

**Bibliographical note**
ORG=ase,0.8
ORG=mat,0.2
Source: researchoutputwizard
Source-ID: 24
Research output: Scientific - peer-review › Conference contribution

**New Insights for Relational Capital**
In this paper, we concentrate on relational capital, manifestation of the old adage “it is not what you know but who you know”. We propose that in this networked world, the importance of relationships between multiple stakeholders created by key personnel and financing becomes fundamental, and hence understanding and measuring those becomes fundamental, too. Accordingly, we highlight a need to go beyond social, individual or personal relationships and organizational context, as well as beyond the limitations of the dyadic (one actor to one actor) view on relationships. Hence, we are introducing the ecosystem as the context for measuring relational capital. This paper builds on a construct of ecosystemic relational capital, created for understanding and measuring the importance of relationships in the context of ecosystems. It looks at the totality of relationships both at organizational level and at individual level, measuring the structures and characteristics related to individuals, organizations as well as the ecosystem as a whole (Still et al. 2014a). We acknowledge that the initial framework emphasizes the “networking capabilities” element of relational capital, with less attention to the element of “customer loyalty and reputation”, which is the motivation for building on the construct. The processes of ecosystemic relational capital are built on the possibilities afforded by the volumes of digital data, mostly from social media, providing details on the relationships between various actors related to various regions, sectors, technologies and products. However, we propose enhancing the holistic integration for better understanding and measuring of relational capital with the application of methods of social network analysis (SNA), network visualizations and social media analytics. In this paper, we present concrete examples of the enhanced framework. At the same time, we acknowledge that there are many other avenues for obtaining novel insights for relational capital with these analytics, and we strongly encourage researchers and practitioners to do so.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory
Authors: Still, K., Huhtamäki, J., Russell, M. G.
Number of pages: 16
Pages: 167-182
Publication date: 2015
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:
Scopus rating (2016): SJR 4.733 SNIP 2.621 CiteScore 7.28
Scopus rating (2015): SJR 5.382 SNIP 2.842 CiteScore 7.61
Scopus rating (2014): SJR 4.112 SNIP 2.452 CiteScore 6.29
Scopus rating (2013): SJR 3.011 SNIP 2.427 CiteScore 5.34
Scopus rating (2012): SJR 2.106 SNIP 1.648 CiteScore 3.56
Original language: English
DOIs:
10.1111/2041-210X.12301

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-12-16<br/>Publisher name: Wiley-Blackwell Publishing
Source: researchoutputwizard
Source-ID: 199
Research output: Scientific - peer-review » Article

Novel Method For Online Stereo Self-Calibration

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Melin, J., Ritala, R.
Publication date: 2015

Host publication information
Title of host publication: XXI IMEKO World Congress "Measurements In Research and Industry"
ISBN (Print): 978-80-01-05793-3
On Robustness of Strongly Stable Semigroups with Spectrum on iR

We study the robustness properties of strong stability of a strongly continuous semigroup on a Hilbert space. We concentrate on a situation where the generator of the unperturbed semigroup has a finite spectral point on the imaginary axis and the resolvent operator is polynomially bounded elsewhere on the imaginary axis. As our main result we present conditions for preservation of the strong stability of the semigroup under bounded perturbations.

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Mathematics, Research group: MAT Mathematical and semantic modelling
Authors: Paunonen, L.
Number of pages: 17
Pages: 105-121
Publication date: 2015

Host publication information
Title of host publication: Semigroups of Operators - Theory and Applications : Będlewo, Poland, October 2013
Publisher: Springer International Publishing
Editors: Banasiak, J., Bobrowski, A., Lachowicz, M.
ISBN (Print): 978-3-319-12144-4
ISBN (Electronic): 978-3-319-12145-1

Publication series
Name: Springer Proceedings in Mathematics & Statistics
Publisher: Springer International Publishing
Volume: 113
ISSN (Print): 2194-1009
Keywords: Strongly Continuous Semigroup, Functional Analysis
ASJC Scopus subject areas: Analysis
DOIs: 10.1007/978-3-319-12145-1
Research output: Scientific - peer-review › Chapter

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

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 Intelligent Information Systems Laboratory
Authors: Huhtamäki, J., Russell, M. G., Rubens, N., Still, K.
Pages: 197-222
Publication date: 2015

Host publication information
Title of host publication: Transparency in Social Media : Tools, Methods and Algorithms for Mediating Online Interactions
Publisher: Springer International Publishing
Editors: Matei, S. A., Russell, M. G., Bertino, E.
ISBN (Print): 978-3-319-18551-4
ISBN (Electronic): 978-3-319-18552-1

Publication series
Name: Computational Social Science
DOIs: 10.1007/978-3-319-18552-1
Research output: Scientific - peer-review › Chapter

Perfect Pavelka Logic

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
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
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

Host publication information
Title of host publication: Proceedings of the SIAM Conference on Control and Its Applications (CT15)
Publisher: SIAM, Society for Industrial and Applied Mathematics
ISBN (Electronic): 978-1-611973-92-1
ASJC Scopus subject areas: Control and Optimization, Applied Mathematics
DOIs: 10.1137/1.9781611974072.43
Research output: Scientific - peer-review » Conference contribution

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.
Number of pages: 6
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Automatic Control
ISSN (Print): 0018-9286
Ratings:
Scopus rating (2016): CiteScore 6.06 SJR 4.174 SNIP 3.159
Scopus rating (2015): SJR 3.926 SNIP 2.884 CiteScore 5.08
Scopus rating (2014): SJR 4.196 SNIP 3.347 CiteScore 5.14
Scopus rating (2013): SJR 4.096 SNIP 3.13 CiteScore 5.24
Scopus rating (2012): SJR 4.143 SNIP 3.292 CiteScore 5.11
Scopus rating (2011): SJR 3.749 SNIP 2.961 CiteScore 4.11
Scopus rating (2010): SJR 2.939 SNIP 2.917
Scopus rating (2009): SJR 3.945 SNIP 3.449
Scopus rating (2006): SJR 3.67 SNIP 2.917
Scopus rating (2005): SJR 1.968 SNIP 2.566
Scopus rating (2004): SJR 2.959 SNIP 2.708
Scopus rating (2003): SJR 3.359 SNIP 2.589
Scopus rating (2002): SJR 3.982 SNIP 2.349
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

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
Links:
https://silvilaser2015.teledetection.fr/files/Proceedings_Silvilaser_22_09_2015_2.pdf (Conference proceedings)
Research output: Professional › Conference contribution

Using context overlays to analyse the role of a priori information with Process Mining
Notwithstanding the significant advances in context-aware computing in pervasive computing and self-adaptive systems, there is still much more to be desired in providing better context services. The number of sensors deployed world-wide increases very rapidly. The Internet of Things, amongst others, generates vast amounts of data of many different data types. How data are used is essential to improve user experience and efficiencies of the systems in which they occur. We explain how familiar concepts of Process Mining strengthen generalised sensor context services. We present a laboratory case to explain the approach. By way of a real-world example, we confirm the viability of using Process Mining to strengthen context-aware computing.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics, Research group: MAT Intelligent Information Systems Laboratory
Authors: Pileggi, P., Rivero Rodriguez, A., Nykänen, O.
Number of pages: 6
Pages: 639-644
Publication date: 2015

Host publication information
Title of host publication: 2015 IEEE International Systems Conference (SysCon 2015) Proceedings
Place of publication: Vancouver, BC, Canada
Publisher: IEEE
ISBN (Print): 978-1-4799-5927-3
Keywords: Context-aware computing, Process mining, Self- adaptive systems, Pervasive computing
DOI:
10.1109/SYSCON.2015.7116823
Links:
http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=7116823
Research output: Scientific - peer-review › Conference contribution

UWB Positioning with Generalized Gaussian Mixture Filters
Low-complexity Bayesian filtering for nonlinear models is challenging. Approximative methods based on Gaussian mixtures (GM) and particle filters are able to capture multimodality, but suffer from high computational demand. In this paper, we provide an in-depth analysis of a generalized GM (GGM), which allows component weights to be negative, and requires significantly fewer components than the traditional GM for ranging models. Based on simulations and tests with real data from a network of UWB nodes, we show how the algorithm's accuracy depends on the uncertainty of the measurements. For nonlinear ranging the GGM filter outperforms the extended Kalman filter (EKF) in both positioning accuracy and consistency in environments with uncertain measurements, and requires only slightly higher computational effort when the number of measurement channels is small. In networks with highly reliable measurements, the GGM filter yields similar accuracy and better consistency than the EKF.

General information
State: Published
Finite Element Method for Electromagnetics on Riemannian Manifolds: Topology and Differential Geometry Toolkit

This thesis applies new branches of mathematics in computational electromagnetics software. Namely, we consider the application of algebraic topology and differential geometry in finite element modeling. We conclude that from this approach, one can draw benefits to practical electromagnetic modeling. For example, more efficient numerical formulations, field-circuit coupling, and metric and coordinate free modeling techniques. We present efficient methods for homology and cohomology computation of finite element meshes together with their software implementation. The presented homology and cohomology solver is a part of finite element mesh generator Gmsh. Therefore, its use can be easily incorporated into finite element modeling workflow. We demonstrate the use of homology and cohomology computation results in static and quasistatic electromagnetic field problems. We describe finite element formulations which can be used in lumped parameter extraction from field problems and which can be naturally coupled to electronic circuit problems. Importantly, cohomology computation enables the use of magnetic scalar potential in eddy current problems without any topological restrictions, leading to more efficient and robust field computations. Lastly, we present a finite element programming environment, where the language of differential geometry has the main role. We interpret the finite element model as a Riemannian manifold, and the fields of interest as differential forms. Using the environment, one can give the computational instructions in metric and coordinate free manner, as the used metric and coordinate system are provided separately. Then, the environment translates the instructions to the actual floating-point operations, which ultimately depend on the used metric and coordinate system. The programming environment implementation builds on top
of the Gmsh API. That is, we implement tools from differential geometry which utilize an existing finite element framework. The main contribution of this thesis is the development of these tools to the point where they can be readily exploited in computationally demanding engineering problems. Also, this thesis offers a unified exposition of the needed mathematical concepts and their relation to the electromagnetic field problem formulations.

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Electrical Engineering
Authors: Pellikka, M.
Number of pages: 131
Publication date: 2 May 2014

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: 1209
ISSN (Print): 1459-2045
Electronic versions:
PELLIKKA.pdf
Links:

Bibliographical note
Awarding institution: Tampere University of Technology
Source: researchoutputwizard
Source-ID: 1254
Research output: Monograph › Doctoral Thesis

A Measurement-based Statistical Model to Evaluate Uncertainty in Long-range Noise Assessments
Carefully validated long-range sound propagation measurements with extensive meteorological instrumentation were continued for 612 days without interruption, around the clock, resulting in a database with millions of files, terabytes of sound and environmental data, and hundreds of pages of documentation. More than 100 environmental variables were analysed by statistical means, and many statistically highly significant dependencies linked to excess attenuation were found. At a distance of 3 km from the source, excess attenuation was spread over a dynamic range of 80 dB, with differences of 10 dB between individual quarters of the year; also, negative excess attenuation at frequencies below 400 Hz existed. The low frequencies were affected mainly by the stability characteristics of the atmosphere and the lapse rate. Humidity; lapse rate; sensible heat flux; and longitudinal, transverse, and vertical turbulence intensities explain excess attenuation at higher frequencies to a statistically highly significant extent. Through application of a wide range of regression analyses, a set of criteria for frequency-dependent uncertainty in sound propagation was created. These criteria were incorporated into a software module, which, together with a state-of-the-art physical sound propagation calculation module, makes it possible to perform environmental noise assessments with known uncertainty. This approach can be applied to the short term measurements too and it was shown that some of the most complex meteorological variables, among them atmospheric turbulence, can be taken into account. Comparison with two standardized noise modelling methods showed that the statistical model covers well a range of uncertainty not matched with the standardized methods and the measured excess attenuation fit within the limits of predicted uncertainty.

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Organisations: Department of Automation Science and Engineering
Authors: Maijala, P.
Number of pages: 178
Publication date: 3 Jan 2014

Publication information
Publisher: VTT
20th Inverse Days 2014, Tampere 9th-11th December 2014: Abstracts
Proceedings of the Inverse Days 2014 conference organized in Tampere 9th - 11th December 2014. This document contains the schedule of the conference, the list of participants and the abstracts of the talks given at the conference.

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Mathematics, Research group: MAT Inverse Problems
Authors: Åkerblom, M. (ed.)
Number of pages: 38
Publication date: 2014

Publication information
Publisher: Tampere University of Technology, Department of Mathematics
Original language: English

Publication series
Name: University of Technology. Department of Mathematics. Research Report
Publisher: Tampere University of Technology
Volume: 101
ISSN (Print): 1459-3750
Electronic versions:
inverse_days_2014
Links:

Bibliographical note
Versio ok 14.12.2015
Research output: Professional › Commissioned report

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

General information
State: Published
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

Host publication information
Title of host publication: 17th International Conference on Information Fusion (FUSION), 7-10 July 2014, Salamanca, Spain
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers
ISBN (Print): 978-84-9012-355-3
Electronic versions:
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
Links:
http://urn.fi/URN:NBN:fi:tty-201603173645

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
Ratings:
Scopus rating (2016): SJR 0.75 SNIP 1.204 CiteScore 2.07
Scopus rating (2015): SJR 0.724 SNIP 1.179 CiteScore 1.53
Scopus rating (2014): SJR 0.793 SNIP 1.518 CiteScore 2.01
Scopus rating (2013): SJR 0.857 SNIP 1.454 CiteScore 2
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
Publisher name: IEEE
Source-ID: 1243
Research output: Scientific - peer-review Conference contribution

Another paraconsistent algebraic semantics for Łukasiewicz-Pavelka 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: Rodriguez, J. T., Turunen, E., Ruan, D., Montero, J.
Number of pages: 16
Pages: 132-147
Publication date: 2014
Peer-reviewed: Yes

Publication information
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
DOIs:
10.1109/ICL-GNSS.2014.6934162
Links:
http://urn.fi/URN:NBN:fi:tty-201603173647

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: Elsevier BV
Source: researchoutputwizard
Source-ID: 1390
Research output: Scientific - peer-review › Article
A Time-Harmonic Approach to Numerically Model Losses in the Metal Matrix in Twisted Superconductors in External Magnetic Field

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering
Authors: Lyly, M., Lahtinen, V., Stenvall, A., Rostila, L., Mikkonen, R.
Number of pages: 9
Pages: 1-9
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Applied Superconductivity
Volume: 24
Issue number: 2
ISSN (Print): 1051-8223
Ratings:
Scopus rating (2016): SJR 0.395 SNIP 1.031 CiteScore 1.42
Scopus rating (2015): SJR 0.35 SNIP 0.935 CiteScore 1.27
Scopus rating (2014): SJR 0.47 SNIP 1.113 CiteScore 0.83
Scopus rating (2013): SJR 0.431 SNIP 1.171 CiteScore 1.32
Scopus rating (2012): SJR 0.575 SNIP 1.27 CiteScore 1.11
Scopus rating (2011): SJR 0.364 SNIP 1.063 CiteScore 1.16
Scopus rating (2010): SJR 0.468 SNIP 1.073
Scopus rating (2009): SJR 0.452 SNIP 1.033
Scopus rating (2008): SJR 0.878 SNIP 0.987
Scopus rating (2007): SJR 0.611 SNIP 1.104
Scopus rating (2006): SJR 0.731 SNIP 0.935
Scopus rating (2005): SJR 0.645 SNIP 0.996
Scopus rating (2004): SJR 0.867 SNIP 0.9
Scopus rating (2003): SJR 0.494 SNIP 1.045
Scopus rating (2002): SJR 0.849 SNIP 1.024
Scopus rating (2001): SJR 0.523 SNIP 1.336
Scopus rating (2000): SJR 0.799 SNIP 0.95
Scopus rating (1999): SJR 1.073 SNIP 2.106
Original language: English
DOIs:
10.1109/TASC.2014.2308255

Bayesian Methods for Hybrid Indoor Positioning

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research group: Positioning
Authors: Nurminen, H.
Number of pages: 2
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:
Scopus rating (2016): SJR 1.31 SNIP 1.661 CiteScore 3.56
Scopus rating (2015): SJR 1.339 SNIP 1.691 CiteScore 3.76
Scopus rating (2014): SJR 1.28 SNIP 1.886 CiteScore 3.23
Scopus rating (2013): SJR 1.167 SNIP 1.981 CiteScore 3.01
Scopus rating (2012): SJR 0.999 SNIP 1.645 CiteScore 2.36
Scopus rating (2011): SJR 0.498 SNIP 1.268 CiteScore 1.3
Scopus rating (2010): SJR 0.315 SNIP 0.531
Original language: English
DOIs:
10.3390/rs6053906

Bibliographical note
Contribution: organisation=mat,FACT1=1<br>/Portfolio EDEND: 2014-09-30<br>/Publisher name: MDPI AG
Source: researchoutputwizard
Source-ID: 631
Research output: Scientific › peer-review › Article

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
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.
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
Issue number: 6
ISSN (Print): 1757-1693
Ratings:
Scopus rating (2016): SJR 1.734 SNIP 1.427 CiteScore 4.52
Scopus rating (2015): SJR 1.962 SNIP 1.61 CiteScore 5.14
Scopus rating (2014): SJR 2.385 SNIP 1.804 CiteScore 4.81
Scopus rating (2013): SJR 1.54 SNIP 1.434 CiteScore 4.31
Scopus rating (2012): SJR 1.056 SNIP 1.316 CiteScore 3.93
Scopus rating (2011): SJR 0.782 SNIP 0.456
Scopus rating (2010): SJR 0.162 SNIP 0.158
Original language: English
DOI:
10.1111/gcbb.12091

Bibliographical note
Article first published online: 26 MAY 2013
Portfolio EDEND: 2013-07-29
Publisher name: Wiley-Blackwell
Source: researchoutputwizard
Source-ID: 957
Research output: Scientific - peer-review › Article

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

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: Medina, J., Turunen, E., Bartl, E., Diaz-Moreno, J. C.
Number of pages: 10
Pages: 81-90
Publication date: 2014

Host publication 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.

On Convergence and Accuracy of State-Space Approximations of Squared Exponential Covariance Functions

General information
State: Published
On polynomial stability of linear systems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Mathematics
Authors: Paunonen, L., Laakkonen, P.
Number of pages: 6
Pages: 233-238
Publication date: 2014

Host publication information
Title of host publication: 21st International Symposium on Mathematical Theory of Networks and Systems, MTNS 2014, July 7-11, 2014, Groningen, the Netherlands
Place of publication: Groningen, the Netherlands
Publisher: University of Groningen

Publication series
Name: International Symposium on Mathematical Theory of Networks and Systems
Links:
https://fwn06.housing.rug.nl/mtns2014/

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-12-31<br/>Publisher name: University of Groningen
Source: researchoutputwizard
Source-ID: 1242
Research output: Scientific - peer-review › Conference contribution

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
Performance of HQ02, an Optimized Version of the 120 mm Nb3Sn LARP Quadrupole

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Applied Superconductivity
Volume: 24
Issue number: 3
ISSN (Print): 1051-8223
Ratings:
Scopus rating (2016): SJR 0.395 SNIP 1.031 CiteScore 1.42
Scopus rating (2015): SJR 0.35 SNIP 0.935 CiteScore 1.27
Scopus rating (2014): SJR 0.47 SNIP 1.113 CiteScore 0.83
Scopus rating (2013): SJR 0.431 SNIP 1.171 CiteScore 1.32
Scopus rating (2012): SJR 0.575 SNIP 1.27 CiteScore 1.11
Scopus rating (2011): SJR 0.364 SNIP 1.063 CiteScore 1.16
Scopus rating (2010): SJR 0.468 SNIP 1.073
Scopus rating (2009): SJR 0.452 SNIP 1.033
Scopus rating (2008): SJR 0.878 SNIP 0.987
Scopus rating (2007): SJR 0.611 SNIP 1.104
Scopus rating (2006): SJR 0.731 SNIP 0.935
Scopus rating (2005): SJR 0.645 SNIP 0.996
Scopus rating (2004): SJR 0.867 SNIP 0.9
Scopus rating (2003): SJR 0.494 SNIP 1.045
Scopus rating (2002): SJR 0.849 SNIP 1.024
Scopus rating (2001): SJR 0.523 SNIP 1.336
Scopus rating (2000): SJR 0.799 SNIP 0.95
Scopus rating (1999): SJR 1.073 SNIP 2.106
Original language: English
DOIs: 10.1109/TASC.2013.2285885

Bibliographical note
Contribution: organisation=dee,FACT1=1
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 225
Research output: Scientific - peer-review › Article

Predicting tree structure from tree height using terrestrial laser scanning and quantitative structure models
Quench Protection Study of the Nb3Sn Low-beta Quadrupole for the LHC Luminosity Upgrade

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering
Authors: Manfreda, G., Ambrosio, G., Marinozzi, V., Salmi, T., Sorbi, M., Volpini, G.
Number of pages: 5
Pages: 1-5
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: IEEE Transactions on Applied Superconductivity
Volume: 24
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
DOI: 10.1109/MMAR.2014.6957411

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2014-12-16<br/>Publisher name: IEEE
Source: researchoutputwizard
Source-ID: 845
Research output: Scientific - peer-review › Conference contribution
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
Pages: 3967-4000
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: SIAM Journal on Control and Optimization
Volume: 52
Issue number: 6
ISSN (Print): 0363-0129
Ratings:
Scopus rating (2016): CiteScore 2.3 SJR 1.933 SNIP 1.89
Scopus rating (2015): SJR 1.872 SNIP 1.554 CiteScore 1.92
Scopus rating (2014): SJR 1.765 SNIP 1.761 CiteScore 1.9
Scopus rating (2013): SJR 1.866 SNIP 2.018 CiteScore 1.95
Scopus rating (2012): SJR 2.1 SNIP 1.94 CiteScore 2.4
Scopus rating (2011): SJR 2.776 SNIP 2.2 CiteScore 2.33
Scopus rating (2010): SJR 1.836 SNIP 2.06
Scopus rating (2009): SJR 2.093 SNIP 1.942
Scopus rating (2008): SJR 2.228 SNIP 1.83
Scopus rating (2007): SJR 1.938 SNIP 1.654
Scopus rating (2006): SJR 1.95 SNIP 2.088
Scopus rating (2005): SJR 1.53 SNIP 1.829
Scopus rating (2004): SJR 2.053 SNIP 1.612
Scopus rating (2003): SJR 2.518 SNIP 2.219
Scopus rating (2002): SJR 2.971 SNIP 2.216
Scopus rating (2001): SJR 3.303 SNIP 2.043
Scopus rating (2000): SJR 3.247 SNIP 2.61
Scopus rating (1999): SJR 2.377 SNIP 1.889
Original language: English
DOIs:
10.1137/130921362

Bibliographical note
Contribution: organisation=mat,FACT1=1
Portfolio EDEND: 2014-12-31
Publisher name: Society for Industrial and Applied Mathematics
Source: researchoutputwizard
Source-ID: 1245
Research output: 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
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:
Scopus rating (2016): SJR 0.679 SNIP 0.923 CiteScore 2.06
Scopus rating (2015): SJR 0.632 SNIP 0.767 CiteScore 1.76
Scopus rating (2014): SJR 0.795 SNIP 0.972 CiteScore 1.84
Scopus rating (2013): SJR 0.633 SNIP 0.632 CiteScore 1.34
Algorithm for Pedestrian Navigation Combining IMU Measurements and Gait Models

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Pervasive Computing, Wireless Communications and Positioning (WICO)
Authors: Davidson, P., Takala, J.
Number of pages: 6
Pages: 79-84
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Gyroscopy and Navigation
Volume: 4
Issue number: 2
ISSN (Print): 2075-1087
Ratings:
Scopus rating (2016): CiteScore 0.99 SJR 0.27 SNIP 0.825
Scopus rating (2015): SJR 0.269 SNIP 1.206 CiteScore 0.93
Scopus rating (2014): SJR 0.279 SNIP 1.006 CiteScore 0.65
Scopus rating (2013): SJR 0.292 SNIP 0.65 CiteScore 0.44
Scopus rating (2012): SJR 0.248 SNIP 0.366 CiteScore 0.34
Scopus rating (2011): SJR 0.163 SNIP 0.135 CiteScore 0.12
Original language: English
DOIs:
10.1134/S207510871302003X
Links:

Bibliographical note
julkaistu myös Russian in Giroskopiya i Navigatsiya -lehdessä, 2013, No. 1, pp. 85-106.<br/>Contribution: organisation=tie,FACT1=1<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: MAIK Nauka/Interperiodica distributed exclusively by Springer Science+Business Media LLC
Source: researchoutputwizard
Source-ID: 2072
Research output: Scientific - peer-review › Article

A linear state model for PDR+WLAN positioning
Indoor positioning based on WLAN signals is often enhanced using pedestrian dead reckoning (PDR) based on an inertial measurement unit. The state evolution model in PDR is usually nonlinear. We present a new linear state evolution model for PDR. In simulated-data and real-data tests of tightly coupled WLAN-PDR positioning, we find that the positioning accuracy with this linear model is almost as good as with traditional models when the initial state is known, and better when the initial state is not known. The proposed method is computationally light and is also suitable for smoothing.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
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.
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:

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
Pages: 14-19
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Physica D: Nonlinear Phenomena
Volume: 243
Issue number: 1
ISSN (Print): 0167-2789
Ratings:
Scopus rating (2016): SJR 0.845 SNIP 1.266 CiteScore 1.71
Scopus rating (2015): SJR 1.035 SNIP 1.312 CiteScore 1.79
Scopus rating (2014): SJR 1.067 SNIP 1.204 CiteScore 1.71
Scopus rating (2013): SJR 1.029 SNIP 1.364 CiteScore 1.76
Scopus rating (2012): SJR 1.067 SNIP 1.234 CiteScore 1.69
Scopus rating (2011): SJR 0.959 SNIP 1.144 CiteScore 1.58
Scopus rating (2010): SJR 1.037 SNIP 1.11
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
Pages: 1-8
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Astronomy and Astrophysics
Volume: 558
Article number: A104
ISSN (Print): 0004-6361

Ratings:
Scopus rating (2016): CiteScore 3.68 SJR 2.246 SNIP 1.16
Scopus rating (2015): SJR 2.543 SNIP 1.189 CiteScore 3.5
Scopus rating (2014): SJR 2.823 SNIP 1.219 CiteScore 2.82
Scopus rating (2013): SJR 2.544 SNIP 1.058 CiteScore 2.01
Scopus rating (2012): SJR 2.585 SNIP 1.295 CiteScore 3.14
Scopus rating (2011): SJR 2.373 SNIP 1.231 CiteScore 3.42
Scopus rating (2010): SJR 2.74 SNIP 1.444
Scopus rating (2009): SJR 2.879 SNIP 1.404
Scopus rating (2008): SJR 2.923 SNIP 1.297
Scopus rating (2007): SJR 2.816 SNIP 1.34
Scopus rating (2006): SJR 3.224 SNIP 1.349
Scopus rating (2005): SJR 2.891 SNIP 1.355
Scopus rating (2004): SJR 2.633 SNIP 1.462
Scopus rating (2003): SJR 1.967 SNIP 1.373
Scopus rating (2002): SJR 1.742 SNIP 1.346
Scopus rating (2001): SJR 1.555 SNIP 0.727
Scopus rating (2000): SJR 2.178 SNIP 1.039
Scopus rating (1999): SJR 2.489 SNIP 1.076
Original language: English
DOIs:
10.1051/0004-6361/201322221

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., Armstrong, 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
Links:

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Silvilaser Beijing 2013
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
http://urn.fi/URN:NBN:fi:tty-201402041071

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
Links:

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-05-29
Source: researchoutputwizard
Source-ID: 3147
Research output: Scientific - peer-review › Chapter
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/

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-07-29
Source: researchoutputwizard
Source-ID: 3248
Research output: Scientific - peer-review › Chapter

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, Saariselkä, Finland
Place of publication: Vantaa
Publisher: Finnish Society of Forest Science; Finnish Forest Research Institute; University of Helsinki
Editors: Siievänen, 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: 2013-07-29<br/>Publisher name: Finnish Society of Forest Science; Finnish Forest Research Institute; University of Helsinki
Source: researchoutputwizard
Source-ID: 3243
Research output: Scientific - peer-review › Conference contribution

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.
Inertial Sensors and Their Applications

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Pervasive Computing
Authors: Collin, J., Davidson, P., Kirkko-Jaakkola, M., Leppäkoski, H.
Number of pages: 1,399
Pages: 69-96
Publication date: 2013

Host publication information
Title of host publication: Handbook of Signal Processing Systems
Place of publication: New York, NY, USA
Publisher: Springer
Editors: Bhattacharyya, S., Deprettere, E., Leupers, R., Takala, J.
Edition: 2
DOIs:
10.1007/978-1-4614-6859-2_3
Links:

Bibliographical note
Vaihdettu luokka d2 -> a3<br/>
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

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
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:
Scopus rating (2016): SJR 1.248 SNIP 0.917 CiteScore 1.96
Scopus rating (2015): SJR 1.038 SNIP 1.052 CiteScore 1.96
Scopus rating (2014): SJR 1.119 SNIP 0.926 CiteScore 1.96
Scopus rating (2013): SJR 0.869 SNIP 0.819 CiteScore 1.59
Scopus rating (2012): SJR 1.29 SNIP 1.011 CiteScore 2.14
Scopus rating (2011): SJR 1.249 SNIP 0.911 CiteScore 1.96
Scopus rating (2010): SJR 1.353 SNIP 0.965
Scopus rating (2009): SJR 1.387 SNIP 1.128
Scopus rating (2008): SJR 1.484 SNIP 1.243
Scopus rating (2007): SJR 1.112 SNIP 1.056
Scopus rating (2006): SJR 1.045 SNIP 1.038
Scopus rating (2005): SJR 1.052 SNIP 1.051
Scopus rating (2004): SJR 1.054 SNIP 1.28
Scopus rating (2003): SJR 0.864 SNIP 0.963
Scopus rating (2002): SJR 0.838 SNIP 0.938
Scopus rating (2001): SJR 0.733 SNIP 0.67
Scopus rating (2000): SJR 0.676 SNIP 0.606
Scopus rating (1999): SJR 0.746 SNIP 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
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:
Scopus rating (2016): SJR 0.573 SNIP 1.282 CiteScore 1.42
Scopus rating (2015): SJR 0.477 SNIP 1.533 CiteScore 1.15
Scopus rating (2014): SJR 0.482 SNIP 1.396 CiteScore 1.15
Scopus rating (2013): SJR 0.455 SNIP 1.129 CiteScore 1.04
Scopus rating (2012): SJR 0.63 SNIP 1.756 CiteScore 1.08
Scopus rating (2011): SJR 0.393 SNIP 1.015 CiteScore 0.85
Scopus rating (2010): SJR 0.599 SNIP 1.516
Scopus rating (2009): SJR 0.417 SNIP 1.252
Scopus rating (2008): SJR 0.763 SNIP 1.504
Scopus rating (2007): SJR 0.454 SNIP 1.183
Scopus rating (2006): SJR 0.633 SNIP 1.322
Scopus rating (2005): SJR 0.492 SNIP 0.986
Scopus rating (2004): SJR 1.482 SNIP 1.14
Scopus rating (2003): SJR 0.488 SNIP 0.938
Scopus rating (2002): SJR 0.898 SNIP 1.274
Scopus rating (2001): SJR 0.519 SNIP 0.965
Scopus rating (2000): SJR 0.662 SNIP 0.894
Scopus rating (1999): SJR 0.649 SNIP 1.347
Original language: English
DOIs:
10.1016/j.cryogenics.2012.06.005

Bibliographical note
Contribution: organisation=dee,FACT1=0.5<br/>Contribution: organisation=mat,FACT2=0.5<br/>Portfolio EDEND: 2013-04-29<br/>Publisher name: Pergamon
Source: researchoutputwizard
Source-ID: 3194

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
Normal Distributions Transform Occupancy Maps: Application to Large-Scale Online 3D Mapping

On the Structure of Robust Controllers for Infinite-Dimensional Systems
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.
Pedestrian Navigation Based on Inertial Sensors, Indoor, Map, and WLAN Signals

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Computer Systems, Signal Processing Research Community (SPRC), Wireless Communications and Positioning (WICO)
Authors: Leppäkoski, H., Collin, J., Takala, J.
Pages: 287-296
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Signal Processing Systems
Volume: 71
Issue number: 3
ISSN (Print): 1939-8018
Ratings:
Scopus rating (2016): CiteScore 0.78 SJR 0.226 SNIP 0.625
Scopus rating (2015): SJR 0.228 SNIP 0.639 CiteScore 0.7
Scopus rating (2014): SJR 0.292 SNIP 1 CiteScore 0.99
Scopus rating (2013): SJR 0.27 SNIP 0.858 CiteScore 0.97
Scopus rating (2012): SJR 0.281 SNIP 0.869 CiteScore 1.04
Scopus rating (2011): SJR 0.252 SNIP 0.717 CiteScore 0.92
Scopus rating (2010): SJR 0.288 SNIP 0.829
Scopus rating (2009): SJR 0.293 SNIP 0.849
Scopus rating (2008): SJR 0.314 SNIP 0.661
Scopus rating (2007): SJR 0.34 SNIP 1.021
Scopus rating (2006): SJR 0.261 SNIP 0.688
Scopus rating (2005): SJR 0.379 SNIP 0.914
Scopus rating (2004): SJR 0.384 SNIP 1.05
Scopus rating (2003): SJR 0.561 SNIP 1.024
Scopus rating (2002): SJR 0.475 SNIP 1.004
Scopus rating (2001): SJR 0.316 SNIP 0.752
Scopus rating (2000): SJR 0.21 SNIP 0.592
Scopus rating (1999): SJR 0.189 SNIP 0.569
Original language: English
Electronic versions:
Leppakoski_JSPS(2013)_PedestrianNavigation
DOIs:
10.1007/s11265-012-0711-5
Links:
http://urn.fi/URN:NBN:fi:ttv-201703281225

Bibliographical note
Online first : Published online November 2012<br/>Contribution: organisation=tkt,FACT1=1<br/>Publisher name: Springer Science+Business Media
Source: researchoutputwizard
Source-ID: 2767
Research output: Scientific - peer-review » Article

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.
State-machine-based operation of a coverage-model-related process

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning
Authors: Wirola, L., Laine, T., Raitoharju, M., Sirola, N.
Publication date: 2013

Publication information
Patent number: US 8498636 B2
Priority date: 30/07/13
Original language: English

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
Original language: English
DOIs:
http://dx.doi.org/10.5081/jgps.12.1.13
Links:
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:
Scopus rating (2016): SJR 2.462 SNIP 1.288 CiteScore 3.2
Scopus rating (2015): SJR 2.396 SNIP 1.335 CiteScore 3.31
Scopus rating (2014): SJR 2.191 SNIP 1.233 CiteScore 3.05
Scopus rating (2013): SJR 1.947 SNIP 1.09 CiteScore 2.84
Scopus rating (2012): SJR 2.342 SNIP 1.301 CiteScore 3.08
Scopus rating (2011): SJR 2.601 SNIP 1.224 CiteScore 3.2
Scopus rating (2010): SJR 2.722 SNIP 1.3
Scopus rating (2009): SJR 2.61 SNIP 1.371
Scopus rating (2008): SJR 2.54 SNIP 1.241
Scopus rating (2007): SJR 2.578 SNIP 1.352
Scopus rating (2005): SJR 3.67 SNIP 1.728
Scopus rating (2004): SJR 2.641 SNIP 1.558
Scopus rating (2003): SJR 2.182 SNIP 1.46
Scopus rating (2002): SJR 2.038 SNIP 1.463
Scopus rating (2001): SJR 2.487 SNIP 1.199
Scopus rating (2000): SJR 2.316 SNIP 1.211
Scopus rating (1999): SJR 2.965 SNIP 1.259
Original language: English
DOI:
10.1016/j.icarus.2013.01.010

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

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
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:
http://www.uta.fi/cmt/tutkimus/comet/index.html

Bibliographical note
Contribution: organisation=mat,FACT1=1<br/>Portfolio EDEND: 2013-12-29
Source: researchoutputwizard
Source-ID: 3630
Research output: Professional › Commissioned report

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<br/>Portfolio EDEND: 2013-12-29
Source: researchoutputwizard
Source-ID: 2330
Research output: Scientific - peer-review › Chapter