High-Linear Digital Hydraulic Valve Control by an Equal Coded Valve System and Novel Switching Schemes

This study proposes a novel digital hydraulic valve system using multiple equal size on/off valves and a circulating switching control, with an aim to increase the resolution and the linearity of the digital hydraulic valve systems. The solution is founded on the equal coded valve system concept which represents a recent development in the digital hydraulic valve technology. The circulating switching control algorithm is used to overcome non-linearities occurring in the typical non-circulating switching control and to decrease the operating frequency of single on/off valves. As a result, a substantial improvement in tracking control performance is demonstrated with 8×8 parallel connected valves. The results verify that compact, robust and high-performance valve control can be realized.

General information
State: E-pub ahead of print
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Automation and Hydraulic Engineering, Research group: Intelligent drives and actuators, Research group: Innovative Hydraulic Automation
Authors: Paloniitty, M., Linjama, M.
Publication date: 4 Jan 2018
Peer-reviewed: Yes

Publication information
ISSN (Print): 0959-6518
Ratings:
Scopus rating (2016): CiteScore 1.4 SJR 0.436 SNIP 0.743
Scopus rating (2015): SJR 0.405 SNIP 0.741 CiteScore 1.18
Scopus rating (2014): SJR 0.528 SNIP 1.037 CiteScore 1.29
Scopus rating (2013): SJR 0.486 SNIP 0.895 CiteScore 1.3
Scopus rating (2012): SJR 0.416 SNIP 0.84 CiteScore 1.13
Scopus rating (2011): SJR 0.298 SNIP 0.75 CiteScore 0.79
Scopus rating (2010): SJR 0.346 SNIP 0.926
Scopus rating (2009): SJR 0.279 SNIP 0.698
Scopus rating (2008): SJR 0.261 SNIP 0.431
Scopus rating (2007): SJR 0.298 SNIP 0.678
Scopus rating (2006): SJR 0.235 SNIP 0.571
Scopus rating (2005): SJR 0.226 SNIP 0.686
Scopus rating (2004): SJR 0.315 SNIP 0.867
Scopus rating (2003): SJR 0.347 SNIP 0.514
Scopus rating (2002): SJR 0.297 SNIP 0.6
Scopus rating (2001): SJR 0.229 SNIP 0.634
Scopus rating (2000): SJR 0.43 SNIP 0.891
Scopus rating (1999): SJR 0.306 SNIP 0.834
Original language: English
Electronic versions:
NovelSwitchingSheme_accepted_version
DOIs:
0.1177/0959651817750519
Links:
http://urn.fi/URN:NBN:fi:tty-201801231117
Research output: Scientific - peer-review › Article

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

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

Semantic technologies are currently on the advent in Industrial Informatics. They provide data standards with formal syntax and semantics to define and exchange knowledge in a machine interpretable way, thus ensuring the interoperability of the exchanged data. They are perfectly suitable for domain modeling, classification, semantic search, and deriving new insights by reasoning. Expressiveness and flexibility coupled with verifiable structure make semantic technologies a key to overcome common modeling, model exchange, and interoperability problems that need to be solved across the life cycle to automate the automation of future automation systems. This results in an increasing application of semantic technologies to automation systems with a wide usage in industrial processes, factory automation, smart buildings, and global sensor networks. This Special Section addresses this field of automation systems and presents novel research in the field of semantic technologies that demonstrate new capabilities in Industrial Informatics.
A Miniature On/Off Valve Concept for High Performance Water Hydraulics
Digital hydraulic control valve technology has shown its strengths in providing reliable, leak-tight and high performance valve control regardless of the pressure medium used, oil or water. This is enabled by the intelligent use of robust on/off seat valves. However, the availability of these valves for water hydraulics is limited, especially that of compact valves, which are needed for digital valve systems. Thus, with the aim to create a compact digital water hydraulic valve system, this paper presents the development process of a water hydraulic miniature valve. The starting point for the development is a previously developed miniature valve for oil hydraulics. Experimental results with the new prototype show that good performance can be achieved for the miniature valve even with using stainless steel materials. This enables high-performance digital water hydraulic control.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Automation and Hydraulic Engineering, Research group: Digital hydraulics
Authors: Paloniitty, M., Linjama, M.
Number of pages: 8
Publication date: 19 Oct 2017

Utilization of Models for Online Estimation in Combustion Applications
The emerging environmental and energy system related requirements urge renewed combustion systems, with a focus on extended flexibility and decreased emissions. At the same time, monitoring and measurement reliability requirements are increasing. All these requirements also increasingly affect existing combustion plants.

To tackle the increasing needs and requirements of existing combustion processes, this thesis’ objective is to integrate process and domain knowledge, models, and online estimation to provide cost effective and practically feasible solutions for online emission monitoring and control in existing combustion processes. These solutions are domain specific, comprising power level, main fuel, boiler technology, process environment, and market. This thesis presents a framework to provide practically justified, online monitoring and control solutions that is applied to selected combustion applications.

The first application is combustion control of small-scale (<0.5 MW) wood chip combustion systems, to tackle fuel feed disturbances and provide stabilized combustion conditions with improved process performance. The second application area is medium-scale (15 MW – 50 MW) natural gas fired boilers. Indirect, data based, NOx monitoring methods were developed for such boilers, to cost effectively fulfil emerging monitoring requirements. The third application area is large-scale power plants (>100 MW). A novel, first principle combustion model was developed for these. The generic combustion model interlinks the combustion related measurements distributed within any boilers regardless of boiler type or fuels. The interlinking enables combustion processes to be considered as an entity that reveals if a measurement provide realistic readings compared with others. The static, computationally light model enables simultaneous data reconciliation and gross error detection and hence several attractive online applications, such as reliable estimation of unmeasured variables, and separation of process disturbances from sensor malfunctions.

The results verify that the process performance improved in all studied practical applications, providing feasible solutions for increasing requirements.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Automation and Hydraulic Engineering
Authors: Korpela, T.
Number of pages: 84
Publication date: 13 Oct 2017

Publication information
Publisher: Tampere University of Technology
Capacitive Facial Activity Measurement: Online Detection of Facial Expressions

General information
State: Published
Ministry of Education publication type: I1 Audiovisual material
Organisations: Faculty of Biomedical Sciences and Engineering, Research area: Microsystems, Research group: Sensor Technology and Biomeasurements (STB)
Authors: Rantanen, V.
Publication date: 17 Aug 2017
Media of output: Online
Size: 52M
Electronic versions:
capacitive_facial_activity_measurement-online_detection_of_facial_expressions-2014-09-23-720p
Links:
http://urn.fi/URN:NBN:fi:tty-201708211687
Links:
http://www.vrantanen.com/publications/capacitive-facial-activity-measurement-online-detection-of-facial-expressions
Research output: Scientific » Digital or Visual Products

Indirect NOx emission monitoring in natural gas fired boilers
New emission regulations will increase the need for inexpensive NOx emission monitoring solutions also in smaller power plants. The objective in this study is to find easily maintainable and transparent but still valid models to predict NOx emissions in natural gas fired hot water boilers utilizing existing process instrumentation. With a focus on long-term applicability in practical installations, the performance of linear regression is compared in two municipal 43 MW boilers with three widely used nonlinear methods: multilayer perceptron, support vector regression, and fuzzy inference system. The linear models were the most applicable providing the best estimation results (relative error of 1 applications in practise. However, each boiler model should be identified individually.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Korpela, T., Kumpulainen, P., Majanne, Y., Häyринen, A., Lautala, P.
Number of pages: 15
Pages: 11-25
Publication date: 1 Aug 2017
Peer-reviewed: Yes

Publication information
Journal: Control Engineering Practice
Volume: 65
ISSN (Print): 0967-0661
Ratings:
Scopus rating (2016): CiteScore 3.42 SJR 1.287 SNIP 2.156
Scopus rating (2015): SJR 1.194 SNIP 2.091 CiteScore 3.05
Scopus rating (2014): SJR 1.323 SNIP 2.626 CiteScore 3.26
Scopus rating (2013): SJR 1.433 SNIP 3.278 CiteScore 3.5
Scopus rating (2012): SJR 1.267 SNIP 3.118 CiteScore 3.02
Utilization of Drum Boilers’ Storage Capacity for Flexible Operation

Due to increasing amount of intermittent and uncontrollable renewable energy production and reducing amount of stabilizing inertia in power systems, requirements for improved dynamic performance of controllable steam boilers will increase remarkably. Load tracking capacity of steam boilers consists of utilization of fast responding energy storages in boiler structures and change rate of available combustion power. This paper presents results of a simulation based dynamic analysis of the transient operation of a steam boiler exposed to fast load change. The results are evaluated against the requirements set by the maximum allowed thermal stresses in boiler structures and stability of steam parameters set by steam turbine operation. This project is a part of the FLEXe (Flexible Future Energy Systems) research program coordinated by CLIC Innovation Ltd and funded by the Finnish Funding Agency for Innovation TEKES.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Automation and Hydraulic Engineering, Valmet Technologies, Valmet Automation, Aalto University
Authors: Majanne, Y., Yli-Fossi, T., Korpela, T., Nurmoranta, M., Kortela, J.
Number of pages: 6
Pages: 2005-2010
Publication date: 1 Jul 2017

Host publication information
Title of host publication: IFAC-PapersOnLine
Publisher: IFAC

Publication series
Name: IFAC-PapersOnLine
Volume: 50
ISSN (Electronic): 2405-8963
ASJC Scopus subject areas: Control and Systems Engineering
Keywords: Boilers, dynamic simulation, load control, thermal stability, transient analysis
Electronic versions: 1-s2.0-S2405896317303336-main
DOIs: 10.1016/j.ifacol.2017.08.186
Dispenser system for nanocellulose 3D printing
A 3D-printed stepper motor dispenser assembly for a 10ml plastic syringe was constructed. This dispenser assembly was used to run a set of calibration experiments to evaluate its suitability to dose nanocellulose mass. The control of the dosing was done with a Labview software along with an Arduino Uno board. A set of dosing trials was conducted with three different dosing speeds and two different dosing volumes to verify the accuracy and repeatability of the constructed system in the nanocellulose mass dosing. The average dosing accuracy of the system was estimated to be at acceptable level for the application.

Monocular vision-based range estimation supported by proprioceptive motion
This paper describes an approach for fusion of monocular vision measurements, camera motion, odometer and inertial rate sensor measurements. The motion of the camera between successive images generates a baseline for range computations by triangulation. The recursive estimation algorithm is based on extended Kalman filtering. The depth estimation accuracy is strongly affected by the mutual observer and feature point geometry, measurement accuracy of observer motion parameters and line of sight to a feature point. The simulation study investigates how the estimation accuracy is affected by the following parameters: linear and angular velocity measurement errors, camera noise, and observer path. These results impose requirements to the instrumentation and observation scenarios. It was found that under favorable conditions the error in distance estimation does not exceed 2% of the distance to a feature point.
Stability-Guaranteed Nonlinear Model-Based Control of Hydraulic Robotic Manipulators

Robotics technology is booming and it is projected to dominate in the coming decade. Although robotics has already made a considerable impact on many aspects of modern life, advanced robotics is still in its infancy. However, applications of robots are increasing all the time, and their structures are becoming more complex. This increasing complexity creates new challenges in control design, and with the advent of more advanced and more demanding operations, new solutions for controlling robots are needed.

Hydraulic actuators can benefit robotic systems because, compared to electric actuators, they can produce significant forces and torques for their size. Thus, typical operations with hydraulic robotic systems are contact tasks in which heavy objects are handled or in which forces are generated on the environment (e.g., excavation). However, in contact tasks, the control system stability (which is the primary requirement for all control systems) has drawn considerable attention since the installation of the first industrial robots, and numerous reasons for unstable responses have been identified. One of the most significant reasons for instability is that a robot's nonlinear dynamics are not considered rigorously. However, rigorously addressing robot dynamics is one of the fundamental challenges in highly nonlinear hydraulic robotic systems, and this issue has also slowed the spread of their closed-loop control solutions. To address the highly nonlinear dynamics of hydraulic robotic systems, nonlinear model-based (NMB) control methods can be used. However, a stability-guaranteed NMB control design for hydraulic robotic systems has remained an open problem in contact tasks.

This thesis studies a high-performance NMB control method for hydraulic robotic manipulators and provides a rigorous solution for the above open problem. In this thesis, a novel subsystem-dynamics-based virtual decomposition control (VDC) approach is used as an underlying control design framework. The unique features of VDC enable the system's control design and stability analysis at the subsystem level, without imposing additional approximations. This thesis also studies another fundamental challenge of the lack of energy efficiency in hydraulic systems and a force-sensorless contact force estimation for hydraulic robotic manipulators. For energy-efficient control of hydraulic systems, the control design principles of VDC are extended from robotic systems to a broader group of dynamic systems.

This compendium thesis is composed of four publications and one unpublished manuscript. The publications extend the state of the art in the control of hydraulic robotic manipulators in free-space motion and in constrained motion. To provide a possibility for reducing energy consumption, the unpublished manuscript proposes an adaptive and NMB controller for variable displacement axial piston pumps (VDAPPs), whose dynamic behaviour is highly nonlinear in the fourth order, for the first time without using any linearization or order reduction. All control designs in this thesis are stability-guaranteed NMB controls.
We propose a filter for piecewise affine state-space models. In each filtering recursion, the true filtering posterior distribution is a mixture of truncated normal distributions. The proposed filter approximates the mixture with a single normal distribution via moment matching. The proposed algorithm is compared with the extended Kalman filter (EKF) in a numerical simulation, where the proposed method obtains, on average, better root mean square error than the EKF.
Model-based force and position tracking control of an asymmetric cylinder with a digital hydraulic valve
This paper presents a model-based control solution for large inertia systems controlled by a fast digital hydraulic valve. The solution is based on model-based force control and it is shown that the cylinder chamber pressures have first order dynamics with the proper parameter selection. The robust stability is analyzed under unknown load mass, bulk modulus, and delay, and it is shown that a simple cascaded P + PID controller results in good control performance and robustness. The simulated results show smooth and stable response with good tracking performance despite large variations in the load mass and bulk modulus.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Digital hydraulics, Research group: Fluid power automation in mobile machines
Authors: Linjama, M., Huova, M., Huhtala, K.
Pages: 163-172
Publication date: 1 Sep 2016
Peer-reviewed: Yes
Early online date: 25 May 2016

Publication information
Journal: International Journal of Fluid Power
Volume: 17
Issue number: 3
ISSN (Print): 1439-9776
Ratings:
Scopus rating (2016): SJR 0.211 SNIP 0.609 CiteScore 0.91
Scopus rating (2015): SJR 0.282 SNIP 0.758 CiteScore 0.86
Scopus rating (2014): SJR 0.121 SNIP 0.24 CiteScore 0.46
Scopus rating (2013): SJR 0.296 SNIP 0.783 CiteScore 0.9
Scopus rating (2012): SJR 0.228 SNIP 0.946 CiteScore 0.38
Scopus rating (2011): SJR 0.493 SNIP 1.496 CiteScore 0.5
Scopus rating (2010): SJR 0.214 SNIP 0.657
Scopus rating (2009): SJR 0.202 SNIP 0.481
Scopus rating (2008): SJR 0.29 SNIP 0.918
Scopus rating (2007): SJR 0.275 SNIP 1.26
Scopus rating (2006): SJR 0.352 SNIP 1.757
Scopus rating (2005): SJR 0.254 SNIP 0.56
Scopus rating (2004): SJR 0.183 SNIP 0.736
Original language: English
Keywords: Digital hydraulics, tracking control, force control, position control
ASJC Scopus subject areas: Control and Systems Engineering
Electronic versions:
Model based tracking control linjama. Embargo ended: 25/05/17
DOI:
10.1080/14399776.2016.1185876
Links:
Research output: Scientific - peer-review › Article

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.
Combating Unilateral Facial Paralysis With Low-Latency Muscle Reanimation

The Challenge:
Addressing unilateral facial paralysis by creating a measurement and control system for facial pacing, which measures facial movements from the healthy side of the face and uses functional electrical stimulation to simultaneously reanimate the paralysed side.

The Solution:
Using myRIO combined with custom electronics to measure multiple channels of surface EMG, process the acquired signals, and produce stimulation waveforms to activate facial muscles with the low-latency and reliability required for this novel medical system.
Fuel optimal controller for hydrostatic drives and real-world experiments on a wheel loader

In this study, we design a fuel optimal controller for hydrostatic drive transmissions (HSD) that significantly improves their fuel economy. Contrary to great proportion of the literature, efficacy of the controller is demonstrated by real machine implementation equipped with online fuel consumption measurement system. The main control objective of the devised controller is to minimise consumed fuel per travelled distance. Control commands are determined utilizing steady-state equations of the system, which facilitates real-time implementation. Dynamic situations are addressed with auxiliary functions running at higher frequency than the fuel economy part of the controller. The machine is a 5-ton wheel loader with pure HSD and no energy storage devices installed. In addition, all the components are commercially available. Thus, structure of the HSD and presented improvements in fuel economy are comparable to commercial machines and retrofitting existing drive-by-wire machinery with proposed controller will require little cost. The optimal controller is compared to a rule-based alternative that is based on a control method utilized in commercial wheel loaders. In autonomously driven drive cycles, measured total fuel consumption reduced up to 16.6% with the devised controller. In addition, the functionality of the controller is proven in extreme hill climbing tests.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Field robotics and control, Research group: Powertain design, Research group: Fluid power automation in mobile machines
Authors: Backas, J., Ghabcheloo, R., Tikkanen, S., Huhtala, K.
Number of pages: 16
Pages: 187-201
Publication date: 7 Jul 2016
Peer-reviewed: Yes

Publication information
Journal: International Journal of Fluid Power
Volume: 17
Issue number: 3
ISSN (Print): 1439-9776
Ratings:
Scopus rating (2016): SJR 0.211 SNIP 0.609 CiteScore 0.91
Scopus rating (2015): SJR 0.282 SNIP 0.758 CiteScore 0.86
Scopus rating (2014): SJR 0.121 SNIP 0.24 CiteScore 0.46
Scopus rating (2013): SJR 0.296 SNIP 0.783 CiteScore 0.9
Scopus rating (2012): SJR 0.228 SNIP 0.946 CiteScore 0.38
Scopus rating (2011): SJR 0.493 SNIP 1.496 CiteScore 0.5
Scopus rating (2010): SJR 0.214 SNIP 0.657
Scopus rating (2009): SJR 0.202 SNIP 0.481
Scopus rating (2008): SJR 0.29 SNIP 0.918
Scopus rating (2007): SJR 0.275 SNIP 1.26
Scopus rating (2006): SJR 0.352 SNIP 1.757
Scopus rating (2005): SJR 0.254 SNIP 0.56
Scopus rating (2004): SJR 0.183 SNIP 0.736
Original language: English
DOIs: 10.1080/14399776.2016.1202081
Research output: Scientific - peer-review » Article

Mimetic Interfaces Project: Eye Blink Pacing

General information
State: Published
Ministry of Education publication type: I1 Audiovisual material
Organisations: Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control, University of Tampere
Authors: Rantanen, V., Vehkaoja, A., Verho, J., Lekkala, J., Ilves, M., Lylykangas, J., Surakka, V., Mäkelä, E., Rautiainen, M., Veselý, P.
Constrained Global Path Optimization for Articulated Steering Vehicles

This article proposes a new, efficient path-planning algorithm for articulated steering vehicles operating in semistructured environments, in which obstacles are detected online by the vehicle’s sensors. The first step of the algorithm is offline and computes a finite set of feasible motions that connect discrete robot states in order to construct a search space. The motion primitives are parameterized using Bézier curves and optimized as a nonlinear programming problem (NLP) equivalent to the constrained path planning problem. Applying the A* search algorithm to the search space produces the shortest paths as a sequence of these primitives. The sequence is drivable and suboptimal, but it can cause unnatural swerves. Therefore, online path smoothing, which uses a gradient-based method, is applied in order to solve another NLP. Numerical simulations demonstrate that performance of the proposed algorithm is significantly better than that of existing methods when determining constrained path optimization. Also, field experimental results demonstrate the successful generation of fast, safe trajectories for real-time autonomous driving.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Fluid power automation in mobile machines, Intelligent Vehicle Research Center, Hyundai MOBIS
Authors: Choi, J., Huhtala, K.
Pages: 1868-1879
Publication date: 1 Apr 2016
Peer-reviewed: Yes
Early online date: 30 Apr 2015

Publication information
Journal: IEEE Transactions on Vehicular Technology
Volume: 65
Issue number: 4
ISSN (Print): 0018-9545
Ratings:
Scopus rating (2016): CiteScore 4.33 SJR 0.855 SNIP 1.91
Scopus rating (2015): SJR 0.97 SNIP 2.325 CiteScore 4
Scopus rating (2014): SJR 1.063 SNIP 2.567 CiteScore 4.02
Scopus rating (2013): SJR 1.599 SNIP 3.031 CiteScore 4.23
Scopus rating (2012): SJR 1.542 SNIP 2.852 CiteScore 3.83
Scopus rating (2011): SJR 1.168 SNIP 2.393 CiteScore 3.16
Scopus rating (2010): SJR 0.995 SNIP 1.927
Scopus rating (2009): SJR 1.074 SNIP 2.009
Scopus rating (2008): SJR 1.193 SNIP 2.294
Scopus rating (2007): SJR 1.463 SNIP 2.8
Scopus rating (2006): SJR 1.055 SNIP 2.332
Scopus rating (2005): SJR 1.004 SNIP 1.885
Scopus rating (2004): SJR 1.238 SNIP 2.185
Scopus rating (2003): SJR 1.283 SNIP 2.267
Scopus rating (2002): SJR 2.363 SNIP 2.337
Scopus rating (2001): SJR 1.677 SNIP 2.108
Scopus rating (2000): SJR 1.739 SNIP 1.631
Scopus rating (1999): SJR 1.059 SNIP 2.012
Original language: English
An ICT-driven Hybrid Automation System for Elderly Care Support: A Rehabilitation Facility Study Case

The demographic statistics in developed countries suggest growth in the elderly segment of the population. At the same time, other studies forecast a shortage of nurses, increasing the pressure on hospitals to provide treatment for longer periods of time. These trends suggest a need for new ways of taking care of elderly population that support safe, comfortable and independent living. Meanwhile, prominent advances in information and communications technology (ICT) have enabled new systems that address various needs of the elderly. This paper presents an automation system combining ambient assisted living (AAL) and building automation (BA) system functionalities. The paper introduces a case study of a rehabilitation facility situated in Tampere, Finland. It details a field study summarizing the needs of the users, describes functional scenarios supported by the system, and reports the results of the first usability tests suggesting acceptance of a new technology by residents and care-giving personnel. The unique combination of ambient assisted living and building automation offers a safer and more comfortable environment for the elderly as well as helps caregivers on site in managing their workloads.

Product, process and resource model coupling for knowledge-driven assembly automation

Accommodating frequent product changes in a short period of time is a challenging task due to limitations of the contemporary engineering approach to design, build and reconfigure automation systems. In particular, the growing quantity and diversity of manufacturing information, and the increasing need to exchange and reuse this information in an efficient way has become a bottleneck. To improve the engineering process, digital manufacturing and Product, Process and Resource (PPR) modelling are considered very promising to compress development time and engineering cost by enabling efficient design and reconfiguration of manufacturing resources. However, due to ineffective coupling of PPR data, design and reconfiguration of assembly systems are still challenging tasks due to the dependency on the knowledge...
and experience of engineers. This paper presents an approach for data models integration that can be employed for coupling the PPR domain models for matching the requirements of products for assembly automation. The approach presented in this paper can be used effectively to link data models from various engineering domains and engineering tools. For proof of concept, an example implementation of the approach for modelling and integration of PPR for a Festo test rig is presented as a case study.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Factory automation systems technology
Authors: Ramis Ferrer, B., Ahmad, B., Vera, D., Lobov, A., Harrison, R., Martínez Lastra, J. L.
Number of pages: 13
Pages: 231-243
Publication date: 11 Mar 2016
Peer-reviewed: Yes

Publication information
Journal: at - Automatisierungstechnik
Volume: 64
Issue number: 3
ISSN (Print): 0178-2312
Ratings:
Scopus rating (2016): SJR 0.262 SNIP 0.645 CiteScore 0.55
Scopus rating (2015): SJR 0.198 SNIP 0.468 CiteScore 0.41
Scopus rating (2014): SJR 0.188 SNIP 0.247 CiteScore 0.24
Scopus rating (2013): SJR 0.251 SNIP 0.465 CiteScore 0.37
Scopus rating (2012): SJR 0.24 SNIP 0.469 CiteScore 0.38
Scopus rating (2011): SJR 0.3 SNIP 0.545 CiteScore 0.38
Scopus rating (2010): SJR 0.214 SNIP 0.394
Scopus rating (2009): SJR 0.511 SNIP 0.359
Original language: English
DOIs:
10.1515/auto-2015-0073
Links:
Source: Bibtex
Source-ID: urn:00a69065ee02c82159ea774399ef4fba
Research output: Scientific - peer-review › Article

Longitudinal study on text entry by gazing and smiling
This study presents the results of a longitudinal study on multimodal text entry where objects were selected by gazing and smiling. Gaze was used to point at the desired characters and smiling movements were performed to select them. Participants (N=12) took part in the experiments where they entered text for a total of 2.5 hours in ten 15-minute-long sessions during one-month time period. The results showed that the text entry rate improved with practice from 4.1 to 6.7 words per minute. However, the learning curve had not reached its plateau phase at the end of the experiment. Subjective ratings showed that the participants appreciated this multimodal technique.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Measurement Technology and Process Control
Authors: Tuisku, O., Rantanen, V., Surakka, V.
Number of pages: 4
Pages: 253-256
Publication date: Mar 2016

Host publication information
Title of host publication: Proceedings of the Ninth Biennial Symposium on Eye Tracking Research & Applications
Place of publication: New York, NY, USA
Publisher: ACM
ISBN (Electronic): 978-1-4503-4125-7
High strain rate radial compression of Norway spruce earlywood and latewood
The mechanical properties of Norway spruce were studied and a compression model for mechanical pulping was developed. The split-Hopkinson pressure bar technique was combined with high-speed photography to analyse local radial compression. Data analysis focussed on the differences between mechanical properties of earlywood and latewood. Measurements were conducted at both room temperature and 135 °C. The effect of pre-fatigue treatment was also studied. A simple material model was defined linearly in parts and fitted to the measurement data to quantify the differences. New results were found on the differences in inelastic behaviour of earlywood and latewood at large deformations. In addition, other results were in line with previously published results.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Mechanical Engineering and Industrial Systems, Research area: Applied Mechanics, Department of Automation Science and Engineering, Research area: Measurement Technology and Process Control
Authors: Moilanen, C. S., Björkqvist, T., Engberg, B. A., Salmi, L. I., Saarenrinne, P.
Number of pages: 17
Pages: 873-889
Publication date: 1 Feb 2016
Peer-reviewed: Yes
Early online date: 26 Nov 2015

Publication information
Journal: Cellulose
Volume: 23
Issue number: 1
ISSN (Print): 0969-0239
Ratings:
Scopus rating (2016): CiteScore 3.68 SJR 1.126 SNIP 1.144
Scopus rating (2015): SJR 1.153 SNIP 1.24 CiteScore 3.55
Scopus rating (2014): SJR 1.071 SNIP 1.334 CiteScore 3.58
Scopus rating (2013): SJR 1.127 SNIP 1.48 CiteScore 3.83
Scopus rating (2012): SJR 1.179 SNIP 1.71 CiteScore 3.74
Scopus rating (2011): SJR 1.354 SNIP 1.795 CiteScore 3.99
Scopus rating (2010): SJR 0.873 SNIP 1.384
Scopus rating (2009): SJR 1.038 SNIP 1.219
Scopus rating (2008): SJR 0.926 SNIP 1.123
Scopus rating (2007): SJR 0.754 SNIP 1.034
Scopus rating (2006): SJR 0.699 SNIP 1.15
Scopus rating (2005): SJR 1.112 SNIP 1.318
Scopus rating (2004): SJR 0.855 SNIP 1.072
Scopus rating (2003): SJR 0.81 SNIP 1.02
Scopus rating (2002): SJR 0.649 SNIP 0.689
Scopus rating (2001): SJR 0.602 SNIP 0.785
Scopus rating (2000): SJR 0.583 SNIP 0.773
Scopus rating (1999): SJR 0.67 SNIP 1.14

Original language: English
Keywords: Norway spruce, radial compression, split-Hopkinson pressure bar, high speed photography, local strain

DOIs: 10.1007/s10570-015-0826-5

Bibliographical note
ORG=mei,0.7
ORG=ase,0.3
Research output: Scientific › peer-review › Article

A novel micro-robotic approach to study the environmental degradation of matrix and fibre materials

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Automation Science and Engineering, Research area: Microsystems, Outotec Research Center
Authors: Sarlin, E., Essen von, M., Lindgren, M., Kallio, P., Vuorinen, J.
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the SAMPE Europe Conference
ISBN (Electronic): 978-90-821727-4-4
Research output: Scientific › Conference contribution

Cyber-Physical Systems for Open-Knowledge-Driven Manufacturing Execution Systems
Manufacturing execution systems play an important role of bridging high-level enterprise functions and production or manufacturing operations. The embedded systems are usually in charge of controlling execution of the operations. Modern embedded systems have become capable of simultaneous and deterministic execution of control algorithms and IP-based communication, making it possible to create complex cyber–physical systems (CPSs), where the computational and communication resources of a device can be used directly for various control, supervisory, or monitoring functions. The complexity for defining open-knowledge-driven manufacturing execution system (OKD-MES) is in maintaining awareness of overall system state to avoid disruptive actions as various functions may be requested from a system. The problem is that obtaining such information on system state may necessitate collecting data from a number of devices, as there may not be a single data point for state information. This paper describes and illustrates an approach for designing OKD-MES on top of CPSs that controls robot workstations and conveyor-based transportation system of a pallet-based production system.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research group: Factory automation systems technology
Design and simulation of a thermal flow sensor for gravity-driven microfluidic applications

Gravity-driven flow is an attractive approach to develop simpler microfluidic systems. Because clogged microchannels could easily lead to fatal operational failures, it is crucial to monitor flow rate in these systems. Therefore, we propose here for the first time a numerical model that combines a calorimetric flow sensor and a gravity-driven system. With the validated model, we studied the flow behavior in a gravity-driven system. Furthermore, we were able to improve the sensitivity of the measurement based on simulation results. This demonstrates, how the model could be used as an effective optimization tool in the gravity-driven system including calorimetric flow measurement.
Determination of environmental degradation of matrix and fibre materials with a novel, statistically reliable micro-robotic approach

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Materials Science, Research group: Plastics and Elastomer Technology, Department of Automation Science and Engineering, Outotec Research Center
Authors: Sarlin, E., Essen von, M., Palola, S., Lindgren, M., Kallio, P., Vuorinen, J.
Number of pages: 8
Publication date: 2016

Host publication information
Title of host publication: Proceedings of the 17th European Conference on Composite Materials
ISBN (Electronic): 978-3-00-053387-7
Research output: Scientific › Conference contribution

Functionality Testing of Water Pressure and Flow Calculation for Dynamic Power Plant Modelling
Water pressure and flow rate calculation in dynamic boiler models is challenging because of stiff system dynamics meaning that time constants of model states vary by several orders of magnitude. Furthermore, strong interconnections between pressures and flow variables may cause instability problems in simulation runs. This study presents a method to implement and test dynamic thermal power plant water-steam system models. A dynamic water-steam system model is presented. The model is applied for testing of the functionality of the presented computation model. Computational performance was tested using different numerical solvers. Also sensitivity to changes in initial values of system states and model parameters was tested. The results indicate that a workable way to make flexible models was found.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Measurement Technology and Process Control
Authors: Yli-Fossi, T.
Number of pages: 6
Pages: 842-847
Publication date: 2016

Host publication information
Title of host publication: 2016 9th EUROSIM Congress on Modelling and Simulation
Publisher: IEEE Computer Society, Conference Publishing Services, CPS
ISBN (Electronic): 978-1-5090-4119-0
Keywords: modelling, simulation, power plant
DOIs:
10.1109/EUROSIM.2016.77

Bibliographical note
JUFOID=81925
Research output: Scientific - peer-review › Conference contribution

Gain-Scheduled Composite Nonlinear Feedback Control of an Exothermic Chemical Reactor
This paper studies gain-scheduled composite nonlinear feedback (CNF) control of a continuous stirred tank reactor (CSTR). Inside the reactor, an exothermic chemical reaction occurs, which is commanded from high to low residual
concentration. During the transition, the reaction dynamics change through stable-unstable-stable chain while the residual concentration decreases. Therefore, appropriate cooling is necessary to stabilize the reaction, and to prevent a thermal runaway and overheating of the CSTR. A full-state gain-scheduled CNF controller is designed for adjusting the coolant temperature of the CSTR. A traditional gain-scheduled cascade controller and a gain-scheduled model predictive controller (MPC) are also fabricated for comparison. The simulation results show that the closed-loop system using CNF controller is able to offer the best tracking performance as measured by the integral-of-absolute-error (IAE) criterion. In addition, the CNF controller needs fewer scheduled tuning parameters as opposed to the cascade structure.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Information Systems in Automation, Research area: Dynamic Systems
Authors: Pyrhönen, V., Koivisto, H.
Number of pages: 7
Publication date: 2016

Host publication information
Title of host publication: European Control Conference, ECC2016
Publisher: IEEE
ISBN (Electronic): 978-1-5090-2590-9
Keywords: Constrained control, Process control, Chemical process control
DOIs: 10.1109/ECC.2016.7810265
Research output: Scientific - peer-review » Conference contribution

Oценка дальности на основе монокулярного зрения и проприоцептивного движения
В статье описывается метод комплексирования измерений монокулярной камеры, движения камеры, а также измерений одометров и инерциальных датчиков скорости. Движение камеры между последовательными изображениями создает базовую линию для расчета дальности путем триангуляции. Рекурсивный алгоритм оценивания основывается на расширенном фильтре Калмана. На точность оценивания глубины сильно влияют взаимная геометрия наблюдателя и ориентира, точность измерения параметров движения наблюдателя и линия визирования на ориентир. С помощью моделирования исследуется, как влияют на точность оценивания погрешности измерения линейной и угловой скорости, шум камеры и траектория наблюдателя. Из результатов этих исследований можно вывести требования к измерительной аппаратуре и сценариям наблюдения. При благоприятных условиях погрешность оценки дальности не превышает 2% от расстояния до ориентира.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Davidson, P., Raunio, J., Piche, R.
Pages: 98-111
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Giroskopiya I Navigatsiya
Volume: 24
Issue number: 4
ISSN (Print): 0869-7035
Original language: Russian
DOIs: 10.17285/0869-7035.2016.24.4.098-111
Links:

Bibliographical note
Englanninkielinen versio http://dx.doi.org/10.1134/S2075108717020043
Research output: Scientific - peer-review » Article

NOx-häytyjän epäsuora monitorointi maakaasu- ja öljykäyttöisissä lämpövoimalaitoksissa
Real Time Monitoring of Environmental Efficiency of Power Plants

Today total environmental impacts of power production are a subject of emerging interest. Operation of power plants presents direct and indirect impacts to the environment. Direct impacts consist of instant emissions due to the operation of power plants and indirect impacts are originated from the production and transportation of fuels and waste handling. The direct emissions are monitored with Continuous Emission Monitoring Systems (CEMS) but indirect Life Cycle Impacts (LCI) are typically assessed only once during the design phase of process properties such as applied combustion technology and fuels. This paper introduces a procedure for a real time monitoring of total environmental impacts of power plants. The monitoring system aggregates direct and indirect impacts as a total environmental efficiency of the power plant. The procedure can be used e.g. for designing the environmentally friendly operation strategy for the power plant and sustainable purchasing of fuels. This project is a part of the MMEA (Measurement Monitoring and Environmental Assessment) research program coordinated by CLEEN Ltd and funded by the Finnish Funding Agency for Innovation TEKES.
On-Board Electronic Control Systems of Future Automated Heavy Machinery
The level of automation and wireless communication has increased in heavy machinery recently. This requires utilizing new devices and communication solutions in heavy machinery applications which involve demanding operating conditions and challenging life-cycle management. Therefore, the applied devices have to be robust and hardware architectures flexible, consisting of generic modules. In research and development projects devices that have various communication interfaces and insufficient mechanical and electrical robustness need to be applied. Although this thesis has its main focus on machines utilized as research platforms, many of the challenges are similar with commercial machines.

The applicability of typical solutions for data transfer is discussed. Controller area network with a standardized higher level protocol is proposed to be applied where data signalling rates above 1 Mb/s are not required. The main benefits are the availability of robust, generic devices and well-established software tools for configuration management. Ethernet can be utilized to network equipment with high data rates, typically used for perception. Although deterministic industrial Ethernet protocols would fulfil most requirements, the conventional internet protocol suite is likely to be applied due to device availability.

Sometimes sensors and other devices without a suitable communication interface need to be applied. In addition, device-related real-time processing or accurate synchronization of hardware signals may be required. A small circuit board with a microcontroller can be utilized as a generic embedded module for building robust, small and cost-efficient prototype devices that have a controller area network interface. Although various microcontroller boards are commercially available, designing one for heavy machinery applications, in particular, has benefits in robustness, size, interfaces, and flexible software development. The design of such a generic embedded module is presented.

The device-specific challenges of building an automated machine are discussed. Unexpected switch-off of embedded computers has to be prevented by the control system to avoid file system errors. Moreover, the control system has to protect the batteries against deep discharge when the engine is not running. With many devices, protective enclosures with heating or cooling are required.

The electronic control systems of two automated machines utilized as research platforms are presented and discussed as examples. The hardware architectures of the control systems are presented, following the proposed communication solutions as far as is feasible. Several applications of the generic embedded module within the control systems are described. Several research topics have been covered utilizing the automated machines. In this thesis, a cost-efficient operator-assisting functionality of an excavator is presented and discussed in detail.

The results of this thesis give not only research institutes but also machine manufacturers and their subcontractors an opportunity to streamline the prototyping of automated heavy machinery.
Kalman filter with a linear state model for PDR+WLAN positioning and its application to assisting a particle filter

Indoor positioning based on wireless local area network (WLAN) signals is often enhanced using pedestrian dead reckoning (PDR) based on an inertial measurement unit. The state evolution model in PDR is usually nonlinear. We present a new linear state evolution model for PDR. In simulated-data and real-data tests of tightly coupled WLAN-PDR positioning, the positioning accuracy with this linear model is better than with the traditional models when the initial heading is not known, which is a common situation. The proposed method is computationally light and is also suitable for smoothing. Furthermore, we present modifications to WLAN positioning based on Gaussian coverage areas and show how a Kalman filter using the proposed model can be used for integrity monitoring and (re)initialization of a particle filter.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Raitoharju, M., Nurminen, H., Piché, R.
Publication date: 1 Dec 2015
Peer-reviewed: Yes

Publication information
Journal: Eurasip Journal on Advances in Signal Processing
Volume: 2015
Issue number: 1
Article number: 33
ISSN (Print): 1687-6172
Ratings:
Scopus rating (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: Computational modeling, Indoor positioning, Pedestrian dead reckoning, Wireless LAN
Electronic versions:
s13634-015-0216-z
DOIs:
10.1186/s13634-015-0216-z
Links:
Source: Scopus
Source-ID: 84928397748
Research output: Scientific - peer-review › Article
Towards a simulation-based product process: SIMPRO research project final report

Computer-aided design and engineering are daily tools for designers, engineers, and researchers both in Finland and worldwide, but there is still unleashed potential in the computational approach. The Tekes research project, SIMPRO, focused on the efficient application of a computational approach in the whole product life-cycle process, from the concept phase design until product maintenance and simulation life-cycle management. The objective of the project was to produce new research knowledge and to develop existing and new knowledge into an easily exploitable form in industry.

The main conclusion of the project was that the computational methods and available tools are already mature. The bottleneck for fast progress in industry is in the application of these methods and tools, which would require further development and renewal of the processes.

Robust Inference for State-Space Models with Skewed Measurement Noise

Filtering and smoothing algorithms for linear discrete-time state-space models with skewed and heavy-tailed measurement noise are presented. The algorithms use a variational Bayes approximation of the posterior distribution of models that have normal prior and skew-t-distributed measurement noise. The proposed filter and smoother are compared with conventional low-complexity alternatives in a simulated pseudorange positioning scenario. In the simulations the proposed methods achieve better accuracy than the alternative methods, the computational complexity of the filter being roughly 5 to 10 times that of the Kalman filter.

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), Linköping University
Authors: Nurminen, H., Ardeshiri, T., Piché, R., Gustafsson, F.
Clean Components of Fluid Power System Reduce Maintenance Costs

**General information**

State: Published

Ministry of Education publication type: B3 Non-refereed article in conference proceedings

Organisations: Department of Intelligent Hydraulics and Automation, Research group: Condition monitoring of hydraulic components and systems

Authors: Rinkinen, J., Elo, L.

Number of pages: 8

Publication date: 1 Oct 2015

**Host publication information**

Title of host publication: Maintenance, Condition Monitoring and Diagnostics; Maintenance Performance Measurement and Management : MCMD 2015 and MPMM 2015

Article number: 2 (2015-10-01)

ISBN (Print): 978-951-98113-7-6

Research output: Scientific → Conference contribution
Influence of application method and sintering temperature on porosity and thermal conductivity of two commercial silicon carbide based castables

Information about thermal conductivity of refractory castables is crucial in heat conducting structures. Two commercial castables were studied to find out the effect of silicon carbide content (58-67 %) and installation method on thermal conductivity. One castable was designed to be installed by casting and the other one was shotcrete castable. The shotcrete castable was casted and shotcreted in to metal mold sized 200x200x50 mm. The other castable was casted in laboratory conditions and on site. Porosities and thermal conductivities were measured from samples after heat treatment at 400, 600, 800 and 1000 °C. Thermal conductivities were measured by transient plane source method, porosities were measured by Archimedes' method and microstructures were characterized by scanning electron microscopy. Thermal conductivities varied from 6.8-16.3 W/mK and porosities 12.74-21.92 %. Thermal conductivity of measured samples increased with SiC content and higher heat treatment temperature as expected. Porosities and thermal conductivities in castables casted in laboratory and on site varied only slightly. In shotcrete castable applied by casting the porosity and thermal conductivity were higher than in shotcreted sample. So the interconnection between low porosity and high thermal conductivity was not as clear as expected.

Automated Microrobotic Manipulation of Paper Fiber Bonds

This paper presents a novel method for automated manipulation of individual paper fiber bonds using a microrobotic platform, a computer vision algorithm and a robotic software framework. This is a challenging task due to the three-dimensional, heterogeneous and complex morphology of the fiber bonds. The goal is to automatically grasp the fiber bond, and break it by pulling apart the fibers it consists of. We present the components of the microrobotic platform, and the different rules utilized in detecting suitable grasp points from a 3D reconstruction of the bond generated from an image pair. We demonstrate the functionality of the approach with bond breaking experiments of seven fiber bonds. The time required for grasping and breaking of a bond is 10 – 15 seconds making the approach much faster than the current state-of-the-art testing, which is based on manual manipulation. The success rate of the tests is as high as 80 %.

Automated Microrobotic Manipulation of Paper Fiber Bonds

This paper presents a novel method for automated manipulation of individual paper fiber bonds using a microrobotic platform, a computer vision algorithm and a robotic software framework. This is a challenging task due to the three-dimensional, heterogeneous and complex morphology of the fiber bonds. The goal is to automatically grasp the fiber bond, and break it by pulling apart the fibers it consists of. We present the components of the microrobotic platform, and the different rules utilized in detecting suitable grasp points from a 3D reconstruction of the bond generated from an image pair. We demonstrate the functionality of the approach with bond breaking experiments of seven fiber bonds. The time required for grasping and breaking of a bond is 10 – 15 seconds making the approach much faster than the current state-of-the-art testing, which is based on manual manipulation. The success rate of the tests is as high as 80 %.

Automated Microrobotic Manipulation of Paper Fiber Bonds

This paper presents a novel method for automated manipulation of individual paper fiber bonds using a microrobotic platform, a computer vision algorithm and a robotic software framework. This is a challenging task due to the three-dimensional, heterogeneous and complex morphology of the fiber bonds. The goal is to automatically grasp the fiber bond, and break it by pulling apart the fibers it consists of. We present the components of the microrobotic platform, and the different rules utilized in detecting suitable grasp points from a 3D reconstruction of the bond generated from an image pair. We demonstrate the functionality of the approach with bond breaking experiments of seven fiber bonds. The time required for grasping and breaking of a bond is 10 – 15 seconds making the approach much faster than the current state-of-the-art testing, which is based on manual manipulation. The success rate of the tests is as high as 80 %.
Decomposition analysis of Cuban energy production and use: Analysis of energy transformation for sustainability

The aim of the article to analyse the changes in Cuban energy system. It uses decomposition analysis to reveal the impacts of the changes in key drivers of energy consumption and CO2 emissions. The Cuban Energy Revolution, which was started in 2006, was the policy response to the local energy crisis; oil imports caused serious balance of payment problems, the old centralised electricity production system was inefficient and hurricanes caused wide damage to the transmission and distribution system resulting large black outs. The Energy Revolution has been quite successful in changing the energy use patterns in Cuban households. Switch from kerosene to electricity in cooking and using energy saving pressure cookers have had an effect on energy efficiency. In addition, the decentralisation of electricity production has increased the reliability of supply and improved the efficiency when new smaller scale power plants have replaced older technology. The energy revolution has, so far not had much impact on energy use in industry, transport and agriculture, which are the areas where the future policies should be directed.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Measurement Technology and Process Control
Authors: Vazquez, L., Luukkanen, J., Kaisti, H., Käkönen, M., Majanne, Y.
Number of pages: 8
Pages: 638-645
Publication date: Sep 2015
Peer-reviewed: Yes

Publication information
Journal: Renewable and Sustainable Energy Reviews
Volume: 49
ISSN (Print): 1364-0321
Ratings:
Scopus rating (2016): SJR 3.051 SNIP 3.454 CiteScore 9.52
Scopus rating (2015): SJR 2.999 SNIP 3.387 CiteScore 8.35
Scopus rating (2014): SJR 3.106 SNIP 3.761 CiteScore 7.79
Scopus rating (2013): SJR 3.072 SNIP 3.889 CiteScore 7.88
Scopus rating (2012): SJR 2.814 SNIP 3.915 CiteScore 7.24
Scopus rating (2011): SJR 2.787 SNIP 3.901 CiteScore 7.39
Scopus rating (2010): SJR 2.374 SNIP 3.112
Scopus rating (2009): SJR 2.494 SNIP 3.6
Scopus rating (2008): SJR 2.447 SNIP 3.127
Scopus rating (2006): SJR 0.889 SNIP 1.758
Scopus rating (2005): SJR 0.956 SNIP 2.649
Scopus rating (2004): SJR 1.152 SNIP 2.268
Scopus rating (2003): SJR 0.813 SNIP 2.492
Scopus rating (2002): SJR 0.72 SNIP 2.152
Scopus rating (2001): SJR 0.201 SNIP 1.035
Scopus rating (2000): SJR 0.267 SNIP 1.112
Scopus rating (1999): SJR 0.219 SNIP 1.351
Original language: English
Keywords: Energy efficiency, Decomposition, Renewable energy, Cuba, Advanced Sustainability Analysis
DOIs:
10.1016/j.rser.2015.04.156
Links:
Energy Efficiency Considerations for LED-Based Lighting of Multipurpose Outdoor Environments

Nowadays, street lighting accounts for 53% of outdoor lighting use, and the market is continuously increasing. In the context of rising energy prices and growing environmental awareness, energy efficiency is becoming one of the most important criteria for street lighting systems design. LED-based lights have become the primary option for replacing conventional light bulbs, being digitally controllable, small, highly efficient, and cheap to manufacture. Advanced control strategies adapted to ambient conditions are needed to combine low energy consumption and high-quality light ambience according to changing specifications. This paper describes an outdoor lighting solution aimed at energy-efficient performance in the context of multipurpose outdoor environments, where control is crucial in achieving efficiency improvements. This paper addresses efficiency at the component level, by optimizing the performance of LED drivers, and at the system level, by defining the control strategy and associated hardware infrastructure. The approach designed was tested in a real environment. The performance of the lighting installation was assessed using the Web-based monitoring application, providing real-time consumption information and aggregated historical data.
Automatic image-based detection and inspection of paper fibres for grasping

An automatic computer vision algorithm that detects individual paper fibres from an image, assesses the possibility of grasping the detected fibres with microgrippers and detects the suitable grasping points is presented. The goal of the algorithm is to enable automatic fibre manipulation for mechanical characterisation, which has traditionally been slow manual work. The algorithm classifies the objects in images based on their morphology, and detects the proper grasp points from the individual fibres by applying given geometrical constraints. The authors test the ability of the algorithm to detect the individual fibres with 35 images containing more than 500 fibres in total, and also compare the graspability analysis and the calculated grasp points with the results of an experienced human operator with 15 images that contain a total of almost 200 fibres. The detection results are outstanding, with fewer than 1% of fibres missed. The graspability analysis gives sensitivity of 0.83 and specificity of 0.92, and the average distance between the grasp points of the human and the algorithm is 220 μm. Also, the choices made by the algorithm are much more consistent than the human choices.
In this paper, a force-sensorless high-performance contact force/motion control approach is proposed for multiple-degree-of-freedom hydraulic manipulators. A rigorous stability proof for an entire hydraulic manipulator performing contact tasks is provided for the first time. The controller design for the manipulator is based on the recently introduced virtual decomposition control approach. As a significant novelty, the end-effector contact force is directly estimated from the manipulator's cylinder pressure data, which provides a practical solution for heavy-duty contact force control without engaging fragile force/torque sensors. In the experiments, the proposed controller achieved a force control accuracy of 4.1% at a desired contact force of 8000 N while in motion. This can be considered a significant result due to the hydraulic actuators' highly nonlinear behaviors, the coupled mechanical linkage dynamics, and the complex interaction dynamics between the manipulator and the environment.

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Field robotics for efficient work sites (FIRE)
Authors: Koivumäki, J., Mattila, J.
Number of pages: 18
Pages: 918-935
Publication date: 1 Aug 2015
Peer-reviewed: Yes

**Publication information**
Journal: IEEE Transactions on Robotics
Volume: 31
Issue number: 4
ISSN (Print): 1552-3098
Ratings:
Scopus rating (2016): SJR 1.915 SNIP 2.48 CiteScore 4.93
Scopus rating (2015): SJR 2.359 SNIP 2.816 CiteScore 4.86
Scopus rating (2014): SJR 2.884 SNIP 3.671 CiteScore 5.53
Scopus rating (2013): SJR 2.248 SNIP 3.81 CiteScore 5.88
Scopus rating (2012): SJR 1.83 SNIP 4.069 CiteScore 5.07
Scopus rating (2011): SJR 1.706 SNIP 3.875 CiteScore 4.91
Scopus rating (2010): SJR 1.709 SNIP 3.406
Scopus rating (2009): SJR 1.335 SNIP 2.785
Scopus rating (2008): SJR 1.427 SNIP 3.242
Scopus rating (2007): SJR 1.578 SNIP 3.262
Scopus rating (2005): SJR 0.356 SNIP 1.581

**Original language:** English
ASJC Scopus subject areas: Electrical and Electronic Engineering, Control and Systems Engineering, Computer Science Applications
Keywords: Contact force estimation, contact force/motion control, hydraulic manipulators, nonlinear model-based control, stability analysis, virtual decomposition control (VDC)

**DOI:** 10.1109/TRO.2015.2441492

Links:
http://www.scopus.com/inward/record.url?scp=84939173864&partnerID=8YFLogxK (Link to publication in Scopus)
Context-aware knowledge-based middleware for selective information delivery in data-intensive monitoring systems

Multiple embedded devices in modern control and monitoring systems are able to sense different aspects of the current context such as environmental conditions, current processes in the system and user state. The number of captured situations in the environment and quantity and variety of devices in the system produce considerable amounts of data, which should be processed, understood and followed by corresponding actions. However, fully delivered to the user regardless of their role in the system and needs, data flows cause cognitive overload and thus may compromise the safety of the system depending on the timely response of the operators. This paper addresses the problem of selective information delivery with respect to the user's role in the system, his needs and responsibilities, by proposing context-aware information management middleware. The system utilizes Semantic Web technologies by capturing relevant information in the knowledge model of the system, which decouples data from the application logics. A clear division of data and application logics enables context-awareness and facilitates the reconfiguration process, when new information should be added into the system. The chosen approach is justified with an analysis of main trends in context-aware solutions. The engineering principles of the knowledge model are described and illustrated with simple scenarios from the building automation domain. The prototype developed proves the feasibility of the approach via performance evaluation and demonstrates the reconfiguration capabilities of information flows in the system. Further work assumes the extension of the knowledge model and integration of the system with adaptive human–machine interfaces for multi-role and multi-user environments.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Manufacturing and Automation, Research group: Factory automation systems technology
Authors: Evchina, Y., Puttonen, J., Dvoryanchikova, A., Martinez Lastra, J. L.
Number of pages: 16
Pages: 111-126
Publication date: Aug 2015
Peer-reviewed: Yes
Early online date: 22 May 2015

Publication information
Journal: Engineering Applications of Artificial Intelligence
Volume: 43
ISSN (Print): 0952-1976
Ratings:
Scopus rating (2016): SJR 1.047 SNIP 1.94 CiteScore 3.74
Scopus rating (2015): SJR 1.152 SNIP 2.223 CiteScore 3.51
Scopus rating (2014): SJR 1.201 SNIP 2.629 CiteScore 3.56
Scopus rating (2013): SJR 1.074 SNIP 2.394 CiteScore 3.19
Scopus rating (2012): SJR 1.086 SNIP 2.51 CiteScore 3
Scopus rating (2011): SJR 0.916 SNIP 2.334 CiteScore 2.81
Scopus rating (2010): SJR 0.795 SNIP 2.146
Scopus rating (2009): SJR 0.64 SNIP 1.651
Scopus rating (2008): SJR 0.661 SNIP 1.769
Scopus rating (2007): SJR 0.599 SNIP 1.665
Scopus rating (2006): SJR 0.493 SNIP 1.767
Scopus rating (2005): SJR 0.333 SNIP 1.291
Scopus rating (2004): SJR 0.251 SNIP 0.898
Scopus rating (2003): SJR 0.36 SNIP 0.859
Scopus rating (2002): SJR 0.386 SNIP 0.696
Scopus rating (2001): SJR 0.283 SNIP 0.72
Scopus rating (2000): SJR 0.248 SNIP 0.531
Scopus rating (1999): SJR 0.269 SNIP 0.787
Original language: English
DOIs:
10.1016/j.engappai.2015.04.008
Microrobotic platform with integrated force sensing microgrippers for characterization of fibrous materials: Case study on individual paper fibers

Mechanical characterization of micro-scale fibrous materials determines the key parameters which affect the quality of products such as composites, textile and paper. The current laboratory tests are mainly based on bulk measurements. This thesis introduces a microrobotic platform to handle and to characterize micro-scale fibers (MF), with the dimensions of few micrometers to hundreds of micrometers, at individual fiber level. The platform facilitates handling and specimen preparation of micro-scale fibrous material. A major challenge in mechanical characterization of MF is lack of proper force sensing microgrippers in the market. MF do not need a lot of force to manipulate, but their ultimate tensile strength is high and relatively large forces are required to perform a micro-tensile test. In this thesis, three force sensing microgrippers are developed and they are integrated into the mentioned microrobotic platform. Two of them are developed to measure the bonding forces between individual pulp fibers, normal to the bonded area (Z-direction) and parallel to the bonded area (shear-mode). Their force sensing solution is based on bending polyvinylidene fluoride (PVDF) films and their force range is up to 10mN. The third one, with the force range of 20mN, is developed to perform micro-tensile tests on MF. It uses a microspring and a magnetic encoder to measure the force. The force range of this force sensing microgripper can easily be increased by changing its microspring to a stiffer one. This feature makes the proposed force sensing approach adaptable to a wide range of MF. Even though pulp and paper fibers are used as a case study in this thesis, the applications of microrobotic solutions presented here are not limited to pulp and paper fibers for the following reason: pulp and paper fibers are natural fibers with random morphology, therefore if a microrobotic solution is capable of handling these morphologically challenging fibers, it is easily adaptable to synthetic fibers which have uniform morphology. The prototypes of all three force sensing microgrippers are calibrated and their performance are validated.

General information
State: Published
Ministry of Education publication type: G4 Doctoral dissertation (monograph)
Authors: Saketi, P.
Number of pages: 116
Publication date: 21 Jul 2015

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: 1309
ISSN (Print): 1459-2045
Electronic versions:
saketi_1309
Links:

Bibliographical note
Awarding institution:Tampere University of Technology
Versio ok 16.12.2015
Research output: Monograph › Doctoral Thesis

Divertor remote handling for DEMO: Concept design and preliminary FMECA studies
The paper describes a concept design of a remote handling (RH) system for replacing divertor cassettes and cooling pipes in future DEMO fusion power plant. In DEMO reactor design important considerations are the reactor availability and reliable maintenance operations. The proposed divertor mover is a hydraulic telescopic boom driven from the transportation cask through the maintenance tunnel of the reactor. The boom is divided in three sections and it is driving an end-effector in order to perform the scheduled operations of maintenance inside the vacuum vessel. Two alternative designs of the end effector to grip and manipulate the divertor cassette are presented in this work. Both concepts are hydraulically actuated, based on ITER previous studies. The divertor cassette end-effector consists of a lifting arm linked to the divertor mover, a lifting plate, a cantilever arm and a hook-plate. Taking advantage of the ITER RH background and
experience, the proposed hydraulic RH system is compared with the rack and pinion system currently designed for ITER and is an object of simulations at Divertor Test Platform (DTP2) in VTT's Labs of Tampere, Finland. Pros and cons will be put in evidence.

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Fluid power automation in mobile machines, Field robotics for efficient work sites (FIRE), VTT Technical Research Centre of Finland, ENEA/CREATE/Università Degli Studi Napoli Federico II
Authors: Carfora, D., Di Gironimo, G., Järvenpää, J., Huhtala, K., Määttä, T., Siuko, M.
Number of pages: 5
Pages: 1437-1441
Publication date: 9 Jul 2015
Peer-reviewed: Yes

**Publication information**

Journal: Fusion engineering and design
Volume: 98-99
ISSN (Print): 0920-3796
Ratings:
Scopus rating (2016): SJR 0.65 SNIP 0.904 CiteScore 1.14
Scopus rating (2015): SJR 0.76 SNIP 1.595 CiteScore 1.41
Scopus rating (2014): SJR 0.709 SNIP 1.26 CiteScore 1.2
Scopus rating (2013): SJR 0.619 SNIP 1.454 CiteScore 1.35
Scopus rating (2012): SJR 0.636 SNIP 1.078 CiteScore 0.99
Scopus rating (2011): SJR 0.664 SNIP 1.755 CiteScore 1.4
Scopus rating (2010): SJR 0.44 SNIP 1.111
Scopus rating (2009): SJR 0.655 SNIP 1.272
Scopus rating (2008): SJR 0.557 SNIP 0.959
Scopus rating (2007): SJR 0.682 SNIP 1.265
Scopus rating (2006): SJR 0.386 SNIP 0.795
Scopus rating (2005): SJR 0.486 SNIP 1.375
Scopus rating (2004): SJR 0.963 SNIP 0.617
Scopus rating (2003): SJR 0.541 SNIP 0.975
Scopus rating (2002): SJR 0.954 SNIP 0.95
Scopus rating (2001): SJR 0.394 SNIP 1.051
Scopus rating (2000): SJR 0.526 SNIP 0.893
Scopus rating (1999): SJR 0.365 SNIP 0.461
Original language: English
Keywords: Concept design, DEMO, Divertor, Hydraulic telescopic boom, Remote handling
ASJC Scopus subject areas: Nuclear Energy and Engineering, Materials Science(all), Civil and Structural Engineering, Mechanical Engineering
DOIs: 10.1016/j.fusengdes.2015.06.056
Links: http://www.scopus.com/inward/record.url?scp=84942553949&partnerID=8YFLogxK (Link to publication in Scopus)
Source: Scopus
Source-ID: 84942553949
Research output: Scientific - peer-review › Article

**A knowledge-based solution for automatic mapping in component based automation systems**

Due to the current business requirements, the manufacturing industry is striving to reduce design, development and commissioning time of production systems to manufacture new products in a timely manner. The use of new technologies such as virtual engineering, automatic code generation and knowledge-based approaches is being extensively researched. This paper presents a framework that utilizes a knowledge-based approach to automate the component mapping in the code generation process. The raw data is taken from simulation models of manufacturing systems developed in 3D based virtual engineering tools. Moreover, a prototype implementation is presented and the results are discussed.

**General information**
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.

Knowledge-driven finite-state machines. Study case in monitoring industrial equipment

Traditionally state machines are implemented by coding the desired behavior of a given system. This work proposes the use of ontological models to describe and perform computations on state machines by using SPARQL queries. This approach represents a paradigm shift relating to the customary manner in which state machines are stored and computed.
The main contribution of the work is an ontological model to represent state machines and a set of generic queries that can be used in any knowledge-driven state machine to compute valuable information. The approach was tested in a study case where the state machines of industrial robots in a manufacturing line were modeled as ontological models and used for monitoring the behavior of these devices on real time.
Representation of manufacturing equipment and services for OKD-MES: From service descriptions to ontology

Demand for efficiency in the domain of manufacturing increases driven by competition for resources and customers. Adaptation of the modern concepts which have proven their benefits in other domains to the automation of manufacturing systems provides a field for innovation. Recent developments in Cyber-Physical Systems, Service-oriented Architecture and Knowledge-Driven Approach suggest an ecosystem for contemporary factory. Such set of concepts is applied in the eScop project for implementation of Open Knowledge-Driven Manufacturing Execution System (OKD-MES). The Knowledge-Driven approach introduces new possibilities for efficient operation of the system, but also requires significant effort to describe knowledge about the system. Significant part of this knowledge may be provided by the equipment in the factory shop floor. The approach which facilitates the process of population of knowledge base using the data from manufacturing equipment in automated manner should lower the cost and the organizational threshold for introduction of OKD-MES to the industry. This paper evaluates the possibilities for extraction of required semantic data from the descriptions provided by the smart service-oriented manufacturing equipment.

Towards processing and reasoning streams of events in knowledge-driven manufacturing execution systems

The incessant need of the industry to optimize processes due to market demands derived in a huge investment on information communication technologies implementation during last decades, in the industrial automation domain. This caused the implementation of paradigms as service-oriented or event-driven architectures in factories, used for wide data integration. Moreover, the use of knowledge representation, within ontologies, permitted the description of system status in knowledge bases, which can be queried and updated at runtime. Due to the massive occurrence of events at any location of the enterprise, complex event processing (CEP) technologies can be used for anticipating facts that can compromise the production at shop floors. In fact, recent implementations on processing and reasoning streams of events in the Semantic Web can be applied also in the industrial automation domain because they combine CEP and SPARQL, which are technologies nowadays used by factory systems. This article describes how these technologies can support the study of the ontological system models evolution through time and an approach to bring predictability to current knowledge-based systems.
Vision-based path coordination for multiple mobile robots with four steering wheels using an overhead camera

In this paper, we extend our previous work to introduce a vision-based path coordination method for multiple mobile robots with four steering wheels to avoid mutual collisions, so that the generated paths are always in the visibility range of the overhead camera. The proposed algorithm generates the synchronized trajectories for all wheels belonging to each mobile robot, with respect to its inertial-frame, relying on only one calibrated camera. These synchronized trajectories reduce the complexity of the robot kinematic model to plan maximum allowable bounded driving and steering velocities for each mobile robot. The main contribution of the proposed method is coordinating the trajectories for multiple mobile robots to avoid intersection boundaries that are obtained by generated geometrical traces in real world coordinates. Our experimental results are presented to illustrate the efficiency of the proposed method for the path coordination of multiple mobile robots with four steering wheels to avoid mutual collision.

Service-oriented approach to fault tolerance in CPSs

Cyber-physical systems (CPSs) are open and interconnected embedded systems that control or interact with physical processes. Failures in CASs can lead to loss of production time, damage to the equipment and environment, or loss of life, meaning that dependability and resilience are key properties for their design. However, existing fault tolerance and safety approaches are inadequate for complex, networked and dynamic CPSs. Service-orientation, on the other hand, is generally considered to be a robust architectural style, but there is a limited amount of research on fault tolerance of...
service-oriented architecture (SOA), especially on distributed real-time systems. We propose an approach that utilizes the loosely coupled nature of services to implement fault tolerance using a middleware-based real-time SOA (RTSOA) for CPSs. The approach, based on the concepts of fault isolation and recovery at the service level, is empirically evaluated using a demanding bilateral teleoperation (remote handling) application. The empirical evaluation demonstrates that RTSOA supports real-time fault detection and recovery, use of services as a unit of fault isolation, and it provides capability to implement fault tolerance patterns flexibly and without significant overhead. (C) 2015 Elsevier Inc. All rights reserved.

**General information**
State: Published  
Ministry of Education publication type: A1 Journal article-refereed  
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Field robotics for efficient work sites (FIRE)  
Authors: Alho, P., Mattila, J.  
Number of pages: 17  
Pages: 1-17  
Publication date: Jul 2015  
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Systems and Software  
Volume: 105  
ISSN (Print): 0164-1212  
Ratings:  
Scopus rating (2016): SJR 0.64 SNIP 2.039 CiteScore 3.1  
Scopus rating (2015): SJR 0.721 SNIP 2.392 CiteScore 2.93  
Scopus rating (2014): SJR 0.798 SNIP 2.46 CiteScore 2.82  
Scopus rating (2013): SJR 0.669 SNIP 2.325 CiteScore 2.71  
Scopus rating (2012): SJR 0.624 SNIP 2.131 CiteScore 2.4  
Scopus rating (2011): SJR 0.653 SNIP 2.014 CiteScore 2.55  
Scopus rating (2010): SJR 0.613 SNIP 2.018  
Scopus rating (2009): SJR 0.614 SNIP 1.49  
Scopus rating (2008): SJR 0.68 SNIP 1.469  
Scopus rating (2007): SJR 0.584 SNIP 1.448  
Scopus rating (2006): SJR 0.527 SNIP 1.349  
Scopus rating (2005): SJR 0.657 SNIP 1.545  
Scopus rating (2004): SJR 0.634 SNIP 1.613  
Scopus rating (2003): SJR 0.58 SNIP 1.157  
Scopus rating (2002): SJR 0.472 SNIP 0.749  
Scopus rating (2001): SJR 0.563 SNIP 0.885  
Scopus rating (2000): SJR 0.315 SNIP 0.705  
Scopus rating (1999): SJR 0.21 SNIP 0.765  
Original language: English  
Keywords: Dependability, Resilience, RTSOA, CYBER-PHYSICAL SYSTEMS, REAL-TIME SYSTEMS, WEB SERVICES, FRAMEWORK, RECOVERY, SOFTWARE  
DOIs:  
10.1016/j.jss.2015.03.041  
Source: WOS  
Source-ID: 000355707300001  
Research output: Scientific - peer-review › Article

**A time-optimal bounded velocity path-following controller for generic Wheeled Mobile Robots**
This paper, as a generalization of our previous works, presents a unified time-optimal path-following controller for Wheeled Mobile Robots (WMRs). Unlike other path-following controllers, we solve the path-following problem for all common categories of WMRs such as car-like, differential, omnidirectional, all wheels steerable and others. We show that the insertion of our path-following controller into the kinematic and non-holonomic constraints of the wheels, simplifies the otherwise impenetrable constraints, resulting in explicit monotonic functions between the velocity of the base and that of the wheels. Based on this foundation, we present a closed-form solution that keeps all the wheels' steering and driving velocities within their corresponding pre-specified bounds. Simulation data and experimental results from executing the controller in a real-time environment demonstrate the efficacy of the method.
Electroplated nickel microspring and low-friction precision linear slider: A novel micro-force sensing tool
This paper introduces a novel micro-force sensing approach utilizing an electroplated nickel microspring and a precision linear slider (PLS) for micro-tensile testing applications. After investigating the effects of friction forces in a PLS, an electroplated nickel microspring is designed, fabricated and integrated into the PLS, and the proposed micro-force sensor concept is validated through experimental results. The microspring fabricated in this paper is limited to forces up to 6 mN with the average sensitivity of 36.63 μN/μm. It is shown that the friction forces introduce uncertainties only to the forces less than 500 μN. The proposed approach allows the fabrication of micro-force sensors for the force ranges of up to tens of Millinewtons for different applications.

Novel pairwise coupled kinematic solution for algebraic angular acceleration estimation of serial link manipulators
We consider low-noise angular acceleration estimation for multi-axis robotic manipulators. The proposed model uses pairwise coupled inertial measurements across a section of the kinematic chain, which is reduced to a single rigid body. Experimental validation is built upon compact low-power micro-electro-mechanical (MEMS) components, installed on a full-scale heavy-duty mobile manipulator. While the model itself has a built-in mechanism for common-mode disturbance rejection, an adaptive transversal filter is devised for a further improvement. The results indicate a 40-80 fold suppression.
of high-frequency perturbations with respect to a baseline motion derivative, the discrete difference. As inertial sensors require no mechanical contact to rotating axes and the number of parameters is kept low, the model is easily applicable to motion control feedback of typical heavy-duty manipulators.

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: MMDM, Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Research area: Information Technology for Biology and Health, Research area: Intelligence in Machines, Research area: Signal and Information Processing, Signal Processing Research Community (SPRC)
Authors: Vihonen, J., Honkakorpi, J., Mattila, J., Visa, A.
Number of pages: 6
Pages: 809-814
Publication date: 29 Jun 2015

**Host publication information**
Title of host publication: 2015 IEEE International Conference on Robotics and Automation (ICRA)
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-6923-4
ASJC Scopus subject areas: Software, Artificial Intelligence, Control and Systems Engineering, Electrical and Electronic Engineering
DOIs:
10.1109/ICRA.2015.7139271
Links:
http://www.scopus.com/inward/record.url?scp=84938217097&partnerID=8YFLogxK (Link to publication in Scopus)

**Bibliographical note**
ORG=sgn,0.5
ORG=iha,0.5
Source: Scopus
Source-ID: 84938217097
Research output: Scientific - peer-review » Conference contribution

**Optimal sensing via multi-armed bandit relaxations in mixed observability domains**
Sequential decision making under uncertainty is studied in a mixed observability domain. The goal is to maximize the amount of information obtained on a partially observable stochastic process under constraints imposed by a fully observable internal state. An upper bound for the optimal value function is derived by relaxing constraints. We identify conditions under which the relaxed problem is a multi-armed bandit whose optimal policy is easily computable. The upper bound is applied to prune the search space in the original problem, and the effect on solution quality is assessed via simulation experiments. Empirical results show effective pruning of the search space in a target monitoring domain.

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Dynamic Systems
Authors: Lauri, M., Ritala, R.
Number of pages: 6
Pages: 4807-4812
Publication date: 29 Jun 2015

**Host publication information**
Title of host publication: 2015 IEEE International Conference on Robotics and Automation (ICRA), 26-30 May 2015, Seattle, WA
Volume: 2015-June
ISBN (Print): 978-1-4799-6923-4
ASJC Scopus subject areas: Software, Artificial Intelligence, Control and Systems Engineering, Electrical and Electronic Engineering
Electronic versions:
ICRA15_1071_FI
DOIs:
10.1109/ICRA.2015.7139867
Links:
http://urn.fi/URN:NBN:fi:ttly-201605033926
Passive resonance sensor based method for monitoring particle suspensions

Control of particle suspensions is needed in several modern industrial processes. A reason for the difficulty in this task has been the lack of a fast and reliable measurement. In this study, we tested the measurement of particle suspension by using a method based on a passive resonance sensor. The relative amounts of dispersing agent and aluminium oxide in the suspension were varied. The studied method yielded signals which depended on the complex permittivity of the suspension. The results indicated that we were able to measure information that can be used as feedback for the suspension preparation process. In addition, the tested instrumentation was simple and robust and thus this method may allow online measurements directly from the industrial processes.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Salpavaara, T., Järveläinen, M., Seppälä, S., Yli-Hallila, T., Verho, J., Vilkko, M., Lekkala, J., Levänen, E.
Number of pages: 7
Pages: 324-330
Publication date: 8 Jun 2015
Peer-reviewed: Yes

Publication information
Journal: Sensors and Actuators B: Chemical
Volume: 219
ISSN (Print): 0925-4005

Ratings:
Scopus rating (2016): SJR 1.333 SNIP 1.463 CiteScore 5.07
Scopus rating (2015): SJR 1.25 SNIP 1.509 CiteScore 4.84
Scopus rating (2014): SJR 1.229 SNIP 1.679 CiteScore 4.37
Scopus rating (2013): SJR 1.242 SNIP 1.622 CiteScore 4.25
Scopus rating (2012): SJR 1.405 SNIP 1.679 CiteScore 3.92
Scopus rating (2011): SJR 1.474 SNIP 1.744 CiteScore 4.08
Scopus rating (2010): SJR 1.409 SNIP 1.437
Scopus rating (2009): SJR 1.297 SNIP 1.509
Scopus rating (2008): SJR 1.436 SNIP 1.576
Scopus rating (2007): SJR 1.434 SNIP 1.592
Scopus rating (2006): SJR 1.336 SNIP 1.526
Scopus rating (2005): SJR 1.267 SNIP 1.849
Scopus rating (2004): SJR 1.336 SNIP 1.504
Scopus rating (2003): SJR 1.159 SNIP 1.381
Scopus rating (2002): SJR 1.086 SNIP 1.07
Scopus rating (2001): SJR 0.835 SNIP 1.128
Scopus rating (2000): SJR 0.928 SNIP 1.2
Scopus rating (1999): SJR 0.907 SNIP 1.07

Original language: English
Keywords: Complex permittivity, Inductive coupling, Passive resonance sensor, Slurry, Suspension

DOI: 10.1016/j.snb.2015.04.121
Links:
http://www.scopus.com/inward/record.url?scp=84930646590&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
ORG=ase,0.5
ORG=mol,0.5
Model-Driven Development of Control Applications: On Modeling Tools, Simulations and Safety

Control systems are required in various industrial applications varying from individual machines to manufacturing plants and enterprises. Software applications have an important role as an implementation technology in such systems, which can be based on Distributed Control System (DCS) or Programmable Control System (PLC) platforms, for example. Control applications are computer programs that, with control system hardware, perform control tasks. Control applications are efficient and flexible by nature; however, their development is a complex task that requires the collaboration of experts and information from various domains of expertise.

This thesis studies the use of Model-Driven Development (MDD) techniques in control application development. MDD is a software development methodology in which models are used as primary engineering artefacts and processed with both manual work and automated model transformations. The objective of the thesis is to explore whether or not control application development can benefit from MDD and selected technologies enabled by it. The research methodology followed in the thesis is the constructive approach of design science.

To answer the research questions, tools are developed for modeling and developing control applications using UML Automation Profile (UML AP) in a model-driven development process. The modeling approach is developed based on open source tools on Eclipse platform. In the approach, modeling concepts are kept extendable. Models can be processed with model transformation techniques that plug in to the tool. The approach takes into account domain requirements related to, for example, re-use of design. According to assessment of industrial applicability of the approach and tools as part of it, they could be used for developing industrial DCS based control applications.

Simulation approaches that can be used in conjunction to model-driven development of control applications are presented and compared. Development of a model-in-the-loop simulation support is rationalized to enable the use of simulations early while taking into account the special characteristics of the domain. A simulator integration is developed that transforms UML AP control application models to Modelica Modeling Language (ModelicaML) models, thus enabling closed-loop simulations with ModelicaML models of plants to be controlled. The simulation approach is applied successfully in simulations of machinery applications and process industry processes.

Model-driven development of safety applications, which are parts of safety systems, would require taking into account safety standard requirements related to modeling techniques and documentation, for example. Related to this aspect, the thesis focuses on extending the information content of models with aspects that are required for safety applications. The modeling of hazards and their associated risks is supported with fault tree notation. The risk and hazard information is integrated into the development process in order to improve traceability. Automated functions enable generating documentation and performing consistency checks related to the use of standard solutions, for example. When applicable, techniques and notations, such as logic diagrams, have been chosen so that they are intuitive to developers but also comply with recommendations of safety standards.

General Information

State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Automation Science and Engineering, Research area: Information Systems in Automation
Authors: Vepsäläinen, T.
Number of pages: 115
Publication date: 5 Jun 2015

Publication Information

Publisher: Tampere University of Technology
ISBN (Print): 978-952-15-3528-4
Original language: English

Publication series

Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1303
ISSN (Print): 1459-2045
Electronic versions:
vepsalainen_1303
Links:
Active Object Recognition via Monte Carlo Tree Search

This paper considers object recognition with a camera, whose viewpoint can be controlled in order to improve the recognition results. The goal is to choose a multi-view camera trajectory in order to minimize the probability of having misclassified objects and incorrect orientation estimates. Instead of using offline dynamic programming, the resulting stochastic optimal control problem is addressed via an online Monte Carlo tree search algorithm, which can handle various constraints and provides exceptional performance in large state spaces. A key insight is to use an active hypothesis testing policy to select camera viewpoints during the rollout stage of the tree search.

General information
State: Published
Ministry of Education publication type: D3 Professional conference proceedings
Authors: Lauri, M., Atanasov, N., Pappas, G., Ritala, R.
Number of pages: 3
Publication date: 30 May 2015

Host publication information
Article number: 8
Keywords: Active classification, Object detection, Monte Carlo methods, Decision-making
Electronic versions:
Lauri_et_al_Active_Object
Links:
http://urn.fi/URN:NBN:fi:tty-201706151600
Links:
http://people.csail.mit.edu/jingjin/ICRA15/ (Workshop website)

Energy Efficient Digital Hydraulic Valve Control

The topic of the thesis is the energy saving potential of digital hydraulic valve controlled drives. Digital hydraulic valves are capable of independent metering of flow paths, enabling reduction of energy losses when compared to traditional 4/3-way control valves with mechanically fixed opening ratio between inflow and outflow control edges. So far independent metering control has been studied using proportional valves with four and five metering edges. In addition to four- and five-edge digital valves, six-edge controlled three-chamber cylinder and four-edge digital valve with pressurized tank line are studied in this thesis and their capability of reducing energy losses is systematically compared.

In addition to model-based valve controller, control mode switching logic is needed to control and optimize the energy consumption of digital hydraulic valve drives. The thesis presents the mode switching logic for the digital hydraulic valve drives studied. The main focus in the design of mode switching logic is the avoidance of unnecessary throttling losses, retaining the stiffness of the drive and enabling control mode switching during motion.

The energy efficiency of the different digital hydraulic drives is studied using experimental test setup. Furthermore, a method based on steady-state calculation is used to estimate the efficiency of the drives in single- and multi-actuator systems. Steady-state analysis gives the possibility of analyzing energy losses in a certain work cycle without building a dynamic simulation model as long as velocity and load profile are known. The results of the steady-state analysis can also be applied to independent metering proportional valve systems as long as the control method is not changed and there are no significant leakages. Measured and predicted energy losses are compared to study the validity of the analysis.

The results of the steady-state analysis and measured energy losses agree relatively well for four- and five-edge controlled systems. Significant amount of power losses of three-chamber cylinders results from system dynamics worsening the applicability of the steady-state analysis. Both the experimental results and steady-state analysis show that energy losses can be decreased significantly when a four-edge digital valve is used with pressurized tank line. However, a significant amount of energy is returned to the pressurized tank line in typical load cycles and thus the supply system
should be designed such that the energy of the tank line is not lost. The three-chamber cylinder enables a significant reduction of energy losses in multi-actuator systems due to the increased number of control modes. The result is remarkable since the three-chamber cylinder is fed with constant supply pressure, whereas the other systems studied utilize load sensing supply pressure. However, the reduction of energy losses depends heavily on the load cycle and therefore a number of different load profiles are studied.

### General information
- **State:** Published
- **Ministry of Education publication type:** G4 Doctoral dissertation (monograph)
- **Organisations:** Department of Intelligent Hydraulics and Automation, Research group: Digital hydraulics
- **Authors:** Huova, M.
- **Number of pages:** 158
- **Publication date:** 27 May 2015

### Publication information
- **Place of publication:** Tampere
- **Publisher:** Tampere University of Technology
- **ISBN (Print):** 978-952-15-3523-9
- **ISBN (Electronic):** 978-952-15-3553-6
- **Original language:** English

### Publication series
- **Name:** Tampere University of Technology. Publication
- **Volume:** 1298
- **ISSN (Print):** 1459-2045
- **Electronic versions:** huova_1298
- **Links:**

### Bibliographical note
- **Awarding institution:** Tampere University of Technology
- **Versio ok 14.12.2015**
- **Research output:** Monograph › Doctoral Thesis

---

## Microrobotic system for multi-rate measurement of bio-based fibres Z-directional bond strength

The core content of this study is micro-testing of microscale objects - an emerging application area for microrobotics - where microrobotics has been used in paper industry for measuring properties at the single fibre level. Pulp and paper scientists are interested to have experimental data of single fibre-fibre bond strength distribution of paper/board products in different loading modes and rates. Meeting this demand is quite challenging since the system should be able to measure the bond strength i) in the individual fibre level, ii) in different loading modes, and iii) in different loading rates. The current methods of measurement do not satisfy all these three requirements. Among the four different loading modes, the Z-directional behaviour of paper/board products is a matter of high significance for papermaking and paper converting companies. The Z-directional properties influence compressive properties, and accordingly the performance of structural paper/board products. According to the literature, there is not any reported method to facilitate the measurement of Z-directional strength at the single fibre level in different loading rates. This paper reports an in-depth study of a measurement method for experimental evaluation of Z-directional individual fibre-fibre bond strength in multiple loading rates using microrobotics and a Polyvinylidene fluoride (PVDF) film microforce sensor. The results from the measurement system are promising. In summary, the first concept for multi-rate measurement of Z-directional bond strength at the individual fibre level is developed during this work which has a high practical impact on the fibre characterization research field.

### General information
- **State:** Published
- **Ministry of Education publication type:** A1 Journal article-refereed
- **Organisations:** Department of Automation Science and Engineering, Research area: Microsystems, Research area: Measurement Technology and Process Control
- **Authors:** Latifi, S. K., Saketi, P., Kallio, P.
- **Number of pages:** 14
- **Pages:** 13-26
- **Publication date:** 24 May 2015
- **Peer-reviewed:** Yes

### Publication information
- **Journal:** Journal of Micro-Bio Robotics
Digital Hydraulics on Rails – Pilot Project of Improving Reliability on Railway Rolling Stock by Utilizing Digital Valve System

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Fluid power automation in mobile machines, Research group: Powertrain design, Research group: Digital hydraulics, Bosch Rexroth AG, VR-Group Ltd
Authors: Fischer, H., Laamanen, A., Iso-Heiko, A., Schäfer, O., Karvonen, M., Karhu, O., Huhtala, K., Pulkkinen, V., Huttunen, A.
Number of pages: 11
Pages: 644-654
Publication date: 20 May 2015

Host publication information
Title of host publication: Proceedings of The Fourteenth Scandinavian International Conference on Fluid Power, SICFP15
Editors: Laamanen, A., Huhtala, K.
Links:
Research output: Scientific › Conference contribution

Fault Tolerance of Digital Hydraulics in High Dynamic Hydraulic System

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Digital hydraulics, Robert Bosch GmbH, Germany, Tamlinc ltd
Authors: Siivonen, L., Linjama, M., Huova, M., Försterling, H., Stamm, E., Deubel, T.
Number of pages: 11
Publication date: 20 May 2015

Host publication information
Title of host publication: The Fourteenth Scandinavian International Conference on Fluid Power
Volume: 1
Place of publication: Tampere, Finland
Edition: 1
Links:
Research output: Scientific - peer-review › Conference contribution

Hydraulic Hybrid Actuator: Theoretical Aspects and Solution Alternatives
This paper presents and analyzes a hybrid solution, in which the hydraulic energy storage element is integrated to the hydraulic actuator. The approach results in a new system layout—a distributed hybrid system—in which only mean power is transmitted between the actuators and the high power peaks are handled locally. Three different implementations are
Vehicle Mass Estimation for Hydraulic Drive System using Longitudinal Motion Model
The real-time mass estimation of the vehicle is applied for the machine with the hydraulic drive system. The mass estimation is based on the longitudinal drive model comprising the model of hydraulic drive transmission. The resistance forces of the longitudinal motion such as the air drag, rolling resistance and friction of the drive system are modelled. The actual mass of the vehicle is deduced from the measured hydraulic torque and from the force causing the acceleration. As the aerodynamic drag, rolling resistance, road grade load and transmission losses have a significant share from the total drive torque, the effects of these forces are taken account.
Further, the estimated mass data is classified by recognising operation conditions where the mass estimation is accurate. After a short acceleration-deceleration period, the measured signals provide enough data for estimating the mass of the vehicle. The experimental tests are run with a middle-size wheel loader and with a typical work cycle resulting ±5% accuracy from the real mass. Furthermore, the proposed model and recognition of the operation conditions are applicable to estimate also other vehicle parameters such as friction force or road grade.

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

The present paper proposes a structured Product Development Lifecycle (PDL) model to deal with the concept design stage of complex assemblies. The proposed method provides a systematic approach to design, aimed to improve requirements management, project management and communication among stakeholders as well as to avoid project failures reducing project development time. This research also provides suggestions and recommendations for utilizing different analysis, synthesis and assessment methodologies along with the proposed approach. The process developed, named Iterative and Participative Axiomatic Design Process (IPADeP), is consistent with ISO/IEC 15288:2008 – “Systems and software engineering”, and INCOSE Systems engineering handbook. It is an iterative and incremental design process, participative and requirements driven, based on the theory of Axiomatic Product Development Lifecycle (APDL). IPADeP provides a systematic methodology in which, starting from a set of experts’ assumptions, a number of conceptual solutions are generated, analysed and evaluated. Based on the results obtained, new iterations can be performed for each level of decomposition while product requirements are refined. In this paper, we applied IPADeP to the initial phase of conceptual design activities for DEMO divertor-to-vacuum vessel locking system in order to propose new innovative solutions.
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.

Systematic approach to secure automation – coordinated voltage control use-case

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research area: Information Systems in Automation, Research area: Dynamic Systems, Department of Automation Science and Engineering
Authors: Pyrhönen, V., Koivisto, H.
Publication date: 18 Mar 2015

Host publication information
Title of host publication: Proceedings of AutomaatioXXI, The Industrial Revolution of Internet – From Intelligent Devices to Networked Intelligence
Place of publication: Helsinki, Finland
Publisher: Suomen Automaatioseura ry

Publication series
Name: SAS julkaisusarja
Publisher: Finnish Society of Automation
Volume: 44
Keywords: exothermic reaction, nonlinear control, nonlinear dynamics, cascade control
Research output: Scientific - peer-review › Conference contribution
High performance nonlinear motion/force controller design for redundant hydraulic construction crane automation

In this paper, a stability-guaranteed Cartesian free-space motion control for the redundant articulated hydraulic construction crane is addressed in order to increase system safety and productivity. To cope with the nonlinearities of coupled mechanical linkage dynamics of articulated systems and the inherently strong nonlinearities of hydraulic actuator dynamics, the proposed controller is designed based on the recently introduced Virtual Decomposition Control (VDC) approach. The VDC approach, which was developed especially for the control of complex robotic systems, allows the conversion of the control problem of the entire system to a control problem of individual subsystems, while rigorously guaranteeing the stability of the entire hydraulic system. In the experiments it is demonstrated that, the proposed controller is able to extensively cope with the highly nonlinear nature of the articulated hydraulic system, and an improved control performance is achieved compared to the current state-of-the-art studies in the category of the hydraulic robot manipulators.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Field robotics for efficient work sites (FIRE)
Authors: Koivumäki, J., Mattila, J.
Number of pages: 19
Pages: 59-77
Publication date: 1 Mar 2015
Peer-reviewed: Yes
Early online date: 10 Jan 2015

Publication information
Journal: Automation in Construction
Volume: 51
ISSN (Print): 0926-5805
Ratings:
Scopus rating (2016): CiteScore 4.64 SJR 1.391 SNIP 2.686
Scopus rating (2015): SJR 1.462 SNIP 2.464 CiteScore 4.03
Scopus rating (2014): SJR 1.501 SNIP 2.655 CiteScore 3.58
Scopus rating (2013): SJR 1.394 SNIP 3.035 CiteScore 3.44
Scopus rating (2012): SJR 1.219 SNIP 2.651 CiteScore 3.2
Scopus rating (2011): SJR 1.135 SNIP 2.329 CiteScore 2.45
Scopus rating (2010): SJR 0.728 SNIP 1.613
Scopus rating (2009): SJR 1.258 SNIP 1.84
Scopus rating (2008): SJR 0.87 SNIP 1.662
Scopus rating (2007): SJR 0.676 SNIP 1.659
Scopus rating (2006): SJR 0.773 SNIP 1.55
Scopus rating (2005): SJR 0.689 SNIP 1.006
Scopus rating (2004): SJR 0.514 SNIP 1.286
Scopus rating (2003): SJR 0.486 SNIP 0.936
Scopus rating (2002): SJR 0.476 SNIP 0.706
Scopus rating (2001): SJR 0.41 SNIP 0.884
Scopus rating (2000): SJR 0.262 SNIP 0.796
Scopus rating (1999): SJR 0.185 SNIP 0.474
Original language: English
Keywords: Hydraulic construction cranes, Robust control, Nonlinear model-based control, Virtual decomposition control, Cartesian space control, Stability
DOIs:
10.1016/j.autcon.2014.12.014
Research output: Scientific - peer-review › Article
Passive pumping using gravity-driven flow is a fascinating approach for microfluidic systems. When designing a passive pumping system, generated flow rates should be known precisely. While reported models used to estimate the flow rates do not usually consider capillary forces, this paper shows that their exclusion is unrealistic in typical gravity-driven systems. Therefore, we propose a new analytical model to estimate the generated flow rates. An extensive set of measurements is used to verify that the proposed model provides a remarkably more precise approximation of the real flow rates compared to the previous models. It is suggested that the developed model should be used when designing a gravity-driven pumping system.
PVDF Microforce Sensor for the Measurement of Z-directional Strength in Paper Fiber Bonds

The Z-directional strength of paper fiber bonds is an important parameter for the paper and board industry. The current methods of studying Z-directional paper fiber bond strength rely on handsheet measurements. This paper presents a novel tool for measuring the Z-directional strength of individual paper fiber bonds. A polyvinylidenefluoride (PVDF) film microforce sensor, with a special specimen holder, was designed, fabricated and calibrated to perform the measurements. The microforce sensor operates in a cantilever-like bending mode and is capable of measuring forces up to 10 mN. It is demonstrated that the output of our microforce sensor is linear, in addition to which it can measure forces higher than 3 mN with a coefficient of variation of less than 2%. This new microforce sensor was integrated into a microrobotic platform and is shown to be able to accurately measure the Z-directional bond strength of paper fibers.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Saketi, P., Latifi, S. K., Hirvonen, J., Rajala, S., Vehkaoja, A., Salpavaara, T., Lekkala, J., Kallio, P.
Number of pages: 10
Pages: 194–203
Publication date: 1 Feb 2015
Peer-reviewed: Yes
Early online date: 11 Dec 2014

Publication information
Journal: Sensors and Actuators A: Physical
Volume: 222
Issue number: 1
ISSN (Print): 0924-4247
Ratings:
Scopus rating (2016): CiteScore 2.79 SJR 0.803 SNIP 1.655
Scopus rating (2015): SJR 0.848 SNIP 1.599 CiteScore 2.73
Scopus rating (2014): SJR 0.878 SNIP 1.798 CiteScore 2.41
Scopus rating (2013): SJR 0.827 SNIP 1.802 CiteScore 2.53
Scopus rating (2012): SJR 0.915 SNIP 2.113 CiteScore 2.34
Scopus rating (2011): SJR 0.907 SNIP 2.111 CiteScore 2.5
Scopus rating (2010): SJR 1.106 SNIP 1.834
Scopus rating (2009): SJR 1.029 SNIP 1.674
Scopus rating (2008): SJR 0.973 SNIP 1.612
Scopus rating (2007): SJR 0.944 SNIP 1.42
Scopus rating (2006): SJR 0.913 SNIP 1.636
Scopus rating (2005): SJR 0.955 SNIP 1.736
Scopus rating (2004): SJR 0.964 SNIP 1.727
Scopus rating (2003): SJR 1.149 SNIP 1.484
Scopus rating (2002): SJR 1.055 SNIP 1.458
Scopus rating (2001): SJR 0.946 SNIP 1.458
Scopus rating (2000): SJR 0.789 SNIP 1.251
Scopus rating (1999): SJR 0.578 SNIP 0.875
Original language: English
AS/JC Scopus subject areas: Control and Systems Engineering
Keywords: PVDF film, Microforce sensor, Sensor calibration, Z-directional strength measurement
DOI: 10.1016/j.sna.2014.12.003
Research output: Scientific - peer-review › Article

Characteristics of Digital Hydraulics with Commercial Controllers

Model-based control algorithms of digital hydraulic valves offer optimized control performance, but are computationally heavy. Research work has been carried out using PC hardware such as dSPACE real-time systems. In order to apply digital hydraulic valve control in real, series production application, the algorithms should be redesigned such that controllers with limited computation power are sufficient. The paper presents methods for lowering the computational
burden and shows the effect of optimization methods in execution time. Model-based controller design is carried out in MATLAB/Simulink and automatic code generation is used in implementation phase. A wheel loader equipped with digital hydraulic valve system is presented as a test case, where control algorithms are implemented on commercial Bosch Rexroth BODAS RC controller. Preliminary work for computationally faster control algorithms is carried out on mobile boom mock-up. The methods presented decrease the execution time to approximately 1/194 of the original.

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Digital hydraulics, Research group: Fluid power automation in mobile machines, Research group: Powertrain design
Authors: Huova, M., Ahopelto, M., Ketonen, M., Ahola, V., Linjama, M., Huhtala, K.
Number of pages: 15
Pages: 114-128
Publication date: Feb 2015

Host publication information
Title of host publication: The Seventh Workshop on Digital Fluid Power
Publisher: Linz Center of Mechatronics
ISBN (Print): 978-3-200-04014-4
Keywords: Digital Hydraulics, Digital Valve System, Digital hydraulic valve control, DFCU, Optimization, Mobile machine
Research output: Scientific > Conference contribution

Numerically Efficient Flow Model for On/Off Valves
General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Digital hydraulics
Authors: Linjama, M., Siivonen, L., Huova, M.
Pages: 164-172
Publication date: Feb 2015

Host publication information
Title of host publication: Proceedings of the Seventh Workshop on Digital Fluid Power
Place of publication: Linz, Austria
Publisher: LCM GmbH
Editors: Scheidl, R., Winkler, B., Kogler, H.
ISBN (Print): 978-3-200-04014-4
Research output: Scientific > Conference contribution

Problems Analysis and Solutions for the Establishment of Augmented Reality Technology in Maintenance and Education
Maintenance is one important area in the life-cycle management of scientific facilities. The design of a maintenance model requires time and effort, and the best solutions and technologies need to be considered for its implementation. Scientific infrastructures that emit ionizing radiation are complex facilities that require taking into account not only traditional maintenance approaches but also specific solutions to prevent operational and health risks. Radiation directly affects workers' health, and therefore new approaches for enhancing maintenance operations are sought. For instance, scientific facilities are integrating remote handling techniques to reduce the radiation dose of workers. As a result of the need for risk reduction, a fast and accurate maintenance procedure is required to provide working conditions for the equipment, increasing the safety in the facilities and reducing costs and maintenance time. Augmented Reality (AR) is a technology that has previously shown benefits in the maintenance field. AR applications allow workers to follow virtual in-place instructions of the maintenance tasks displayed on real devices. This approach provides shorter maintenance time, as workers do not need to find the required help in the appropriate manual and reduces risks, as the right steps to follow are always displayed to the worker. This is especially important in scientific facilities, as less maintenance time implies less radiation affecting workers and equipment, while less risk reduces the potential damages created by a wrong procedure. This thesis proposes a new platform to provide a flexible AR solution targeted to help maintenance procedures at scientific facilities. The platform comprises the required elements for the creation and updating and execution of AR applications, including maintenance-specific features. The platform includes a powerful AR engine capable of producing AR scenes in maintenance environments and an authoring tool for the creation of the AR applications. The platform has been tested in a prototype case in a real facility, where a guiding system has been designed to aid the collimator exchange at the Large Hadron Collider (LHC) at CERN. In order to demonstrate the flexibility of the platform in adapting to other environments, it has been used as basis to develop a solution for a problem detected in a second field: education. AR has been previously used in the education field with promising results. However, the technology has not been established in the large majority of schools and universities. The difficulties in creating AR experiences for educators (related to the lack of time or the required programming expertise) have constituted a barrier to the expansion of the technology in the field. Therefore, new solutions that help to overcome this barrier are needed. For this reason, the main platform developed in this thesis has
been utilised as a basis to develop a new educational platform that aims to promote collaboration between developers and educators in order to overcome the detected problems. Finally, during the development of the aforementioned solutions, a comprehensive review of the state of the art of AR technology has been carried out. During the study, the main drivers and bottlenecks of the technology in several fields have been analysed. The results of this analysis have been published with the aim of helping other researchers to find solutions that help the spread of AR technology.

General information
State: Published
Ministry of Education publication type: G5 Doctoral dissertation (article)
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Martínez Landa, H.
Number of pages: 67
Publication date: 30 Jan 2015

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

Publication series
Name: Tampere University of Technology. Publication
Publisher: Tampere University of Technology
Volume: 1275
ISSN (Print): 1459-2045
Electronic versions:
martinez_landa_1275
Links:

Bibliographical note
INT=ia,"Martínez Landa, Héctor"

Awarding institution:Tampereen teknillinen yliopisto - Tampere University of Technology<br/>
Submitter:Submitted by Hector Martinez Landa (hector.martinezlanda@student.tut.fi) on 2014-12-18T08:37:09Z
No. of bitstreams: 1
Martinez_Landa.pdf: 20684503 bytes, checksum: fc4d7456e774571d10c1d436010a8a99 (MD5)<br/>
Submitter:Approved for entry into archive by Kaisa Kulkki (kaisa.kulkki@tut.fi) on 2015-01-12T06:11:34Z (GMT)
No. of bitstreams: 1
Martinez_Landa.pdf: 20684503 bytes, checksum: fc4d7456e774571d10c1d436010a8a99 (MD5)<br/>
Submitter:Made available in DSpace on 2015-01-12T06:11:34Z (GMT)
No. of bitstreams: 1
Martinez_Landa.pdf: 20684503 bytes, checksum: fc4d7456e774571d10c1d436010a8a99 (MD5)

Source: researchoutputwizard
Source-ID: 123456789/22693
Research output: Collection of articles › Doctoral Thesis

Fault tolerant control architecture design for mobile manipulation in scientific facilities
This paper describes one of the challenging issues implied by scientific infrastructures on a mobile robot cognition architecture. For a generally applicable cognition architecture, we study the dependencies and logical relations between several tasks and subsystems. The overall view of the software modules is described, including their relationship with a fault management module that monitors the consistency of the data flow among the modules. The fault management module is the solution of the deliberative architecture for the single point failures, and the safety anchor is the reactive solution for the faults by redundant equipment. In addition, a hardware architecture is proposed to ensure safe robot movement as a redundancy for the cognition of the robot. The method is designed for a four-wheel steerable (4WS) mobile manipulator (iMoro) as a case study.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Research group: Field robotics and control, Field robotics for efficient work sites (FIRE)
Authors: M. Aref, M., Oftadeh, R., Ghabcheloo, R., Mattila, J.
Publication date: 29 Jan 2015
Peer-reviewed: Yes

Publication information
Journal: international Journal of Advanced Robotic Systems
A comparison of five optical surface topography measurement methods

The results of optical surface topography measurement techniques have been questioned in the past because of possible measurement artifacts due to light penetration into the paper. We compared the topography measurement results from five optical techniques: laser profilometry, shape-from-focus, stripe projection, chromatic sensing, and photometric stereo. These techniques were tested on coated and uncoated papers with a PPS roughness range from 0.7 μm to 7.7 μm. We made the measurement results directly comparable by measuring exactly the same regions on the paper samples and registering the resulting topography maps. We then calculated the point-wise Pearson correlation between the maps at different wavelength bands to obtain quantitative values for the similarity of the measurement results at different structure sizes. The correspondences between the measured topography maps were also examined through multivariate linear regression and roughness indices evaluated at two different structure sizes. For rougher grades like office paper or sack paper, the topography measurements from the five measurement techniques showed corresponding results. For a moderately smooth lightweight coated (LWC) paper, the measured topographies agreed to some degree, and for smooth supercalendered (SC) and woodfree coated (WFC) papers, the agreement was poor. From the available data, it is impossible to tell which of the measurement techniques delivers the true surface topography of smooth papers.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Field robotics for efficient work sites (FIRE), Graz University of Technology
Authors: Mettänen, M., Hirn, U.
Number of pages: 12
Pages: 27-38
Publication date: 1 Jan 2015
Peer-reviewed: Yes

Publication information

Journal: TAPPI Journal
Volume: 14
Issue number: 1
ISSN (Print): 0734-1415
Ratings:
Scopus rating (2016): SJR 0.406 SNIP 0.494
Scopus rating (2015): SJR 0.441 SNIP 0.741
This paper presents improved autoregressive modelling (AR) to reduce noise in SPECT images. An AR filter was applied to prefilter projection images and postfilter ordered subset expectation maximisation (OSEM) reconstruction images (AR-OSEM-AR method). The performance of this method was compared with filtered back projection (FBP) preceded by Butterworth filtering (BW-FBP method) and the OSEM reconstruction method followed by Butterworth filtering (OSEM-BW method). A mathematical cylinder phantom was used for the study. It consisted of hot and cold objects. The tests were performed using three simulated SPECT datasets. Image quality was assessed by means of the percentage contrast resolution (CR%) and the full width at half maximum (FWHM) of the line spread functions of the cylinders. The BW-FBP method showed the highest CR% values and the AR-OSEM-AR method gave the lowest CR% values for cold stacks. In the analysis of hot stacks, the BW-FBP method had higher CR% values than the OSEM-BW method. The BW-FBP method exhibited the lowest FWHM values for cold stacks and the AR-OSEM-AR method for hot stacks. In conclusion, the AR-OSEM-AR method is a feasible way to remove noise from SPECT images. It has good spatial resolution for hot objects.

Adaptive autoregressive model for reduction of noise in SPECT
This paper presents improved autoregressive modelling (AR) to reduce noise in SPECT images. An AR filter was applied to prefilter projection images and postfilter ordered subset expectation maximisation (OSEM) reconstruction images (AR-OSEM-AR method). The performance of this method was compared with filtered back projection (FBP) preceded by Butterworth filtering (BW-FBP method) and the OSEM reconstruction method followed by Butterworth filtering (OSEM-BW method). A mathematical cylinder phantom was used for the study. It consisted of hot and cold objects. The tests were performed using three simulated SPECT datasets. Image quality was assessed by means of the percentage contrast resolution (CR%) and the full width at half maximum (FWHM) of the line spread functions of the cylinders. The BW-FBP method showed the highest CR% values and the AR-OSEM-AR method gave the lowest CR% values for cold stacks. In the analysis of hot stacks, the BW-FBP method had higher CR% values than the OSEM-BW method. The BW-FBP method exhibited the lowest FWHM values for cold stacks and the AR-OSEM-AR method for hot stacks. In conclusion, the AR-OSEM-AR method is a feasible way to remove noise from SPECT images. It has good spatial resolution for hot objects.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Division of Nuclear Medicine, Department of Diagnostic Radiology, Oulu University Hospital, Department of Clinical Physiology and Nuclear Medicine, Joint Authority for Päijät-Häme Social and Health Care
Authors: Takalo, R., Hytti, H., Ihalainen, H., Sohlberg, A.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Computational and Mathematical Methods in Medicine
Volume: 2015
Article number: 494691
ISSN (Print): 1748-670X
Ratings:
Scopus rating (2016): SJR 0.381 SNIP 0.674 CiteScore 1.18
A dynamic paper machine simulator for testing of model predictive control applications

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Measurement Technology and Process Control
Authors: Yli-Fossi, T., Kuusisto, R.
Number of pages: 6
Pages: 1-6
Publication date: 2015

Host publication information
Title of host publication: Proceedings of AutomaatioXXI seminaari
Publisher: Suomen Automaatioseura ry
ISBN (Print): 978-952-5183-46-7

Publication series
Name: SAS julkaisusarja
No.: 42
ISSN (Print): 1455-6502
Research output: Scientific - peer-review › Conference contribution

A Mapping Method Tolerant to Calibration and Localization Errors Based on Tilting 2D Laser Scanner

Autonomous mobile machines use onboard sensors for navigation and obstacle avoidance. The accuracy of the sensor data in global frame is however dependent on the localization accuracy of the machine. Simultaneous localization and mapping algorithms (SLAM) are widely used with 3D laser scanners for mapping the world. They use scan matching algorithms to solve the accuracy problem by matching prior sensor data of the environment with the newly acquired data. However matching scans is not always possible. Insufficient amount of prior data or too few features in the scan can prevent the scan matching algorithm from finding a match. Thus it is important that also the mapping algorithm is tolerant to some degree of error in localization and calibration. We present a method for generating obstacle maps from smaller data segments at a time, thus making the mapping system more tolerant to navigation and calibration errors. The obstacle mapping method is tested with modified Avant multipurpose loader.

General information
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.

Anomaly Detection and Diagnostics of a Wheel Loader Using Dynamic Mathematical Model and Joint Probability Distributions

In this paper, we present anomaly detection and diagnostics for articulated frame steered hydraulic wheel loader. The presented methodology is based on the analysis and comparison of the responses of a dynamic mathematical model and a real wheel loader using a joint probability distribution of correlation coefficients of multiple variables. The behaviour of an undamaged machine is modelled by probability density functions of the correlation coefficients using histograms and test how well the future behaviour fits the model. First, the time series data of multiple variables are segmented into segments of the same length. Correlation coefficients are then calculated for each segment and the distributions of the correlation coefficients are estimated by computing probability density functions using histograms. Finally, the joint probabilities that the correlations in the data segments of the time series data are observed are calculated using the already computed histograms. The diagnostics is based on the combination of static threshold and threshold based on mean value of joint probabilities. The dynamic mathematical model of the wheel loader is presented with verification results. A jammed flushing valve of the hydrostatic transmission was used as an anomaly to study the changes in the joint probability values. Finally, the efficiency of the presented method is presented with good results regarding detection of anomalies and diagnostics of the wheel loader.
Assistive Situation Awareness System for Mobile Multimachine Work Environments

Mobile multimachine work environments, in general, consist of varying types of machines driving across a site to complete a moving or manipulation task. As the view from the machines over the environment can be limited due to the structure of the machines, the environment, and the moved/manipulated items, there is a risk of collision between machines. In this paper, we propose a situation awareness system aimed as a driver/operator assistive system to enhance the safety and efficiency of multimachine work environments. The system consists of the pose estimation of the machines, the M2M communication based on IEEE 802.11p, the future pose prediction of the machines, and a graphical user interface. The system is designed to be general enough to be applicable in diverse work environments, which is most easily implemented as a retrofit for existing machines. In this paper, the implementation of the system presented is a proof of concept, and the focus is on how the overall system works in a real harbor environment during operation, ultimately aiming for the collision avoidance of harbor machines. The field tests show promising results, particularly regarding the applicability of the M2M communication technology in a very challenging and uncertain harbor environment.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Bayesian statistical analysis for performance evaluation in real-time control systems

This paper presents a method for statistical analysis of hybrid systems affected by stochastic disturbances, such as random computation and communication delays. The method is applied to the analysis of a computer controlled digital hydraulic power management system, where such effects are present. Bayesian inference is used to perform parameter estimation and we use hypothesis testing based on Bayes factors to compare properties of different variants of the system to assess the impact of different random disturbances. The key idea is to use sequential sampling to generate only as many samples from the models as needed to achieve desired confidence in the result.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Digital hydraulics, Åbo Akademi University
Authors: Boström, P., Heikkilä, M., Huova, M., Waldén, M., Linjama, M.
Number of pages: 17
Pages: 312-328
Publication date: 2015
Cooperative Sensing and Path Planning In a Multi-Vehicle Environment
We study the cooperation of an unmanned ground vehicle (UGV) and micro air vehicle (MAV) in a path planning task. The UGV requests the MAV to execute observation missions which provide stereo image data on areas that the UGVs sensors cannot observe. The problem is formulated as a partially observable decision making problem. The solution is a decision policy that determines conditional on current information whether the UGV should move along a certain route or request an observation mission. A case example for a real-world demonstration of the cooperative path planning task is described. We discuss the features of single-vehicle control systems and propose a multi-vehicle communication framework that is tolerant against communication breaks.

Definition of key performance indicators for energy efficient assessment in the transport sector
The transport sector is constantly growing as well as its complexity and energy consumption. One way to reduce the involvement and the volume of data to evaluate and monitor the energy efficiency of the sector for cities authorities is by using Key Performance Indicators (KPIs). This paper describes a set of KPIs to measure and track energy efficiency in the transport sector. The KPIs that are summarized in this paper were identified based on a literature review of mobility projects/strategies/policies that had been implemented in cities around the world. Future applications, which are presented at the end of this article, will give a better understanding of the systems and its components.
Design Patterns for Model-Driven Development

Design patterns document solutions to recurring design and development challenges. UML, which is the de-facto modeling language in software development, supports defining and using patterns with its Collaboration concepts. However, as is demonstrated in the paper, the support is not sufficient for all kinds of patterns and all meaningful ways to use patterns. In this paper, the use of design patterns is suggested for documentation purposes in Model-Driven Development. The pattern support of UML is complemented with an approach that does not constrain the nature of pattern solutions. The approach is tool-supported in a model-driven development tool environment for basic control and safety-related control applications, UML AP tool. The developed tool support includes instantiating and highlighting patterns in models as well as gathering documentation on use of patterns, which could especially benefit safety system development.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Research area: Information Systems in Automation
Authors: Vepsäläinen, T., Kuikka, S.
Number of pages: 18
Pages: 21-38
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Communications in Computer and Information Science
Volume: 555
ISSN (Print): 1865-0929
Ratings:
Scopus rating (2016): SJR 0.162 SNIP 0.317 CiteScore 0.31
Scopus rating (2015): SJR 0.158 SNIP 0.276 CiteScore 0.15
Scopus rating (2014): SJR 0.153 SNIP 0.248 CiteScore 0.13
Scopus rating (2013): SJR 0.14 SNIP 0.22 CiteScore 0.13
Scopus rating (2012): SJR 0.141 SNIP 0.246 CiteScore 0.14
Scopus rating (2011): SJR 0.137 SNIP 0.324 CiteScore 0.16
Scopus rating (2010): SJR 0.133 SNIP 0.214
Developing Open Knowledge-Driven Manufacturing Execution System

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Organisations: Department of Automation Science and Engineering
Authors: Iarovyi, S., Xu, X.
Number of pages: 16
Pages: 295-310
Publication date: 2015

Host publication information
Title of host publication: Open Knowledge Driven Manufacturing and Logistics - the eScop Approach
Publisher: Warsaw University of Technology Publishing House
Editors: Strzelczak, S., Balda, P., Garetti, M., Lobov, A.
ISBN (Print): 978-83-7814-440-3
Keywords: Folder - eScopBook
Source: Bibtex
Source-ID: urn:e0ea45c7bb4d04285cddb71c6427595c
Research output: Scientific - peer-review › Article

Empowering Industrial Maintenance Personnel with Situationally Relevant Information using Semantics and Context Reasoning

Industrial maintenance is a complex discipline requiring experience and know-how. Information such as maintenance work orders are usually provided through mobile devices to field personnel. There are also other information sources with manuals, documented history, contact information etc. that is of value supporting the tasks at hand but typically this needs to be retrieved manually. The challenge is how to utilize information originating from heterogeneous information sources that, in addition, may change e.g. for outsourced maintenance service providers taking care of different sites. To facilitate the use of supporting materials an ontology knowledge management approach is developed that integrates data and documents, and provides relevant information for the task at hand using context and semantics based reasoning. Results from early prototyping show that the approach can improve utilization of information in existing systems through adapter layers and complement existing mobile as well as upcoming augmented reality applications by automatically providing situationally relevant information.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Information Systems in Automation, Smart Energy Systems (SES), Aalto University School of Electrical Engineering
Authors: Hästbacka, D., Aarnio, P., Vyatkin, V., Kuikka, S.
Number of pages: 11
Pages: 182-192
Publication date: 2015

Host publication information
Title of host publication: Proceedings of the 7th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management
Place of publication: Lisbon, Portugal
Keywords: Industrial Maintenance, Knowledge Management, System Integration, Semantic Web, Contextual Reasoning
DOIs: 10.5220/0005595601820192
Research output: Scientific - peer-review › Conference contribution
Gain Scheduling Full State Feedback with D-Implementation for Velocity Tracking of Hydrostatic Drive Transmission

This paper presents a gain-scheduling based velocity controller for hydrostatic drive transmissions (HSD). We design our controller based on a model of the system which captures most of the nonlinear effects and parameter variation. Therefore, we can obtain much better performance compared to existing linear controllers. Our control strategy is based on full state feedback whose gains are scheduled on measured states which are speed and volume pressures, and estimated hydraulic flow. To implement standard state feedback, we would need to calculate operating points of all the states at all time. However, due to modelling uncertainty (specially unknown frictions) pressure equilibrium calculation will be very inaccurate. We will employ D implementation methodology to remedy this problem.

For the proof of concept, we show the efficacy of the controller using a validated simulator of a wheel loader with real machine parameters. The experiments are performed both on flat terrain and slope. The results demonstrate that the performance of velocity tracking is high and the controllability of the machine is maintained in every situation.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Field robotics and control, Research group: Fluid power automation in mobile machines
Authors: Backas, J., Ghabcheloo, R., Huhtala, K.
Number of pages: 12
Pages: 64-75
Publication date: 2015

Host publication information
Publisher: Tampere University of Technology. Department of Intelligent Hydraulics and Automation
ISBN (Print): 978-952-15-3529-1
Links:

Bibliographical note
Research output: Scientific - peer-review Conference contribution

Industrial Tools for micromanipulation

General information
State: Published
Ministry of Education publication type: B2 Part of a book or another research book
Authors: Gauthier, M., Clevy, C., Kallio, P., Heriban, D.
Number of pages: 23
Pages: 369-392
Publication date: 2015

Host publication information
Title of host publication: Micro- and Nanomanipulation Tools
Publisher: Wiley
Editors: Sun, Y., Liu, X.
ISBN (Print): 978-3-527-33784-2
ISBN (Electronic): 978-3-527-69022-0

Publication series
Name: Advanced Micro & Nanosystems
Publisher: Wiley-VCH
Research output: Scientific Chapter

In situ hybridization of pulp fibres using Mg-Al layered double hydroxides

Inorganic Mg2+ and Al3+ containing layered double hydroxide (LDH) particles were synthesised in situ from aqueous solution onto chemical pulp fibers of pine (Pinus sylvestris). High super saturated (hss) solution with sodium carbonate produced LDH particles with an average diameter of 100–200 nm. Nano-size (70 nm)
LDH particles were found from fibers external surface and, to a lesser degree, from the S2 cell wall after synthesis via low super saturated (Iss) route. The synthesis via slow urea hydrolysis (Uhyd) yielded micron and clay sized LDH (2–5 µm) and enabled efficient fiber densification via mineralization of S2 fiber wall layer as indicated by TEM and compliance analysis. The Uhyd method decreased fiber compliance up to 50%. Reduction in the polymerization degree of cellulose was observed with capillary viscometry. Thermogravimetric analysis showed that the hybridization with LDH reduced the exothermic heat, indicating, that this material can be incorporated in flame retardant applications. Fiber charge was assessed by adsorption experiments with methylene blue (MB) and metanil yellow (MY). Synthesis via Iss route retained most of the fibres original charge and provided the highest capacity (10 µmol/g) for anionic MY, indicating cationic character of hybrid fibers. Our results suggested that mineralized fibers can be potentially used in advanced applications such as biocomposites and adsorbent materials.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Authors: Lange, C., Lastusaari, M., Reza, M., Latifi, S. K., Kallio, P., Fardim, P.
Pages: 103-133
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Fibers
Volume: 3
Issue number: 2
ISSN (Print): 2079-6439
Original language: English
Keywords: combustion, compliance, flexibility, FTIR, kraft, mineralization, pine, pulp
Research output: Scientific - peer-review › Article

Low-cost 3D lidar for the mapping of autonomous mobile work machine
Autonomous mobile work machines need the capability of sensing and mapping the surrounding area. Machines can utilize several sensors such as laser scanners and cameras for this purpose. The challenge in their use is the relatively high price compared to the value of mobile work machines, and the sensitivity of sensors to harsh operating conditions. This paper presents a low-cost 3D LIDAR for the sensing and mapping of autonomous work machine, which is based on 2D laser scanner and electric motor drive that rotates the scanner. The 2D laser scanner provides range and intensity values from the measured plane and the controller of electric motor provides the rotation angle and rotation speed of the scanner. By combining these values together with navigation data of the machine, 3D point cloud of the surrounding area can be created. This paper presents the development of hardware and control system for the rotating of the 2D laser...
scanner. Their integration to autonomous mobile work machine and example of mapping results are also presented.

**General information**
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Fluid power automation in mobile machines, Tampere University of Technology
Authors: Kolu, A., Rajapolvi, K., Hyvönen, M., Multanen, P., Huhtala, K.
Number of pages: 10
Publication date: 2015

**Host publication Information**
Keywords: Autonomous mobile machine, Mobile robotics, 3D LIDAR, CANopen, Measurement data time synchronization
Links:

**Bibliographical note**
AUX=iha,"Rajapolvi, Kimmo"
Research output: Scientific › Conference contribution

**Methodology for energy efficiency assessment in the transport sector for smart cities**
To measure the impact of transport projects in smart cities can be expensive and time-consuming. One challenge in measuring the effect of these projects is that impacts are poorly quantified or are not always immediately tangible. Due to transport projects nature, it is often difficult to show results in short term because much of the effort is invested in changing attitudes and behaviour on the mobility choices of city inhabitants. This paper presents a methodology that was developed to evaluate and define city transport projects for increasing energy efficiency. The main objective of this methodology is to help city authorities to improve the energy efficiency of the city by defining strategies and taking actions in the transportation domain. In order to define it, a review of current methodologies for measuring the impact of energy efficiency projects was performed. The defined energy efficiency methodology provides standard structure to the evaluation process, making sure that each project is being evaluated against its own goals and as detailed as it is required to the level of investment. An implementation in a smart city of the first step of this methodology is included in order to evaluate the implementation phase of the defined process.

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Research area: Manufacturing and Automation, Research group: Factory automation systems technology, Tampere University of Technology, Tampereen kaupunki
Authors: Mantilla R., M. F., Nieto Lee, A., Lastra, J. L. M., Kotakorpi, E.
Number of pages: 6
Pages: 72-77
Publication date: 2015

**Host publication Information**
Title of host publication: SMARTGREENS 2015 - 4th International Conference on Smart Cities and Green ICT Systems, Proceedings
Publisher: SCITEPRESS
ISBN (Print): 9789897581052
Keywords: Energy efficiency evaluation, Methodology, Smart cities mobility transport projects
ASJC Scopus subject areas: Computer Networks and Communications, Information Systems
Links:
http://www.scopus.com/inward/record.url?scp=84938801130&partnerID=8YFLogxK (Link to publication in Scopus)

**Bibliographical note**
AUX=ase,"Mantilla R., M. Fernanda"
Source: Scopus
Source-ID: 84938801130
Research output: Scientific › peer-review › Conference contribution

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

Optimal operation of a three camera system on a four-wheel robot
At present the automated moving of a robot is made possible by a complete measurement system including GPS, laser scanners, radars and static cameras. Such approach is reliable but rather expensive. In this paper the optimal operation of a three camera system on a four-wheel robot is studied. The benefit of the dynamic camera system over the complete static measurement system is the reasonable price and the possibility to focus at certain directions.
Parameters affecting the energy performance of the transport sector in smart cities
The energy requirements of cities’ inhabitants have grown during the last decade. Recent studies justify the necessity of reducing the energy consumption/emissions in cities. The present paper gives an overview of the factors affecting the energy consumption of the citizens based on studies conducted in cities across the globe. The studies cover all the factors that affect citizens' mobility choice that at the end, affects in the same way their final energy consumption. The results of the review are being used to support authorities in mobility decisions in order to achieve a sustainable transport sector in smart cities.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Department of Mechanical Engineering and Industrial Systems, Research group: Factory automation systems technology
Authors: Mantilla R., M. F., Nieto Lee, A., Lastra, J. L. M.
Number of pages: 6
Pages: 83-88
Publication date: 2015

Host publication information
Title of host publication: SMARTGREENS 2015 - 4th International Conference on Smart Cities and Green ICT Systems, Proceedings
Publisher: SCITEPRESS
ISBN (Print): 9789897581052
Keywords: Affecting parameters, Energy, Mobility, Transport
ASJC Scopus subject areas: Computer Networks and Communications, Information Systems
Links:
http://www.scopus.com/inward/record.url?scp=84938780476&partnerID=8YFLogxK (Link to publication in Scopus)

Bibliographical note
AUX=ase,"Mantilla R., M. Fernanda"
Source: Scopus
Source-ID: 84938780476
Research output: Scientific - peer-review › Conference contribution

Photometric stereo system for detailed analysis of material surfaces
This paper describes a photometric stereo system for the measurement of surface topography. The system provides versatile experimental possibilities due to movable multicolor LEDs, movable camera, and a traveling (xy-)table for the sample. We introduce our measurement setup and present analysis of its performance. Our topography maps correlate well with the contact profilometry reference map, and reveal different details of the surfaces depending on the illumination wavelength and pixel size.

General information
State: Accepted/In press
Ministry of Education publication type: A4 Article in a conference publication
Authors: Mettänen, M., Melin, J., Ihalainen, H.
Number of pages: 6
Publication date: 2015

Host publication information
Title of host publication: IMEKO XXI World Congress, Measurement in Research and Industry, Proceedings, August 30 - September 4, 2015, Prague, Czech Republic
ISBN (Print): 978-80-01-05793-3
Electronic versions:
Mettanen_IMEKO_2015_preprint
Links:
http://urn.fi/URN:NBN:fi:ttty-201705121384
Research output: Scientific - peer-review › Conference contribution

Piezoelectric sensitivity measurements of cellulose nanofibril sensors
Piezoelectric sensitivity of cellulose nanofibril (CNF) film sensors was measured using a mechanical shaker and charge amplifier setup. In-house fabricated CNF film sensors showed 5-7 pC/N sensitivity in ambient conditions. The CNF film used here contained randomly oriented
fibrils, and the piezoelectric response is expected to increase remarkably after film polarization and fibril alignment. The results obtained in this study suggest that nanocellulose film is a suitable sensor material for applications in various fields such as material sciences, electronics and biomedical diagnostics.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Authors: Rajala, S., Vuoriluoto, M., Rojas, O., Franssila, S., Tuukkanen, S.
Number of pages: 5
Publication date: 2015

Host publication information
Title of host publication: IMEKO XXI World Congress, Proceedings, August 30 - September 4, 2015, Prague, Czech Republic
Editor: Holub, J.
ISBN (Electronic): 978-80-01-05793-3

Bibliographical note
xoa ei tarkistettu
Research output: Scientific - peer-review › Conference contribution

Risk-aversive optimal planning of sensing
Operable sensing is studied as a means for improving system performance. Both single and sequential planning are analysed, and the complexity due to risk-averseness in various formulations discussed. Three classes of sensing operation are defined and analysed.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Authors: Lauri, M., Ropponen, A., Ritala, R.
Publication date: 2015
Peer-reviewed: Yes

Publication information
Journal: Journal of Physics: Conference Series
Volume: 588
Issue number: 1
Article number: 012023
ISSN (Print): 1742-6588
Original language: English
ASJC Scopus subject areas: Physics and Astronomy(all)
Electronic versions:
Lauri_Ropponen_Ritala_Risk_aversive_optimal_planning_of_sensing
DOIs:
10.1088/1742-6596/588/1/012023
Links:
Security Analysis of Various Industrial Devices
Since Stuxnet, the focus of Industrial Control Systems (ICS) security audits has been in the field devices and controllers. However, the commonly use ISA-95 reference model for industrial integration contains four layers: enterprise resource planning, manufacturing execution, process control and field devices. This hierarchy usually shares network components and systems not only internally but also with various external systems like camera monitoring, premises security systems, building automation etc. From automation viewpoint these external systems create critical access path into the core automation. They have different operators and subcontractors but can share network infrastructure. The ICS security therefore should be viewed as a whole where the risk any device introduces must be considered not only by the ISA-95 level it operates on but also with the assets it shares within the company. This paper presents analysis of various ICS devices mapped against ISA-95 levels. The analyses show that the shared components create a real security risk.

Semantic-Driven CEP for Delivery of Information Streams in Data-Intensive Monitoring Systems
Modern control and monitoring systems incorporate large number of heterogeneous devices and are operated by many users with different roles and responsibilities. The information generated by these devices, although preprocessed and filtered, is usually delivered to users regardless of their actual information needs, thus overwhelming cognitive capacities and potentially affecting safety of the system. This paper addresses the problem of personalized information delivery and presents hybrid system capable to deliver information tailored to user needs based on his/her role and responsibilities. The system utilizes Semantic Web technologies (specifically OWL-DL ontologies and SPARQL queries) for configuration purposes and Complex Event Processing (CEP) for run-time analyzing. The combination of mentioned technologies brings two major advantages: (1) the behavior of the system could be easily changed by configuring only underlying ontology; (2) utilization of CEP at run-time makes system event-driven and reactive to frequent changes in the environment. It is expected that proposed approach is able to make monitoring systems personal oriented and thus safer during the operation. The paper presents implemented software tools and illustrates approach with scenarios from building automation domain. Current implementation of the proposed approach suggests feasibility of the solution and prompts directions for future research.
Service Architecture and Interface Design for Mobile Machine Parameter Optimization System

Abstract Performance improvement is a constantly important topic in manufacturing, and mobile work machines are no exception. In some mobile machines, machine behaviour is affected by various device parameters. Their effect can be examined by statistical analysis, but exploiting analysis results during machine operation requires a sophisticated distributed information system. This paper introduces an architecture for such a system suitable for geographically dispersed machine fleets. It covers aspects on data collection, storage, analysis and utilization. Once statistical analysis has been performed, its results are made available for applications that assess machine performance locally during operation. If there is room for improvement in parameter values, the operator of the machine is given suggestions to change them. A prototype implementation is presented. The results show that such an information system has a considerable potential of bringing competitive advantage to machine operators. Besides, added value is also expected to the manufacturer of the machine as performance-related knowledge is augmented. Thus, further service business development is also contributed.
At this time the conference includes various themes like hybrids, drives, digital hydraulics and pneumatics. Special attention in the program is given for energy efficiency, renewable energy production and energy recovery. They are reflecting well the situation, where environmental issues and energy saving are increasingly important issues.

The Fourteenth Scandinavian International Conference on Fluid Power, SICFP15: Proceedings

The conference includes various themes like hybrids, drives, digital hydraulics and pneumatics. Special attention in the program is given for energy efficiency, renewable energy production and energy recovery. They are reflecting well the situation, where environmental issues and energy saving are increasingly important issues.

Bibliographical note
Version ok 16.12.2015
Research output: Scientific - peer-review › Anthology

Time-Critical Cooperative Path Following of Multiple UAVs: Case Studies
Towards dependable automation

Automation runs the modern society and it’s critical systems. It is anetworked software product depending on the co-operation of old and new technologies. Information security for automation systems should be regarded in light of the most important quality required from automation—dependability. This chapter focuses on process of developing dependable solutions for the entire lifecycle of automation systems. The approach includes a guideline for securing automation and a dependability model that is a data flow model extended with security and automation requirements. Results of this analysis should be used in final requirements specification for implementation. Dependability model is the key tool in secure development lifecycle. It can be used in new product development, improving an old automation system and also during the active lifecycle of automation to manage inevitable changes occurring during the entire lifespan of automation system.
Vision-based trajectories planning for four wheels independently steered mobile robots with maximum allowable velocities

In this paper, we extend our previous work to introduce a novel vision-based trajectories planning method for four-wheeled steered mobile robots. Relying only on the overhead camera and by utilizing artificial potential fields and visual servoing concepts, we simultaneously generate the synchronized trajectories for all wheels in the world coordinates with sufficient number of trajectories midpoints. The synchronized trajectories are used to provide the robot's kinematic variables and robot instantaneous-center of rotation to reduce the complexity of the robot kinematic model. Therefore, we plan maximum allowable velocities for all wheels so that at least one of the actuators is always working at maximum velocity. Experiment results are presented to illustrate the efficiency of the proposed method for four-wheel-steered mobile robot called iMoro.

Flexible Piezoelectric Energy Harvesting Circuit With Printable Supercapacitor and Diodes

We report a flexible energy harvesting circuit fabricated by roll-to-roll compatible, solution-processable methods. The circuit incorporates a supercapacitor fabricated from a viscous carbon nanotube dispersion, printed Schottky diodes, and a piezoelectric element. Used low-temperature materials enabled component integration on poly(ethylene terephthalate) substrate. The supercapacitor was built with a paper separator and an aqueous NaCl electrolyte. Together with carbon-based electrodes, these materials translated into a disposable and environmentally safe electronic device. The energy harvested from mechanical movement was used to drive a commercial electrochromic display.
System integration for real-time mobile manipulation

Mobile manipulators are one of the most complicated types of mechatronics systems. The performance of these robots in performing complex manipulation tasks is highly correlated with the synchronization and integration of their low-level components. This paper discusses in detail the mechatronics design of a four wheel steered mobile manipulator. It presents the manipulator’s mechanical structure and electrical interfaces, designs low-level software architecture based on embedded PC-based controls, and proposes a systematic solution based on code generation products of MATLAB and Simulink. The remote development environment described here is used to develop real-time controller software and modules for the mobile manipulator under a POSIX-compliant, real-time Linux operating system. Our approach enables developers to reliably design controller modules that meet the hard real-time constraints of the entire low-level system architecture. Moreover, it provides a systematic framework for the development and integration of hardware devices with various communication mediums and protocols, which facilitates the development and integration process of the software controller. © 2014 The Author(s). Licensee InTech.
Retrofitting digital hydraulics – An analytical study

Reason for the slow adaptation of new greener technologies is often the need for large modifications in products or systems. Different kind of regenerative pump-motor transformers might give an optimal solution for the energy efficiency of upcoming hydraulic systems, but the authors’ viewpoint is that it will take decades before the technology is going to be widely adopted. On the other hand especially the industrial hydraulic systems have long lifetimes and the large scale of the system often makes it unprofitable to fully rebuild the system for improved energy efficiency.

In order to improve the existing industrial and mobile hydraulic systems in a shorter time range, retrofittable digital hydraulic valve concepts are presented to replace the old proportional and servo valves. In this paper, the advantages of the three different digital valve system configurations are analysed. Configurations include utilization of a pressurized return line and a common regenerative pressure line attached to valve block through logic valves. The steady-state energy-efficiency of a multi actuator system is compared to a traditional proportional LS-system. As the improvements are highly dependent on the system work cycle and power distribution during the cycle, worst-case and optimal improvements are presented as well as additional calculations based on a work cycle presented in literature. Also the possibility to improve productivity and technical challenges in retrofitting are discussed.
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.
Adaptive mobile tracking in unknown non-line-of-sight conditions with application to digital TV networks

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Research group: MAT Positioning, Department of Automation Science and Engineering, Research group: Positioning, Wireless Communications and Positioning (WICO)
Authors: Chen, L., Piche, R., Kuusniemi, H., Chen, R.
Number of pages: 10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Eurasip Journal on Advances in Signal Processing
Volume: 2014
Article number: UNSP 22
ISSN (Print): 1687-6172
Ratings:
Scopus rating (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

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2014-05-25<br/>Publisher name: Springer
Source: researchoutputwizard
Source-ID: 219
Research output: Scientific › peer-review › Article

Analysis by Simulation of Different Control Algorithms of A Digital Hydraulic Two-Actuator System
Many hydraulic systems have losses, which could be avoided with new technology. Because component efficiency can be optimized to a certain operation point, hydraulic machines are no worse than other machines. More important than the peak efficiency values of each individual component in a system is the efficiency of the whole power transfer line. In a system where the amount of required power and the velocity/force ratio are variables, components may but seldom operate at their optimal design points. A typical approach to mobile work hydraulics is to use a load-sensing pump for a hydraulic multi-actuator system. This approach is efficient but seldom, if many actuators are used simultaneously. Our recent prototype of an improved hydraulic power supply system is the Digital Hydraulic Power Management System (DHPMS), which can serve many actuators at optimised supply pressure but is also capable of motoring and transforming. This functionality holistically reduces losses in the system. Losses can be further reduced by using distributed valve systems with sophisticated control algorithms together with the DHPMS. In this study, we used digital hydraulic valves, which efficiency strongly depends on the control algorithms used. We studied here different control methods for a system with two actuators, a DHPMS, and digital valves.

General information
Analysis of signals and power flow in a digital hydraulic multi actuator application

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Karvonen, M., Heikkilä, M., Linjama, M., Huhtala, K.
Number of pages: 12
Pages: 1-12
Publication date: 2014

Host publication information
Title of host publication: 8th FPNI Ph.D Symposium on Fluid Power, FPNI2014, June 11-13, 2014, Lappeenranta, Finland
Publisher: The American Society of Mechanical Engineers ASME
ISBN (Electronic): 978-0-7918-4582-0
DOIs: 10.1115/FPNI2014-7845

Bibliographical note
Contribution: organisation=iha,FACT1=1
Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 673
Research output: Scientific - peer-review › Conference contribution

A New Flexible Augmented Reality Platform for Development of Maintenance and Educational Applications

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Martinez, H., Laukkanen, S., Mattila, J.
Number of pages: 10
Pages: 18-27
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: International Journal of Virtual Worlds and Human-Computer Interaction
Volume: 2
Issue number: 1
ISSN (Print): 2368-6103
Original language: English
DOIs: 10.11159/vwhci.2014.003

Bibliographical note
Contribution: organisation=iha,FACT1=1
Portfolio EDEND: 2014-05-30
Publisher name: Avestia Publishing
Source-ID: 1036
Research output: Scientific - peer-review › Article

Aspects of the energy consumption of a digital hydraulic power management system supplying a digital and proportional valve controlled multi actuator system

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Augmented reality aiding collimator exchange at the LHC

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Martinez, H., Fabry, T., Laukkanen, S., Mattila, J., Tabourout, L.
Number of pages: 10
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Nuclear instruments and Methods in Physics Research Section A: Accelerators Spectrometers Detectors and Associated Equipment
Volume: 763
ISSN (Print): 0168-9002
Ratings:
Scopus rating (2016): SJR 0.916 SNIP 1.352 CiteScore 1.44
Scopus rating (2015): SJR 0.915 SNIP 1.334 CiteScore 1.21
Scopus rating (2014): SJR 0.852 SNIP 1.303 CiteScore 1.24
Scopus rating (2013): SJR 0.944 SNIP 1.398 CiteScore 1.48
Scopus rating (2012): SJR 0.806 SNIP 1.071 CiteScore 1.19
Scopus rating (2011): SJR 0.918 SNIP 1.424 CiteScore 1.29
Scopus rating (2010): SJR 0.893 SNIP 1.113
Scopus rating (2009): SJR 0.75 SNIP 1.386
Scopus rating (2008): SJR 0.753 SNIP 1.073
Scopus rating (2007): SJR 0.716 SNIP 1.383
Scopus rating (2006): SJR 0.818 SNIP 1.108
Scopus rating (2005): SJR 0.819 SNIP 1.156
Scopus rating (2004): SJR 0.844 SNIP 1.489
Scopus rating (2003): SJR 0.673 SNIP 1.226
Scopus rating (2002): SJR 0.628 SNIP 1.108
Scopus rating (2001): SJR 0.688 SNIP 1.104
Scopus rating (2000): SJR 0.594 SNIP 0.974
Scopus rating (1999): SJR 0.754 SNIP 1.006
Original language: English
DOIs:
10.1016/j.nima.2014.06.037

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-10-31<br/>Publisher name: Elsevier
Automated drop-on-fiber contact angle measurement using a microrobotic platform

**General information**

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Saketi, P., Hirvonen, J., Lai, Y., Ganser, C., Teichert, C., Järnström, J., Fardim, P., Kallio, P.
Number of pages: 7
Pages: 225-231
Publication date: 2014
Peer-reviewed: Yes

**Publication information**

Volume: 29
Issue number: 2
ISSN (Print): 0283-2631
Ratings:
Scopus rating (2016): CiteScore 1.2 SJR 0.385 SNIP 0.652
Scopus rating (2015): SJR 0.375 SNIP 0.787 CiteScore 0.91
Scopus rating (2014): SJR 0.444 SNIP 0.823 CiteScore 0.99
Scopus rating (2013): SJR 0.389 SNIP 0.684 CiteScore 0.71
Scopus rating (2012): SJR 0.628 SNIP 1.281 CiteScore 1.13
Scopus rating (2011): SJR 0.582 SNIP 0.902 CiteScore 0.78
Scopus rating (2010): SJR 0.658 SNIP 0.764
Scopus rating (2009): SJR 1.167 SNIP 0.984
Scopus rating (2008): SJR 0.928 SNIP 0.857
Scopus rating (2007): SJR 2.018 SNIP 1.035
Scopus rating (2006): SJR 1.002 SNIP 0.951
Scopus rating (2005): SJR 1.181 SNIP 0.997
Scopus rating (2004): SJR 2.08 SNIP 1.354
Characterizing Porous Ceramics by Frequency-Response Method

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Department of Automation Science and Engineering, Engineering materials science and solutions (EMASS), Smart Energy Systems (SES)
Authors: Järveläinen, M., Salpavaara, T., Seppälä, S., Roinila, T., Yli-Hallila, T., Levänen, E., Vikko, M.
Number of pages: 6
Pages: 10012-10017
Publication date: 2014

Host publication information
Title of host publication: Proceedings of 19th IFAC World Congress, Cape Town, South Africa, August 24-29, 2014
Publisher: International Federation of Automatic Control
Editors: Boje, E., Xia, X.
ISBN (Print): 978-3-902823-62-5

Publication series
Name: IFAC papers online
Publisher: International Federation of Automatic Control
Volume: 19
No.: 1
ISSN (Print): 1474-6670
DOIs:
10.3182/20140824-6-ZA-1003.02423

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2014-06-11
Source: researchoutputwizard
Source-ID: 1434
Research output: Scientific - peer-review › Article

Comparison of proportional control and displacement control using digital hydraulic power management system

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Heikkilä, M., Karvonen, M., Linjama, M., Tikkanen, S., Huhtala, K.
Number of pages: 8
Pages: 1-8
Publication date: 2014

Host publication information
Title of host publication: ASME/BATH 2014 Symposium on Fluid Power and Motion Control, FPMC2014, September 10-12, 2014, Bath, United Kingdom
Constrained Path Optimization with Bézier Curve Primitives

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Choi, J., Huhtala, K.
Number of pages: 6
Pages: 246-251
Publication date: 2014

**Host publication information**
Publisher: Institute of Electrical and Electronics Engineers IEEE
DOIs: 10.1109/IROS.2014.6942568

**Bibliographical note**
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 427
Research output: Scientific - peer-review › Conference contribution

Deriving Efficient and Dependable Parallel Programs from Simulink Models

**General information**
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Ostroumov, S., Boström, P., Waldén, M., Huova, M.
Number of pages: 38
Publication date: 2014

**Publication information**
Place of publication: Turku
Publisher: TURKU CENTRE FOR COMPUTER SCIENCE
ISBN (Print): 978-952-12-3066-0
Original language: English

**Publication series**
Name: TUCS Technical Report
Publisher: Turku Centre for Computer Science
No.: 1111
ISSN (Print): 1239-1891
Links:
http://tucs.fi/publications/view/?pub_id=tOsBoWa14a

**Bibliographical note**
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-10-31
Source: researchoutputwizard
Source-ID: 1202
Design and Implementation of an Illumination System for Microrobotic Paper Fiber Studies

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Hirvonen, J., Hänninen, A., Kallio, P.
Number of pages: 6
Pages: 5854-5859
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE International Conference on Robotics and Automation (ICRA), May 31 - June 7, 2014, Hong Kong, China
ISBN (Print): 978-1-4799-3686-1
DOIs: 10.1109/ICRA.2014.6907720

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/> Portfolio EDEND: 2014-10-30
Source: researchoutputwizard
Source-ID: 481
Research output: Scientific - peer-review › Conference contribution

Design Pattern Support for Model-Driven Development

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Vepsäläinen, T., Kuikka, S.
Number of pages: 10
Pages: 277-286
Publication date: 2014

Host publication information
Title of host publication: 9th International Conference on Software Engineering and Applications, ICSOFT-EA 2014, 29-31, August 2014, Vienna, Austria
Publisher: SCITEPRESS - Science and Technology Publications
Editors: Holzinger, A., Libourel, T., Maciaszek, L., Mellor, S.
ISBN (Print): 978-989-758-036-9
Links:
http://www.icsoft-ea.org

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/> Portfolio EDEND: 2014-10-30
Source: researchoutputwizard
Source-ID: 1722
Research output: Scientific - peer-review › Conference contribution

Device Status Information Service Architecture for Condition Monitoring Using OPC UA

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Hästbacka, D., Barna, L., Karaila, M., Liang, Y., Tuominen, P., Kuikka, S.
Number of pages: 7
Pages: 1-8
Publication date: 2014
Digital Hydraulic Power Management System with Five Independent Outlets - Simulation Study of Displacement Controlled Excavator Crane

Electro hydraulic gas exchange valve actuation of 4-stroke large bore diesel engine
Equal coded digital hydraulic valve system - improving tracking control with pulse frequency modulation

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Palonitty, M., Linjama, M., Huhtala, K.
Number of pages: 9
Pages: 618-626
Publication date: 2014

Host publication information
Title of host publication: The Second International Conference on Dynamics and Vibroacoustics of Machines, September 15-17, 2014, Samara, Russia
ISBN (Print): 978-5-7883-0977-4
Links:
http://confdvm.ssau.ru/

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-10-31
Source: researchoutputwizard
Source-ID: 1223
Research output: Scientific - peer-review › Conference contribution

Experimental Evaluation of Z-Directional Fibre-Fibre Bond Strength using Microrobotics

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Latifi, S. K., Saketi, P., Kallio, P.
Number of pages: 6
Pages: 383-388
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 4th International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale (3M-NANO), 27-31 October 2014, Taipei, Taiwan
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-7923-3

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2015-01-09
Source: researchoutputwizard
Source-ID: 893
Research output: Scientific - peer-review › Conference contribution

Extracting Mobile Machine Routes from GPS Traces

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Laurikkala, M., Vilkko, M.
Number of pages: 5
Pages: 6350-6354
Publication date: 2014

Host publication information
Title of host publication: Proceedings of 19th IFAC World Congress, Cape Town, South Africa, August 24-29, 2014
Publisher: International Federation of Automatic Control
Editors: Boje, E., Xia, X.
Geometry-Aided Inversion of Manipulator Telescopic Link Length from MEMS Accelerometer and Rate Gyro Readings

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: MMDM, Department of Intelligent Hydraulics and Automation, Research group: Mobile manipulation, Research area: Intelligence in Machines, Signal Processing Research Community (SPRC)
Authors: Vihonen, J., Honkakorpi, J., Mattila, J., Visa, A.
Number of pages: 6
Pages: 181-186
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE International Conference on Robotics & Automation (ICRA) Hong Kong Convention and Exhibition Center, May 31 - June 7, 2014. Hong Kong, China
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-3685-4

Geometry-Aided Low-Noise Angular Velocity Sensing of Rigid-Body Manipulator Using MEMS Rate Gyros and Linear Accelerometers

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Research group: MMDM, Department of Signal Processing, Department of Intelligent Hydraulics and Automation, Signal Processing Research Community (SPRC)
Authors: Vihonen, J., Honkakorpi, J., Koivumäki, J., Mattila, J., Visa, A.
Number of pages: 6
Pages: 1-6
Publication date: 2014

Host publication information
Title of host publication: IEEE/ASME International Conference on Advanced Intelligent Mechatronics, Besancon, France, July 8-11, 2014
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4799-5736-1
DOIs: 10.1109/AIM.2014.6878139
Global Path Planning with Obstacle Avoidance for Omnidirectional Mobile Robot Using Overhead Camera

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Ziaei, Z., Oftadeh, R., Mattila, J.
Number of pages: 8
Pages: 697-704
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE International Conference on Mechatronics and Automation, ICMA 2014, Tianjin, China, August 3-6, 2014
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4799-3978-7
DOIs: 10.1109/ICMA.2014.6885782

Bibliographical note
Contribution: organisation=sgn,FACT1=0.5<br/>Contribution: organisation=iha,FACT2=0.5<br/>Portfolio EDEND: 2014-08-29
Source: researchoutputwizard
Source-ID: 1731
Research output: Scientific - peer-review › Conference contribution

Hydraulic Manipulator Virtual Decomposition Control with Performance Analysis Using Low-Cost MEMS Sensors

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Department of Intelligent Hydraulics and Automation, Signal Processing Research Community (SPRC)
Authors: Koivumäki, J., Honkakorpi, J., Vihonen, J., Mattila, J.
Number of pages: 8
Pages: 1-8
Publication date: 2014

Host publication information
Title of host publication: IEEE/ASME International Conference on Advanced Intelligent Mechatronics, Besancon, France, July 8-11, 2014
Place of publication: Piscataway, NJ
Publisher: IEEE
ISBN (Print): 978-1-4799-5736-1
DOIs: 10.1109/AIM.2014.6878196

Bibliographical note
Contribution: organisation=iha,FACT1=0.5<br/>Contribution: organisation=sgn,FACT2=0.5<br/>Portfolio EDEND: 2014-08-29
Improving concept design of divertor support system for FAST tokamak using TRIZ theory and AHP approach

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Di Ginorimo, G., Carfora, D., Esposito, G., Labate, C., Mozzillo, R., Renno, F., Lanzotti, A., Siuko, M.
Number of pages: 7
Pages: 3014-3020
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Fusion engineering and design
Volume: 88
Issue number: 11
ISSN (Print): 0920-3796
Ratings:
Scopus rating (2016): SJR 0.65 SNIP 0.904 CiteScore 1.14
Scopus rating (2015): SJR 0.76 SNIP 1.595 CiteScore 1.41
Scopus rating (2014): SJR 0.709 SNIP 1.26 CiteScore 1.2
Scopus rating (2013): SJR 0.619 SNIP 1.454 CiteScore 1.35
Scopus rating (2012): SJR 0.636 SNIP 1.078 CiteScore 0.99
Scopus rating (2011): SJR 0.664 SNIP 1.755 CiteScore 1.4
Scopus rating (2010): SJR 0.44 SNIP 1.111
Scopus rating (2009): SJR 0.655 SNIP 1.272
Scopus rating (2008): SJR 0.557 SNIP 0.959
Scopus rating (2007): SJR 0.682 SNIP 1.265
Scopus rating (2006): SJR 0.386 SNIP 0.795
Scopus rating (2005): SJR 0.486 SNIP 1.375
Scopus rating (2004): SJR 0.963 SNIP 0.617
Scopus rating (2003): SJR 0.541 SNIP 0.975
Scopus rating (2002): SJR 0.954 SNIP 0.95
Scopus rating (2001): SJR 0.394 SNIP 1.051
Scopus rating (2000): SJR 0.526 SNIP 0.893
Scopus rating (1999): SJR 0.365 SNIP 0.461
Original language: English
DOIs:
10.1016/j.fusengdes.2013.07.005

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-12-15<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 257
Research output: Scientific - peer-review › Article

Improving the performance of DTP2 bilateral teleoperation control system with haptic augmentation
Inspections on Control Performance of a Digital Hydraulic Power Management System Supplying Digital and Proportional Valve Driven Multi-Actuator System
Integrated microfluidic culture environments for in vitro cell studies

**General information**
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Automation Science and Engineering
Authors: Kreutzer, J., Kallio, P.
Number of pages: 5
Pages: 10-14
Publication date: 2014

**Host publication information**
Title of host publication: COST Action MP 1205 Advances in Optofluidics: Integration of Optical Control and Photonics with Microfluidics, General meeting, FOCAS Research Institute, Dublin, 24-25, April 2014

**Publication series**
Name: Annual conference of the COST Action MP 1205 Advances in Optofluidics

Integrating Robotic Software Frameworks for Convenient Software Component Exchange in Micro- and Nanoscale Applications

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Tiemerding, T., Von Essen, M., Diederichs, C., Kallio, P., Fatikow, S.
Number of pages: 6
Pages: 978-983
Publication date: 2014

**Host publication information**
Title of host publication: 2014 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), Besancon, France, July 8-11. 2014, Besacon
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-3685-4
DOIs: 10.1109/AIM.2014.6878207

**Bibliographical note**
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 1629
Research output: Scientific › peer-review › Conference contribution
Mechatronic design of digital hydraulic micro valve package

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Linjama, M., Paloniitty, M., Tiainen, L., Huhtala, K.
Number of pages: 8
Pages: 610-617
Publication date: 2014

Host publication information
Title of host publication: The Second International Conference on Dynamics and Vibroacoustics of Machines, September 15-17, 2014, Samara, Russia
ISBN (Print): 978-5-7883-0977-4
Links: http://confdvm.ssau.ru/

Model-Driven Development of Automation and Control Applications: Modeling and Simulation of Control Sequences

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Authors: Vepsäläinen, T., Kuikka, S.
Number of pages: 14
Pages: 1-14
Publication date: 2014
Peer-reviewed: Yes
Non-invasive System for Mechanical Arterial Pulse Wave Measurements

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Peltokangas, M., Verho, J., Salpavaara, T., Vehkaoja, A.
Number of pages: 4
Pages: 1493-1496
Publication date: 2014

Host publication information
Title of host publication: XIII Mediterranean Conference on Medical and Biological Engineering and Computing 2013, MEDICON 2013, 25 - 28 September 2013, Seville, Spain. IFMB Proceedings Volume 41
Publisher: Springer
Editor: Roa Romero, L. M.
ISBN (Print): 978-3-319-00845-5
ISBN (Electronic): 978-3-319-00846-2

Novel Procedure for Supporting Maintenance of Mobile Work Machines Using R&D Simulators

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Hietala, J., Krogerus, T., Multanen, P., Hyvönen, M., Huhtala, K.
Number of pages: 9
Pages: 1-9
Publication date: 2014

Host publication information
Title of host publication: The Eleventh International Conference on Condition Monitoring and Machinery Failure Prevention Technologies, CM2014 / MFPT2014, 10-12 June 2014, Manchester, UK
Publisher: The British Institute of Non-Destructive Testing
ISBN (Print): 978-0-903132-575
On Design and Development of Super-FRS main tunnel Remote Handling System Concept

The Super Fragment Separator (Super-FRS) main tunnel at the Facility of Antiproton and Ion Research (FAIR) consists of 11 focal planes with vacuum chamber to perform physics experiments. Four of the vacuum chambers at four different focal planes contain activated beamline inserts that requires remote maintenance. The remote maintenance will be performed using automated equipment that can safely conduct remote manipulation on to the activated beamline inserts. In this paper we discuss the conceptual design and development process for the remote handling (RH) system to be used in the Super-FRS main tunnel environment. The RH system for Super-FRS main tunnel is presented here along with conceptual design phase methodology. The main features of the new concept design are to utilize the state of the art of the shelf technologies and products from the industry, which in accordance to Super-FRS needs and requirements to make it more reliable and available during the remote maintenance tasks. The selected design concept are verified with virtual reality simulations and are fulfilling the requirements defined during the concept design phase, including structural, assembly sequence, safety and reliability

Online monitoring of flue gas emissions in power plants having multiple fuels

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Korpela, T., Björkqvist, T., Majanne, Y., Lautala, P.
Number of pages: 6
Pages: 1355-1360
Publication date: 2014
Photocontrol of Mechanical Properties of Pulp Fibers and Fiber-to-Fiber Bonds via Self-Assembled Polysaccharide Derivatives

Photoresponsive pulp fibers are prepared by self-assembly of photoactive cationic cellulose derivatives with pulp fibers in aqueous environment. Photoactive groups of the derivatives undergo 2π + 2π cycloaddition reaction under UV-light irradiation. Fast photocrosslinking leads to the formation of the covalent bonds between the photoactive groups on the fiber surfaces. This results in drastic enhancement of the mechanical properties of the fiber network. Tensile strength and Z-directional tensile strength increase by 81 and 84% compared to the original fiber network. Stiffness of the individual fibers increases by 60%. Such concept of controlling mechanical properties of the fiber materials by the light gives a possibility to design smart bio-based materials and to increase end value of the fiber products. Photoresponsive cellulosic fibers are prepared by charge-directed self-assembly of multifunctional photoactive cellulose derivatives in aqueous environment. The mechanical performance of the single fibers (e.g., stiffness) and the fiber network (e.g., ultimate strength) can be actively controlled via light-induced crosslinking of the pendant coumarin moieties of the adsorbed derivative.

General information

State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Grigoray, O., Wondraczek, H., Daus, S., Kühnöl, K., Latifi, S. K., Saketi, P., Fardim, P., Kallio, P., Heinze, T.
Number of pages: 6
Pages: 277-282
Publication date: 2014
Peer-reviewed: Yes

Publication information

Journal: Macromolecular Materials and Engineering
Volume: 300
Issue number: 3
ISSN (Print): 1438-7492
Ratings:
Scopus rating (2016): SJR 0.894 SNIP 0.971 CiteScore 3.01
Scopus rating (2015): SJR 0.852 SNIP 1.097 CiteScore 2.88
Scopus rating (2014): SJR 1.005 SNIP 1.309 CiteScore 2.81
Scopus rating (2013): SJR 0.952 SNIP 1.244 CiteScore 2.66
Scopus rating (2012): SJR 0.949 SNIP 1.145 CiteScore 2.34
Scopus rating (2011): SJR 0.962 SNIP 1.055 CiteScore 2.18
Scopus rating (2010): SJR 0.923 SNIP 0.917
Scopus rating (2009): SJR 1.069 SNIP 0.983
Scopus rating (2008): SJR 0.941 SNIP 0.941
Scopus rating (2007): SJR 0.821 SNIP 0.85
Scopus rating (2006): SJR 0.936 SNIP 1.154
Scopus rating (2005): SJR 0.941 SNIP 0.956
Scopus rating (2004): SJR 0.814 SNIP 0.928
Scopus rating (2003): SJR 0.966 SNIP 1.083
Scopus rating (2002): SJR 0.595 SNIP 0.669
Scopus rating (2001): SJR 0.596 SNIP 0.728
Scopus rating (2000): SJR 0.372 SNIP 0.591
Scopus rating (1999): SJR 0.478 SNIP 0.688
Original language: English
DOIs:
10.1002/mame.201400286
Pneumatic cell stretching system for cardiac differentiation and culture
This paper introduces a compact mechanical stimulation device suitable for applications to study cellular mechanobiology. The pneumatically controlled device provides equiaxial strain for cells on a coated polydimethylsiloxane (PDMS) membrane and enables real time observation of cells with an inverted microscope. This study presents the implementation and operation principles of the device and characterizes membrane stretching. Different coating materials are also analyzed on an unstretched membrane to optimize the cell attachment on PDMS. As a result, gelatin coating was selected for further experiments to demonstrate the function of the device and evaluate the effect of long-term cyclic equiaxial stretching on human pluripotent stem cells (hPSCs). Cardiac differentiation was induced with mouse visceral endoderm-like (END-2) cells, either on an unstretched membrane or with mechanical stretching. In conclusion, hPSCs grew well on the stretching platform and cardiac differentiation was induced. Thus, the platform provides a new possibility to study the effect of stretching on cellular properties including differentiation and stress induced cardiac diseases.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering
Research (ITTE)
Authors: Kreutzer, J., Ikonen, L., Hirvonen, J., Pekkanen-Mattila, M., Aalto-Setälä, K., Kallio, P.
Number of pages: 6
Pages: 496-501
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Medical Engineering and Physics
Volume: 36
Issue number: 5
ISSN (Print): 1350-4533
Ratings:
Scopus rating (2016): SJR 0.713 SNIP 1.199 CiteScore 2.1
Scopus rating (2015): SJR 0.791 SNIP 1.273 CiteScore 2.11
Scopus rating (2014): SJR 0.739 SNIP 1.638 CiteScore 2.36
Scopus rating (2013): SJR 0.834 SNIP 1.562 CiteScore 2.51
Scopus rating (2012): SJR 0.797 SNIP 1.599 CiteScore 2.34
Scopus rating (2011): SJR 0.753 SNIP 1.638 CiteScore 2.39
Scopus rating (2010): SJR 0.685 SNIP 1.299
Scopus rating (2009): SJR 0.614 SNIP 1.551
Scopus rating (2008): SJR 0.741 SNIP 1.478
Scopus rating (2007): SJR 0.683 SNIP 1.308
Scopus rating (2006): SJR 0.687 SNIP 1.09
Scopus rating (2005): SJR 0.452 SNIP 1.216
Scopus rating (2004): SJR 0.553 SNIP 1.177
Scopus rating (2003): SJR 0.499 SNIP 0.832
Scopus rating (2002): SJR 0.374 SNIP 0.718
Scopus rating (2001): SJR 0.426 SNIP 1.042
Scopus rating (2000): SJR 0.333 SNIP 0.651
Scopus rating (1999): SJR 0.341 SNIP 0.716
Original language: English
Electronic versions:
kreutzer_pneumatic_cell_stretching_system.pdf
DOIs:
10.1016/j.medengphy.2013.09.008
Links:
Prediction of drive torque in hydraulic wheel loader

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Ahopelto, M., Huhtala, K.
Number of pages: 8
Pages: 1-8
Publication date: 2014

Host publication information
Title of host publication: ASME/BATH 2014 Symposium on Fluid Power and Motion Control, FPMC2014, September 10-12, 2014, Bath, United Kingdom
Publisher: The American Society of Mechanical Engineers ASME
ISBN (Print): 978-0-7918-4597-4
DOIs:
10.1115/FPMC2014-7809

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 68
Research output: Scientific - peer-review › Conference contribution

Preliminary concept design of the divertor remote handling system for DEMO power plant

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Carfora, D., Di Gironimo, G., Järvenpää, J., Huhtala, K., Määttä, T., Siuko, M.
Number of pages: 5
Pages: 2743-2747
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Fusion engineering and design
Volume: 89
Issue number: 11
ISSN (Print): 0920-3796
Ratings:
Scopus rating (2016): SJR 0.65 SNIP 0.904 CiteScore 1.14
Scopus rating (2015): SJR 0.76 SNIP 1.595 CiteScore 1.41
Scopus rating (2014): SJR 0.709 SNIP 1.26 CiteScore 1.2
Scopus rating (2013): SJR 0.619 SNIP 1.454 CiteScore 1.35
Scopus rating (2012): SJR 0.636 SNIP 1.078 CiteScore 0.99
Scopus rating (2011): SJR 0.664 SNIP 1.755 CiteScore 1.4
Scopus rating (2010): SJR 0.44 SNIP 1.111
Scopus rating (2009): SJR 0.655 SNIP 1.272
Scopus rating (2008): SJR 0.557 SNIP 0.959
Scopus rating (2007): SJR 0.682 SNIP 1.265
Scopus rating (2006): SJR 0.386 SNIP 0.795
Releasing tool-adhered natural fibrous microscale objects with vacuum system

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Lai, Y., Cervinka, T., Kallio, P.
Number of pages: 6
Pages: 378-383
Publication date: 2014

Host publication information
Title of host publication: 2014 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM), 8-11 July 2014, Besacon
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-5736-1
DOIs:
10.1109/AIM.2014.6878108

Bibliographical note
Contribution: organisation=iae,FACT1=1<br/>Portfolio EDEND: 2014-12-15<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 208
Research output: Scientific - peer-review › Article

Robotic software frameworks and software component models in the development of automated handling of individual natural fibers

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering (ITTE)
Research (ITTE)
Authors: Von Essen, M., Hirvonen, J., Kuikka, S., Kallio, P.
Number of pages: 17
Pages: 29-45
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Journal of Micro-Bio Robotics
Volume: 9
Issue number: 1-2
ISSN (Print): 2194-6418
Secure integration of the Home Energy Management System to the battery management system in the customer domain of the smart grid

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering, Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Jafary, P., Repo, S., Koivisto, H.
Number of pages: 5
Pages: 1-5
Publication date: 2014

Host publication information
Title of host publication: IEEE Power & Energy Society General Meeting, 27-31 July, 2014, National Harbor, MD, United States
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
DOIs: 10.1109/PESGM.2014.6938986

Bibliographical note
Contribution: organisation=dee,FACT1=0.7<br/>Contribution: organisation=ase,FACT2=0.3<br/>Portfolio EDEND: 2014-11-30
Source: researchoutputwizard
Source-ID: 567
Research output: Scientific - peer-review › Conference contribution

Semi-automatic Measurement of Microfibril Angle on a Microrobotic Platform

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Augmented Human Activities (AHA), Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Hirvonen, J., Latifi, S. K., Palovuori, K., Kallio, P.
Number of pages: 4
Pages: 375-378
Publication date: 2014

Host publication information
Title of host publication: Proceedings of the 4th International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale (3M-NANO), 27-31 October 2014, Taipei, Taiwan
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-7923-3

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Contribution: organisation=elt,FACT2=0
Portfolio EDEND: 2015-01-09
Source: researchoutputwizard
Source-ID: 483
Simulation-based design process for the verification of ITER remote handling systems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Sibois, R., Määttä, T., Siuko, M., Mattila, J.
Number of pages: 6
Pages: 2341-2346
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Fusion engineering and design
ISSN (Print): 0920-3796
Ratings:
Scopus rating (2016): SJR 0.65 SNIP 0.904 CiteScore 1.14
Scopus rating (2015): SJR 0.76 SNIP 1.595 CiteScore 1.41
Scopus rating (2014): SJR 0.709 SNIP 1.26 CiteScore 1.2
Scopus rating (2013): SJR 0.619 SNIP 1.454 CiteScore 1.35
Scopus rating (2012): SJR 0.636 SNIP 1.078 CiteScore 0.99
Scopus rating (2011): SJR 0.664 SNIP 1.755 CiteScore 1.4
Scopus rating (2010): SJR 0.44 SNIP 1.111
Scopus rating (2009): SJR 0.655 SNIP 1.272
Scopus rating (2008): SJR 0.557 SNIP 0.959
Scopus rating (2007): SJR 0.682 SNIP 1.265
Scopus rating (2006): SJR 0.386 SNIP 0.795
Scopus rating (2005): SJR 0.486 SNIP 1.375
Scopus rating (2004): SJR 0.963 SNIP 0.617
Scopus rating (2003): SJR 0.541 SNIP 0.975
Scopus rating (2002): SJR 0.954 SNIP 0.95
Scopus rating (2001): SJR 0.394 SNIP 1.051
Scopus rating (2000): SJR 0.526 SNIP 0.893
Scopus rating (1999): SJR 0.365 SNIP 0.461
Original language: English
DOIs:
10.1016/j.fusengdes.2014.02.049
Links:
http://www.elsevier.com/locate/fusengdes

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-10-31<br/>Publisher name: Elsevier BV
Source: researchoutputwizard
Source-ID: 1500
Research output: Scientific - peer-review › Article

Software fault detection and recovery in critical real-time systems: An approach based on loose coupling

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Alho, P., Mattila, J.
Number of pages: 6
Pages: 2272-2277
Publication date: 2014
Peer-reviewed: Yes
Stereo vision with consumer grade high resolution cameras for a micro air vehicle

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Melin, J., Lauri, M., Ritala, R.
Number of pages: 7
Pages: 69-76
Publication date: 2014

Host publication information
Links:
http://repository.tudelft.nl/search/conferencepapers/?q=imav+2014+ritala

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 1067
Research output: Scientific - peer-review › Conference contribution

Stochastic control for maximizing mutual information in active sensing

General information
Systeemiteoria yksinkertaisesti

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Automation Science and Engineering
Authors: Lautala, P., Ollus, M., Wahlström, B.
Number of pages: 24
Pages: 14-24
Publication date: 2014

Host publication information
Title of host publication: Systeemiteoria ennen ja nyt - systeemit muuttuvassa maailmassa, Hans Blomberg -seminaari, 13.-14.5.2013, Brändö, Ahvenanmaa
Place of publication: Helsinki
Publisher: Aalto-yliopisto
Editors: Wahlström, H., Ollus, M.
ISBN (Print): 978-952-60-5670-8

Publication series
Name: Aalto-yliopiston julkaisusarja, Tiede + Teknologia
Publisher: Aalto yliopisto
No.: 6
ISSN (Print): 1799-487X
ISSN (Electronic): 1799-4888

The Effect of Refining on Z-directional Strength of Bleached Softwood Kraft Pulp Fibre Bonds using Microrobotics

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Latifi, S. K., Saketi, P., Bozic, M., Kallio, P.
Number of pages: 3
Pages: 1-3
Publication date: 2014

Host publication information
Title of host publication: Progress in Paper Physics, (PPPS-2014), September 8-11, 2014, Raleigh, North Carolina, USA
Links:

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>&nbsp;Portfolio EDEND: 2014-12-30
Source: researchoutputwizard
Source-ID: 399
Research output: Scientific › Conference contribution
Using a data-centric event-driven architecture approach in the integration of real-time systems at DTP2

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Tuominen, J., Viinikainen, M., Alho, P., Mattila, J.
Number of pages: 5
Pages: 2289-2293
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Fusion engineering and design
Volume: 89
Issue number: 9-10
ISSN (Print): 0920-3796
Ratings:
Scopus rating (2016): SJR 0.65 SNIP 0.904 CiteScore 1.14
Scopus rating (2015): SJR 0.76 SNIP 1.595 CiteScore 1.41
Scopus rating (2014): SJR 0.709 SNIP 1.26 CiteScore 1.2
Scopus rating (2013): SJR 0.619 SNIP 1.454 CiteScore 1.35
Scopus rating (2012): SJR 0.636 SNIP 1.078 CiteScore 0.99
Scopus rating (2011): SJR 0.664 SNIP 1.755 CiteScore 1.4
Scopus rating (2010): SJR 0.44 SNIP 1.111
Scopus rating (2009): SJR 0.655 SNIP 1.272
Scopus rating (2008): SJR 0.557 SNIP 0.959
Scopus rating (2007): SJR 0.682 SNIP 1.265
Scopus rating (2006): SJR 0.386 SNIP 0.795
Scopus rating (2005): SJR 0.486 SNIP 1.375
Scopus rating (2004): SJR 0.963 SNIP 0.617
Scopus rating (2003): SJR 0.541 SNIP 0.975
Scopus rating (2002): SJR 0.954 SNIP 0.95
Scopus rating (2001): SJR 0.394 SNIP 1.051
Scopus rating (2000): SJR 0.526 SNIP 0.893
Scopus rating (1999): SJR 0.365 SNIP 0.461
Original language: English
DOI:
10.1016/j.fusengdes.2014.04.040

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-09-30<br/>Publisher name: Elsevier
Source: researchoutputwizard
Source-ID: 1651
Research output: Scientific - peer-review › Article

Using Digital Mock-Ups Within Simulation Lifecycle Environment for the Verification of ITER Remote Handling Systems Design

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Sibois, R., Määttä, T., Siuko, M., Mattila, J.
Number of pages: 5
Pages: 698-702
Publication date: 2014
Peer-reviewed: Yes
Verification and Validation of a Pressure Control Unit for Hydraulic Systems

State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Boström, P., Heikkilä, M., Huova, M., Waldén, M., Linjama, M.
Number of pages: 15
Pages: 101-115
Publication date: 2014

Title of host publication: 6th International Workshop, SERENE 2014, Budapest, Hungary, October 15-16, 2014
Publisher: Springer International Publishing
ISBN (Print): 978-3-319-12240-3
ISBN (Electronic): 978-3-319-12241-0

Name: Lecture Notes in Computer Science
Volume: 8785
ISSN (Print): 0302-9743
ISSN (Electronic): 1611-3349
DOIs:
10.1007/978-3-319-12241-0_8
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.

Analysing security issues for a smart grid demonstration environment

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electrical Engineering, Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Paananen, K., Seppälä, J., Koivisto, H., Repo, S.
Number of pages: 4
Pages: 1-4
Publication date: 2013

Host publication information
Title of host publication: 22nd International Conference on Electricity Distribution, CIRED2013, Stockholm, 10-13 June, 2013
Analysis of Textural Features for Face Biometric Anti-Spoofing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Research group: Video, Research Community on Data-to-Decision (D2D)
Authors: Waris, M., Zhang, H., Ahmad, I., Kiranyaz, S., Gabbouj, M.
Number of pages: 5
Pages: 1-5
Publication date: 2013

Host publication information
Title of host publication: 21st European Signal Processing Conference, EUSIPCO 2013, 9 -13 September 2013, Marrakech, Morocco
Publisher: European Association for Signal Processing EURASIP

Publication series
Name: European Signal Processing Conference
ISSN (Print): 2219-5491
Links:

Bibliographical note
Contribution: organisation=sgn,FACT1=1<br/
Portfolio EDEND: 2013-12-29<br/>
Publisher name: European Association for Signal Processing EURASIP
Source: researchoutputwizard
Source-ID: 3736
Research output: Scientific - peer-review › Conference contribution

An Energy-Efficient High Performance Motion Control of a Hydraulic Crane Applying Virtual Decomposition Control

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Koivumäki, J., Mattila, J.
Number of pages: 8
Pages: 4426-4433
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) November 3-7, 2013, Tokyo, Japan
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-6357-0

Publication series
Name: IEEE/RSJ International Conference on Intelligent Robots and Systems
ISSN (Print): 2153-0858
ISSN (Electronic): 2153-0866

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>
Portfolio EDEND: 2013-12-29<br/>
Publisher name: Institute of Electrical and Electronics Engineers IEEE
A New Hybrid Approach for Augmented Reality Maintenance in Scientific Facilities

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Martinez, H., Laukkanen, S., Mattila, J.
Number of pages: 10
Pages: 1-10
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: International Journal of Advanced Robotic Systems
Volume: 10
Article number: 321
ISSN (Print): 1729-8806
Ratings:
Scopus rating (2016): SJR 0.364 SNIP 0.914 CiteScore 1.26
Scopus rating (2015): SJR 0.338 SNIP 0.849 CiteScore 1.02
Scopus rating (2014): SJR 0.287 SNIP 0.71 CiteScore 0.89
Scopus rating (2013): SJR 0.221 SNIP 0.813 CiteScore 0.9
Scopus rating (2012): SJR 0.252 SNIP 0.97 CiteScore 1.09
Scopus rating (2011): SJR 0.21 SNIP 0.853 CiteScore 0.78
Scopus rating (2010): SJR 0.24 SNIP 0.949
Scopus rating (2009): SJR 0.347 SNIP 0.908
Scopus rating (2008): SJR 0.383 SNIP 0.915
Scopus rating (2007): SJR 0.391 SNIP 1.525
Scopus rating (2006): SJR 0.224 SNIP 0.76
Scopus rating (2005): SJR 0.179 SNIP 1.194
Original language: English
DOIs:
10.5772/56845

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: InTech Open Access
Source: researchoutputwizard
Source-ID: 2889
Research output: Scientific - peer-review » Article

An extended second order polynomial model for hydraulic fluid density

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Karjalainen, J., Karjalainen, R., Huhtala, K.
Number of pages: 8
Pages: 1-8
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the ASME/BATH 2013 Symposium on Fluid Power and Motion Control, FPMC2013, October 6-9, 2013, Sarasota, Florida
Place of publication: Sarasota, Florida, USA
Publisher: ASME
ISBN (Print): 978-0-7918-5608-6
A Novel Time Optimal Path Following Controller with Bounded Velocities for Mobile Robots with Independently Steerable Wheels

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Oftadeh, R., Ghabcheloo, R., Mattila, J.
Number of pages: 7
Pages: 4845-4851
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) November 3-7, 2013, Tokyo, Japan
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-6357-0

Publication series
Name: IEEE/RSJ International Conference on Intelligent Robots and Systems
ISSN (Print): 2153-0858
ISSN (Electronic): 2153-0866

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-11-29<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 3038
Research output: Scientific - peer-review › Conference contribution

Antimicrobial assay optimization and validation for HTS in 384-well format using a bioluminescent E. coli K-12 strain
This report describes the optimization and validation of an antimicrobial assay based on the genetically modified bacterial strain Escherichia coli K-12 (pTetlux1). The use of this particular strain enables an inducible cell-based bioluminescent assay for high-throughput screening (HTS) of antimicrobial agents, which shows a pronounced detection of compounds targeting transcriptional and translational events in protein synthesis. The optimizations in 96-well format led to several improvements in assay conditions, such as reduction of the pre-incubation time before luminescence induction by half. The threshold for DMSO tolerability was concluded to be up to 1%. Assay protocol was further miniaturized into 384-well format and the liquid handling was automated using a robotic workstation. The use of compound pre-plating into 384-well plates as a part of the process was evaluated, and the total assay volume was further downscaled from 50 μl to 30 μl. With this approach, the amount of test compound needed per well was reduced to nanoliter volumes. Using the miniaturized protocol a pilot screen of 2000 known drugs and bioactives was performed. The assay performance was evaluated by calculating known assay quality parameters, the Z' factor having a mean value of 0.8 during the compound library screening indicated an excellent performance. Of the assay positives, 54 compounds showed high inhibitions (60-100%), of which the majority (89%) were known antibacterial agents. Of the actives showing >60% inhibition, 16 compounds were identified as known transcriptional and translational inhibitors. The screening results demonstrated that the miniaturized assay is well suited for identification of antimicrobial compounds in HT screening, and that the assay is specifically sensitive towards bacterial transcription and translation inhibitors. © 2013 Elsevier B.V.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Chemistry and Bioengineering, Research group: Industrial Bioengineering and Applied Organic Chemistry, Tampere University of Technology, Urban circular bioeconomy (UrCirBio), Centre for Drug Research, Faculty of Pharmacy, Helsinki University
Authors: Nybond, S., Karp, M., Tammela, P.
Number of pages: 8
A positive tensions PID controller for a planar cable robot: An experimental study

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Khosravi, M. A., Taghirad, H. D., Oftadeh, R.
Number of pages: 6
Pages: 325-330
Publication date: 2013

Host publication information
Title of host publication: 2013 1st RSI/ISM International Conference on Robotics and Mechatronics, ICRoM 2013, Tehran, Iran, 13.-15.2.2013
ISBN (Print): 978-1-4673-5809-5

Publication series
Name: International Conference on Robotics and Mechatronics
DOIs:
A Track Following Stage Controller for HDD Servo System Using Reduced Order Controller with Integration

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Pyrhönen, V., Koivisto, H.
Number of pages: 6
Pages: 1-6
Publication date: 2013

Host publication information
Title of host publication: Proceedings of Automaatio XX-seminaari, Automation and systems without borders - beyond future, 21.-22.5.2013, Helsinki
Publisher: Suomen Automaatioseura ry
Editor: Vilkko, M.
ISBN (Print): 978-952-5183-44-3

Publication series
Name: SAS julkaisusarja
No.: 42
ISSN (Print): 1455-6502

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Suomen Automaatioseura ry
Source: researchoutputwizard
Source-ID: 3672
Research output: Scientific - peer-review › Conference contribution
Barkhausen kohina -mittauksen hyödyntäminen materiaaliominaisuuksien ennustamisessa

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science
Authors: Sorsa, A., Leiviskä, K., Santa-aho, S., Vippola, M., Lepistö, T.
Number of pages: 7
Pages: 1-7
Publication date: 2013

Host publication information
Title of host publication: Proceedings of Automaatio XX-seminaari, Automation and systems without borders - beyond future, 21.-22.5.2013, Helsinki
Publisher: Suomen Automaatioseura ry
Editor: Vilkko, M.
ISBN (Print): 978-952-5183-44-3

Publication series
Name: SAS julkaisusarja
No.: 42
ISSN (Print): 1455-6502

Bibliographical note
Contribution: organisation=mol,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Suomen Automaatioseura ry
Source: researchoutputwizard
Source-ID: 3448
Research output: Scientific - peer-review › Conference contribution

Benefit from Simulating Early in MDE of Industrial Control

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Vepsäläinen, T., Kuikka, S.
Number of pages: 8
Pages: 1-8
Publication date: 2013

Host publication information
Title of host publication: Proceedings of 2013 IEEE 18th International Conference on Emerging Technologies and Factory Automation (ETFA2013), September 10-13, 2013, Cagliari, Italy
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronic Engineers IEEE

Publication series
Name: IEEE International Conference on Emerging Technologies & Factory Automation
ISSN (Print): 1946-0740
DOIs: 10.1109/ETFA.2013.6647961

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-11-29<br/>Publisher name: Institute of Electrical and Electronic Engineers IEEE
Source: researchoutputwizard
Source-ID: 3673
Research output: Scientific - peer-review › Conference contribution
Breaking down the requirements: Reliability in remote handling software

Software requirements have an important role in achieving reliability for operational systems like remote handling: requirements are the basis for architectural design decisions and also the main cause of defects in high quality software. We analyze related recommendations and requirements given in software safety standards, handbooks etc. and apply them to remote handling control systems, which typically have safety-critical functionality, but are not actual safety-systems - for example the safety-systems in ITER will be hardware-based. Based on the analysis, we develop a set of generic recommendations for control system software requirements, including quality attributes, software fault tolerance, and safety and as an example we analyze ITER remote handling system software requirements to identify and present dependability requirements in a useful manner. Based on the analysis, we divide a high-level control system into safety-critical and non-safety-critical subsystems, and give examples of requirements that support building a dependable system.
Broadband Methods for Online Grid Impedance Measurement

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Roinila, T., Vilkko, M., Sun, J.
Number of pages: 8
Pages: 3003-3010
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE Energy Conversion Congress & Exposition ECCE, Denver Colorado, USA; September 15-19, 2013
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-0336-8

Publication series
Name: IEEE Energy Conversion Congress and Exposition
DOIs:
10.1109/ECCE.2013.6647093

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 3283
Research output: Scientific - peer-review › Conference contribution

Combining the Information of Unconstrained Electrocardiography and Ballistography in the Detection of Night-Time Heart Rate and Respiration Rate

General information
State: Published
Computer-Assisted Bilateral Teleoperation System for Water Hydraulic Manipulator

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Viinikainen, M., Mattila, J., Tuominen, J.
Number of pages: 5
Pages: 1-5
Publication date: 2013

Host publication information
Title of host publication: The 8th International Conference on Fluid Power Transmission and Control, ICFP 2013, April 9-11, 2013, Zhejiang University, Hangzhou, China
Editors: Yongxiang, L., Qingfeng, W., Bingfeng, J., Jun, Z.
ISBN (Print): 978-7-89-460-153-7

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-04-29<br/>Source: researchoutputwizard<br/>Source-ID: 3686<br/>Research output: Scientific - peer-review › Conference contribution

Control arrangement of an electro-hydraulic gas exchange valve actuation system

General information
State: Published
Ministry of Education publication type: H1 Granted patent
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Herranen, M., Huhtala, K., Virvalo, T.
Publication date: 2013

Publication information
Patent number: Pat. EP 2 529 090 B1
Priority date: 3/07/13
Priority number: (30) FI 20105082
Original language: English

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Source: researchoutputwizard<br/>Source-ID: 2300
Correlation approach for the detection of the heartbeat intervals using force sensors placed under the bed posts

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Vehkaoja, A., Rajala, S., Kumpulainen, P., Lekkala, J.
Number of pages: 7
Pages: 327-333
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Medical Engineering & Technology
Volume: 37
Issue number: 5
ISSN (Print): 0309-1902
Ratings:
Scopus rating (2016): SJR 0.253 SNIP 0.476 CiteScore 0.92
Scopus rating (2015): SJR 0.342 SNIP 0.707 CiteScore 0.99
Scopus rating (2014): SJR 0.313 SNIP 0.796 CiteScore 1.05
Scopus rating (2013): SJR 0.253 SNIP 0.706 CiteScore 0.97
Scopus rating (2012): SJR 0.282 SNIP 0.563 CiteScore 0.95
Scopus rating (2011): SJR 0.27 SNIP 0.75 CiteScore 1.05
Scopus rating (2010): SJR 0.22 SNIP 0.49
Scopus rating (2009): SJR 0.249 SNIP 0.813
Scopus rating (2008): SJR 0.253 SNIP 0.568
Scopus rating (2007): SJR 0.216 SNIP 0.669
Scopus rating (2006): SJR 0.306 SNIP 0.811
Scopus rating (2005): SJR 0.35 SNIP 0.89
Scopus rating (2004): SJR 0.292 SNIP 0.472
Scopus rating (2003): SJR 0.291 SNIP 0.501
Scopus rating (2002): SJR 0.317 SNIP 0.642
Scopus rating (2001): SJR 0.239 SNIP 0.579
Scopus rating (2000): SJR 0.273 SNIP 0.813
Scopus rating (1999): SJR 0.237 SNIP 0.498
Original language: English
DOIs:
10.3109/03091902.2013.807523
Links:

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-11-29<br/>Publisher name: Informa Healthcare
Source: researchoutputwizard
Source-ID: 3662
Research output: Scientific › peer-review › Article

Design and analysis of secure integration solution for Smart grids

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Salmenperä, M., Eerola, R., Seppälä, J., Koivistom, H.
Number of pages: 6
Pages: 1-6
Detection and isolation of faults in mobile hydraulic valves based on a reduced-order model and adaptive thresholds

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Nurmi, J., Mattila, J.
Number of pages: 10
Pages: 1-10
Publication date: 2013

Host publication information
Title of host publication: Proceedings of ASME/BATH 2013 Symposium on Fluid Power and Motion Control, FPMC2013, October 6-9, 2013, Sarasota, Florida
Place of publication: Sarasota, Florida, USA
Publisher: ASME
ISBN (Print): 978-0-7918-5608-6

Publication series
Name: Symposium on Fluid Power and Motion Control
DOIs: 10.1115/FPMC2013-4435

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: ASME
Source: researchoutputwizard
Source-ID: 3015
Research output: Scientific - peer-review › Conference contribution

Digitaihydraulikan seminaarin satoa Tampereella

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Linjama, M.
Number of pages: 1
Pages: 8-8
Publication date: 2013
Peer-reviewed: Unknown

Publication information
Journal: Fluid Finland
Volume: 12
Displacement control of a mobile crane using a digital hydraulic power management system

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Heikkilä, M., Linjama, M.
Number of pages: 10
Pages: 452-461
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Mechatronics
Volume: 23
Issue number: 4
ISSN (Print): 0957-4158
Ratings:
Scopus rating (2016): CiteScore 2.89 SJR 0.871 SNIP 1.715
Scopus rating (2015): SJR 0.962 SNIP 2.056 CiteScore 2.74
Scopus rating (2014): SJR 1.017 SNIP 2.434 CiteScore 2.87
Scopus rating (2013): SJR 0.983 SNIP 2.631 CiteScore 2.91
Scopus rating (2012): SJR 0.764 SNIP 2.531 CiteScore 2.3
Scopus rating (2011): SJR 0.803 SNIP 2.354 CiteScore 2.23
Scopus rating (2010): SJR 0.636 SNIP 1.539
Scopus rating (2009): SJR 0.984 SNIP 1.867
Scopus rating (2008): SJR 0.811 SNIP 1.83
Scopus rating (2007): SJR 0.638 SNIP 1.549
Scopus rating (2006): SJR 0.668 SNIP 1.75
Scopus rating (2005): SJR 0.416 SNIP 1.233
Scopus rating (2004): SJR 0.585 SNIP 1.344
Scopus rating (2003): SJR 0.61 SNIP 1.357
Scopus rating (2002): SJR 0.508 SNIP 1.12
Scopus rating (2001): SJR 0.497 SNIP 1.297
Scopus rating (2000): SJR 0.27 SNIP 0.689
Scopus rating (1999): SJR 0.296 SNIP 0.621
Original language: English
DOIs:
10.1016/j.mechatronics.2013.03.009

Divertor cassette locking system remote handling trials with WHMAN at DTP2

General information
State: Published
Dynamic modeling and simulation of cone crushing circuits

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Itävuo, P., Vilkko, M., Jaatinen, A., Vilo, K.
Number of pages: 7
Pages: 29-35
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Minerals Engineering
Issue number: 43-44
ISSN (Print): 0892-6875
Ratings:
Scopus rating (2016): CiteScore 2.48 SJR 1.133 SNIP 1.766
Scopus rating (2015): SJR 1.114 SNIP 1.865 CiteScore 2.31
Scopus rating (2014): SJR 1.063 SNIP 1.876 CiteScore 1.92
Scopus rating (2013): SJR 1.342 SNIP 2.267 CiteScore 2.09
Scopus rating (2012): SJR 1.109 SNIP 1.864 CiteScore 1.66
Scopus rating (2011): SJR 0.909 SNIP 1.826 CiteScore 1.64
Scopus rating (2010): SJR 0.945 SNIP 1.644
Scopus rating (2009): SJR 0.966 SNIP 1.655
Scopus rating (2008): SJR 0.805 SNIP 1.222
Scopus rating (2007): SJR 1.009 SNIP 1.401
Scopus rating (2006): SJR 0.882 SNIP 1.372
Scopus rating (2005): SJR 0.843 SNIP 1.198
Scopus rating (2004): SJR 0.564 SNIP 0.969
Scopus rating (2003): SJR 0.59 SNIP 0.993
Scopus rating (2002): SJR 0.664 SNIP 1.044
Scopus rating (2001): SJR 0.446 SNIP 0.86
Scopus rating (2000): SJR 0.502 SNIP 0.972
Scopus rating (1999): SJR 0.735 SNIP 1.131
Original language: English
DOIs:
10.1016/j.mineng.2012.07.019
Links:
http://www.elsevier.com/locate/mineng

Early design verification of ITER remote handling systems using Digital Mock-Ups within simulation lifecycle environment
Energy Efficiency of Digital Hydraulic Valve Control Systems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Huova, M., Linjama, M., Huhtala, K.
Number of pages: 13
Publication date: 2013

Host publication information
Title of host publication: SAE 2013 Commercial Vehicle Engineering Congress (COMVEC), October 1-3, 2013, Rosemont, Illinois, USA
Publication series
Name: SAE Technical Papers
ISSN (Print): 0148-7191
DOIs: 10.4271/2013-01-2347

Bibliographical note
Contribution: organisation=ih,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 2335
Research output: Scientific - peer-review › Conference contribution

Enhancement of the use of digital mock-ups in the verification and validation process for ITER remote handling systems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Sibois, R., Salminen, K., Siuko, M., Mattila, J., Määttä, T.
Number of pages: 4
Pages: 2190-2193
Publication date: 2013
Peer-reviewed: Yes
Euratom and EFDA Fusion Training Scheme, EFDA goal oriented training in remote handling -GOTRH

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Mattila, J., Alho, P., Väyrynen, J., Sibois, R., Salminen, K., Määttä, T.
Number of pages: 3
Publication date: 2013

Publication information
Publisher: VTT
Original language: English

Publication series
Name: VTT Science
Publisher: VTT
Volume: 30
ISSN (Print): 2242-119X
ISSN (Electronic): 2242-1203
Links:

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2014-05-30
Experiences of Online Measurements in Technical Cleanliness of Fluid Power System

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation, Research group: Condition monitoring of hydraulic components and systems
Authors: Elo, L., Pekkonen, J., Rinkinen, J.
Number of pages: 9
Pages: 1-9
Publication date: 2013

Host publication information
Title of host publication: The Tenth International Conference on Condition Monitoring and Machinery Failure Prevention Technologies, CM2013/MFPT2013, 18-20 June 2013, Krakow, Poland
Publisher: Coxmoor Publishing
ISBN (Print): 978-1-901892-37-6

Publication series
Name: International Conference on Condition Monitoring and Machinery Failure Prevention Technologies

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: Coxmoor Publishing
Source: researchoutputwizard
Source-ID: 2108
Research output: Scientific - peer-review › Conference contribution

Extracting the respiration cycle lengths from ECG signal recorded with bed sheet electrodes

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Vehkaoja, A., Peltokangas, M., Lekkala, J.
Number of pages: 6
Pages: 1-6
Publication date: 2013

Host publication information
Title of host publication: 2013 Joint Imeko (International Measurement Confederation) Tc1-Tc7-Tc13 Symposium: Measurement Across Physical And Behavioural Sciences
Publisher: IOP Publishing
Article number: 012015

Publication series
Name: Journal of Physics: Conference Series
Volume: 459
ISSN (Print): 1742-6598
ISSN (Electronic): 1742-6596
DOIs: 10.1088/1742-6596/459/1/012015
Links: http://dx.doi.org/10.1088/1742-6596/459/1/012015

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-11-29<br/>Publisher name: IOP Publishing
Source: researchoutputwizard
Source-ID: 3660
Research output: Scientific - peer-review › Conference contribution
Huokaisen keraamin karakterisointi sähköisellä herätteellä

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Materials Science, Department of Automation Science and Engineering
Authors: Järveläinen, M., Salpavaara, T., Seppälä, S., Roinila, T., Vilkko, M., Levänen, E.
Number of pages: 6
Pages: 1-6
Publication date: 2013

Hydraulic Energy Recovery in Displacement Controlled Digital Hydraulic System

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Heikkilä, M., Linjama, M.
Number of pages: 7
Pages: 1-7
Publication date: 2013
**Host publication information**
Title of host publication: Proceedings of the 13th Scandinavian International Conference on Fluid Power, 3-5 June, Linköping, Sweden
Publisher: Scandinavian International Conference on Fluid Power

**Publication series**
Name: Scandinavian International Conference on Fluid Power

**Bibliographical note**
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-06-29<br/>Publisher name: Scandinavian International Conference on Fluid Power
Source: researchoutputwizard
Source-ID: 2259
Research output: Scientific - peer-review › Conference contribution

---

**Improved energy efficiency and controllability of mobile work machines by reduced engine rotational speed**

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Ahopelto, M., Backas, J., Ghabcheloo, R., Huhtala, K.
Number of pages: 8
Pages: 1-8
Publication date: 2013

**Host publication information**
Title of host publication: Proceedings of the ASME 2013 International Mechanical Engineering Congress and Exposition, IMECE2013, November 15-21, 2013, San Diego, California, USA
Publisher: ASME
Article number: 64239

**Publication series**
Name: ASME International Mechanical Engineering Congress and Exposition

**Bibliographical note**
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: ASME
Source: researchoutputwizard
Source-ID: 1888
Research output: Scientific - peer-review › Conference contribution

---

**Improving Asset Management: Plant Models Supported by Composite Services**

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Kannisto, P., Hästbacka, D., Kuikka, S.
Number of pages: 6
Pages: 1-6
Publication date: 2013

**Host publication information**
Title of host publication: Proceedings of Automaatio XX-seminaari, Automation and systems without borders - beyond future, 21.-22.5.2013, Helsinki
Place of publication: Helsinki
Publisher: Suomen Automaatioseura ry
Editor: Vilkko, M.
ISBN (Print): 978-952-5183-44-3

**Publication series**
Name: SAS julkaisusarja
No.: 42
ISSN (Print): 1455-6502
Indirect Particle Size Distribution Control in Cone Crushers

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Itävuo, P., Vilkko, M., Jaatinen, A.
Number of pages: 12
Pages: 224-229
Publication date: 2013

Host publication information
Title of host publication: 15th IFAC Symposium on Automation in Mining, Mineral and Metal Processing,
Publisher: International Federation of Automatic Control
Editor: Kongoli, F.
ISBN (Print): 978-3-902823-42-7

Publication series
Name: Elsevier IFAC Publications / IFAC Proceedings series
ISSN (Print): 1474-6670
DOI: 10.3182/20130825-4-US-2038.00052

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: International Federation of Automatic Control
Source: researchoutputwizard
Source-ID: 2384
Research output: Scientific - peer-review › Conference contribution

Integration of Microfluidic System with Silicon Nanowires Biosensor for Multiplexed Detection

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Gao, A., Dai, P., Lu, N., Li, T., Wang, Y., Hemmilä, S., Kallio, P.
Number of pages: 4
Pages: 348-351
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the Third International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale, 3M-NANO, Suzhou, China, 26-30 August, 2013

Publication series
Name: International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale
ISSN (Print): 1932-4510

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source-ID: 2156
Research output: Scientific - peer-review › Conference contribution
Internal leakage fault detection for variable displacement axial piston pump

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Kivelä, T., Mattila, J.
Number of pages: 9
Pages: 1-9
Publication date: 2013

**Host publication information**
Title of host publication: Proceedings of ASME/BATH 2013 Symposium on Fluid Power and Motion Control, FPMC2013, October 6-9, 2013, Sarasota, Florida
ISBN (Print): 978-0-7918-5608-6

**Publication series**
Name: Symposium on Fluid Power and Motion Control

**Bibliographical note**
Contribution: organisation=iha,FAC1=1<br/>
Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source-ID: 2569
Research output: Scientific - peer-review › Conference contribution

Interoperability of remote handling control system software modules at Divertor Test Platform 2 using middleware

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Tuominen, J., Rasi, T., Mattila, J., Siuko, M., Esque, S., Hamilton, D.
Number of pages: 4
Pages: 2177-2180
Publication date: 2013
Peer-reviewed: Yes

**Publication information**
Journal: Fusion engineering and design
Volume: 88
Issue number: 9-10
ISSN (Print): 0920-3796
Ratings:
Scopus rating (2016): SJR 0.65 SNIP 0.904 CiteScore 1.14
Scopus rating (2015): SJR 0.76 SNIP 1.595 CiteScore 1.41
Scopus rating (2014): SJR 0.709 SNIP 1.26 CiteScore 1.2
Scopus rating (2013): SJR 0.619 SNIP 1.454 CiteScore 1.35
Scopus rating (2012): SJR 0.636 SNIP 1.078 CiteScore 0.99
Scopus rating (2011): SJR 0.664 SNIP 1.755 CiteScore 1.4
Scopus rating (2010): SJR 0.44 SNIP 1.111
Scopus rating (2009): SJR 0.655 SNIP 1.272
Scopus rating (2008): SJR 0.557 SNIP 0.959
Scopus rating (2007): SJR 0.682 SNIP 1.265
Scopus rating (2006): SJR 0.386 SNIP 0.795
Scopus rating (2005): SJR 0.486 SNIP 1.375
Scopus rating (2004): SJR 0.963 SNIP 0.617
Scopus rating (2003): SJR 0.541 SNIP 0.975
Scopus rating (2002): SJR 0.954 SNIP 0.95
Scopus rating (2001): SJR 0.394 SNIP 1.051
Scopus rating (2000): SJR 0.526 SNIP 0.893
Scopus rating (1999): SJR 0.365 SNIP 0.461
Introduction to Fast Frequency-Response Measurement in Micro and Nano Technology

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Authors: Roinila, T., Kai, L., Wen-ming, X., Li-hui, L., Yu, X., Hui-guo, Z., Vilkko, M.
Number of pages: 7
Pages: 24-30
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Changshu Gao-Zhuan Xuebao
Volume: 27
Issue number: 4
ISSN (Print): 1008-2794
Original language: Chinese

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: Changshu Ligong Xueyuan
Source-ID: 3279
Research output: Scientific - peer-review › Article

Kohti automaattista yksittäisten paperikuitujen manipulointia

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Hirvonen, J., Kallio, P.
Number of pages: 6
Pages: 1-6
Publication date: 2013

Host publication information
Title of host publication: Proceedings of Automaatio XX-seminaari, Automation and systems without borders - beyond future, 21.-22.5.2013, Helsinki
Publisher: Suomen Automaatioseura ry
ISBN (Print): 978-952-5183-44-3

Publication series
Name: SAS julkaisusarja
No.: 42
ISSN (Print): 1455-6502

Bibliographical note
Contribution: organisation=ase,FACT1=1
Portfolio EDEND: 2013-09-29
Publisher name: Suomen Automaatioseura ry
Source-ID: 2309
Research output: Scientific - peer-review › Conference contribution
Making sense of information security in real time automation - information flow approach

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Seppälä, J., Salmenperä, M., Koivisto, H.
Number of pages: 6
Pages: 1-6
Publication date: 2013
Host publication information
Title of host publication: Proceedings of Automaatio XX-seminaari, Automation and systems without borders - beyond future, 21.-22.5.2013, Helsinki
Publisher: Suomen Automaatioseura ry
ISBN (Print): 978-952-5183-44-3
Publication series
Name: SAS julkaisusarja
ISSN (Print): 1455-6502
Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Suomen Automaatioseura ry
Source: researchoutputwizard
Source-ID: 3395
Research output: Scientific - peer-review › Conference contribution
Mass-Flow Estimation in Mineral-processing Applications

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Väyrynen, T., Itävuo, P., Vilkko, M., Jaatinen, A., Peltonen, M.
Number of pages: 6
Pages: 271-276
Publication date: 2013

Host publication information
Title of host publication: 15th IFAC Symposium on Automation in Mining, Mineral and Metal Processing,
Publisher: International Federation of Automatic Control
Editor: Kongoli, F.
ISBN (Print): 978-3-902823-42-7

Publication series
Name: Elsevier IFAC Publications / IFAC Proceedings series
ISSN (Print): 1474-6670
DOIs:
10.3182/20130825-4-US-2038.00023

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: International Federation of Automatic Control
Source: researchoutputwizard
Source-ID: 3658
Research output: Scientific - peer-review › Conference contribution

Measuring Resistive Characteristics of Silicon Nanowire by Applying Electrostatic Tensile Device and Broadband Test Signal

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE), Smart Energy Systems (SES)
Number of pages: 4
Pages: 23-26
Publication date: 2013

Host publication information
Title of host publication: Nanotechnology 2013: Advanced Materials, CNTs, Particles, Films and Composites Nanotech, Conference & Expo 2013, May 12-16, 2013 Washington, DC
Publisher: Nano Science and Technology Institute
ISBN (Print): 978-1-4822-0581-7

Publication series
Name: Nanotechnology Conference and Expo
MEMS-based State Feedback Control of Multi-Body Hydraulic Manipulator

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Department of Intelligent Hydraulics and Automation, Signal Processing Research Community (SPRC)
Authors: Honkakorpi, J., Vihonen, J., Mattila, J.
Number of pages: 7
Pages: 4419-4425
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), November 3-7, 2013, Tokyo, Japan
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-6357-0

Publication series
Name: IEEE/RSJ International Conference on Intelligent Robots and Systems
ISSN (Print): 2153-0866
ISSN (Electronic): 2153-0866

Bibliographical note
Contribution: organisation=iha,FACT1=0.5<br/>Contribution: organisation=sgn,FACT2=0.5<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 2323
Research output: Scientific - peer-review › Conference contribution

Mems sensor network based anti-sway control system for articulated hydraulic crane

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Department of Intelligent Hydraulics and Automation, Signal Processing Research Community (SPRC)
Authors: Honkakorpi, J., Vihonen, J., Mattila, J.
Number of pages: 9
Pages: 1-9
Publication date: 2013

Host publication information
Title of host publication: Proceedings of ASME/BATH 2013 Symposium on Fluid Power and Motion Control, FPMC2013, October 6-9, 2013, Sarasota, Florida

Publication series
Name: Symposium on Fluid Power and Motion Control

Bibliographical note
Contribution: organisation=iha,FACT1=0.5<br/>Contribution: organisation=sgn,FACT2=0.5<br/>Portfolio EDEND: 2013-10-29
Source: researchoutputwizard
Source-ID: 2324
Research output: Scientific - peer-review › Conference contribution
Method for detecting free fiber ends in tissue paper

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Field robotics for efficient work sites (FIRE)
Authors: Raunio, J., Ritala, R.
Number of pages: 6
Pages: 1-6
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Measurement Science and Technology
Volume: 24
Issue number: 12
Article number: 125206
ISSN (Print): 0957-0233
Ratings:
Scopus rating (2016): CiteScore 1.75 SJR 0.668 SNIP 1.173
Scopus rating (2015): SJR 0.687 SNIP 1.303 CiteScore 1.71
Scopus rating (2014): SJR 0.657 SNIP 1.319 CiteScore 1.58
Scopus rating (2013): SJR 0.555 SNIP 1.244 CiteScore 1.53
Scopus rating (2012): SJR 0.716 SNIP 1.529 CiteScore 1.65
Scopus rating (2011): SJR 0.844 SNIP 1.703 CiteScore 1.77
Scopus rating (2010): SJR 0.679 SNIP 1.462
Scopus rating (2009): SJR 0.919 SNIP 1.573
Scopus rating (2008): SJR 0.881 SNIP 1.494
Scopus rating (2007): SJR 0.823 SNIP 1.492
Scopus rating (2006): SJR 0.744 SNIP 1.58
Scopus rating (2005): SJR 0.82 SNIP 1.584
Scopus rating (2004): SJR 0.828 SNIP 1.64
Scopus rating (2003): SJR 0.666 SNIP 1.199
Scopus rating (2002): SJR 0.589 SNIP 1.2
Scopus rating (2001): SJR 0.616 SNIP 1.548
Scopus rating (2000): SJR 0.79 SNIP 1.204
Scopus rating (1999): SJR 1.484 SNIP 0.905
Original language: English
DOIs:
10.1088/0957-0233/24/12/125206

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Institute of Physics Publishing IOP
Source: researchoutputwizard
Source-ID: 3245
Research output: Scientific - peer-review › Article

Method for Investigations of Aged Fibre-Fibre Bonds with Micro and Nanorobotic Tools

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Saketi, P., Mikczinski, M., Fatikow, S., Kallio, P.
Number of pages: 18
Pages: 125-142
Publication date: 2013
Micro-electromechanical System Sensors in Unscented Kalman Filter-based Condition Monitoring of Hydraulic Systems

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Signal Processing, Department of Intelligent Hydraulics and Automation, Signal Processing Research Community (SPRC)
Authors: Nurmi, J., Honkakorpi, J., Vihonen, J., Mattila, J.
Pages: 354-361
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE/ASME International Conference on Advanced Intelligent Mechatronics, July 9-12, 2013, Wollongong, Australia, AIM 2013 Conference Digest, Mechatronics for Human Wellbeing
Publisher: IEEE; ASME

Publication series
Name: IEEE/ASME International Conference on Advanced Intelligent Mechatronics
Electronic versions:
Micro-electromechanical system sensors in unscented Kalman filter-based condition monitoring of hydraulic systems
DOIs: 10.1109/AIM.2013.6584117

Bibliographical note
Contribution: organisation=iha,FACT1=0.5<br/>Contribution: organisation=sgn,FACT2=0.5<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: IEEE; ASME
Source: researchoutputwizard
Source-ID: 3014
Research output: Scientific - peer-review › Conference contribution

Monitoring of CO2 emissions in coal fired power plants

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering
Authors: Uotila, T., Korpela, T., Majanne, Y.
Number of pages: 6
Pages: 1-6
Publication date: 2013

Host publication information
New energy efficient solutions to mobile machines

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Huhtala, K., Ahopelto, M., Heikkilä, M., Backas, J., Tammisto, J., Huova, M., Linjama, M.
Number of pages: 15
Pages: 38-52
Publication date: 2013

Host publication information
Title of host publication: The 8th International Conference on Fluid Power Transmission and Control, ICFP 2013, April 9-11, 2013, Zhejiang University, Hangzhou, China
Editors: Yongxiang, L., Qingfeng, W., Bingfeng, J., Jun, Z.
ISBN (Print): 978-7-89460-153-7

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-04-29<br/>Source: researchoutputwizard
Source-ID: 2328
Research output: Scientific - peer-review › Conference contribution

New Scheme for Image Space Path Planning Incorporating CAD-Based Recognition Methods for Visual Servoing

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Ziaei, Z., Oftadeh, R., Mattila, J.
Number of pages: 6
Pages: 212-217
Publication date: 2013

Host publication information
Title of host publication: RAM 2013, 2013 6th IEEE Conference on Robotics, Automation and Mechatronics (RAM), 12-15 November 2013, Manila and Pico de Loro, Philippines
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-1201-8

Publication series
Name: IEEE Conference on Robotics, Automation and Mechatronics
Volume: 6
ISSN (Print): 2158-2181

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Novel method for intensity correction using a simple maskless lithography device

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Field robotics for efficient work sites (FIRE), Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Kattipparambil Rajan, D., Raunio, J., Karjalainen, M. T., Rynänen, T., Lekkala, J.
Number of pages: 7
Pages: 40-46
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Sensors and Actuators A: Physical
Volume: 194
ISSN (Print): 0924-4247
Ratings:
Scopus rating (2016): CiteScore 2.79 SJR 0.803 SNIP 1.655
Scopus rating (2015): SJR 0.848 SNIP 1.599 CiteScore 2.73
Scopus rating (2014): SJR 0.878 SNIP 1.798 CiteScore 2.41
Scopus rating (2013): SJR 0.827 SNIP 1.802 CiteScore 2.53
Scopus rating (2012): SJR 0.915 SNIP 2.113 CiteScore 2.34
Scopus rating (2011): SJR 0.907 SNIP 2.111 CiteScore 2.5
Scopus rating (2010): SJR 1.106 SNIP 1.834
Scopus rating (2009): SJR 1.029 SNIP 1.674
Scopus rating (2008): SJR 0.973 SNIP 1.612
Scopus rating (2007): SJR 0.944 SNIP 1.42
Scopus rating (2006): SJR 0.913 SNIP 1.636
Scopus rating (2005): SJR 0.955 SNIP 1.736
Scopus rating (2004): SJR 0.964 SNIP 1.727
Scopus rating (2003): SJR 1.149 SNIP 1.484
Scopus rating (2002): SJR 1.055 SNIP 1.458
Scopus rating (2001): SJR 0.946 SNIP 1.458
Scopus rating (2000): SJR 0.789 SNIP 1.251
Scopus rating (1999): SJR 0.578 SNIP 0.875
Original language: English
DOIs: 10.1016/j.sna.2013.01.024
Links:

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-11-29<br/>Publisher name: Elsevier S.A.
Source: researchoutputwizard
Source-ID: 2527
Research output: Scientific - peer-review › Article

On frequency-response measurements of power-electronic systems applying MIMO identification techniques

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Electrical Engineering, Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Roinila, T., Huusari, J., Vilkko, M.
Online Grid Impedance Measurement Using Discrete-Interval Binary Sequence Injection

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Roinila, T.; Vilkko, M.; Sun, J.
Number of pages: 8
Pages: 1-8
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE 14th Workshop on Control and Modeling for Power Electronics COMPEL, The University of Utah, Salt Lake City, Utah, USA June 23 - 26,2013
Place of publication: Piscataway
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-4914-7

Publication series
Name: IEEE Workshop on Control and Modeling for Power Electronics
ISSN (Print): 1093-5142
Participatory multi-criteria assessment as 'opening up' vs. 'closing down' of policy resources: A case of old-growth forest conflict in Finnish upper Lapland

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Authors: Saarikoski, H., Mustajoki, J., Marttunen, M.
Number of pages: 8
Pages: 329-336
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Land Use Policy
Volume: 32
Issue number: May 2013
ISSN (Print): 0264-8377
Ratings:
Scopus rating (2016): CiteScore 3.5 SJR 1.376 SNIP 1.739
Scopus rating (2015): SJR 1.422 SNIP 1.734 CiteScore 3.45
Scopus rating (2014): SJR 1.486 SNIP 1.937 CiteScore 3.25
Scopus rating (2013): SJR 1.49 SNIP 2.41 CiteScore 3.78
Scopus rating (2012): SJR 1.445 SNIP 2.001 CiteScore 3
Scopus rating (2011): SJR 1.349 SNIP 1.678 CiteScore 2.7
Scopus rating (2010): SJR 1.14 SNIP 1.622
Scopus rating (2009): SJR 1.132 SNIP 2.03
Scopus rating (2008): SJR 0.867 SNIP 1.587
Scopus rating (2007): SJR 0.961 SNIP 1.861
Scopus rating (2006): SJR 1.045 SNIP 1.781
Scopus rating (2005): SJR 0.667 SNIP 1.05
Scopus rating (2004): SJR 0.688 SNIP 1.229
Scopus rating (2003): SJR 0.487 SNIP 1.038
Scopus rating (2002): SJR 0.496 SNIP 0.933
Scopus rating (2001): SJR 0.613 SNIP 0.712
Scopus rating (2000): SJR 0.347 SNIP 1.046
Scopus rating (1999): SJR 0.339 SNIP 1.267
Original language: English
DOIs:
10.1016/j.landusepol.2012.11.003

Path Planning in Dynamic Environments with the Partially Observable Canadian Traveller's Problem
Patterns for Light-Weight Fault Tolerance and Decoupled Design in Distributed Control Systems

This paper presents three software patterns that can be used to improve control system dependability by implementing a decoupled architectural design with supporting fault handling. The decoupled architecture can also be used to introduce additional fault tolerance solutions gradually to the system, until a sufficient level of reliability has been achieved. Our patterns have been encountered originally in research of remote handling control systems used to teleoperate robotic manipulators, but all patterns have examples of other known uses as well.
Patterns for safety and control system cooperation

This is the proceedings of VikingPLoP 2013 – a record of all papers workshopped during the conference. VikingPLoP is a Nordic conference of pattern languages of programs which took place this year in Horse Inn of Luomajärvi, Ikaalinen, Finland in March 2013. VikingPLoP was organized jointly by Tampere University of Technology and Hillside Europe. VikingPLoP 2013 was also sponsored by Wiley which provided books for the focus group reading session. The conference was organized in Finland for the second time in a row. Previous location in 2012 was in Saariselkä Lapland. In 2013 vikings were moving towards south and chose the Horse Inn in Ikaalinen as the venue as it offered a luxurious opportunity for participants to experience rustic romance, good food, horseback riding, traditional Finnish sauna, the nature, and wilderness tracks. In March the landscape was still covered in snow making the landscape ruggedly beautiful. The papers in this proceedings book are updated versions of the papers workshopped in the conference. In the beginning, participants submitted their papers for shepherding process. In the shepherding process, the shepherd, an experienced pattern writer, gave ideas and feedback for the author, colloquially known as a sheep. The sheep incorporated this feedback in to her paper. After three iterations of shepherding the paper was discussed at the conference in a writer’s workshop. The workshop group gave comments, criticism and praise. After the conference the authors updated their papers according to the workshop feedback. This process of giving feedback was made possible by having a community of trust. Mutual trust was built by playing non-competitive games and by having social activities. VikingPLoP 2013 focused on patterns and their usage in various fields of expertise. These fields included a wide range of topics from educational patterns to safety patterns and embedded system’s software architecture patterns. Bringing people together from various fields of expertise stimulates creativity and new ideas might emerge. These innovations are reflected in the papers in these proceedings. VikingPLoP 2013 was especially a conference for newcomers and over half of the participants were first time PLoP participants. These proceedings contain 9 papers. In addition, a book reading workshop was arranged with Bob Hanmer who presented his new title Pattern-Oriented Software Architecture for Dummies and discussed it with the participants using video conferencing tools.
Planning for multiple measurement channels in a continuous-state POMDP

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Field robotics for efficient work sites (FIRE)
Authors: Lauri, M., Ritala, R.
Number of pages: 35
Pages: 283-317
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Annals of Mathematics and Artificial Intelligence
Volume: 67
Issue number: 3-4
ISSN (Print): 1012-2443
Ratings:
Scopus rating (2016): SJR 0.441 SNIP 1.069 CiteScore 1.27
Scopus rating (2015): SJR 0.497 SNIP 0.986 CiteScore 0.93
Scopus rating (2014): SJR 0.517 SNIP 1.418 CiteScore 1.08
Scopus rating (2013): SJR 0.409 SNIP 0.92 CiteScore 0.94
Scopus rating (2012): SJR 0.361 SNIP 1.072 CiteScore 0.65
Scopus rating (2011): SJR 0.412 SNIP 1.132 CiteScore 0.78
Scopus rating (2010): SJR 0.372 SNIP 0.881
Scopus rating (2009): SJR 0.535 SNIP 1.25
Scopus rating (2008): SJR 0.794 SNIP 1.243
Scopus rating (2007): SJR 0.663 SNIP 1.197
Scopus rating (2006): SJR 0.493 SNIP 1.129
Scopus rating (2005): SJR 0.771 SNIP 1.434
Scopus rating (2004): SJR 0.589 SNIP 1.728
Scopus rating (2003): SJR 0.548 SNIP 0.994
Scopus rating (2002): SJR 0.752 SNIP 1.287
Scopus rating (2001): SJR 0.835 SNIP 1.73
Scopus rating (2000): SJR 0.503 SNIP 0.867
Scopus rating (1999): SJR 0.277 SNIP 0.699
Original language: English
DOIs: 10.1007/s10472-013-9361-y
Polttoainekulut kurin

General information
State: Published
Ministry of Education publication type: D1 Article in a trade journal
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Huhtala, K.
Number of pages: 3
Pages: 14-16
Publication date: 2013
Peer-reviewed: Unknown

Publication information
Journal: Fluid Finland
Volume: 12
Issue number: 2
ISSN (Print): 1458-7599
Original language: Finnish

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Omnipress Oy
Source: researchoutputwizard
Source-ID: 2327
Research output: Professional › Article

Position-Based Visual Servoing for Pallet Picking by an Articulated-frame-steering Hydraulic Mobile Machine

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Aref, M. M., Ghacheloo, R., Kolu, A., Hyvönen, M., Huhtala, K., Mattila, J.
Number of pages: 7
Pages: 218-224
Publication date: 2013

Host publication information
Title of host publication: RAM 2013, 2013 6th IEEE Conference on Robotics, Automation and Mechatronics (RAM), 12-15 November 2013, Manila and Pico de Loro, Philippines
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4799-1201-8

Publication series
Name: IEEE Conference on Robotics, Automation and Mechatronics
Volume: 6
ISSN (Print): 2158-2181

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 1938
Research output: Scientific - peer-review › Conference contribution

Potential of full-web imaging in measuring web structure on-line

General information
State: Published
Real-Time Service-Oriented Architectures: A Data-Centric Implementation for Distributed and Heterogeneous Robotic System

Cyber-physical systems like networked robots have benefited from improvements in hardware processing power, and can facilitate modern component and service-based architectures that promote software reuse and bring higher-level functionality, improved integration capabilities, scalability and ease of development to the devices. However, these systems also have very specific requirements such as reliability, safety, and strict timeliness requirements set by the physical world, that must be addressed in the architecture.

This paper proposes a real-time capable service-oriented architecture, based on data-centric middleware and an open real-time operating system. A prototype implementation for a robotic remote handling scenario is used to test the approach. The architecture is evaluated on the basis of how well it fulfils the expectations given for the service-orientation, including: reusability, evolvability, interoperability and real-time performance. In one sentence, the goal is to evaluate the benefits of a data-centric approach to service-orientation in a performance-critical and distributed system.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Alho, P., Mattila, J.
Number of pages: 10
Pages: 262-271
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the 4th IFIP TC 10 International Embedded Systems Symposium, IESS 2013, Paderborn, Germany, June 2013.
Publisher: Springer
Recognition of Operating States of a Medium-Sized Mobile Machine

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Krogerus, T., Hyvönen, M., Raivio, K., Huhtala, K.
Number of pages: 10
Pages: 1-10
Publication date: 2013

Host publication information
Title of host publication: Proceedings of the 13th Scandinavian International Conference on Fluid Power, 3-5 June, Linköping, Sweden

Publication series
Name: Scandinavian International Conference on Fluid Power

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-06-29<br/>Publisher name: Springer
Source: researchoutputwizard
Source-ID: 2646
Research output: Scientific - peer-review › Conference contribution

Recognition of Operating States of a Wheel Loader for Diagnostics Purposes

In this paper, the operating states of a wheel loader were studied for diagnostics purposes using a real time simulation model of an articulated-frame-steered wheel loader. Test drives were carried out to obtain measurement data, which were then analyzed. The measured time series data were analyzed to find the sequences of operating states using two different data sets, namely the variables of hydrostatic transmission and working hydraulics. A time series is defined as a collection of observations made sequentially in time. In our proposed method, the time series data were first segmented to find operating states. One or more segments build up an operating state. A state is defined as a combination of the patterns of the selected variables. The segments were then clustered and classified. The operating states were further analyzed using the quantization error method to detect anomalies. The recognized operating states define the operation of the machine so the analysis can be focused on specific sections and situations in time series and to identify which kinds of operating situations generate anomalies. Simulated leakages in the main hydraulic components of the hydrostatic transmission and the working hydraulics were used as anomalies to study the changes in the recognized operating states and the magnitude of the quantization error.

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Reliability of operating window identified from process data

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering
Authors: Ihalainen, H., Ritala, R., Saarela, O.
Number of pages: 6
Pages: 625-630
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Computer Aided Chemical Engineering
Volume: 32
ISSN (Print): 1570-7946
Ratings:
Scopus rating (2016): SJR 0.198 SNIP 0.215 CiteScore 0.48
Scopus rating (2015): SJR 0.245 SNIP 0.249 CiteScore 0.39
Scopus rating (2014): SJR 0.239 SNIP 0.217 CiteScore 0.4
Scopus rating (2013): SJR 0.216 SNIP 0.175 CiteScore 0.28
Scopus rating (2012): SJR 0.196 SNIP 0.267 CiteScore 0.33
Scopus rating (2011): SJR 0.194 SNIP 0.199 CiteScore 0.3
Scopus rating (2010): SJR 0.181 SNIP 0.135
Scopus rating (2009): SJR 0.16 SNIP 0.163
Reliability requirements management for ITER Remote Handling maintenance systems

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Väyrynen, J., Mattila, J.
Number of pages: 4
Pages: 1920-1923
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Fusion engineering and design
Volume: 88
Issue number: 9-10
ISSN (Print): 0920-3796
Ratings:
Scopus rating (2016): SJR 0.65 SNIP 0.904 CiteScore 1.14
Scopus rating (2015): SJR 0.76 SNIP 1.595 CiteScore 1.41
Scopus rating (2014): SJR 0.709 SNIP 1.26 CiteScore 1.2
Scopus rating (2013): SJR 0.619 SNIP 1.454 CiteScore 1.35
Scopus rating (2012): SJR 0.636 SNIP 1.078 CiteScore 0.99
Scopus rating (2011): SJR 0.664 SNIP 1.755 CiteScore 1.4
Scopus rating (2010): SJR 0.44 SNIP 1.111
Scopus rating (2009): SJR 0.655 SNIP 1.272
Scopus rating (2008): SJR 0.557 SNIP 0.959
Scopus rating (2007): SJR 0.682 SNIP 1.265
Scopus rating (2006): SJR 0.386 SNIP 0.795
Scopus rating (2005): SJR 0.486 SNIP 1.375
Scopus rating (2004): SJR 0.963 SNIP 0.617
Scopus rating (2003): SJR 0.541 SNIP 0.975
Scopus rating (2002): SJR 0.954 SNIP 0.95
Scopus rating (2001): SJR 0.394 SNIP 1.051
Scopus rating (2000): SJR 0.526 SNIP 0.893
Scopus rating (1999): SJR 0.365 SNIP 0.461
Original language: English
DOIs:
Remote Handling Control System for Water Hydraulic Mover

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Tuominen, J., Mattila, J.
Number of pages: 5
Pages: 387-391
Publication date: 2013

Host publication information
Title of host publication: The 8th International Conference on Fluid Power Transmission and Control, ICFP 2013, April 9-11, 2013, Zhejiang University, Hangzhou, China
Editors: Yongxiang, L., Qingfeng, W., Bingfeng, J., Jun, Z.
ISBN (Print): 978-7-89460-153-7

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-04-29<br/>Source: researchoutputwizard<br/>Source-ID: 3574
Research output: Scientific - peer-review › Conference contribution

Scale and Rotation Invariant Two View Microgripper Detection that Uses a Planar Pattern

In automated grasping of microparts or objects with unknown dimensions and orientations, at least two cameras have to be used to acquire the depth information. In addition to recognition and reconstruction of the real-world coordinates of the target objects, the system has to be able to detect also the real-world coordinates of the microgrippers from the images. This paper presents a scale and rotation invariant microgripper detection method that uses a planar pattern. The method is suitable especially for prototyping systems, whose composition might vary between the experiments. The gripper detection is shown to be accurate enough for challenging micromanipulation tasks of small electronic components and individual paper fibers.

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Hirvonen, J., Kallio, P.
Number of pages: 9
Pages: 414-422
Publication date: 2013

Host publication information
Title of host publication: 6th IFAC Symposium on Mechatronic Systems, April 10-12, 2013, Hangzhou, China
Publisher: International Federation of Automatic Control
Editor: Ju, B.
ISBN (Print): 978-3-902823-31-1

Publication series
Name: Elsevier IFAC Publications / IFAC Proceedings series
ISSN (Print): 1474-6670
Electronic versions:
hirvonen_kallio_scale_and_rotation_invariant.pdf
DOIs:
10.3182/20130410-3-CN-2034.00056
Links:
Semantics enhanced engineering and model reasoning for control application development

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Smart Energy Systems (SES)
Authors: Hästbacka, D., Kuikka, S.
Pages: 47-62
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Multimedia Tools and Applications
Volume: 65
Issue number: 1
ISSN (Print): 1380-7501
Ratings:
Scopus rating (2016): SJR 0.396 SNIP 0.775 CiteScore 1.19
Scopus rating (2015): SJR 0.354 SNIP 0.941 CiteScore 0.95
Scopus rating (2014): SJR 0.386 SNIP 1.295 CiteScore 1.33
Scopus rating (2013): SJR 0.382 SNIP 1.303 CiteScore 1.33
Scopus rating (2012): SJR 0.388 SNIP 1.338 CiteScore 1.34
Scopus rating (2011): SJR 0.364 SNIP 1.346 CiteScore 1.41
Scopus rating (2010): SJR 0.419 SNIP 1.134
Scopus rating (2009): SJR 0.351 SNIP 0.939
Scopus rating (2008): SJR 0.305 SNIP 0.763
Scopus rating (2007): SJR 0.262 SNIP 1.097
Scopus rating (2006): SJR 0.268 SNIP 0.836
Scopus rating (2005): SJR 0.221 SNIP 0.659
Scopus rating (2004): SJR 0.312 SNIP 0.606
Scopus rating (2003): SJR 0.357 SNIP 1.038
Scopus rating (2002): SJR 0.4 SNIP 1.063
Scopus rating (2001): SJR 0.248 SNIP 0.467
Scopus rating (2000): SJR 0.292 SNIP 0.8
Scopus rating (1999): SJR 0.437 SNIP 0.753
Original language: English
DOIs: 10.1007/s11042-012-1134-9

Simulation-Based Development of Safety Related Interlocks

General information
State: Published
Ministry of Education publication type: A3 Part of a book or another research book
Stable and high performance energy-efficient motion control of electric load sensing controlled hydraulic manipulators

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Koivumäki, J., Mattila, J.
Number of pages: 10
Pages: 1-10
Publication date: 2013

Host publication information
Title of host publication: Proceedings of ASME/BATH 2013 Symposium on Fluid Power and Motion Control, FPMC2013, October 6-9, 2013, Sarasota, Florida
Place of publication: Sarasota, Florida, USA
Publisher: ASME
ISBN (Print): 978-0-7918-5608-6

Publication series
Name: Symposium on Fluid Power and Motion Control

Bibliographical note
Contribution: organisation=ha,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: ASME
Source-ID: 2586
Research output: Scientific - peer-review › Conference contribution

Super-FRS target area remote handling: Scenario and development

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Orona, L. M., Weick, H., Mattila, J., Amjad, F., Kozlova, E., Karagiannis, C., Behr, K., Winkler, M.
Number of pages: 9
Pages: 1-9
Publication date: 2013

Host publication information
Title of host publication: Proceedings of ASME/BATH 2013 Symposium on Fluid Power and Motion Control, FPMC2013, October 6-9, 2013, Sarasota, Florida
Place of publication: Sarasota, Florida, USA
Publisher: ASME
ISBN (Print): 978-0-7918-5608-6

Publication series
Name: Symposium on Fluid Power and Motion Control

Bibliographical note
Contribution: organisation=ha,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: ASME
Source-ID: 2586
Research output: Scientific - peer-review › Conference contribution
Survey and Introduction to the Focused Section on Mechatronics for Sustainable and Resilient Civil Infrastructure

General information
State: Published
Ministry of Education publication type: A2 Review article in a scientific journal
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Yunhua, L., Yang, W., Chase, J., Mattila, J., Hyun, M., Sawodny, O.
Number of pages: 10
Pages: 1637 - 1646
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: IEEE - ASME Transactions on Mechatronics
Volume: 18
Issue number: 6
ISSN (Print): 1083-4435
Ratings:
Scopus rating (2016): SJR 1.666 SNIP 2.519 CiteScore 5.22
Scopus rating (2015): SJR 2.053 SNIP 3.225 CiteScore 5.49
Scopus rating (2014): SJR 2.022 SNIP 3.388 CiteScore 4.94
Scopus rating (2013): SJR 1.609 SNIP 3.423 CiteScore 5.09
Scopus rating (2012): SJR 1.632 SNIP 3.184 CiteScore 4.44
Scopus rating (2011): SJR 1.436 SNIP 2.657 CiteScore 3.94
Scopus rating (2010): SJR 1.259 SNIP 2.644
Scopus rating (2009): SJR 1.121 SNIP 2.439
Scopus rating (2008): SJR 1.211 SNIP 2.068
Scopus rating (2007): SJR 0.741 SNIP 2.347
Scopus rating (2006): SJR 0.779 SNIP 2.263
Survey on Remote Handling Logistics for Super-FRS Regular Paper

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organizations: Department of Intelligent Hydraulics and Automation, Field robotics for efficient work sites (FIRE)
Authors: Amjad, F., Weick, H., Mattila, J., Orona, L. M., Kozlova, E., Winkler, M., Behr, K., Karagiannis, C.
Number of pages: 14
Pages: 1-14
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: International Journal of Advanced Robotic Systems
Volume: 10
Article number: 348
ISSN (Print): 1729-8806
Ratings:
Scopus rating (2016): SJR 0.364 SNIP 0.914 CiteScore 1.26
Scopus rating (2015): SJR 0.338 SNIP 0.849 CiteScore 1.02
Scopus rating (2014): SJR 0.287 SNIP 0.71 CiteScore 0.89
Scopus rating (2013): SJR 0.221 SNIP 0.813 CiteScore 0.9
Scopus rating (2012): SJR 0.252 SNIP 0.97 CiteScore 1.09
Scopus rating (2011): SJR 0.21 SNIP 0.853 CiteScore 0.78
Scopus rating (2010): SJR 0.24 SNIP 0.949
Scopus rating (2009): SJR 0.347 SNIP 0.908
Scopus rating (2008): SJR 0.383 SNIP 0.915
Scopus rating (2007): SJR 0.381 SNIP 1.525
Scopus rating (2006): SJR 0.224 SNIP 0.76
Scopus rating (2005): SJR 0.179 SNIP 1.194
Original language: English
DOI:
10.5772/56848

Bibliographical note
Contribution: organisation=iha,FACT1=1
Portfolio EDEND: 2013-12-29
Publisher name: InTech Open Access
Source: researchoutputwizard
Source-ID: 1917
Research output: Scientific - peer-review › Article
The Automation of Multi Degree of Freedom Hydraulic Crane by Using Virtual Decomposition Control

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Koivumäki, J., Mattila, J.
Number of pages: 8
Pages: 912-919
Publication date: 2013

Host publication information
Title of host publication: 2013 IEEE/ASME International Conference on Advanced Intelligent Mechatronics, AIM 2013, Mechatronics for Human Wellbeing, July 9-12, 2013, Wollongong, Australia
Place of publication: Piscataway, NJ
Publisher: Institute of Electrical and Electronics Engineers IEEE
ISBN (Print): 978-1-4673-5319-9

Publication series
Name: IEEE/ASME International Conference on Advanced Intelligent Mechatronics
ISSN (Print): 2159-6247
DOIs: 10.1109/AIM.2013.6584210

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-07-29<br/>Publisher name: Institute of Electrical and Electronics Engineers IEEE
Source: researchoutputwizard
Source-ID: 2587
Research output: Scientific - peer-review › Conference contribution

Three-dimensional calibration of micromanipulators using stereo vision

Calibration is of great significance in the development of automatic micromanipulation systems. This paper presents a novel vision based procedure for three-dimensional (3D) calibration of micromanipulators. Two major issues in the proposed calibration approach - vision system calibration and manipulator kinematic calibration - are discussed in detail in this paper. Verification and evaluation experiments are conducted using a 3D micromanipulator in a microrobotic fiber characterization platform. Experimental results demonstrate that the proposed calibration approach is able to achieve prediction errors below 5 μm. The proposed approach also demonstrates the feasibility of calibrating the decoupled
motion, by reducing the undesired movement from 28 μm to 8 μm (for 4800 μm desired movement).

**General information**
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Xiong, Y., Hirvonen, J., Kallio, P.
Number of pages: 12
Pages: 13-24
Publication date: 2013
Peer-reviewed: Yes

**Publication information**
Journal: Journal of Micro-Bio Robotics
Volume: 8
Issue number: 1
ISSN (Print): 2194-6418
Ratings:
Scopus rating (2016): SJR 0.352 SNIP 0.646 CiteScore 1.7
Scopus rating (2015): SJR 0.336 SNIP 1.025 CiteScore 1
Scopus rating (2014): SJR 0.105 SNIP 0.02
Original language: English
Electronic versions:
xiong_three_dimensional_calibration_of_micromanipulators.pdf
DOIs:
10.1007/s12213-013-0061-9
Links:
http://urn.fi/URN:NBN:fi:tty-201409291457

**Bibliographical note**
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-10-29<br/>Publisher name: Springer
Source: researchoutputwizard
Source-ID: 3759
Research output: Scientific - peer-review › Article

Towards Fully Automated Pick and Place Operations of Individual Natural Fibers
This paper reports automated image-based pick and place procedures for manipulation of individual natural fibers. The developed procedures are part of an effort to develop a fully automated microrobotic-based platform for fiber characterization. The presented procedures are divided into unit operations, which can reused in multiple tasks that the platform must perform. Two different demonstrations: pick and place, and coordinated fiber lifting are presented. In addition, a component-based software that promotes reusability of the developed unit operations is presented.

**General information**
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE)
Authors: Von Essen, M., Hirvonen, J., Kuikka, S., Kallio, P.
Number of pages: 6
Pages: 21-26
Publication date: 2013

**Host publication information**
Title of host publication: Proceedings of the Third International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale, 3M-NANO, Suzhou, China, 26-30 August, 2013
ISBN (Print): 978-1-4799-1213-1

**Publication series**
Name: International Conference on Manipulation, Manufacturing and Measurement on the Nanoscale
Electronic versions:
von_essen_towards_fully_automated_pick_and_place.pdf
DOIs:
10.1109/3M-NANO.2013.6737419
Washing Durability of Embroidered Polymer Coated RFID Tags

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Department of Electronics and Communications Engineering, Department of Automation Science and Engineering, Integrated Technologies for Tissue Engineering Research (ITTE), Sensing Systems for Wireless Medicine (MediSense)
Authors: Toivonen, M., Koski, K., Moradi, E., Babar, A. A., Sydänheimo, L., Ukkonen, L., Kallio, P., Rahmat-Samii, Y.
Number of pages: 2
Pages: 1490-1491
Publication date: 2013

Host publication information
ISBN (Print): 978-1-4673-5317-5

Publication series
Name: IEEE International Symposium on Antennas and Propagation and USNC-URSI National Radio Science Meeting
ISSN (Print): 1522-3965

Web-wide imaging of paper; Analyzing the potential of on-line light transmittance measurement in quality control and diagnostics of paper

General information
State: Published
Ministry of Education publication type: A1 Journal article-refereed
Organisations: Department of Automation Science and Engineering, Field robotics for efficient work sites (FIRE)
Authors: Raunio, J., Tirronen, V., Lehtoranta, I., Ritala, R.
Number of pages: 9
Pages: 137-145
Publication date: 2013
Peer-reviewed: Yes

Publication information
Volume: 28
Issue number: 1
ISSN (Print): 0283-2631
Ratings:
Scopus rating (2016): CiteScore 1.2 SJR 0.385 SNIP 0.652
Scopus rating (2015): SJR 0.375 SNIP 0.787 CiteScore 0.91
Scopus rating (2014): SJR 0.444 SNIP 0.823 CiteScore 0.99
Scopus rating (2013): SJR 0.389 SNIP 0.684 CiteScore 0.71
Scopus rating (2012): SJR 0.628 SNIP 1.281 CiteScore 1.13
Scopus rating (2011): SJR 0.582 SNIP 0.902 CiteScore 0.78
Work and Learning of Automation Expert in Industry

General information
State: Published
Ministry of Education publication type: B3 Non-refereed article in conference proceedings
Organisations: Department of Automation Science and Engineering
Authors: Rask, O., Kuikka, S.
Number of pages: 16
Pages: 1-16
Publication date: 2013

Host publication information
Title of host publication: 8th International Conference: Researching Work and Learning, June 2013, “The visible and invisible in work and learning”, Stirling Management Centre, University of Stirling, UK, 19-21 June 2013
Article number: 112

Publication series
Name: International Conference on Researching Work and Learning
Links:
https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxyd2w4cHJvY2VlZGluZ3N8Z3g6NmVlNzQSOGISOxNjg5MA

Bibliographical note
Contribution: organisation=ase,FACT1=1<br/>Portfolio EDEND: 2013-12-29<br/>Publisher name: Svenska Pappers- och Cellulosaingförsöksföreningen SPCI
Source: researchoutputwizard
Source-ID: 3247
Research output: Scientific › Article

Divertor RH design updates and DTP2 Phase 2 testing

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Siuko, M., Järvenpää, J., Mattila, J.
Number of pages: 8
Publication date: 2012

Publication information
Publisher: VALTION TEKNILLinen TUTKIMUSKESKUS
EFDA goal oriented training in remote handling - GOTRH

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Mattila, J., Alho, P., Väyrynen, J., Sibois, R., Salminen, K.
Number of pages: 3
Publication date: 2012

Publication information
Publisher: VALTION TEKNILLINEN TUTKIMUSKESKUS
Original language: English

Publication series
Name: VTT Science
Publisher: Valtion teknillinen tutkimuskeskus
Volume: 7
ISSN (Print): 2242-119X
ISSN (Electronic): 2242-1203
Links:

Bibliographical note
Contribution: organisation=iha,FACT1=1<br/>Portfolio EDEND: 2013-05-29
Source: researchoutputwizard
Source-ID: 5331
Research output: Professional › Commissioned report

Divertor RH design updates and DTP2 Phase 2 testing

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Siuko, M., Järvenpää, J., Mattila, J.
Number of pages: 6
Publication date: 2011

Publication information
Place of publication: Espoo
Publisher: VTT
Original language: English
EFDA quality assurance exercise

General information
State: Published
Ministry of Education publication type: D4 Published development or research report or study
Organisations: Department of Intelligent Hydraulics and Automation
Authors: Mattila, J., Järvenpää, J.
Number of pages: 2
Publication date: 2008

Publication information
Place of publication: Espoo
Publisher: VTT
ISBN (Print): 978-951-38-7091-1
Original language: English

The design and development of ITER divertor RH equipment @ DTP2 facility

General information
State: Published
Ministry of Education publication type: A4 Article in a conference publication
Organisations: Institute of Hydraulics and Automation
Authors: Mattila, J., Poutanen, J., Saarinen, H., Kekäläinen, T., Siuko, M., Palmer, J., Irving, M., Timperi, A.
Pages: 277-291
Publication date: 2007

Host publication information
Title of host publication: The Tenth Scandinavian International Conference on Fluid Power, May 21-23, 2007, Tampere, Finland, SICFP'07
Place of publication: Tampere
Publisher: Tampere University of Technology
Editors: Vilenius, J., Koskinen, K.
ISBN (Print): 978-952-15-1760-0