

# **7th International Conference on Electrical and Control Technologies**

**(ECT 2012)**

**Kaunas, Lithuania  
3 – 4 May 2012**

## **Editors:**

**A. Navickas  
A. Sauhats  
A. Virbalis  
M. Azubalis**

**V. Galvanauskas  
K. Brazauskas  
A. Jonaitis**

**ISBN: 978-1-63439-801-5**

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

Copyright© (2012) by Kaunas University of Technology  
All rights reserved.

Printed by Curran Associates, Inc. (2015)

For permission requests, please contact Kaunas University of Technology  
at the address below.

Kaunas University of Technology  
K. Donelaicio g. 73, 44249  
Kaunas, Lithuania

Phone: +370 37 300 000  
+370 37 300 423  
Fax: +370 37 324 144

ktu@ktu.lt

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2634  
Email: curran@proceedings.com  
Web: www.proceedings.com

# CONTENTS

<b>Multimodal Automation Controller for Smart Homes</b> .....	9
Rytis Maskeliūnas*, Vidas Raudonis*, Grigor Stambolov**, Rimvydas Simutis* <i>* Kaunas University of Technology, Lithuania; ** Technical University-Sofia, Bulgaria</i>	
<b>Identification of Interconnected Systems by Instrumental Variables Method</b> .....	13
Grzegorz Mzyk <i>Wroclaw University of Technology, Institute of Computer Engineering, Control and Robotics, Wroclaw, Poland</i>	
<b>Investigation of Automatic Control System in Wood Drying Facilities</b> .....	17
Bronius Karaliūnas*, Dalia Lukošienė*, Liudmila Andriušienė** <i>*Vilnius Gediminas Technical University, Lithuania **Vilnius College of Technologies and Design, Lithuania</i>	
<b>Artificial Intelligence Approach to SoC Estimation for Smart BMS</b> .....	21
K.L. Man <sup>1,2,3</sup> , C. Chen <sup>5</sup> , T.O. Ting <sup>1</sup> , T. Krilavičius <sup>3,4</sup> , J. Chang <sup>6</sup> , S.H. Poon <sup>7</sup> <i><sup>1</sup>Xi'an Jiaotong-Liverpool University, China; <sup>2</sup>Myongji University, South Korea; <sup>3</sup>Baltic Institute of Advanced Technology, Lithuania; <sup>4</sup>Vytautas Magnus University, Lithuania; <sup>5</sup>Global Institute of Software Technology, China; <sup>6</sup>Texas Instruments, Inc, USA; <sup>7</sup>National Tsing Hua University, Taiwan</i>	
<b>Closed-Loop Optimization Algorithms in Digital Self-Tuning PID Control of Pressure Process</b> .....	25
Gediminas Liaučius, Vytautas Kaminskas <i>Department of Systems Analysis, Vytautas Magnus University, Lithuania</i>	
<b>Toolbox for Automatic Control of Fermentation Processes for the Production of Recombinant Therapeutic Protein</b> .....	30
Artur Kuprijanov*, Sebastian Schaepe**, Mathias Aehle**, Andreas Lübbert**, Rimvydas Simutis* <i>* Institute of Automation and Control Systems, Kaunas University of Technology, Lithuania ** Institute of Biochemistry and Biotechnology, Martin-Luther-University Halle-Wittenberg, Germany</i>	
<b>An Automatic System of Lithuanian Speech Formant Synthesizer Parameter Estimation</b> .....	36
Grażina Pyž*, Virginija Šimonytė**, Vytautas Slivinskas** <i>*Vilnius University Institute of Mathematics and Informatics, Lithuania **Lithuanian University of Educational Sciences, Lithuania</i>	
<b>Wireless Sensor Networks Application at Water Distribution Networks in Latvia</b> .....	40
Anatolijs Zabasta*, Viesturs Selmanovs-Pless**, Nadezda Kunicina* <i>*Riga Technical University, Institute of Industrial Electronics and Electrical Engineering, Latvia **Micro Dators Ltd, Latvia</i>	
<b>IEEE802.11n Standard's Capability to Support Wireless Device in Vehicular Environment</b> .....	44
Janis Jansons, Ernests Petersons, Nikolajs Bogdanovs <i>Department of Transport Electronics and Telematics, Riga Technical University, Latvia</i>	
<b>Predicting Trends of Financial Attributes by an Adaptive Committee of Models</b> .....	48
Zivile Kalsyte*, Antanas Verikas***, Asta Vasiliauskaite*** <i>*Department of Electrical &amp; Control Equipment, Kaunas University of Technology, Lithuania **Intelligent Systems Laboratory, Halmstad University, Sweden ***Faculty of Economics and Management, Department of Finance, Kaunas University of Technology, Lithuania</i>	
<b>Forecast of Healthcare Industry Distress Ratio According to the Companies Sectors</b> .....	54
Audrius Kabasinskas*, Zivile Kalsyte**, Asta Vasiliauskaite*** <i>*Department of Mathematical Research in Systems, Kaunas University of Technology, Lithuania ** Department of Electrical &amp; Control Equipment, Kaunas University of Technology, Lithuania ***Faculty of Economics and Management, Department of Finance, Kaunas University of Technology, Lithuania</i>	
<b>Modeling Results of Vehicular Network for File Transfer Protocol</b> .....	60
Nikolajs Bogdanovs, Ernests Petersons, Janis Jansons <i>Department of Transport Electronics and Telematics, Riga Technical University, Latvia</i>	
<b>Temperature Control Prototype for Education and Training Purposes</b> .....	64
Gediminas Valiulis, Edvardas Bielskis <i>Electrical Engineering Department, Šiauliai University, Lithuania</i>	

<b>Face Geometric Normalization Based on Eye Position .....</b>	<b>70</b>
Audrius Bukis, Paulius Lengvenis, Rimvydas Simutis <i>Department of Process Control, Kaunas University of Technology, Lithuania</i>	
<b>Orientation Invariant Objects Recognition in Infrared and Visible Lights on Hierarchical Temporal Memory .</b>	<b>74</b>
Saulius Sinkevičius*, Vytenis Sinkevičius** *Department of Information Systems and Communications, Panevezys College, Lithuania **Department of Electrical Engineering, Kaunas University of Technology, Lithuania	
<b>Microcontroller Based Model of Fitzhugh-Nagumo System.....</b>	<b>78</b>
Andrius Petrovas*, Saulius Lisauskas*, Alvydas Šlepikas* *Vilnius Gediminas Technical University, Lithuania	
<b>Investigation of the Multidimensional Automatic Control System, Having Structure of the Chain, Applying Lambert W Function .....</b>	<b>82</b>
Irma Ivanoviene, Jonas Rimas <i>Department of Applied Mathematics, Kaunas University of Technology, Lithuania</i>	
<b>Research of Temperature Regulation at Variable Air Volume .....</b>	<b>87</b>
Ansis Klūga*, Romualds Beļinskis*, Andris Krūmiņš** *Department of Transport Electronics and Telematics, Riga Technical University, Latvia **Institute of Heat, Gas and water technology, Riga Technical University, Latvia	
<b>Building Classification Models Using Adaptive Basis Function Construction.....</b>	<b>91</b>
Gints Jekabsons <i>Institute of Applied Computer Systems, Riga Technical University, Latvia</i>	
<b>Technical Characteristics of TI DM3730 Embedded Platform When Processing Video Information .....</b>	<b>95</b>
Paulius Lengvenis, Rimvydas Simutis <i>Process control department, Kaunas University of Technology, Lithuania</i>	
<b>Investigation of Avatar’s Face Features Influence on User’s Emotional State Using Neuro-Feedback .....</b>	<b>99</b>
Egidijus Vaškevičius, Edvinas Bazevičius, Aušra Vidugirienė, Vytautas Kaminskas <i>Department of System Analysis, Vytautas Magnus University, Lithuania</i>	
<b>Business Process Dimension in Design of Control Systems .....</b>	<b>105</b>
Edvinas Pakalnickas, Dalius Misiūnas <i>Lietuvos energija AB, Lithuania</i>	
<b>Exploration of Color Histograms Applicability for Amber Surface Analysis .....</b>	<b>109</b>
Saulius Sinkevičius, Arūnas Lipnickas <i>Department of Control Technology, Kaunas University of Technology, Lithuania</i>	
<b>Hexapod Kinematic Model Optimization for Control System.....</b>	<b>113</b>
Tomas Luneckas, Dainius Udris <i>Vilnius Gediminas Technical University, Lithuania</i>	
<b>Investigation into Frequency Controlled Electric Drive .....</b>	<b>117</b>
Jonas Kriaučiūnas, Roma Rinkevičienė <i>Vilnius Gediminas Technical University, Lithuania</i>	
<b>Optimization of Spare Parts Warehouse Costs .....</b>	<b>121</b>
Rytis Briedis, Vygandas Vaitkus, Saulius Žiukas <i>Kaunas University of Technology, Lithuania</i>	
<b>Mobile Robot Prediction of Potential Conflicts .....</b>	<b>127</b>
Stanislovas Bartkevičius, Kastytis Šarkauskas, Žydrūnas Jakas <i>Department of Electrical Engineering, Kaunas University of Technology, Lithuania</i>	
<b>Mobile Robot Coordinates Detection Problems Using Centre of Gravity of Visible Environment.....</b>	<b>131</b>
Stanislovas Bartkevičius, Alma Dervinienė, Olga Fiodorova, Kastytis Šarkauskas <i>Kaunas University of Technology, Lithuania</i>	
<b>Application of Smart Grid Technologies in Emergency Automation .....</b>	<b>135</b>
Vladimir Chuvychin, Roman Petrichenko <i>Riga Technical University, Latvia</i>	

<b>Impact on Reliability of Electrical Power Supply by Feeding of Offshore Wind Parks.....</b>	<b>139</b>
Marco Fleckenstein, Gerd Balzer <i>TU Darmstadt, Germany</i>	
<b>The Means of Magnetic and Electric Fields Indication .....</b>	<b>143</b>
Gabija Nedzinskaitė*, Juozapas Arvydas Virbalis*, Algis Vegys** *Kaunas University of Technology, Department of Electrical Engineering, Lithuania **Kaunas University of Technology, Department of Ergonomics, Lithuania	
<b>Stability Analysis of Electrical Power System Trough Characteristic Polynomial Roots Locality .....</b>	<b>147</b>
Georgi Georgiev*, Inga Zicmane**, Sergey Kovalenko***** * Energy Institute JSC Sofia, Bulgaria; ** Riga Technical University, Institute of Power Engineering, Latvia; *** JSC "Siltumelektroprojekts", Latvia	
<b>Mathematical Model for 110/10 kV Transformer Substations' Optimum Power Choice.....</b>	<b>151</b>
Svetlana Guseva, Olegs Borscevskis <i>Riga Technical University, Latvia</i>	
<b>Lightning Performance on Transmission Line Towers .....</b>	<b>157</b>
Olegs Sliskis, Ilja Dvornikovs, Karlis Ketners <i>Riga Technical University, Latvia</i>	
<b>Dynamic Mathematical Model and Single-Phase Short Circuit Analysis of Variable Speed Pump Storage Unit.....</b>	<b>161</b>
Rimantas Pranas Deksnys, Darius Ališauskas <i>Kaunas University of Technology, Lithuania</i>	
<b>Operating Condition Processes Research of Inverter – Three Phase Dual System Converter .....</b>	<b>166</b>
Povilas Balčiūnas, Povilas Norkevičius <i>Kaunas University of Technology, Lithuania</i>	
<b>Assessment of the Reactive Power Flows Impact on the Nodal Prices of Active Power .....</b>	<b>170</b>
Anatolij Mahnitko, Inga Umbrashko <i>Institute of Power Engineering, Riga Technical University, Latvia</i>	
<b>Measurements of Electrical Drive .....</b>	<b>175</b>
Robertas Janickas, Zita Savickienė <i>Vilnius Gediminas Technical University, Lithuania</i>	
<b>Modeling and Analysis of Voltage Unbalance and its Influence on Transmission Network and Power Quality .</b>	<b>179</b>
Tanel Sarnet, Jako Kilter <i>Department of Electrical Power Engineering, Tallinn University of Technology, Estonia</i>	
<b>Wind Park and Transmission Network Cooperation Considering Grid Code Requirements .....</b>	<b>183</b>
Jako Kilter, Edgar Dubbelman, Ivo Palu, Jaan Niitsoo <i>Department of Electrical Power Engineering, Tallinn University of Technology, Estonia</i>	
<b>Transmission Network Development Planning by Using a Cooperative Game Theory Approach .....</b>	<b>189</b>
Igor Moshkin, Svetlana Berjozkina, Antans Sauhats <i>Riga Technical University Riga, Latvia</i>	
<b>The Power Distribution in the Electrical Power System Taking into Account Reservation .....</b>	<b>195</b>
Renata Varfolomejeva, Anatolij Mahnitko <i>Riga Technical University, Latvia</i>	
<b>High Temperature Low Sag Conductors as Method for the Improvement of Electrical Transmission Lines.....</b>	<b>200</b>
Svetlana Berjozkina*, **, Antans Sauhats *, **, Vladimirs Bargels **, Edvins Vanzovichs * * Riga Technical University, Institute of Power Engineering, Latvia; ** JSC "Siltumelektroprojekts", Latvia	
<b>Supply Voltage Level Optimisation in Low Voltage Networks Using Shunt Capacitors .....</b>	<b>206</b>
Toomas Vinnal, Kuno Janson, Heljut Kalda, Lauri Kütt <i>Department of Fundamentals of Electrical Engineering and Electrical Machines Tallinn University of Technology, Estonia</i>	
<b>Design of High-Frequency Transient Current Sensor for Powerline on-Line Measurement .....</b>	<b>212</b>
Lauri Kütt*, Jaan Järvik*, Jako Kilter*, Muhammad Shafiq**, Matti Lehtonen** *Tallinn University of Technology, Estonia; **Aalto University, Finland	

<b>Characteristics of Unconventionally Controlled Linear Electric Drives .....</b>	<b>217</b>
Algimantas Juozas Poška, Zita Savickienė <i>Vilnius Gediminas Technical University, Lithuania</i>	
<b>Economic Intervals' Method for Choice of Line Cross-Section and its Realization in Matlab Software .....</b>	<b>221</b>
Svetlana Guseva, Lubov Petrichenko <i>Riga Technical University, Latvia</i>	
<b>The Probabilistic Approach to Find a Solution of Electrostatic Field With Dirichlet Boundary Conditions .....</b>	<b>227</b>
Renaldas Urniežius, Stasys Žebrauskas <i>Kaunas University of Technology, Lithuania</i>	
<b>Comparison of Corona Field in Wire-to-Plane and “a Set Of Wires Under a Plane” Electrode System .....</b>	<b>231</b>
Povilas Marčiulionis, Stasys Žebrauskas <i>Department of Electrical Engineering, Kaunas University of Technology, Lithuania</i>	
<b>Numerical Analysis of Combined Corona and Electrostatic Field in Multi-Electrode Systems.....</b>	<b>235</b>
Ričardas Barčiauskas, Juozapas Arvydas Virbalis, Stasys Žebrauskas <i>Department of Electrical Engineering, Kaunas University of Technology, Lithuania</i>	
<b>Research of the Reactive Power Compensation Influence to the Losses in Electrical Networks.....</b>	<b>239</b>
Timurs Kuznecovs*, Anatolijs Mahnitko*, Tatjana Lomane*, Viktors Rimarevs**, Renata Varfolomejeva* <i>* Riga Technical University, Latvia; **Latvenergo, Latvia</i>	
<b>Shielding of the Electric Field Created by High Voltage Devices and Lines .....</b>	<b>245</b>
Ramunas Deltuva, Juozapas Arvydas Virbalis <i>Department of Electrical Engineering, Kaunas University of Technology, Lithuania</i>	
<b>Wholesale Electricity Price Forecasting Models: Lithuanian Case.....</b>	<b>249</b>
Viktorija Bobinaitė***, Inga Konstantinavičiūtė*** <i>*Lithuanian Energy Institute, Lithuania; **Kaunas University of Technology, Lithuania</i>	
<b>Possibilities of the LNG Import Terminals Operation in Lithuania .....</b>	<b>255</b>
Arvydas Galinis, Algis Kuprys, Dalius Tarvydas, Egidijus Norvaiša, Inga Konstantinavičiūtė, Irena Alėbaitė, Vaclovas Miškinis, Vidas Lekavičius <i>Lithuanian Energy Institute, Lithuania</i>	
<b>Experimental Research of Electromagnetic Disturbances Related with Substation Grounding Contour .....</b>	<b>261</b>
Nerijus Bagdanavičius*, Gediminas Daukšys***, Vitalijus Gvozdas**, Gintvilė Maslauskaitė**, Pavel Vasiljevich Kryksin*** <i>*Kaunas University of Applied Engineering Sciences, Lithuania; **Kaunas University of Technology, Lithuania; *** Tavrda Electric BP JSC, Belarus</i>	
<b>Solar-Assisted Partial Apartment’s Space Heating System .....</b>	<b>266</b>
Vytautas Adomavičius*, Česlovas Ramonas** <i>Kaunas University of Technology, Lithuania</i>	
<b>Market Based Cross-Border Congestion Management Methods .....</b>	<b>270</b>
Donatas Matelionis, Mindaugas Ažubalis <i>Kaunas University of Technology, Lithuania</i>	
<b>Mathematical Modeling of Balancing Utilities of Power Systems .....</b>	<b>274</b>
Giedrius Tamulis <i>Kaunas University of Technology, Lithuania</i>	