

The 11th International Conference on
Development and Application Systems
DAS 2012

www.dasconference.ro

Abstracts Book

May 17-19, 2012 Suceava - Romania

Organized by

Stefan cel Mare University of Suceava
Faculty of Electrical Engineering
and Computer Science
ROMANIA

Published by: *Faculty of Electrical Engineering and Computer Science*

Editors:

*Adrian GRAUR
Stefan Gh. PENTIUC
Cristina TURCU
Valentin POPA
Cornel TURCU
Alin Dan POTORAC
Eugen COCA*

ISSN 1844-5020

All rights reserved. No part of this book may be reproduced in any form or by any means, without written permission from the publisher.

Wording, contents and translations quality of the papers are entirely in the responsibility of the authors.

International Steering Committee

Nicolae Dumitru ALEXANDRU - Gh. Asachi Technical University of Iasi - ROMANIA
Tudor AMBROS - Technical University of Chisinau - MOLDOVA
Petru ANDREI - Florida State University - United States of America
Dragan ANTIC - University of Nis - SERBIA
Oleg BREKHOV - Moscow Aviation Institute - RUSSIA
Luc De BACKER - Katholieke Hogeschool Sint-Lieven Gent - BELGIUM
Christophe CHAILLOU - Laboratoire d'Informatique Fondamentale de Lille - FRANCE
Timothy HALL - University of Limerick - IRELAND
Ileana HAMBURG - Institute for Technology Gelsenkirchen - GERMANY
Stefan HOLBAN - Politehnica University of Timisoara - ROMANIA
Maria IOANNIDES - National Technical University of Athens - GREECE
Ionel JIAN - Politehnica University of Timisoara - ROMANIA
Vladimir KATIC - University of Novi Sad - SERBIA
Eleftherios A. KAYAFAS - National Technical University of Athens - GREECE
Vladimir KRAPIVIN - Moscow Institute of Radioengineering - RUSSIA
Vladimir MESYURA - The State Technical University of Vinnitsa - UKRAINE
Mihai MICEA - Politehnica University of Timisoara - ROMANIA
John MILNER - City University London - GREAT BRITAIN
Bogdan MOROSAN - AB Sciex, Ontario - CANADA
Radu MUNTEANU - Technical University of Cluj-Napoca - ROMANIA
Carine NAESSENS - Katholieke Hogeschool Sint-Lieven Gent - BELGIUM
Jose OLIVEIRA e SA - Instituto Politecnico do Porto - PORTUGAL
Andrei PAUN - Louisiana Tech University - United States of America
Nicola PITRONE - Universita degli Studi Catania - ITALIA
Radu Emil PRECUP - Politehnica University of Timisoara - ROMANIA
Fedor SOPRONIUK - National University of Cernauti - UKRAINE
Lieven De STRYCKER - Katholieke Hogeschool Sint-Lieven Gent - BELGIUM
Gavril TODEREAN - Technical University of Cluj-Napoca - ROMANIA
Petre TODOS - Technical University of Chisinau - MOLDOVA
Bernard TOURSEL - Universite des Sciences et Technologies de Lille - FRANCE

National Organizing Committee

Theodor BORANGIU - Politehnica University of Bucharest
Mihai CERNAT - Transilvania University of Brasov
Dorel CERNOMAZU - Stefan cel Mare University of Suceava
Calin CIUFUDEAN - Stefan cel Mare University of Suceava
Eugen COCA - Stefan cel Mare University of Suceava
Elena CURELARU - Stefan cel Mare University of Suceava
Mihai DIMIAN - Stefan cel Mare University of Suceava
Constantin FILOTE - Stefan cel Mare University of Suceava
Adina Magda FLOREA - Politehnica University of Bucharest
Adrian GRAUR - Stefan cel Mare University of Suceava
Ioan Alfred LETIA - Technical University of Cluj-Napoca
George MAHALU - Stefan cel Mare University of Suceava
Leon MANDICI - Stefan cel Mare University of Suceava
Dan MILICI - Stefan cel Mare University of Suceava
Mariana MILICI - Stefan cel Mare University of Suceava
Costica NITU - Politehnica University of Bucharest
Stefan Gheorghe PENTIUC - Stefan cel Mare University of Suceava
Radu Dumitru PENTIUC - Stefan cel Mare University of Suceava
Mircea PETRESCU - Politehnica University of Bucharest
Cezar POPA - Stefan cel Mare University of Suceava
Valentin POPA - Stefan cel Mare University of Suceava
Alin Dan POTORAC - Stefan cel Mare University of Suceava
Octavian PROSTEAN - Politehnica University of Timisoara
Gabriela RATA - Stefan cel Mare University of Suceava
Mircea STRATULAT - Politehnica University of Timisoara
Virgil TIPONUT - Politehnica University of Timisoara
Viorel TRIFA - Technical University of Cluj-Napoca
Cornel Octavian TURCU - Stefan cel Mare University of Suceava
Cristina Elena TURCU - Stefan cel Mare University of Suceava
Nicolae TAPUS - Politehnica University of Bucharest
Alexandru VALACHI - Gh. Asachi Technical University of Iasi
Mihai VOICU - Gh. Asachi Technical University of Iasi
Mihai Horia ZAHARIA - Gh. Asachi Technical University of Iasi

CONTENTS

SECTION A - Systems, Process Control and Automations

<i>Theoretical Aspects of Parallel-hierarchical multi-level Transformation of Digital Signals</i> Andriy YAROVYY, Leonid TIMCHENKO, Nataliya KOKRIATSKAIA	1
<i>A Sectioning Method for Classification of Laser Beam Spots with Parallel Calculations on FPGA</i> Leonid TYMCHENKO, Mykola PETROVSKYI, Natalia KOKRYATSKAYA, Volodymir GUBERNATOROV, Yuriy KUTAIEV	2
<i>Simulation of Fermentation Bioreactor Control for Ethanol Production</i> Ana Maria MARGINEAN, Viorel TRIFA, Calin MARGINEAN	3
<i>Integrating RFID Readers for Data Acquisition in SCADA systems</i> Andrei Valeriu SMOLENIC, Vasile Gheorghitã GĂITAN, Elisabeta TĂTULESCU, Mihai Florentin URSULEANU, Simona Anda GHERASIM	4
<i>Analysis of the Induction Railway Traction Motor in Regenerative Braking</i> M. TULBURE, R. BOTH, R. FESTILA	5
<i>The Iterative Algorithm of Tuning Controllers to the Models Object with Inertia and Astatism</i> Bartolomeu IZVOREANU, Irina COJUHARI	6
<i>Greenhouse Temperature Control System</i> Irina COJUHARI, Bartolomeu IZVOREANU, Dumitru MORARU, Aurel SPEIAN, Alexei ROMANOV	7
<i>Servomechanism with Reduced Sensitivity by Uncertainty</i> A. R. MESAROSIU, I. PORUMB, R. BOTH	8
<i>A GMDH Neural Network Approach to the Actuator Fault Diagnosis</i> Marcin MRUGALSKI, Marcin WITCZAK	9
<i>Optimal Control System Synthesis Based on Multi-controler Architecture</i> Victor ABABII, Ion BALMUS, Gheorghii CEBAN, Radu MELNIC	10

SECTION B - Communications and Computer Networks

<i>Power Spectral Density of MB 810 Code</i> Nicolae Dumitru ALEXANDRU	11
<i>Integration of a CAN bus in an Onboard Computer for Space Applications</i> Stijn WIELANDT, Geoffrey OTTOY, Jean-Pierre GOEMAERE, Nobby STEVENS, Lieven De STRYCKER	12
<i>Enhanced Network Based Model for Measuring Online Games Quality of Experience</i> Dorel PICOVICI, David DENIEFFE, Zenun KASTRATI	13

<i>The Design and Implementation of a HF RFID Loop Antenna for Metallic Environments</i> Ilie FINIS, Valentin POPA, Alexandru LAVRIC, Adrian-Ioan PETRARIU, Stefan SFICHI	14
<i>Energy-Detection Based UWB Demodulator with a Supplementary Integration Block</i> Adrian POPA	15
<i>Remote Cardiac Arrhythmia Monitoring System Using Wireless Sensor Networks</i> Cristian ROTARIU, Vasile MANTA, Razvan CIOBOTARIU	16
<i>Introducing ACE in Distributed Systems for Monitoring and Process Control</i> Elisabeta TATULESCU, Vasile G. GAITAN, Andrei Valeriu SMOLENIC, Simona A. GHERASIM, Mihai F. URSULEANU	17
<i>Address Space Analysis for Middleware Application based on OPC UA</i> Simona A. GHERASIM, Vasile G. GAITAN, Adrian M. GAITAN, Elisabeta TATULESCU, Daniel SIMION, Mihai F. URSULEANU	18
<i>Modified Advanced Encryption Standard</i> Luminița SCRIPCARIU, Mircea-Daniel FRUNZĂ	19
<i>An Original Movement Monitoring System for the Elderly using a WSN protocol</i> Stefan SFICHI, Adrian GRAUR, Valentin POPA, Ilie FINIS, Adrian I. PETRARIU	20
<i>Performance analysis of TCP and UDP using Opnet Simulator</i> Ioan FITIGAU, Gavril TODEREAN	21
<i>An Overview on WiMAX Security Weaknesses/Potential Solutions</i> Daniel SIMION, Mihai F. URSULEANU, Adrian GRAUR	22
 SECTION C - Electronics and Computer Aided Engineering 	
<i>High Performance Wideband CMOS CCI with High Voltage Swing</i> Emre ARSLAN, Bilgin METIN, Norbert HERENC SAR, Jaroslav KOTON, Oguzhan CICEKOGLU	23
<i>Mobile System for Monitoring of Gas Emission on Landfill Sites</i> Živorad MIHAJLOVIĆ, Vladimir MILOSAVLJEVIĆ, Nikola MAODUŠ, Vladimir RAJS, Đorđe OBRADOVIĆ, Miloš ŽIVANOV	24
<i>Low-Voltage Two NMOS IVB-Based Voltage-Mode First-Order All-Pass Filter With Tuning</i> Norbert HERENC SAR, Jaroslav KOTON, Kamil VRBA, Bilgin METIN, Oguzhan CICEKOGLU	25
<i>Micromagnetic Analysis of Magnetization Behavior in Permalloy Nanoparticles for Data Storage Applications</i> Constantin LEFTER, Mihai DIMIAN	26
<i>Considerations regarding the Spectral Efficiency of Orthogonal Frequency Division Multiplexing</i> Alina Elena STANCIU, Lăcrămioara-Mihaela NEMȚOI, Ilona Madalina MOISE	27
<i>Surface Impedance Boundary Conditions – Application to Computer-Aided Electromagnetic Design</i> Nathan IDA	28
<i>Image Enhancement Methods Approach using Verilog Hardware Description Language</i> Iuliana CHIUCHISAN, Marius CERLINCA, Alin-Dan POTORAC, Adrian GRAUR	29
<i>Digital Systems Synthesis based on Direct Translation of Petri Net Model</i> Viorica SUDACEVSCHI, Victor ABABII, Emilian GUTULEAC, Diana PALII	30

Hardware Realization of Spectral Gamma Ray Probe
Miodrag BRKIĆ, Viktor DOGAN, Miloš ŽIVANOV, Nemanja VUKOJE, Goran MANČIĆ..... 31

SECTION D - Software Engineering and Information Technologies

Classification in Emotional Speech for Romanian Language - Preliminary results
Silvia Monica FERARU 32

Software for Modeling Spatial and Temporal Evolution of River-type Systems
Galina MARUSIC, Ion SANDU, Vasile MORARU, Violeta VASILACHE, Ana-Monica CREȚU,
Constantin FILOTE, Calin CIUFUDEAN..... 33

Gait in Parkinson's Disease - Signal Processing and Modeling
Oana GEMAN, Ioan UNGUREAN, Valentin POPA, Cornel Octavian TURCU, Nicoleta-Cristina
GĂITAN 34

Heuristic Clustering Algorithm for Nonlinearly Separable Data
Vasile PURDILĂ, Ștefan-Gheorghe PENTIUC 35

Symmetric and Asymmetric Cryptography Solution(s) for RFID-based Anti-counterfeiting Systems
Marius CERLINĂ, Cristina TURCU, Tudor CERLINĂ, Remus PRODAN, Valentin POPA 36

A Bio inspired alternative to Huffman Coding
Natalia TATAR, Ștefan HOLBAN 37

Multi-Agent Scheduling using Constraint Satisfaction Problem
Ioana COBEANU, Vasile COMNAC 38

A Study about the Statistical Parameters Used in the Emotion Recognition
Marius ZBANCIOC, Monica FERARU 39

Distributed Systems and Artificial Intelligence in Programming
Ștefan-Niko ORZEN 40

A new access control method for cryptographic processing using logical approaches
Dimitris C. VOUKALIS 41

Index of Authors 42

POSTER SESSION

The Design and Implementation of an HF RFID System for Warehouse Management
Ilie FINIȘ, Valentin POPA 44

RFID Data Flow Monitoring using OPC Servers
Adrian-Mihai GĂITAN, Valentin POPA 45

Study of organic light-emitting devices based on new phenanthroline derivatives and poly(p-phenylenevinylene)
Marius PRELIPCEANU, Mihai DIMIAN, Adrian GRAUR, Valentin POPA 46

<i>Contributions concerning the use of Wavelet Transform in defining the main electric power quantities towards increasing energy efficiency to industrial customers</i> Viorel APETREI, Adrian GRAUR, Constantin FILOTE.....	47
<i>Contributions concerning the development of middleware applications</i> Simona-Anda GHERASIM, Vasile GĂITAN	48
<i>Contributions to the development of transcranial magnetic stimulation devices and the methods of diagnostics and concomitant therapies</i> Elena GROSU, Mihai DIMIAN, Adrian GRAUR	49
<i>Contributions to Cyberinfrastructure Development for Remote Visualization and Control of Research and Education Equipment</i> Mihai-Florentin URSULEANU, Adrian GRAUR, Mihai DIMIAN	50
<i>Contributions to automatic meter reading using power line communications</i> Codrin MALEȘ, Valentin POPA.....	51
<i>Solutions Regarding Improvement of HF RFID System Performances in Metallic Environments</i> Adrian-Ioan PETRARIU, Vasile-Gheorghită GĂITAN.....	52
<i>Contributions in data servers development for distributed applications</i> Elisabeta TĂTULESCU, Vasile Gheorghită GĂITAN	53
<i>Advanced Modeling and Simulation Techniques using High Performance Computing</i> Ionela RUSU, Ștefan-Gheorghe PENTIUC.....	54
<i>Analysis of hybrid pattern recognition system with HMM and SVM methods</i> Ștefania Iuliana ȘOIMAN, Ștefan Gheorghe PENTIUC.....	55
<i>New Human Computer Interface for Simulation of Assembly Operations in Virtual Environments</i> Elena-Gina CRACIUN, Ștefan-Gheorghe PENTIUC	56
<i>The Design and Development of a Street Lighting Monitoring and Control System</i> Alexandru LAVRIC, Valentin POPA.....	57
<i>The Design and Development of a Movement Monitoring System using a WSN Protocol</i> Ștefan SFICHI, Adrian GRAUR and Valentin POPA.....	58
<i>Computer Network Security</i> Ovidiu STRUGARU.....	59

Theoretical Aspects of Parallel-Hierarchical Multi-Level Transformation of Digital Signals

Andriy YAROVYY¹, Leonid TYMCHENKO², Nataliya KOKRIATSKAIA¹

¹ Vinnytsia National Technical University
95, Khmelnitske shosse, Vinnytsia, 21021, Ukraine
axa@vinnitsa.com

² State University for Transport Economy and Technologies
19, Lukashevich Street, Kyiv, 03049, Ukraine
timchen@list.ru

Abstract — *The features analysis of structural-functional organization of networking model of parallel-hierarchical transformation of the information environments and corresponding masks generation methods is realized in the given research. On the base of research carried out the method of optimized masks formation while information coding in parallel-hierarchical transformation is proposed. The software package, characterized by increased efficiency of direct and reverse parallel-hierarchical transformation is developed.*

Index Terms — *image processing, information coding, parallel processing; parallel-hierarchical transformation.*

REFERENCES

- [1] Prett U. Digital image processing. – Moscow: Mir, 1982. – Vol. 1 – 310 p., Vol. 2. – 790 p.
- [2] Grenader U. Lectons of theory of patterns. Patterns analysis. – Moscow: Mir, 1981. – 448 p.
- [3] Sklyar B. Digital communication. Theory and practical applications. – Moscow: Publishing house "Wilyams", 2003. – 1104 p.
- [4] Sergienko A. Digital signal processing. – St. Petersburg: Publishing house "Piter", 2006. – 752 p.
- [5] Parallel-hierarchical model of systemic transformation as optoelectronic means of artificial intelligence: [Monograph.] / V.P. Kozhemyako, Yu.F. Kutaev, S.V. Svechnikov, L.I. Timchenko, A.A. Yarovyv – Vinnytsia: Universum-Vinnytsia, 2003. – 324 p. – ISBN 966-641-072-9.
- [6] A.A. Yarovyv Applied Realization of Neural Network and Neurolike Parallel-Hierarchical System Based on GPGPU. – Development and application systems : Proceedings of the 10th International Conference on DAS-2010, May 27-29, 2010, Suceava, Romania – Suceava, Universitatea Stefan cel Mare Suceava, 2010 – p. 351-356.
- [7] V. Kozhemyako, L. Timchenko, A. Yarovyv Methodological Principles of Pyramidal and Parallel-Hierarchical Image Processing on the Base of Neural-Like Network Systems // Advances in Electrical and Computer Engineering – “Stefan cel Mare” University of Suceava, Romania – Volume 8 (15), Number 2 (30), 2008 – pp. 54-60.
- [8] V.P. Kozhemyako, L.I. Timchenko, A.A. Yarovyv Software Support of Accurately Measurement and Prediction of Laser Beam Profile Characteristics. Proceedings of the X International Conference „Swiatowody i ich zastosowania”, 4-7 October 2006, Krasnobryd, Poland, Tom 2 – Lublin, Wydawnictwo-Drukarnia Liber Duo s.c., 2006 – p. 675-684.
- [9] L. Timchenko, Yu. Kutaev, V. Kozhemyako, A. Gertsy, A. Yarovyv, N. Kokryatskaya Method for Processing of Extended Laser Paths Images // Advances in Electrical and Computer Engineering – “Stefan cel Mare” University of Suceava, Romania – Volume 3 (10), Number 2 (20), 2003 – p. 66-78.
- [10] Knut D. Art of programming for computer: Vol. 1-3. – Moscow: Mir, 1978.
- [11] L. Timchenko, Yu. Kutaev, V. Kozhemyako, A. Yarovyv, A. Gertsy, A. Terenchuk, N. Shweiki Method for Training of a Parallel-Hierarchical Network, Based on Population Coding for Processing of Extended Laser Paths Images // Proceedings of SPIE, Volume 4790, 2002. – p. 465-479.
- [12] Yarovyv A. Method of optimization of masks formation procedure while information coding by parallel-hierarchical transformation // Sc. journal "Visnyk of Vinnytsia Polytechnical Institute". – 2011. – № 6 (99). – P. 216 – 223.
- [13] Bryukhovich E. Automatic control and performance of computer systems // Sc. journal "Control systems and machines". – №4. – 1979.
- [14] Metlitskiy E., Kaverznev V. The systems of parallel memory: theory, development, application. / Under the guidance of V. Timokhin. – St. Petersburg, St. Petersburg University Press, 1989. – 240 p.
- [15] Kozhemyako V., Timchenko L., Yarovyv A. The models of parallel-hierarchical information processing based of logic-time function apparatus. – «Information and computer technologies, modeling, control» : Abstracts of International Sc. Conf. – Georgia, Tbilisi, November 1-4, 2010. – Tbilisi, Georgian Tech. Univ. Press, 2010. – P. 231-232.
- [16] Author's certificate of registration of copyright on software product № 39490. "Computer program of direct parallel-hierarchical transformation with optimization of masks formation (with including multiplication procedure of minimal element by the capacity in G-transformation operator)" / Yarovyv A., Sugak I. Date of registration in State Department of Intellectual Property of Ukraine 04.08.2011.
- [17] Author's certificate of registration of copyright on software product № 39489. "Computer program of reverse parallel-hierarchical transformation, based on optimized mask method (with including multiplication procedure of minimal element by the capacity in G-transformation operator)" / Yarovyv A., Sugak I. Date of registration in State Department of Intellectual Property of Ukraine 04.08.2011.

A sectioning method for classification of laser beam spots with parallel calculations on FPGA

Leonid Tymchenko¹, Mykola Petrovskiy¹, Natalia Kokryatskaya¹, Volodymir Gubernatorov¹, Yuriy Kutaev²

¹Department of Telecommunication technologies and automatics, State Economy and Technologies University of Transport, 19 Lukashevich Street, Kyiv, 03049, Ukraine, ²KIA Systems 2nd St.

Enthusiasts #5, b. 34 Moscow, 111024, Russia

timchen@list.ru, petrovski@voliacable.com, kokriatskaia@rambler.ru, pontiw@rambler.ru, petr-rusinov@yandex.ru

Abstract — A sectioning method to solve a problem of control of the shape of laser beam spots in implementing FSO-based satellite communication is discussed in this paper. A mathematical rationale and a possibility to use the form factor to solve the task posed, as well as experimental results are described. In order to increase performance, a possibility of multisequencing of this method is described. Requirements of the technical implementation are given, and a structural chart of the FPGA (PLD)-based implementation of this method is developed.

Index Terms — optical image processing, free space optic, FPGA, image classification, parallel processing

REFERENCES

- [1] M. Khosroffian and B. A. Garetz, (1983). Measurement of a Gaussian laser beam diameter through the direct inversion of knife-edge data. *Appl. Opt.* 22, 3406–3410.
- [2] Kozhemyako V.P., Timchenko L.I., Poplavskyy A.A. et. al, (2003). Analysis of the methodological approaches in connection with the problem solving of extrapolation of object trajectory. *SPIE Symposium, USA*, vol. 5175, pp. 222-236.
- [3] N. G. Basov, E. M. Zemskov, Y. F. Kutaev, et al. , (1998). Laser control of near earth space and possibilities for removal of space debris from orbit with explosive photo-dissociation lasers with phase conjugation. In *Proceedings of GCL/HPL 98, SPIE Symposium, St-Petersburg, Russia*, Vol. 3574, pp. 219–228.
- [4] Giovanni Mana, Enrico Massa, and Alessandro Rovera, , (2001). Accuracy of Laser Beam Center and Width Calculations. *Applied Optics*, Vol. 40, Issue 9, pp. 1378-1385.
- [5] D. A. Orlov and E. A. Neverova, (2003) Determination of the position of the center of a laser beam when the dynamic range of the matrix receiver is exceeded. *Measurement Techniques*. Volume 53, Number 10, 1140-1146.
- [6] Jenny Magnes, Margo Kinneberg, Rahul Khakurel, Nouredine Melikechi, (2010). Opto-mechanical Shape Analysis using Group Theory, *Appl. Opt.*, 49 (22), pp. 4188-4192.
- [7] Malcolm W. Wright, Keith E. Wilson, Joseph Kovalik, Abhijit Biswas and William T. Roberts, , (2011) . A bidirectional low Earth orbit-to-ground optical link experiment. *SPIE Newsroom*, 3 p.
- [8] Israel Gannot, M. Ben-David, A. Inberg, R. W. Waynant, , (2002). Beam shape analysis of waveguide delivered infrared lasers. *SPIE, Opt. Eng.* 41, 244.
- [9] Matthias Hartmann, Vasileios Pantazis, Tom Vander Aa, Mladen Berekovic and Christian Hochberger, (2008). Still Image Processing on Coarse-Grained Reconfigurable Array Architectures. *Journal of SPS*, Vol.60, Number 2, 225-237.
- [10] Shao-Yi Chien , Liang-Gee Chen, (2008). Reconfigurable Morphological Image Processing. *Journal of SPS*, Vol. 56, Num. 2-3, 155-165.
- [11] Accelerator for Video Object Segmentation Atkinson, Kendall E., (1989). *An Introduction to Numerical Analysis* (2nd ed.). John Wiley & Sons.
- [12] Rafael C. González, Richard Eugene Woods, (2003). *Digital Image Processing Using MATLAB*. Pearson Prentice Hall, 609 p.
- [13] Leonid I. Timchenko, Yuriy F. Kutaev, (2002). Method for Training of a Parallel-Hierarchical Network, Based on Population Coding for Processing of Extended Laser Paths Images. *Proceedings of SPIE*, Volume 4790,– P. 465-479.
- [14] John F. Wakerly, (1999) *Digital Design: Principles and Practices*, Third Edition, Prentice Hall, 949 p.
- [15] Nios II Processor Reference, ALTERA, (2011), http://www.altera.com/literature/hb/nios2/n2cpu_nii5v1.pdf
- [16] Peter J. Ashenden, (1995). *The Designer's Guide to VHDL*. Morgan Kaufmann; 1st edition, 668p.

Simulation of Fermentation Bioreactor Control for Ethanol Production

Ana Maria MARGINEAN, Viorel TRIFA, Calin MARGINEAN

Technical University of Cluj-Napoca

str.Memorandumului nr.28, RO-400114 Cluj-Napoca

anamaria.marginean@gmail.com, trifa@edr.utcluj.ro, ignatc@edr.utcluj.ro

Abstract — Today's concerning about global warming and the rapid depletion of coal, gas and crude oil reserves enforced the study of alternative fuels as bioethanol. Bioethanol can be blended at low concentrations with gasoline or diesel for use in today's vehicles, and is considered to be a sustainable transportation fuel. Present paper deals with aspects regarding the simulation of fermentation bioreactor process and fermentation bioreactor control for ethanol production. The bioreactor model was implemented in Matlab Simulink and the results of simulation using different control strategies are presented comparatively.

Index Terms — bioethanol production, continuous fermentation bioreactor, bioreactor modeling and simulation, bioreactor control.

REFERENCES

- [1] O. Popa, P. Niculita, Gh. Batrinescu, N. Babeanu, M. Moscovici, "BIOMASA-materie prima regenerabila pentru obtinerea biocombustibililor", ICIA, 27 nov. 2008 rezumat.
- [2] Z.K. Nagy, "Model based control of a yeast fermentation bioreactor using optimally designed artificial networks" Elsevier, Chemical Engineering Journal 127(2007)95-109.
- [3] M.L.Shuler, F.Kargi, "Bioprocess engineering: basic concepts", 2nd edition, Upper Saddle River, Prentice Hall, 2002.
- [4] Bohn, C. & Atherton, D. P. 1994, "SIMULINK package for comparative studies of PID anti- windup strategies", Proceedings of the IEEE/IFAC Joint Symposium on Computer-Aided pp. 447-452.
- [5] A. Assadzadeh, S.S. Jamuar, "Development and simulation of biochemical reactor by using Matlab", 12th International Conference on Computer Modelling and Simulation, 2010.
- [6] Jutila, P., Orava, P. J. and Salmelin, B., "A Physico-Chemical Model and Simulation of pH Process in Continuous Stirred Tank Reactors", Mathematics and Computers in Simulation, 23, 1981, 99-106.
- [7] C. Garcia, R.J.C. De Godoy, "Modeling and Simulation of pH neutralization Plant Including the Process Instrumentation" from Applications of Matlab in Science and Engineering ISBN 978-953-307-708-6, published by InTech.
- [8] Jiri Vojtesek, Petr Dostal, "Use of MATLAB Environment for simulation and Control of CSTR", International Journal of Mathematics and Computers in Simulation, Issue 6, Volume 5, 2011.

Integrating RFID readers for data acquisition in SCADA systems

Andrei Valeriu SMOLENIC, Vasile Gheorghită GĂITAN, Elisabeta TĂTULESCU
Mihai Florentin URSULEANU, Simona Anda GHERASIM
Stefan cel Mare University of Suceava
str.Universității nr.13, RO-720229 Suceava
andreis@eed.usv.ro

Abstract — with the rapid development of automation industry, the large companies realized the potential of SCADA software systems (Supervisory Control And Data Acquisition). Therefore, the use of these systems has become quite common. Also, the capability of devices to be used in SCADA systems came as a requirement for device manufacturers. This paper proposes a way of using RFID readers for data acquisition in a SCADA system.

Index Terms — data acquisition, EDS, RFID, SCADA, tag

REFERENCES

- [1] X. Hong and W. Jianhua, "Using standard components in automation industry: A study on OPC Specification," *Computer Standards & Interfaces* 28, pp. 386-395, 2006.
- [2] X. Zhu, S. K. Mukhopadhyay and H. Kurata, "A review of RFID technology and its managerial applications in different industries," *Journal of Engineering and Technology Management* 29, pp. 152-167, 2012.
- [3] N. Li and B. Becerik-Gerber, "Performance-based evaluation of RFID-based indoor location sensing solutions for the built environment," *Advanced Engineering Informatics* 25, pp. 535-546, 2011.
- [4] N.-C. GAITAN, V. G. GAITAN, S. G. PENTIUC, I. UNGUREAN and E. DODIU, "Middleware Based Model of Heterogeneous Systems for SCADA Distributed Applications," *Advances in Electrical and Computer Engineering*, vol. 10, no. 2, pp. 121-124, 2010.
- [5] Alien Technology, "ALR-9900+ Enterprise RFID Reader," 9 January 2012. [Online]. Available: <http://www.alientechnology.com/docs/products/Alien-Technology-ALR-9900-Enterprise-RFID-Reader.pdf>.

Analysis of the induction railway traction motor in regenerative braking

M. TULBURE, R.BOTH, R. FESTILA

Department of Automatic Control

Technical University of Cluj-Napoca

G. Baritiu 26-28, 400027, Cluj-Napoca, Romania

Email: miron.tulbure@aut.utcluj.ro, roxana.both@aut.utcluj.ro, rfestila@yahoo.com

Abstract — Electric railway traction is an important component of the national economy being based on a series of advantages: the cheapest method of traction, free from flux gases, reduced cost maintenance, reduced starting time compared to thermal motor railway traction, high starting torque with excellent dynamics by regenerative braking is possible the energy feedback to the national electric grid.

Index Terms — induction traction motor, motor/generator operation, modeling and simulation, regenerative braking, power converters

REFERENCES

- [1] I. Boldea, S. Nasar, "The Induction Machine Handbook", 1st ed., CRC Press, pp. 198-206, 2001
- [2] I. Boldea, L. Nicolae, "Electric Machines: Steady State, Transients, and Design with MATLAB", ISBN-13: 9781420055726, 2009
- [3] S. Gheorghiu, F. Deliu, "Electromechanical converters", Navy Academy Publishing, 2010
- [4] E.G. Strangas, "Notes for an Introductory Course On Electrical Machines and Drives", MSU Electrical Machines and Drive Laboratory
- [5] M. Tulbure, R. Both, "Models for the AC Railways Regenerative Braking", 2012 IEEE International Conference on Automation, Quality and Testing, Robotics (AQTR 2012)
- [6] D. CALUEANU, I. VONCILA, N. BADEA, R. BUHOSU, C. MUNTEANU, „Masini Electrice”, Editura Fundației Universitare „Dunărea de Jos” din Galați, 2003
- [7] www.mathworks.com

The Iterative Algorithm of Tuning Controllers to the Models Object with Inertia and Astatism

Bartolomeu IZVOREANU, Irina COJUHARI

*Technical University of Moldova, Automatica and Informational Technologies Department,
Ștefan cel Mare av., 168, MD 2004, Chișinău, Republic of Moldova
izvor@mail.utm.md, irina.cojuhari@ati.utm.md*

Abstract — This paper proposes an iterative algorithm of tuning the typical controllers P, PI, PID to the model objects with inertia second order and astatism. The proposed algorithm is using the maximal stability degree method for tuning controllers. As the result of this study the algorithm of tuning controllers and the procedure of determining the system's performance in dependence of maximal stability value proposed.

Index Terms — the maximal stability degree method, the iterative algorithm, tuning of controllers.

REFERENCES

- [1] R. K. Dorf, R. X. Bishop, "Sovremennīe sistemī upravleniia (Modern Control Systems)," Moskva: Laboratoriia Bazovīh Znanii, 832 s., 2004.
- [2] Ș. Preitl, R. E. Precup, "Introducere în ingineria reglării automate," Timișoara: Editura Politehnică, 334 p., 2001.
- [3] G. I. Zagarii, A. M. Shubladze, "Sintez sistem upravleniia naosnove criteria maksimalnoi stepeni ustoičivosti. (The Synthesis of the Control System According to the Maximal Stability Degree)," Moskva: Energoatomizdat, 198 s., 1998.
- [4] J.C. Babilio, S.R. Matos, "Design of PI and PID controllers with transient performance specification," IEEE Transactions on Education, Vol. 45, Issue 4, p. 364 – 371, 2002.
- [5] N. Tan, D. P. Atherton, "Design of stabilizing PI and PID controllers," International Journal of Systems Science, Issue 8, Vol. 37, pp. 543-554, 6/20/2006.
- [6] B. Izvoreanu and I. Fiodorov, "The Synthesis of Linear Regulators for Aperiodic Objects with Time Delay According to the Maximal Stability Degree Method," Preprints the Fourth IFAC Conference on System Structure and Control, București: Editura Tehnică, pp. 449 – 454, 1997.
- [7] I. Fiodorov, B. Izvoreanu, M. Pisarenco, "Comparative Analysis of Regulators Tuning Methods to Models of Objects with Inertia," Buletinul Institutului Politehnic din Iași, Tomul L(LIV), Fasc.5A, Electrotehnică, Energetică, Electronică, pp. 63-68, 2000.
- [8] B. Izvoreanu, "Algoritm iterativ de acordare a reguletoarelor la obiecte cu inerție de ordinul doi, timp mort și fază neminimă," Proceedings of the 7th International Conference on Microelectronics and Computer Science ICMCS -2011, Sep. 22-24, Chișinău, Moldova, Vol. 1, p. 210 – 213, 2011.
- [9] B. Izvoreanu, "The Iterative Algorithm of Tuning Controllers to the Model Object with and Inertia Identical Elements, Time Delay and Nonminimal Phase," Proceedings of the 6-th International Conference on Electrical and Power Engineering EPE-2010, 28-30 October, Iași, România, Vol. II, p. 24-27, 2010.

Greenhouse Temperature Control System

Irina COJUHARI, Bartolomeu IZVOREANU, Dumitru MORARU, Aurel SPEIAN, Alexei ROMANOV
*Technical University of Moldova, Automatic and Informational Technologies Department,
Ștefan cel Mare av., 168, MD 2004, Chișinău, Republic of Moldova*
*irina.cojuhari@ati.utm.md, izvor@mail.utm.md, mitru3@mail.ru,
speian.aurel@gmail.com, lexusrv@gmail.com*

Abstract — This paper proposes to control the temperature regime in the greenhouse using the universal controller OWEN TPM 151. The tuning controller was performed using the maximal stability degree method. As a result of this study, the algorithm of tuning controllers and the procedure of determining the system's performance in dependence of maximal stability value are proposed. The control object was identified using the System Identification Toolbox from MATLAB. The obtained results were compared with results obtained using the auto-tune regime from OWEN TPM 151 controller.

Index Terms — the control of temperature regime, identification of control object, tuning controller, the maximal stability degree method.

REFERENCES

- [1] V. Ia. Rotach, Teoria avtomaticheskogo upravlenia termoenegheticheskimi protzessami (Automatic Control Theory of Thermal processes). Moskva: Energoatomizdat, 292 s., 1985.
- [2] V. A. Lukas, Teoria avtomaticheskogo upravlenia (Automatic Control Theory). Moskva: Nedra, 416 s., 1990.
- [3] I. Dumitrache și al., Automatizări electronice. București: EDP, 660 p., 1993.
- [4] G. Shabib, Mesalam Abdel Gayed, A.M. Rashwan, "Optimal Tuning of PID Controller for AVR System using Modified Particle Swarm Optimization," Proceedings of the 14th International Middle East Power Systems Conference (MEPCON'10), Cairo University, Egypt, December 19-21, pp. 305-310, 2010.
- [5] K. Aström, T. Hagglund, PID controllers: theory, design, and tuning. Instrument Society of America, 3rd Edition. 343 p, 1995.
- [6] G. Kafetzis, P. Patelis, E.J. Tripolitakis, G.S. Stavrakakis, D. Kolokotsa, K. Kalaitzakis, "PID Controller Tuning and Implementation Aspects for Building Thermal Control," Proceedings of the 10th WSEAS International Conference on CIRCUITS, Vouliagmeni, Athens, Greece, July 10-12, pp. 308-313, 2006.
- [7] N. Tan, D. P. Atherton, "Design of stabilizing PI and PID controllers," International Journal of Systems Science, Vol. 37 Issue 8, pp. 543-554, 6/20/2006.
- [8] B. Izvoreanu, I. Fiodorov, F. Izvoreanu, "The Tuning of Regulator for Advance Delay Objects According to the Maximal Stability Degree Method," Proceedings of the 11th International Conference on Control Systems and Computer Science (CSCS-11), București, V.I, pp. 179-184, 1997.
- [9] B. Izvoreanu, "The Iterative Algorithm of Tuning Controllers to the Model Object with Advance Delay and Inertia Second Order," Proceedings of the 10-th International Conference on Development and Application Systems DAS-2010, România, Universitatea Ștefan cel Mare Suceava, pp. 111-115, 2010.
- [10] I. Cojuhari, B. Izvoreanu, "Contributions of controllers tuning in the multiple - loop feedback control system with two contours with inertia," Proceedings of the 9 International Conference on Development and Application Systems DAS-2008, România, Suceava, pp. 50-53, 2008.
- [11] D. Moraru, "Reglarea numerică a regimului termic în cuptor în baza regulatorului industrial TPM 151 – 1," Materialele Conferinței Tehnico – Științifice a Colaboratorilor, Doctoranzilor și Studenților UTM, Chișinău: UTM, vol. I, pp. 160 - 163, 2010.

Servomechanism with Reduced Sensitivity by Uncertainty

A.R. MESAROSIU, I. PORUMB, R. BOTH

Department of Automatic Control

Technical University of Cluj-Napoca

G. Baritiu 26-28, 400027, Cluj-Napoca, Romania

Email:mesarosiu@gmail.com, columbulus@hostingsystem.eu

roxana.both@aut.utcluj.ro

Abstract — The reason for using servo systems in contrast to open loop systems includes the need for improved transient response times, reduced steady state errors and reduced sensitivity to load parameters. Improving the transient response time generally means increasing the system bandwidth, and faster response times means quicker settling allowing for higher machine throughput. Reducing the steady state errors relates to servo system accuracy. Finally, reducing the sensitivity to load parameters means the servo system can tolerate fluctuations in both the input and output parameters. Examples of output parameter fluctuation include a change in load inertia or mass.

Index Terms — control system, parameter migration, reduced sensitivity, servomechanism, uncertainty

REFERENCES

- [1] Prof. Dr. Ing. Clement Festila, “Optimum Speed and Acceleration Feedback for Simple Manipulators: Analysis by Simulation”.
- [2] S. Bal and R. Tagawa, “Load insensitive electrical position servo: A new design method and its experimental evaluation”.
- [3] Collins Radio Company, “Fundamentals of Single Side Band”, 2nd Edition, 1 September 1959, Chapter 6
- [4] Encyclopedia Britannica, www.britannica.com/EBchecked/topic/536030/servomechanism
- [5] Parker Hannifin, Electromechanical Automation Div. / 800-358-9070 / www.parkermotion.com

A GMDH Neural Network Approach to the Actuator Fault Diagnosis

Marcin MRUGALSKI and Marcin WITCZAK
*Institute of Control and Computation Engineering,
University of Zielona Góra,
ul. Podgórna 50, 65-246 Zielona Góra, Poland
{M.Mrugalski,M.Witczak}@issi.uz.zgora.pl*

Abstract — A real system often consists of multiple actuators and sensors, which cause the problem to clearly identify which of them was faulty. To solve such a challenging problem, the system outputs and inputs estimator based on a dynamic GMDH neural network in the state-space representation is proposed. In particular, the methodology of calculation of the adaptive thresholds for the diagnosed system inputs and outputs is presented. This result enables to perform robust fault detection and isolation of the sensors and actuators simultaneously. The final part of the paper presents an application study, which confirms the effectiveness of the proposed approach.

Index Terms — Fault diagnosis, robustness, actuators, neural networks, system identification.

REFERENCES

- [1] M. Blanke, M. Kinnaert, J. Lunze, and M. Staroswiecki, *Diagnosis and Fault-Tolerant Control*. New York: Springer-Verlag, 2003.
- [2] S. Ding, *Model-based Fault Diagnosis Techniques: Design Schemes, Algorithms, and Tools*. Berlin/Heidelberg: Springer-Verlag, 2008.
- [3] S. Gillijns and B. D. Moor, "Unbiased minimum-variance input and state estimation for linear discrete-time systems," *Automatica*, vol. 43, pp. 111–116, 2007.
- [4] R. Isermann, *Fault-Diagnosis Systems: An Introduction from Fault Detection to Fault Tolerance*. Heidelberg/Berlin: Springer-Verlag, 2005.
- [5] A. Ivakhnenko and J. Mueller, "Self-organizing of nets of active neurons," *System Analysis Modelling Simulation*, vol. 20, pp. 93–106, 1995.
- [6] S. Julier and J. Uhlmann, "Unscented filtering and nonlinear estimation," *Proceedings of the IEEE*, vol. 92, no. 4, pp. 401–422, 2004.
- [7] J. Korbicz and J. Kościelny, *Modeling, Diagnostics and Process Control: Implementation in the DiaSter System*. Berlin: Springer-Verlag, 2010.
- [8] J. Korbicz, J. Kościelny, Z. Kowalczyk, and W. Cholewa, *Fault Diagnosis. Models, Artificial Intelligence, Applications*. Berlin: Springer-Verlag, 2004.
- [9] J. Korbicz and M. Mrugalski, "Confidence estimation of gmdh neural networks and its application in fault detection system," *International Journal of System Science*, vol. 39, no. 8, pp. 783–800, 2008.
- [10] M. Ławryńczuk and P. Tatjewski, "Nonlinear predictive control based on neural multi-models," *International Journal of Applied Mathematics and Computer Science*, vol. 20, no. 1, pp. 7–21, 2010.
- [11] T. Lee and Z. Jiang, "On uniform global asymptotic stability of nonlinear discrete-time systems with applications," *IEEE Trans. Automatic Control*, vol. 51, no. 10, pp. 1644–1660, 2006.
- [12] L. Ljung, *System Identification: Theory for the User*. Upper Saddle River, New York: Prentice Hall PTR, 1999.
- [13] M. Mrugalski and J. Korbicz, "Gmdh neural networks," in *The Industrial Electronics Handbook*, 2nd ed., B. Wilamowski and J. Irwin, Eds. Boca Raton: CRC Press, Taylor Francis Group, 2011, vol. 5, pp. 8–1–8–21.
- [14] H. Noura, D. Theilliol, J. Ponsart, and A. Chamseddine, *Fault-tolerant Control Systems: Design and Practical Applications*. London: Springer-Verlag, 2009.
- [15] V. Palade, C. Bocaniala, and L. Jain, *Computational Intelligence in Fault Diagnosis*. London: Springer-Verlag, 2006.
- [16] K. Patan, "Local stability conditions for discrete-time cascade locally recurrent neural networks," *International Journal of Applied Mathematics and Computer Science*, vol. 20, no. 1, pp. 23–34, 2011.
- [17] R. Patton, P. Frank, and R. Clark, *Non-linear Systems Identification. From Classical Approaches to Neural Networks and Fuzzy Models*. Berlin: Springer-Verlag, 2000.
- [18] I. Peddle, "Discrete state space control," *Control Systems*, vol. 414, pp. 2–3, 2007.
- [19] B. Teixeira, L. Torres, L. Aguirre, and D. Bernstein, "On unscented kalman filtering with state interval constraints," *Journal of Process Control*, vol. 20, no. 1, pp. 45–57, 2010.
- [20] D. Theilliol, J. C'edric, and Y. Zhang, "Actuator fault tolerant control design based on reconfigurable reference input," *International Journal of Applied Mathematics and Computer Science*, vol. 18, no. 4, pp. 553–560, 2008.
- [21] M. Witczak, *Modelling and Estimation Strategies for Fault Diagnosis of Non-Linear Systems. From Analytical to Soft Computing Approaches*. Berlin: Springer-Verlag, 2007.
- [22] M. Witczak, J. Korbicz, M. Mrugalski, and R. Patton, "A gmdh neural network based approach to robust fault detection and its application to solve the damadics benchmark problem," *Control Engineering Practice*, vol. 14, no. 6, pp. 671–683, 2006.

Optimal Control System Synthesis Based on Multi-controllers Architecture

Victor ABABII, Ion BALMUS, Gheorghii CEBAN, Radu MELNIC

Technical University of Moldova

str.Stefan cel Mare nr. 168, MD-2004 Chisinau

ababii@mail.utm.md, balmus@mail.utm.md, ceban@mail.utm.md, rmelnic@mail.utm.md

Abstract — This paper offers a solution to the problem of optimal control system synthesis based on uniform multi-controller architecture. For this purpose the equations that describe the control system are decomposed into a set of homogeneous equations with the same complexity and the search for the minimum value of the functional optimization is done as a sequential iterative search using a set of one-dimensional equations. In order to ensure maximum efficiency, computational power of the optimal solutions management, is uniformly distributed on a set of computing architecture controllers. AVR ATmega16 microcontrollers and industrial network standard I²C series were used to study the behavior of the control system. In the design process there where developed: math models, the structure of the control system, data protocol, the behavioral algorithm and the circuit of the control system based on four microcontrollers. The functionality of the system and convergence of the results were verified with environment design Proteus 7.6.

Index Terms — control system, optimal control, multi-controller architecture, I²C bus.

REFERENCES

- [1] A. A. Agrachev, Yu. L. Sachkov, Lectures on geometric control theory, Trieste, SISSA preprint, 2001.
- [2] A. A. Agrachev, Introduction to Optimal Control Theory, Trieste, SISSA preprint, 2001.
- [3] Henry, John L., and David A. Patterson. "Multiprocessing and Thread level Parallelism". Computer Architecture. ed. 3rd. Singapore: Elsevier Pte. Ltd, 2003.
- [4] <http://easyelectronics.ru/interface-bus-iic-i2c.html> (citation 20.03.2012)
- [5] <http://www.atmel.com/products/microcontrollers/> (citation 20.03.2012)
- [6] <http://www.labcenter.com/index.cfm> (citation 28.03.2012)

Power Spectral Density of MB 810 Code

Nicolae Dumitru ALEXANDRU
"Gheorghe Asachi" Technical University of Iași
Bd. Carol I No.11, RO-700506 Iași, Romania
nalex@etti.tuiasi.ro

Abstract — The MB 810 is a new line code which is DC-free and has the spectrum bounded within Nyquist band. Due to its complexity, no spectral analysis was successful so far.

The present paper investigates its spectral properties and determines an explicit formula for the coding factor and power spectral density for the equiprobable case ($p = 1-p = 0.5$), where p is the probability of a mark at the coder input. No closed-formula was obtained yet for a generic value of p , taking into account the big complexity of the encoding circuit (12 states, each with 256 possible inputs).

Index Terms — codes, communication systems, encoding, optical fiber transmission, spectral analysis.

REFERENCES

- [1] Changoo Lee, Hyeong Ho Lee, Hae Won Jung, Dae Young Kim, Jung Whan Kim, "A New Line Code for 10-Gigabit Ethernet: MB810", ICC 2000, pp.1774-1777
- [2] D. Y. Kim and Jae Kyoon Kim, "A condition for stable minimum-bandwidth line codes", IEEE Trans. Commun., vol. COM-33. No.2, pp.152-157, Febr. 1985.
- [3] Dae Young Kim, Changoo Lee, Chun Sik Shin, Hae Won Jung, and Hyeong Ho Lee, "White Paper on the MB810 Line Code for 10GbE", http://www.ieee802.org/3/10G_study/public/sept99/kim_1_0999.pdf
- [4] Changoo Lee, Hyeong Ho Lee, Dae Young Kim, Insun Park, and WanKee Lee, "A Comprehensive Grasp on MB810", Available: http://www.ieee802.org/3/ae/public/jul00/lee_1_0700.pdf
- [5] D. Y. Kim, "K3B4 Code for High-Speed Binary Signaling over Fiber Optic Links," *Proc. JCCW*, pp. 397-408, Tokyo, July 13-15, 1989.
- [6] A Method And Apparatus For Encoding MB810 Line Code with the Characteristics of Minimum Bandwidth and DC-Free, US Patent US 6362757 B1, 26-Mar-2002
- [7] N.D. Alexandru, G. Morgenstern, Digital Line Codes and Spectral Shaping. Editura Matrix ROM, București, 1998
- [8] N.D. Alexandru, Dae Young Kim, Spectral Shaping via Coding. CERMI, Iasi, 2003
- [9] http://grouper.ieee.org/groups/802/3/10G_study/public/sept99/kim_1_0999.pdf

Integration of a CAN bus in an Onboard Computer for Space Applications

Stijn WIELANDT, Geoffrey OTTOY, Jean-Pierre GOEMAERE,
Nobby STEVENS and Lieven De STRYCKER
DraMCo research group,
Catholic University College Ghent, Association KULeuven
Gebroeders Desmetstraat 1, 9000 Ghent, Belgium
stijn.wielandt@kahosl.be, info@dramco.be

Abstract — The integration of CAN bus networks in space applications has gained interest over the past years because of its high reliability and cost effectiveness. The bus has already been integrated in some low earth orbit satellites with commercial off-the-shelf components, but the harsh environment in deep space demands a more reliable solution. That is why a radiation hardened design of a CAN transceiver and a CAN controller is being investigated. The transceiver is constructed with a radhard RS-485 transceiver and the CAN controller is implemented in a radhard FPGA by means of VHDL IP cores. For this paper, a CAN IP core from Gaisler Research is selected and implemented in an FPGA. Eventually, this design was successfully tested in simulations of a VHDL test bench as well as in a hardware test bench. These tests proved the fitness of the CAN controller for use in deep space applications.

Index Terms — Data buses, Hardware design languages, Integrated circuit radiation effects, Space vehicle computers, Transceivers

REFERENCES

- [1] ISO 11898-1:2003 - Road vehicles —Controller area network (CAN)— Part 1: Data link layer and physical signalling. 2003.
- [2] MIL-STD-1553b: Aircraft internal time division command/response multiplex data bus. 1979.
- [3] ESA OBDH TTC-B-01: Spacecraft Data Handling Interface Standards. 1978.
- [4] ECSS_Q_ST_60_02 Working Group. Space product assurance: ASIC and FPGA development. Technical report, ESA-ESTEC, 2008.
- [5] Bosch, R. CAN specification version 2.0. 1991.
- [6] BS EN 50325-4: Industrial communication subsystem based on ISO 11898 (CAN) for controller-device interfaces. CANopen. 2002.
- [7] Onboard bus LAN working group,. Recommendations for CAN bus in spacecraft onboard applications, Draft 2.1. Technical report, ECSS, 2005.
- [8] Woodroffe, A. and Madle, P. Application and Experience of CAN as a low cost OBDH bus system. *Data systems in aerospace, 2004. Proceedings.*, 2004.
- [9] Klaus Janschek and Annerose Braune. Application of industrial CAN bus technology for LEO-satellites. *Acta Astronautica*, 46(2-6):313 - 317, 2000. 2nd IAA International Symposium on Small Satellites for Earth Observation.
- [10] Khurram, M. and Zaidi, S.M.Y. CAN as a spacecraft communication bus in LEO satellite mission. *Recent Advances in Space Technologies, 2005. RAST 2005. Proceedings of 2nd International Conference on*, pages 432 - 437, 2005.
- [11] Jun Yang and Tao Zhang and Jingyan Song and Hanxu Sun and Guozhen Shi and Yao Chen. Redundant design of A CAN BUS Testing and Communication System for space robot arm. *Control, Automation, Robotics and Vision, 2008. ICARCV 2008. 10th International Conference on*, pages 1894 -1898, 2008.
- [12] Tai, A.T. and Chau, S.N. and Alkalai, L. COTS-based fault tolerance in deep space: Qualitative and quantitative analyses of a bus network architecture. *High-Assurance Systems Engineering, 1999. Proceedings. 4th IEEE International Symposium on*, pages 97 -104, 1999.
- [13] Savio Chau. Experience of using COTS components for deep space missions. *High-Assurance Systems Engineering, 1999. Proceedings. 4th IEEE International Symposium on*, pages 116, 1999.
- [14] Dr. Emrich, A. CAN application in avionics. Technical report, Omnisys Instruments, ESTEC, 2001.
- [15] ANSI/TIA 485-A1998, Electrical Characteristics of Generators and Receivers for Use in Balanced Digital Multipoint Systems. 2003.
- [16] Plummer, C. and Roos, P. and Stagnaro L. CAN bus as a spacecraft onboard bus. *Data systems in aerospace, 2003. Proceedings.*, pages 51 - 62, 2003.
- [17] Tortosa Lopez, F. and Plummer, C. and Roos, P. and Stagnaro L. and Storni, B. The CAN bus in spacecraft on board applications. *Data systems in aerospace, 2004. Proceedings.*, 2004.

Enhanced Network Based Model for Measuring Online Games Quality of Experience

Dorel PICOVICI¹, David DENIEFFE¹, Zenun KASTRATI²

¹*Institute of Technology Carlow, School of Engineering, Carlow, Ireland*

²*Univesity of Prishtina, Mother Teresa Avenue 9, Prishtina, Kosovo*

Abstract— This paper describes an enhanced network based model for measuring online games quality of experience. The proposed model is in line with existent model currently used for telecommunications network planning assessment. Most of the existent game quality assessment models take into consideration mainly network impairments, therefore the measured games quality of experience is only correlated with the network impairments. In addition to the traditional network-based parameters such as delay, jitter and packet loss, the model described in this paper, is using new parameters based on end-user assessment. The aims are to estimate game quality as perceived by an online game player. In order to validate and calibrate the proposed model a subjective game quality assessment is also developed. Two 5-point scales are introduced: a game-quality scale and a game playing-effort scale. The mean average of each scales termed, as Mean Opinion Score (MOS), will indicate the game quality of experience (MOSGQE) and the playing-effort required (MOSGPE). Reported evaluation results indicate a high level of correlation when compared with other algorithms. Comparative results have been carried out for three online games.

Keywords: Online game quality of experience measurement, objective/subjective game quality assessment, end-user experience estimation.

REFERENCES

- [1] ITU-T Recommendation G. 107. The E-model, a Computational Model for use in Transmission Planning. Geneva, March 2003.
- [2] G. Armitage, Sensitivity of Quake 3 Players to Network Latency, Poster Session, SIGCOMM Internet Measurement Workshop, San Francisco, November 2001.
- [3] G. Armitage, L. Stewart, Thoughts on Emulating Jitter for User Experience Trials, Proceedings of NetGames 2004 Workshop, ACM SIGCOMM2004, Portland, Oregon, USA, August 2004.
- [4] A.F. Wattimena, R.E. Kooij, J.M. Van Vugt, O.K. Ahmed, Predicting the perceived quality of a First Person Shooter: the Quake IV G-model. Proceedings of NetGames 2006, Singapore, October 2006.
- [5] 2006 Essential Facts about the Computer and Video Game Industry, Entertainment Software Association, E3, May 2006. <http://www.theesa.com/archives/files/Essential%20Facts%202006.pdf>
- [6] M. Oliveira, T. Henderson, What Online Gamers Really Think of the Internet, Proceedings of NetGames 2003, Redwood City (California), USA, May 2003.
- [7] Martin Mauve. How to Keep a Dead Man from Shooting. Proc. of the 7th International Workshop on Interactive Distributed Multimedia Systems and Telecommunication Services (IDMS) 2000, Enschede, The Netherlands, 199-204 October 2000.
- [8] Uvicom White Paper, OPScore or Online Playability Score: A Metric for Playability of Online Games with Network Impairments, 2005. <http://www.ubicom.com/news/whitepapers/whitepapers.html>
- [9] M. Dick, O. Wellnitz, and L. Wolf Analysis of Factors Affecting Players' Performance and Perception in Multiplayer Games, 4th Workshop on Network & System Support for Games (NetGames'05), 1-7.
- [10] G.Armitage, M.Claypool, P.Branch, "Networking and Online Games - Understanding and Engineering Multiplayer Internet Games," John Wiley & Sons, UK, April 2006.
- [11] Fedora operating system. <http://www.fedoraproject.org>
- [12] NCTUns Network Simulator and Emulator, <http://nsl10.csie.nctu.edu.tw/>
- [13] Wireshark network protocol analyzer <http://www.wireshark.org>.
- [14] T. Lang, G.J. Armitage, P. Branch, H. Choo, "A Synthetic Traffic Model for Half-Life," Australian Telecommunications Networks & Applications Conference 2003, Melbourne (ATNAC 2003), Australia, December 2003.
- [15] T. Lang, P. Branch, and G. Armitage, A Synthetic Traffic Model for Quake 3, Proc. of Int. Conference on Advances in computer entertainment technology, (2004), 233-238.

The Design and Implementation of HF RFID Loop Antenna for Metallic Environments

Ilie FINIS, Valentin POPA, Alexandru LAVRIC, Adrian-Ioan PETRARIU, Stefan SFICHI

"Stefan cel Mare" University of Suceava
str.Universitatii nr.13, RO-720229 Suceava
ifinis@eed.usv.ro

Abstract—One of the very important factors that may influence and affect the performance of RFID systems and particularly of those using passive tags, consists in the effects of the metallic environments in the proximity of the antenna. For those RFID systems that operate at low frequencies (125 kHz) these effects are less common but, as the frequency increases, interferences increase as well, causing a frequency shift between the antenna and that particular system. In order to alleviate a part of these issues, both the device antennas and their impedance matching units must be optimized. This paper presents a mathematical model that enables the identification of the optimal size of an HF RFID antenna that would encompass the coordinates of a given surface. The antenna has been mathematically modeled, simulated and tested for a specific situation when the metal plate is positioned in its close proximity (approximately 2cm).

Index Terms—RFID, Metal environments, tag, loop antenna

REFERENCES

- [1] K. D'Hoe et al., "Influence of Different Types of Metal Plates on a High Frequency RFID Loop Antenna: Study and Design," *Advances in Electrical and Computer Engineering*, vol. 9, no. 2, pp. 3-8, 2009.
- [2] D'hoë, K., Van Nieuwenhuysse, A., Ottoy, G., Goemaere, J.-P., & De Strycker, L. (2009). A New Low-Cost HF RFID Loop Antenna Concept for Metallic Environments. 2009 16th International Conference on Systems, Signals and Image Processing, (2), 1-5. Ieee. doi:10.1109/IWSSIP.2009.5367785;
- [3] H. Zhu, S. Lai, and H. Dai, "Solutions of Metal Surface Effect for HF RFID Systems," 2007 International Conference on Wireless Communications, Networking and Mobile Computing, no. 1, pp. 2089-2092, Sep. 2007;
- [4] X. Qing and Z. N. Chen, "Characteristics of a Metal-Backed Loop Antenna and its Application to a High-Frequency RFID Smart Shelf," *IEEE Antennas and Propagation Magazine*, vol. 51, no. 2, pp. 26-38, Apr. 2009;
- [5] P.-yi Lau, K. Kin, O. Yung, E. Kai, and N. Yung, "A Smart Bookshelf for Library RFID System," *Electronics*, pp. 3-6, 2008;
- [6] P. Li, Y. L. Lu, and W. Liu, "RFID high frequency 3-dimensional loop antenna analysis and design," 2009 IEEE/ASME International Conference on Advanced Intelligent Mechatronics, pp. 1119-1123, Jul. 2009;
- [7] X. Qing, Z. N. Chen, and A. Cai, "Multi-loop Antenna for High Frequency RFID Smart Shelf Application," *Science*, pp. 5467-5470, 2007.
- [8] X. Wang, H. Wang, and G. Wang, "Distributed High-Frequency RFID Antennas for Smart Storage Racks," 2010 Second International Conference on Networks Security, Wireless Communications and Trusted Computing, pp. 472-474, 2010;
- [9] P. Li, Y. L. Lu, and W. Liu, "RFID high frequency 3-dimensional loop antenna analysis and design," 2009 IEEE/ASME International Conference on Advanced Intelligent Mechatronics, pp. 1119-1123, Jul. 2009;
- [10] A.-I. PETRARIU, V. POPA, V.-G. GAITAN, I. FINIS, "Test results for HF RFID antenna system tuning in metal environment", *Carpathian Control Conference (ICCC)*, 2012 13th International, (unpublished).
- [11] Petrariu Adrian-Ioan, PopaValentin, GaitanVasile-Gheorghita, Finis Ilie, Lavric Alexandru, 13.56 MHz RFID multi-turn antenna for metallic environments, *European Conference on the Use of Modern Information and Communication Technologies 5th Edition" ECUMICT 2012*, Gent, Belgium;
- [12] Finis Ilie, Popa Valentin, Petrariu Adrian-Ioan, Lavric Alexandru, Gaitan Adrian-Mihai Smart shelves architecture for warehouse management using HF RFID, *European Conference on the Use of Modern Information and Communication Technologies 5th Edition" ECUMICT 2012*, Gent, Belgium;
- [13] Klaus Finkenzeller, "RFID Handbook: Fundamentals and Applications in Contactless Smart Cards and Identification, Second Edition", John Wiley & Sons, Ltd., 2003;
- [14] W. M. Frixand G. G. Karady, "A Circuitual Approach to Estimate the Magnetic Field Reduction of Nonferrous Metal Shields," vol. 39, no. 1, pp. 24-32, 1997.
- [15] Design of an RFID loop antenna in non-ideal conditions, D'hoë Kevin, Stevens Nobby, Goemaere Jean-Pierre, De Strycker Lieven, Nauwelaers Bart, *ECUMICT edition:4 location: Ghent, Belgium 2010*;
- [16] Texas Instruments, "RI-I02-112A-03- HF-I Plus Transponder", 2010;
- [17] E. Weber, "Electromagnetic Theory", Dover, p.131-135, 1965
- [18] I. Finis, V. Popa, A. Lavric, A.-I. Petrariu and C. Males, An Analytical Determination of the Reading Volume for an HF RFID Antenna, *Conference on Future Internet Communications BCFIC 2012*, Vilnius, Lithuania (unpublished).

Energy-Detection Based UWB Demodulator with a Supplementary Integration Block

Adrian POPA

"Gheorghe Asachi" Technical University of Iași
Bd. Carol No.11, RO-700.506 Iași, Romania
apopa@etti.tuiasi.ro

Abstract — In this paper it is investigated the non-coherent demodulation of the 2PPM modulated UWB signal, based on energy-detection. This type of demodulation leads to a simple receiver architecture, low power consumption and the benefit of multipath energy capture. However, this technique is very sensitive to noise and channel interference. To minimize this drawback, optimizations have been proposed with respect to the reduction of the integration windows size and bandwidth of input matched filter.

Instead of reducing the integration windows size, the adding of a second integration block is proposed. In this way, a similar effect is obtained by progressive accumulation of energy, the front-side useful signal having a better gain in comparison to later noise signal.

The simulations show an improvement in bit error rate performance relative to the basic method of energy-detection.

Index Terms — ultra-wideband communications, pulse-position modulation; non-coherent detection, ultra-wideband; non-coherent; energy detection; bit-error-rate.

REFERENCES

- [1] IEEE802.11 Task Group 3a. Online Available on <http://www.ieee802.org/15/pub/>
- [2] Tuan Phan, J. Lee, V. Krizhanovskii, Quan Le, S.Han, "Energy-Efficient Low-Complexity CMOS Pulse Generator for Multiband UWB Impulse Radio", IEEE Trans. on Circuits and Systems, 2008: 3552~3563
- [3] Tian, Z.; Sadler, B.M, "Weighted energy detection of ultra-wideband signals", in Signal Processing Advances in Wireless Communications, 2005 IEEE 6th Workshop
- [4] Krebesz, T.; Kolumban, G.; Tse, C.K.; Lau, F.C.M.; "Improving the noise performance of energy detector based UWB systems by optimizing the receiver parameters", ISICIT 2009 Proceedings
- [5] M. Wolf and N. Song, "Chapter 5: Non-Coherent Detection", in *Short-Range Wireless Communications: Emerging Technologies and Applications* John Wiley & Sons, Jan. 2009.
- [6] N. Song, M. Wolf, and M. Haardt, "Low-complexity and Energy Efficient Non-coherent Receivers for UWB Communications, " in *Proc. PIMRC07*, (Athens, Greece), September 2007
- [7] Lucian Stoica, "Non-coherent energy detection transceivers for Ultra Wideband Impulse radio systems" University of Oulu, Finland 2008
- [8] S. Mekki, J. Boutros, J. Danger, B. Miscopain, "EM algorithm development for M-PPM UWB Demodulation based on Energy Detection", European UWB Workshop 2007, Grenoble
- [9] Sorin Pohoată, Adrian Popa, Nicolae Dumitru Alexandru, "Approximation of the third derivative of the Gaussian pulse", 10th International Symposium on Signals, Circuits and Systems (ISSCS), 2011, Iasi, Romania
- [10] Gerosa A., Dalla Costa M, Bevilacqua A, Vogrid D., Neviani A., "An Energy-Detector for Non-Coherent Impulse-Radio UWB Receivers", in Conf. Proceedings ISCAS, Seattle, USA. May 18-21, 2008
- [11] Adel A. M. Saleh and Reinaldo A. Valenzuela, "A Statistical Model for Indoor Multipath Propagation", IEEE J. in communications, vol. sac-5, No.2, February 1987
- [12] M. J. Hao and S. B. Wicker, "Performance evaluation of FSK and CPFSK optical communication systems: a stable and accurate method," Journal of lightwave technology, no. 13, pp. 1613–1623, 1995

Remote Cardiac Arrhythmia Monitoring System Using Wireless Sensor Networks

Cristian ROTARIU, Vasile MANTA, and Razvan CIOBOTARIU
"GHEORGHE ASACHI" TECHNICAL UNIVERSITY OF IASI
Dimitrie Mangeron no. 27, RO-700050
cr.rotariu@yahoo.com

Abstract — In this paper is described the realization of a cardiac arrhythmia monitoring system using wireless sensor networks. The proposed system is able to measure and transmit to a central monitoring station the heart rate (HR). The system can be used for long-time continuous patient monitoring, as medical assistance of a chronic condition, as part of a diagnostic procedure, or recovery from an acute event. The HR are continuously measured using a custom developed devices and then transferred to central monitoring station via a wireless sensor network (WSN). The central monitoring station runs a patient HR monitor application that receives the HR from WSN and activates the alarms when a heart rate arrhythmia is detected. A user-friendly Graphical User Interface was developed for the HR monitor application to display the received measurements from the monitored patients. A prototype of the system has been developed, implemented and tested.

Index Terms — cardiac arrhythmia, heart rate, low power, remote patient monitoring, wireless sensor networks

REFERENCES

- [1] A. Milenkovic, C. Otto, E. Jovanov, "Wireless sensor networks for personal health monitoring: Issues and an implementation", Computer Communications (Special issue: Wireless Sensor Networks: Performance, Reliability, Security, and Beyond, Vol. 29, pp. 2521-2533, 2006.
- [2] C. Rotariu, H. Costin, et al., "An Integrated System for Wireless Monitoring of Chronic Patients and Elderly People", in Proceedings of the 15th International Conference on System Theory, Control and Computing, ISBN:978-973-621-323-6, pp.527-530, 2011.
- [3] eZ430RF2500 Development Tool User's Guide, MSP430 Wireless Development Tool, <http://www.ti.com/tool/ez430-rf2500>
- [4] C. Rotariu, H. Costin, D. Arotaritei, and B. Dionisie, "A Wireless ECG Module for Personal Area Network", Buletinul Institutului Politehnic din Iasi, Tome LIV (LVIII), Fasc.1, (2008), Automatic Control and Computer Science Section, pp. 45-54, 2008.
- [5] MSP430, <http://www.ti.com/lit/ds/symlink/msp430f2274.pdf>
- [6] CC2500, <http://www.ti.com/lit/ds/symlink/cc2500.pdf>.
- [7] TPS60204, <http://www.ti.com/product/tps60204>.
- [8] SimpliciTI, <http://www.ti.com/tool/simpliciti>
- [9] B. Kohler, C. Hennig and R. Orglmeister, "The Principles of software QRS Detection – reviewing and Comparing Algorithm for Detecting this Important ECG Waveform", IEEE Eng. in Medicine and Biology, Jan-Feb, 2002.
- [10] J. Pan and W.J. Tompkins, "A real-time QRS detection algorithm," IEEE Trans. Biomed. Eng., vol. BME-32, pp. 230-236, 1985.
- [11] P.S. Hamilton and W.J. Tompkins, "Quantitative investigation of QRS detection rules using the MIT/BIH arrhythmia database," IEEE Trans. Biomed Eng., vol. BME-33, pp. 1157-1165, 1986.
- [12] P.S. Hamilton, Open Source ECG Analysis Software, E. P. Limited, Somerville, Mass, USA, 2002, <http://www.eplimited.com/osea13.pdf>.

Introducing ACE in distributed systems for monitoring and process control

Elisabeta TATULESCU, Vasile Gheorghita GAITAN, Andrei Valeriu SMOLENIC
Simona Anda GHERASIM, Mihai Florentin URSULEANU
*Stefan cel Mare University, Department of Computers- Electronics - Automation
Suceava, Romania
elisabetat@eed.usv.ro*

Abstract — In this paper is described the realization of a cardiac arrhythmia monitoring system using wireless sensor networks. The proposed system is able to measure and transmit to a central monitoring station the heart rate (HR). The system can be used for long-time continuous patient monitoring, as medical assistance of a chronic condition, as part of a diagnostic procedure, or recovery from an acute event. The HR are continuously measured using a custom developed devices and then transferred to central monitoring station via a wireless sensor network (WSN). The central monitoring station runs a patient HR monitor application that receives the HR from WSN and activates the alarms when a heart rate arrhythmia is detected. A user-friendly Graphical User Interface was developed for the HR monitor application to display the received measurements from the monitored patients. A prototype of the system has been developed, implemented and tested.

Index Terms — cardiac arrhythmia, heart rate, low power, remote patient monitoring, wireless sensor networks

REFERENCES

- [1] X. Hong, W. Jianhua, „Using standard components in automation industry: A study on OPC Specification,” *Computer Standards & Interfaces* 28, pp. 386 - 395 , 2006.
- [2] C. Sahin, E. D. Bolat, „Development of remote control and monitoring of web - based distributed OPC system,” *Computer Standard & Interfaces* 31, pp. 984 - 993, 2009.
- [3] S. Cavalieri, G. Cutuli, S. Monteleone, „Evaluating Impact of Security on OPC UA Performance,” *Human System Interactions*, pp. 687 - 694, 2010.
- [4] S. Cavalieri, G. Cutuli, „Performance Evaluation of OPC UA,” *Emerging Technologies and Factory Automation*, pp. 1 - 8, 2010.
- [5] L. Huiming, Y. Zhifeng, „Research on Key Technology of the Address Space for OPC UA Server,” *Advanced Computer Control*, pp. 278 - 281, 2010.
- [6] A. Girbea, R. Demeter, F. Sisak, „Automatic address space generation for an OPC UA server of a flexible manufacturing system,” *6th IEEE International Symposium on Applied Computational Intelligence and Informatics*, pp. 483 - 488, 2011.
- [7] S. M. YACOUB, H. H. AMMAR, *Pattern-Oriented Analysis and Design: Composing Patterns to Design Software Systems*, Addison Wesley, 2003.
- [8] D. C. Schmidt, „The ADAPTIVE Communication Environment An Object - Oriented Network Programming Toolkit for Developing Communication Software,” *CONFERENCE*, pp. 214--225, 1993.
- [9] N. C. Gaitan, V. G. Gaitan, St. Ghe. Pentiuc, I. Ungurean, E. Dodi, „Middleware Based Model of Heterogeneous Systems for SCADA Distributed Applications,” *Advances in Electricl and Computer Engineering*, pp. 121 - 124, 2010.
- [10] V. G. Gaitan, V. Popa, C. Turcu, N. C. Gaitan, I. Ungurean, „The Uniform Engineering of Distributed Control Systems Using the OPC Specification,” *vol. 8*, 2008.

Address Space Analysis for Middleware Application based on OPC UA

Simona-Anda GHERASIM, Vasile G. GAITAN, Adrian M. GAITAN,
Elisabeta TATULESCU, Daniel SIMION, Mihai F. URSULEANU
*”Stefan cel Mare” University of Suceava,
str.Universitatii nr.13, RO-720229 Suceava
sgherasim@stud.usv.ro*

Abstract — One of the most difficult requirements of applications in automation industry is data transfer. This data transfer is done through a middleware. The researchers have studied various solutions for the transfer of information to be provided in a reliable manner by another application. This paper presents a middleware architecture made for monitoring and controlling industrial processes.

Index Terms — address space; informational model; hierarchical types; middleware application; OPC specifications.

REFERENCES

- [1] Frank Iwanitz, Jurgen Lange. OPC Fundamentals, Implementation and Application, . Heidelberg - Huthig: 2nd rev. Edition, ISBN 3-7785-2883-1, 2002.
- [2] Wolfgang Mahnke, Stefan-Helmut Leitner, Matthias Damm. OPC Unified Architecture, Springer – Verlag Berlin Heidelberg, 2009.
- [3] OPC-Foundation. OPC UA Specification: (Part 1-11) – Concepts. Version 1.00., July 28, 2006.
- [4] OPC-Foundation. OPC UA Specification: (Part 1-11) – Concepts. Version 1.00., July 28, 2006.
- [5] OPC-Foundation. OPC UA Specification: Part 3 – Address Space Model. Version 1.00. July 28, 2006.
- [6] Găitan Gheorghîță Vasile, Dănilă M. G., Robu M. G., Găitan N. C. MCPI – a HMI Application for Monitoring and Controlling Industrial Processes. . Suceava-Romania: The 9th International Conference on Development and Application Systems, ISSN 1844-5020, pp.32-37., 2008.
- [7] Simona-Anda GHERASIM, Vasile Gheorghîță GĂITAN, Daniel SIMION, Address Space Modeling for a New Generation of Middleware - A Review, . Universitatea „Ștefan cel Mare” Suceava, România: Seminarului Științific național „Sisteme Distribuite”, 2011.

Modified Advanced Encryption Standard

Luminița SCRIPCARIU and Mircea-Daniel FRUNZĂ
Technical University "Gheorghe Asachi" of Iasi, Romania
11 Carol I Blvd, RO – 700506 Iasi
luminita.scripcariu@gmail.com, mircea.frunza@gmail.com

Abstract — Information security becomes an important issue of the communication networks. Different cryptographic algorithms are used to ensure the confidentiality of the transmitted information: public-key algorithms, such as RSA (Rivest, Shamir, Adleman), IDEA (International Data Encryption Algorithm) or El-Gamal, and secret-key algorithms, such as DES (Data Encryption Standard), TDES (Triple DES) and AES (Advanced Encryption Standard) [1]. Some of them works binary (DES, TDES), RSA uses decimal numbers; others are defined on finite algebraic fields. The most powerful is considered to be AES, which uses 128, 192 and 256-bit encryption keys. The known attacks against AES are not yet successful but it is a matter of time till breaking AES will be possible. Computing technology evolves quickly and all known encryption algorithms are intensively studied by the cryptanalysts in order to develop efficiently attack methods. So, it is necessary to make AES more robust and one way to do this is to increase the encryption key length to 384, 512, 768 and 1024 bits. This involves larger data structures and also larger algebraic fields. We propose and present the modified AES algorithm, defined on GF (256), on data matrices of 8*6, 8*8, 8*12 and 8*16 bytes.

Index Terms — Data security, Data structures, Cryptography

REFERENCES

- [1] B. Schneier, "Applied cryptography", second edition, NY: John Wiley & Sons, Inc., 1996
- [2] J.G. Proakis, D.G. Manolakis, "Introduction to Digital Signal Processing", MacMillan Publishing Company, 1988
- [3] L. Scripcariu, S. Ciornei, "Improving the Encryption Algorithms Using Multidimensional Data Structures", Proceedings of the Third European Conference on the Use of Modern Information and Communication Technologies, ECUMICT 2008, Gent (Belgium), pp. 375 – 384, Mar. 2008.
- [4] B.D. Hahn, D.T. Valentine, "Essential MATLAB for Engineers and Scientists, 4e", Academic Press, 2010
- [5] L. Scripcariu, A. Alistar, M.D. Frunza, "JAVA Implemented Encryption Algorithm", Proceedings of the 8th Int. Conference "Development and Application Systems", Suceava, DAS 2006, pp. 424-429, May 2006.

An Original Movement Monitoring System for the Elderly using a WSN protocol

Stefan SFICHI, Adrian GRAUR, Valentin POPA, Ilie FINIS, Adrian-Ioan PETRARIU

"Stefan cel Mare" University of Suceava
str.Universitatii nr.13, RO-720229 Suceava
stefans@eed.usv.ro

Abstract — In order to build a new low power application for detecting and identifying people inside a living area, a new Passive Infrared (PIR) - ZigBee system has been designed. The system works on the well-known Infrared detection principle connected through a WSN network. This paper presents the working principle and the logical diagram implementation for the entire network programming components and the whole system. The system must function with very low power consumption and has to be modular and easy to set up. This article shows also how the PIR - ZigBee combination can detect irregular behavior of the person. The system will be coupled to a device that can learn the habits of the individual. All the requirements are followed by the logical diagram.

Index Terms — detection system, PIR, logical diagram, low power, ZigBee.

REFERENCES

- [1] Galvin, Aaron A.; Guscott, John K. (1982) "Passive Infrared Detector", US Patent 4,321,594,
- [2] Barry, T., Fuller, G., Hayatleh, K., Lidgey, J., "Self-Calibrating Infrared Thermometer for Low-Temperature Measurement", ISSN: 0018-9456, pp 2047-2052
- [3] Kinney, Patrickm (2003) "ZigBee Technology: Wireless Control that Simply Works",
- [4] <http://www.zigbee.org/Standards> – December 2011,
- [5] Baronti, P.; Pillai, P.; Chook V. W. C.; Chessa, S.; Gotta, A. (2006) "Wireless Sensor Networks: A Survey on the State of the Art and the 802.15.4 and ZigBee Standards", pp 1-6
- [6] Lee, W. (1994) "Wide-Angle Passive Infrared Radiation Detector" US Patent,
- [7] Asada, G.; Dong, M.; Lin, T. S.; Newberg, F.; Pottie, G.; Kaiser, W. J. (1998) "Wireless Integrated Network Sensors: Low Power System on a Chip" pp 1-8
- [8] Gao, T.; Greenspan, D., Welsh, M.; Juang, R.R.; Alm, A. (2005) "Vital Signs Monitoring and Patient Tracking Over a Wireless Network",
- [9] Tavori, I. (1998) "Portable Vital Signs Monitor", US Patent 5,724,025,
- [10] Arnim, A. von; Arief, B.; Fusee, A. (2008) "Cooperative Road Sign and Traffic Light Using Near Infrared Identification and ZigBee Smartdust Technologies", pp 4-9
- [11] <http://www.wi-ltd.com/security>
- [12] Lavric A., Popa V., Finis I., Males C., Gaitan A.M., An original lighting monitoring and control system using Wireless Sensor Networks, ECUMICT 2012
- [13] M. Cerny, Movement Monitoring in the HomeCare System, 2009

Performance analysis of TCP and UDP using Opnet Simulator

Ioan FITIGAU¹, Gavril TODEREAN²

*Department of Communication, Faculty of Electronics, Telecommunications and Information
Technology, Technical University of Cluj-Napoca, str. Gorge Baritiu nr.26-28, Cluj-Napoca
¹ioan.fitigau@com.utcluj.ro; ²toderean@pro3soft.ro*

Abstract — the transport layer protocols provide connection-oriented sessions and reliable data delivery services. This paper seeks to reflect a comparative analysis between the two transport layer protocols, which are TCP/IP and UDP/IP, as well to observe the effect of using these two protocols in a client server network. The similarities and differences between TCP and UDP over the Internet are also presented in our work. We implement a network structure using Opnet Modeler and finally, based on the practical results obtained we present the conclusions-showing the difference between these two protocols and how they work.

Index Terms — Computers, Internet, Network, Protocols, Testing.

REFERENCES

- [1] RFC 793, Transmission Control Protocol, September 1981.
- [2] RFC 768, User Datagram Protocol, August 1980.
- [3] Andrew S. Tanenbaum, "Computer Networks, 3rd ed.
- [4] Peter Norton, Dave Kearns, "Retele de calculatoare", Ed. Teora.
- [5] D. Comer, "Internetworking with TCP/IP", vol.3: Client-Server Programming and Applications, Prentice Hall, New Jersey, 1993.
- [6] Prokkola, "Simulations and Tools for Telecommunications", Opnet-Network Simulator, 2006.
- [7] J. Martin, J. Leben, "TCP/IP Networking", Prentice Hall, New Jersey, 1994.
- [8] Sheldon Tom, McGraw-Hill "Encyclopedia of Networking and Telecommunications", New York, 2001.
- [9] Jingyi He., S.H. Gary Chan, "TCP and UDP performance for Internet over optical packet-switched networks", 10 april, 2004.
- [10] Andro Milanović, Sinisa Srblijić and Vlado Struk, "Performance of UDP and TCP Communication on personal computers".
- [11] R. Les Cottrell, Saad Ansari, Parakram Khandpur, Ruchi Gupta, Richard Hughes-Jones, Michael Chen, Larry McIntosh, "Characterization and evaluation of TCP and UDP- based transport on real networks".
- [12] Xiangning Liu, Lebin Cheng, Bharat Bhargava, Zhiyuan Zhao, "Experimental study of TCP and UDP protocols for future distributed databases", Department of Computer Sciences, Purdue University, july, 1995.
- [13] Charles R. Simpson, Dheeraj Reddy, George F. Riley, "Empirical models of TCP and UDP end-user network traffic from NETI@home data analysis", Georgia Institute of Technology, Atlanta, Georgia.
- [14] Mostfa M. Kaytan, "TCP versus UDP performance in term of bandwidth usage", University Utara Malaysia, 2010.
- [15] <http://www.linktionary.com/u/udp.html>.

An Overview on WiMAX Security Weaknesses/Potential Solutions

Daniel SIMION, Mihai-Florentin URSULEANU, Adrian GRAUR
Stefan cel Mare University of Suceava
dasimion@eed.usv.ro

Abstract — Nowadays anyone from anywhere in the all world can access all types of data with a high level of QoS. The wireless industry continues to change day by day, tending to use the equipment more easily and safely and with a connection speed that tends to be higher and higher. But this mobility has its price. Intruders or illegitimate users can access important data and data is money. For this reason technologies used in data transmission need extra data security. Even if WiMAX technology has complex authentication and authorization methods and very strong encryption techniques is still vulnerable on different attacks or threats like jamming, scrambling or water torture attacks.

This paperwork is an overview of most threats involved in infrastructure and WiMAX deployment and the security solutions needed to overcome them.

Index Terms — attacks, security, threats, WiMAX, wireless.

REFERENCES

- [1] Rysavy Research and 3G Americas, "EDGE, HSPA & LTE. The Mobile Broadband Advantage", September 2008 (whitepaper).
- [2] Raj Jain and Trung Nguyen, "A survey of WiMAX security threats", Project report, 2009.
- [3] Abdelrahman Elleithy, Alaa Abuzagheh, Abdelshakour Abuzneid, "A new mechanism to solve IEEE 802.16 authentication vulnerabilities", Computer Science and Engineering Department, University of Bridgeport, Bridgeport, CT.
- [4] Mohsen Gerami, "A survey on WiMAX", IJCSIS- International Journal of Computer Science and Information Security, vol. 8, No. 2, 2010, ISSN 1947-5500, pp. 352-357.
- [5] Slim Rekhis and Nouredine Boudriga, "WiMAX Security Defined in 802.16 Standards", Ed. John Wiley & Sons, Ltd, 2010.
- [6] Michel Barbeau, "WiMAX/802.16 Threat Analysis", Proceedings of the 1st ACM international workshop on Quality of service & security in wireless and mobile networks - Q2SWinet '05, New York, USA, ACM, October 13, 2005, ISBN: 1-59593-241-0, pp. 8-15
- [7] Richard A Poisel, "Modern Communications Jamming Principles and Techniques", Artech House Inc. Publisher, USA, ISBN 1-58053-743-x, 2004
- [8] David Johnston and Jesse Walker, "Overview of IEEE 802.16 Security", Journal of IEEE Security and Privacy, IEEE Educational Activities Department Piscataway, NJ, USA, vol. 2, issue 3, May, 2004, ISSN: 1540-7993, pp. 40-48.
- [9] Tao Han, Ning Zhang, Kaiming Liu, Bihua Tang and Yuan'an Liu, "Analysis of mobile WiMAX security: Vulnerabilities and solutions", 5th IEEE International Conference on Mobile Ad Hoc and Sensor Systems - MASS 2008, Atlanta, October 2008, ISBN: 978-1-4244-2574-7, pp. 828-833.
- [10] Taeshik Shon and Wook Choi, "An Analysis of Mobile WiMAX Security: Vulnerabilities and Solutions", Proceedings of the First International Conference on Network-Based Information Systems, Springer-Verlag LNCS No.4658, September 2007, p.88.
- [11] Andreas Deininger, Shinsaku Kiyomoto, Jun Kurihara and Toshiaki Tanaka, "Security Vulnerabilities and Solutions in Mobile WiMAX", IEEE, IJCSNS International Journal of Computer Science and Network Security, VOL.7 No.11, November 2007, pp. 7-15.
- [12] Po-Wen Chi and Chin-Laung Lei, "A prevention approach to scrambling attacks in WiMAX networks", WoWMoM'09, IEEE International Symposium on a World of Wireless, Mobile and Multimedia Networks & Workshops, 15-19 June, ISBN: 978-1-4244-4440-3, 2009, pp. 1-8.
- [13] Md. Rezaul Karim Siddiqui and Sayed Mohammad Atiqur Rahman, "Security analysis of the WiMAX Technology in Wireless Mesh networks", Master thesis, Blekinge Institute of Technology, Karlskrona, Sweden, 2009, pp. 45.

High Performance Wideband CMOS CCI with High Voltage Swing

¹Emre ARSLAN, ²Bilgin METIN, ³Norbert HERENC SAR, ³Jaroslav KOTON,
¹Oguzhan CICEKOGLU

¹Department of Electrical and Electronics Engineering, Bogazici University
34342, Bebek, Istanbul, Turkey

²Department of Management Information Systems, Bogazici University
34342, Bebek, Istanbul, Turkey

³Brno University of Technology, Department of Telecommunications
612 00 Brno Czech Republic

emrears@hotmail.com bilgin.metin@boun.edu.tr herencsn@feec.vutbr.cz kotonj@feec.vutbr.cz
cicekogluo@boun.edu.tr

Abstract — In this study, low-voltage, high performance and wideband CMOS first generation current conveyor (CCI) is proposed. The proposed CCI has very low equivalent impedance on port X. It also has high voltage swings on input and output ports and wideband current and voltage transfer ratios. Furthermore, two novel grounded inductance simulator circuits are proposed as application examples. It is shown that the simulation results are in very good agreement with the expected ones.

Index Terms — CCI, first generation current conveyor, low-voltage.

REFERENCES

- [1] E. Yuce, S. Minaei, O. Cicekoglu, "A novel grounded inductor realization using a minimum number of active and passive components," ETRI Journal, vol. 27, no. 4, pp. 427–432, 2005.
- [2] E. Yuce, "Inductor implementation using a canonical number of active and passive elements," International Journal of Electronics, vol. 94, no.4, pp. 317–326, 2007.
- [3] E. Yuce, S. Minaei, O. Cicekoglu, "Limitations of the simulated inductors based on a single current conveyor," IEEE Transactions on Circuits and Systems-I: Regular Papers, vol. 53, no. 12, pp. 2860–2867, 2006.
- [4] B. Metin, O. Cicekoglu, "A novel floating lossy inductance realization topology with NICs using current conveyors," IEEE Trans. on Circuits and Systems II, vol. 53, no. 6, pp. 483–486, 2006.
- [5] E. Yuce, S. Minaei, "A modified CFOA and its applications to simulated inductors, capacitance multipliers, and analog filters," IEEE Transactions on Circuits and Systems I- Regular Papers, vol. 55, no. 1, p. 254–263, 2008.
- [6] S. I. Liu, H.Y. Wang, "Realization of R-L and C-D impedances using a current feedback amplifier and its applications," Electronics Letters, vol. 30, pp. 380–381, 1994.
- [7] E. Arslan, U. Cam, O. Cicekoglu, "Novel lossless grounded inductance simulators employing only a single first generation current conveyor," Frequenz, vol. 9-10, pp. 204-207, 2004.
- [8] A. Sedra, K. C. Smith, "The current conveyor: A new circuit building block," Proc. IEEE, vol.56, pp. 1368-1369, 1968.
- [9] P. R. Gray, P. J. Hurst, S. H. Lewis, R. G. Meyer, Analysis and Design of Analog Integrated Circuits, Wiley, New York, 2000.

Mobile System for Monitoring of Gas Emission on Landfill Sites

Živorad MIHAJLOVIC, Vladimir MILOSAVLJEVIC, Nikola MAODUS, Vladimir RAJS, Đorđe OBRADOVIC, Miloš ŽIVANOV

*Faculty of Technical Sciences, University of Novi Sad
str.Trg Dositeja Obradovića nr.6, SER-21000 Novi Sad, Serbia*

*zivorad@uns.ac.rs, vladimirm@uns.ac.rs, nikolamaodus@uns.ac.rs, rajs.vladimir@gmail.com,
djordjeo@uns.ac.rs, zivanov@uns.ac.rs*

Abstract — Gas emissions (gas migrations) that occur due to processes in the landfill site can be harmful to the environment or surroundings. General tendency is to use gas emissions from the landfill as an energy source (natural gas) or burned and converted into harmless compounds. Thus, system for monitoring of gas concentration at landfill site should be installed. In this paper one such system is presented. System is prototype solution for monitoring processes inside of boreholes on a landfill site. Measured concentration of gases in function of well depth can be useful for observation and future exploitation. Integration of microcontroller inside sensing process allows automatic monitoring and support for management of the outer actuators and alarms. The measurement data are collected and displayed in specialized software and stored on a standard LAS (Log ASCII) format.

Index Terms — environment protection, gas sensors, landfill gases measurement, microcontroller system, well monitoring.

REFERENCES

- [1] "Landfill Manuals – Landfill Monitoring", 2nd edition, 2003, Environmental Protection Agency, Ireland
- [2] D. Lepley, L. Tozzi, R. Joseph, "Application and Investigation of the Effect on Emission and Performance Associated with Passive Pre-Chamber Spark Plugs and Integrated Controls on Low Btu-Fueled Natural Gas Engines" Gas Machinery Conference, Nashville, Tennessee, 2011.
- [3] K. Sekgoele, S.P. Chowdhury, S. Chowdhury, "Technical and economic assessment of power generation from landfill gas in South Africa", Power and Energy Society General Meeting, pp. 1-8, July 2011, San Diego, USA
- [4] B. Kiernan, S. Beirne, C. Fay, D. Diamond, "Monitoring of Gas Emissions at Landfill Sites Using Autonomous Gas Sensors", Environmental Protection Agency, 2010.
- [5] C.J. Do, K.J. Tae, "Predicting the Methane Gas Generation Rate at Landfill Sites Using the Methane Gas Generation Rate Constant (k)", Asian Journal of Atmospheric Environment, Vol. 2-2, pp. 116-124, Dec. 2008

Low-Voltage Two NMOS IVB-Based Voltage-Mode First-Order All-Pass Filter With Tuning

Norbert HERENC SAR¹, Jaroslav KOTON¹, Kamil VRBA¹, Bilgin METIN², Oguzhan CICEKOGLU³

¹*Dept. of Telecommunications, Brno University of Technology, Purkynova 118, 612 00 Brno, Czech Republic*
{herencsn, koton, vrbak}@feec.vutbr.cz

²*Dept. of Management Information Syst., Bogazici University, Hisar Campus, 34342 Bebek-Istanbul, Turkey*
bilgin.metin@boun.edu.tr

³*Dept. of Electrical and Electronic Engineering, Bogazici University, 34342 Bebek-Istanbul, Turkey*
cicekoglu@boun.edu.tr

Abstract — In this paper, a new voltage-mode first-order all-pass filter suitable for low-voltage operation is presented. The circuit is composed of two n-channel metal-oxide semiconductor field effect transistors (NMOS)-based inverting voltage buffer (IVB), single capacitor, and three resistors. Replacing one of resistors by NMOS-based voltage-controlled resistor, the pole frequency of the filter can be controlled electronically. The theoretical results are verified by SPICE simulations using TSMC 0.13 μm level-7 CMOS process parameters, where ± 0.65 V supply voltages of the IVB is used.

Index Terms — All-pass filter, analog signal processing, inverting voltage buffer, NMOS, voltage-mode circuit.

REFERENCES

- [1] J. E. B. Ponsoy, "Active all-pass filter using a differential operational amplifier", *Electron. Lett.*, vol. 2, pp. 134-135, 1966.
- [2] M. Higashimura and Y. Fukui, "Realization of all-pass and notch filters using a single current conveyor," *Int. J. Electronics*, vol. 65, no. 4, pp. 823-828, 1988.
- [3] B. Metin and K. Pal, "Cascadable allpass filter with a single DO-CCII and a grounded capacitor," *Analog Integr. Circ. Signal Process.*, vol. 61, no. 3, pp. 259-263, 2009.
- [4] S. Maheshwari and I. A. Khan, "Novel first order all-pass sections using a single CCIII," *Int. J. Electronics*, vol. 88, no. 7, 773-778, 2001.
- [5] S. Minaei, "A new high performance CMOS third generation current conveyor (CCIII) and its application," *Electrical Engineering*, vol. 85, pp. 147-153, 2003.
- [6] S. Minaei and E. Yuce, "Novel voltage-mode all-pass filter based on using DVCCs," *Circuits Syst. Signal Process.*, vol. 29, pp. 391-402, 2010.
- [7] A. Toker, S. Ozoguz, O. Cicekoglu, and C. Acar, "Current-mode all-pass filters using current differencing buffered amplifier and a new high-Q bandpass filter configuration," *IEEE Trans. Circuits Syst. II*, vol. 47, pp. 949-954, 2000.
- [8] C. Cakir, U. Cam, and O. Cicekoglu, "Novel allpass filter configuration employing single OTRA," *IEEE Trans. Circuits Syst. II*, vol. 52, pp. 122-125, 2005.
- [9] S. Maheshwari, J. Mohan, and D. S. Chauhan, "Voltage-mode cascadable all-pass sections with two grounded passive components and one active element," *IET Circuits Devices Syst.*, vol. 4, pp. 113-122, 2010.
- [10] B. Metin, N. Herencsar, and K. Pal, "Supplementary first-order all-pass filters with two grounded passive elements using FDCCII," *Radioengineering*, vol. 20, no. 2, pp. 433-437, 2011.
- [11] I. A. Khan and M. T. Ahmed, "Electronically tunable first-order OTA-capacitor filter sections," *Int. J. Electronics*, vol. 61, no. 2, pp. 233-237, 1986.
- [12] N. Herencsar, J. Koton, and K. Vrba, "A new electronically tunable voltage-mode active-C phase shifter using UVC and OTA," *IEICE Electronics Express*, vol. 6, no. 17, pp. 1212-1218, 2009.
- [13] D. Birolek and V. Biolkova, "First-order voltage-mode all-pass filter employing one active element and one grounded capacitor," *Analog Integr. Circ. Signal Process.*, vol. 65, pp. 123-129, 2010.
- [14] N. Herencsar, J. Koton, S. Minaei, E. Yuce, and K. Vrba, "Novel resistorless dual-output VM all-pass filter employing VDIBA," in *Proc. of the 7th Int. Conf. on Electrical Electronics Engineering - ELECO 2011, Bursa, Turkey*, pp. 72-74, 2011.
- [15] S. Minaei and O. Cicekoglu, "A resistorless realization of the first-order allpass filter," *Int. J. Electronics*, vol. 93, no. 3, pp. 177-183, 2006.
- [16] N. Herencsar, J. Koton, and K. Vrba, "Electronically tunable phase shifter employing current-controlled current follower transconductance amplifiers (CCCF-TAs)," in *Proc. of the 32nd Int. Conf. on Telecommunications and Signal Processing - TSP 2009, Dunakiliti, Hungary*, pp. 54-57, 2009.
- [17] N. Herencsar, J. Koton, K. Vrba, and B. Metin, "Novel voltage conveyor with electronic tuning and its application to resistorless all-pass filter," in *Proc. of the 2011 34th Int. Conf. on Telecommunications and Signal Processing - TSP 2011, Budapest, Hungary*, pp. 265-268, 2011.
- [18] B. Metin, K. Pal, and O. Cicekoglu, "All-pass filters using DDCC- and MOSFET-based electronic resistor," *Int. J. Circ. Theor. Appl.*, vol. 39, pp. 881-891, 2011.
- [19] N. Herencsar, J. Koton, J. Jerabek, K. Vrba, and O. Cicekoglu, "Voltage-mode all-pass filters using universal voltage conveyor and MOSFET-based electronic resistors," *Radioengineering*, vol. 20, no. 1, pp. 10-18, 2011.
- [20] N. Herencsar, J. Koton, K. Vrba, and S. Minaei, "Electronically tunable MOSFET-C voltage-mode all-pass filter based on universal voltage conveyor," in *Proc. of the Int. Conf. on Computer and Communication Device - ICCCD 2011, Bali Island, Indonesia*, vol. 1, pp. 53-56, 2011.
- [21] B. Metin and O. Cicekoglu, "Tunable all-pass filter with a single inverting voltage buffer," in *Proc. of the Ph.D. Research in Microelectronics and Electronics - PRIME 2008, Istanbul, Turkey*, pp. 261-263, 2008.
- [22] E. Yuce and S. Minaei, "A novel phase shifter using two NMOS transistors and passive elements," *Analog Integr. Circ. Signal Process.*, vol. 62, no. 1, pp. 77-81, 2010.
- [23] B. Metin, E. Arslan, N. Herencsar, and O. Cicekoglu, "Voltage-mode MOS-only all-pass filter," in *Proc. of the 2011 34th Int. Conf. on Telecommunications and Signal Processing - TSP 2011, Budapest, Hungary*, pp. 317-318, 2011.
- [24] A. S. Sedra and K. C. Smith, *Microelectronic Circuits*, 4th edn., Oxford University Press, New York, 1998.
- [25] TSMC 0.13 μm SPICE models: https://www.mosis.com/cgi-bin/cgiwrap/umosis/swp/params/ibm-013/t97f_8hp_5lm-params.txt

Micromagnetic analysis of magnetization behavior in Permalloy nanoparticles for data storage applications

Constantin LEFTER and Mihai DIMIAN
Department of Computers, Electronics and Automation
Stefan cel Mare University of Suceava
str.Universitatii nr.13, RO-720229 Suceava
colefter@eed.usv.ro, dimian@eed.usv.ro

Abstract — This paper is focused on the analysis of simulation results for the magnetization behavior in Permalloy nano-objects. Various shapes and sizes are considered and hysteresis phenomena and vortex formations are analyzed at different orientations of the applied field. The study was motivated by the recent advances in micro and nano-scale technologies which pushed the current paradigm of magnetic recording towards its physical limits. A deeper understanding of magnetization behavior in nano-objects is thus required in order to develop novel devices that feature higher capacity for data storage devices. The analysis is performed by using the Nmag simulation environment which is a finite-element micromagnetic simulation package based on Python scripts running on a Linux virtual machine.

Index Terms — data storage, hysteresis, micromagnetic, MRAM, Permalloy.

REFERENCES

- [1] T. Thomson, L. Abelman, and H. Groenland, *Magnetic data storage: Past Present and Future*, Springer, vol. Magnetic Nanostructures in Modern Technology, pp. 237–306, 2008.
- [2] Y. Song and D. Zhu, *High density data storage: Principle, Technology, and Materials*, World Scientific Publishing, 2009.
- [3] S. N. Piramanayagam, C. T. Chong, *Developments in data storage: Materials perspective*, John Wiley and Sons, 2011.
- [4] K. Matsumoto, A. Inomata, and Shin-ya Hasegawa, *Termally Assisted Magnetic Recording*, Fujitsu Scientific & Technical Journal, vol. 42, pp. 158-167, January 2006.
- [5] J.M. Slaughter, R.W. Dave, and M.DeHerrera, *Fundamentals of MRAM Technology*, Journal of Superconductivity: Incorporating Novel Magnetism, vol. 15, 2002.
- [6] B. Heinrich and J.A.C. Bland, *Ultrathin Magnetic Structures: Applications of Nanomagnetism* vol. IV: Springer, 2005.
- [7] D. D. Tang and Y.-J. Lee, *Magnetic Memory Fundamentals and Technology*. New York: Cambridge University Press, 2010.
- [8] W. Raberg, A. Gupta, *Material Requirements for Magnetic Random Access Memory (MRAM) Devices*, Thin Films and Heterostructures for Oxide Electronics Multifunctional Thin Film Series, 2005, Part 2, 129-151.
- [9] R. Desikan, C. R. Lefurgy, S. W. Keckler, and D. Burger, *On-chip MRAM as a High-Bandwidth, Low-Latency Replacement for DRAM Physical Memories*, vol. Tech Report TR-02-47, ed. The University of Texas at Austin: Department of Computer Sciences, 2002.
- [10] H. Kronmuller, S. Parkin, *Handbook of Magnetism and Advanced Magnetic Materials*, Wiley September 25, 2007.
- [11] R. Antos, YoshiChika Otani, J. Shibata, *Magnetic Vortex Dynamics*, Journal of the Physical Society of Japan, Vol. 77, No. 3, March, 2008.
- [12] T. Fischbacher, M. Franchin, G. Bordignon, and H. Fangohr, *A Systematic Approach to Multiphysics Extensions of Finite-Element-Based Micromagnetic Simulations: Nmag*, in IEEE Transactions on Magnetism, 43, 6, 2896-2898 2007.
- [13] <http://www.vtk.org/>
- [14] <http://www.hpfem.jku.at/netgen/>
- [15] <http://github.enthought.com/mayavi/mayavi/>
- [16] J. M. D. Coey, *Magnetism and Magnetic Materials*, Cambridge University Press, 2010.
- [17] R. Katti, *MRAM Read Bit with Askew Fixed Layer*, United States Patent, no. US7548452B2, June 16, 2009.

Considerations regarding the spectral efficiency of orthogonal frequency division multiplexing

Alina Elena STANCIU, Lăcrămioara-Mihaela NEMȚOI, Ilona Madalina MOISE,
POLITEHNICA University of Bucharest
Splaiul Independenței str.no.313, RO-060042, Bucharest,
stanciuelenaalina@yahoo.com, lacramioaranemtoi@yahoo.com, ilonamoise@yahoo.com

Abstract — This paper presents briefly the fundamental mechanisms underlying the generation and demodulation of the OFDM signal, starting with the reasons that required the implementation of multi-carrier systems in the first place – i.e. the mitigation of Inter Symbol Interference (ISI) - and ending with the analytical and functional description of the main blocks in the OFDM transmitter and receiver.

The role of IFFT and FFT in the generation and demodulation of OFDM signal is also described to some detail, as this is too often not fully understood by students and engineers.

Eventually, the paper presents a simple and realistic method to calculate the spectral efficiency of OFDM systems, with an example for the practical implementation of IEEE 802.11a systems. The spectral efficiency of OFDM systems is characterized by the maximum data rate for a given bandwidth, and by the minimal requirements for SNR and C/I, for a given modulation type and data rate.

Index Terms — OFDM, ISI, orthogonal sub-carriers, FFT/IFFT, guard interval, spectral efficiency, SNR, C/I.

REFERENCES

- [1] Hammuda, H., Cellular Mobile Radio Systems. Designing Systems for Capacity Optimization, John Wiley & Sons, Chichester, 1998.
- [2] Persson, E. Ström, and T. Ottosson, Analysis of direct-sequence CDMA for downlink OFDM systems, part I and II, submitted to IEEE Transactions on Communications, 2003.
- [3] Zhang Di, Performance Analysis and Comparison of OFDM Based Packet Transmission System with QAM Modulation, Thesis for the degree of master of science, Chalmers University of Technology, Goterborg, Sweden, 2004.
- [4] K. Witrals, "OFDM Air Interface Design for Multimedia Communications", Ch.4, Ph.D. Thesis, Delft University of Technology, The Netherlands, April 2002.
- [5] IEEE, Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, IEEE-SA Standa.
- [6] ANÍBAL LUIS INTINI, Orthogonal Frequency Division Multiplexing for Wireless Networks, University of California Santa Barbara, December 2000.
- [7] Mike Simon, The Association of WEBE Washington Executive Broadcast Engineers, 2GHz BAS Relocation Tech-Fair COFDM Technology Basics.
- [8] Sinan M.A. Dhebab, Orthogonal Frequency Division Multiplexing, Yemen – IBB, 12.01.2010
- [9] B.K. Mishra, S.K. Singh, Mahendra Sharma, Enhancing Quality of Service using OFDM Technique for Next Generation Network, 2nd International Conference and workshop on Emerging Trends in Technology (ICWET) 2011 Proceedings published by International Journal of Computer Applications® (IJCA)

Surface Impedance Boundary Conditions – Application to Computer-Aided Electromagnetic Design

Nathan Ida¹, Luca Di Rienzo² and Sergey Yuferev³

¹The University of Akron, Department of Electrical and Computer Engineering, Akron, Ohio
44325-3904 USA, ida@uakron.edu

² Politecnico di Milano, Department of Electrical Engineering, 32-20133 Milano,
Italy. luca.dirienzo@etec.polimi.it

³ Infineon Technologies, Siemensstrasse 2, Villach 9500, Austria,
Sergey.Yuferev@infineon.com

Abstract — Surface impedance boundary conditions (SIBCs) have been successfully used for over 70 years in both analytical and numerical computation. Currently, its importance in computer-aided design of electromagnetic devices has become prominent. High frequency SIBCs have been particularly successful because of the minimal penetration of electromagnetic fields in conductors and lossy dielectrics. SIBCs based on the skin depth have also been used albeit these have been limited to first order (Leontovich) condition. A general method of derivation of SIBCs of arbitrary order is presented and shown to apply to low frequency power structures. The SIBCs are universally applicable and the order of the SIBC allows control of errors in design. Whereas low order SIBCs apply to classical flat surfaces and perpendicular diffusion, higher order conditions take into account curvatures and lateral diffusion of fields as well. Results shown include transmission line parameters, eddy current testing and other power applications in which they contribute to speed and accuracy of the design.

Index Terms — Boundary element methods, Diffusion processes, Numerical analysis, Surface impedance boundary conditions

REFERENCES

- [1] S.A. Schelkunoff, "The impedance concept and its application to problems of reflection, radiation, shielding and power absorption," Bell Systems Technical Journal, Vol. 17, pp. 17-48, 1938.
- [2] M. A. Leontovich, "On the approximate boundary conditions for the electromagnetic field on the surface of well conducting bodies," in *Investigations of Radio Waves*, B.A. Vvedensky Ed., Moscow: Acad. of Sciences of USSR (in Russian), pp. 5-12, 1948.
- [3] S. Yuferev and N. Ida, *Surface Impedance Boundary Conditions: A Comprehensive Approach*. Boca Raton: CRC Press, 2010.
- [4] S. Yuferev and N. Ida, "Selection of the Surface Impedance Boundary Conditions for a Given Problem," *IEEE Transactions on Magnetics*, Vol. 35, No. 3, pp. 1486-1489, May 1999.
- [5] S. Yuferev and N. Ida, "Time domain surface impedance concept for low frequency electromagnetic problems - Part I: derivation of high order surface impedance boundary conditions in the time domain," *IEE Proceedings - Science, Measurement and Technology*, Vol. 152, No. 4, pp. 175-185, July 2005.
- [6] S. Barmada, L. Di Rienzo, N. Ida, and S. Yuferev, "The time domain surface impedance concept for low frequency electromagnetic problems - Part II: application to transient skin and proximity effect problems in cylindrical conductors," *IEE Proceedings - Science, Measurement and Technology*, Vol. 152, No. 5, pp. 207-216, Sept. 2005.
- [7] S. M. Rytov, "Calcul du skin-effet par la méthode des perturbations," *Journal of Physics*, 2 (3), 1940, 233-242.
- [8] L. Di Rienzo, S. Yuferev, and N. Ida, "Computation of the impedance matrix of multiconductor transmission lines using high order surface impedance boundary conditions," *IEEE Trans. Electromagn. Compat.*, Vol. 50, No. 4, November 2008, pp. 974-984.
- [9] S. Yuferev and L. Di Rienzo, "Surface impedance boundary conditions in terms of various formalisms," *IEEE Trans. Magn.*, Vol. 46, No. 9, September 2010, pp. 3617-3628.
- [10] S. Yuferev, L. Di Rienzo and N. Ida, "Surface Impedance Boundary Conditions for Finite Integration Technique," in *IEEE Transactions on Magnetics*, Vol. 42, No. 4, April 2006, pp. 823-826.
- [11] S. Yuferev, N. Farahat and N. Ida, "Use of the Perturbation Technique for Implementation of Surface Impedance Boundary Conditions for the FDTD Method," *IEEE Transactions on Magnetics*, Vol. 36, No. 4, July 2000, pp. 942-945.
- [12] S. Yuferev and N. Ida, "Efficient Implementation of the Time-Domain Surface Impedance Boundary Condition for the Boundary Integral Method," *IEEE Transactions on Magnetics*, Vol. 34 No. 5, pp. 2763-2666, Sept. 1998.
- [13] S. Yuferev and N. Ida, "Impedance Boundary Conditions of High Order Approximation for Electromagnetic Transient Scattering Problems," Proceedings of the 10th International Conference on Antennas and Propagation, Edinburgh, April 12-17, 1997, IEE Publication No. 426, pp.1,306-1,309, 1997.
- [14] M. Cao and P. P. Biringer, "BIE formulation for skin and proximity effect problems of parallel conductors," *IEEE Trans. Magn.*, Vol. 26, No. 5, pp. 2768-2770, Sept. 1990.
- [15] C. A. Brebbia, *The Boundary Element Method for Engineers*. London: Pentech Press, 1980.
- [16] N. Farahat, S. Yuferev and N. Ida, "High order surface impedance boundary conditions for the FDTD method," *IEEE Transactions on Magnetics*, Vol. 37, No. 5, September 2001, pp. 3242-3245.
- [17] S. Yuferev L. Proekt and N. Ida, "Surface impedance boundary conditions near corners and edges: rigorous consideration," in *IEEE Transactions on Magnetics*, Vol. 37 No. 5, Sep 2001, pp 3465-3468.

More references in full-text paper in www.dasconference.ro.

Image Enhancement Methods Approach using Verilog Hardware Description Language

Iuliana CHIUCHISAN, Marius CERLINCA, Alin-Dan POTORAC, Adrian GRAUR
"Stefan cel Mare" University of Suceava
str. Universitatii nr.13, RO-720229 Suceava
iulia@eed.usv.ro, mariusc@eed.usv.ro, alinp@eed.usv.ro, adriang@usv.ro

Abstract — Given the importance of digital image processing based on hardware implementations in order to achieve higher performance, this paper discusses basic image enhancement techniques with their implementation and results using a hardware description language, Verilog. The use of HDLs to provide signal processing results is a quite new technique replacing the classical simulations and offering a direct connection to hardware VLSI implementations. This paper is providing an innovative method for simulation followed by immediate implementation possibility. The present HDL approach is applied to image processing and accordingly an overview of underlying principle and concepts, along with common algorithms usually used for image enhancement are described.

The paper focuses on image enhancement in the spatial domain, with particular reference to point processing methods like: contrast manipulation, brightness manipulation, inverting images, threshold operation.

Index Terms — Digital image processing, Image enhancement, FPGA, Hardware design languages, Verilog.

REFERENCES

- [1] R. C. Gonzalez, R. E. Woods – “Digital Image Processing”, Prentice Hall, ISBN 0-13-094659-8, pp. 1-142, 2002.
- [2] Dattu Venkateshwar Rao, Shruti Patil, Naveen Anne Babu and V. Muthukumar - “Implementation and Evaluation of Image Processing Algorithms on Reconfigurable Architecture using C-based Hardware Descriptive Languages”, International Journal of Theoretical and Applied Computer Sciences, Volume 1, Number 1, pp. 9–34, 2006 (<http://www.gbspublisher.com/ijtacs/1002.pdf>).
- [3] Venkateshwar Rao Dattu and Muthukumar Venkatesan – “Design and Implementation of an Efficient Reconfigurable Architecture for Image Processing Algorithms using Handel-C”, <http://www.uweb.ucsb.edu/~shahnam/CannyAlgorithmImplementation.pdf>
- [4] Wilhelm Burger, Mark J. Burge - “Principles of Digital Image Processing – Fundamental Techniques”, Undergraduate Topics in Computer Science, DOI 10.1007/978-1-84800-191-6_4, Springer-Verlag London Limited, 2009.
- [5] A. Zuloaga, J.L. Martin, U. Bidarte, J.A. Ezquerro - “VHDL test bench for digital image processing systems using a new image format”, ECSI, 2007 (<http://mx.reocities.com/CapeCanaveral/8482/>).
- [6] John C. Russ - “Image Processing Handbook (sixth edition)”, CRC Press, pp. 270-331, 2011
- [7] Wilhelm Burger, Mark J. Burge - “Digital Image Processing – An Algorithmic Introduction Using Java”, e-ISBN 978-3-540-30941-3, Springer, 2008.
- [8] Priyanka S. Chikkali, K. Prabhushetty - “FPGA based Image Edge Detector and Segmentation”, International Journal of Advanced Engineering Sciences and Technologies, vol. no. 9, issue no.2, pp187-192, ISSN 2230-7818, 2011.
- [9] Raman Maini, H. Aggarwal - “A Comprehensive Review of Image enhancement Techniques”, Journal of Computing, vol. 2, issue 3, ISSN 2151-9617, pp. 269-300, 2010.
- [10] Nick Efford - “Digital Image Processing – A Practical Introduction Using Java”, pp. 103-132, 2000.
- [11] William K. Pratt - “Digital Image Processing (fourth edition)”, A John Wiley & Sons, Inc. Publication, pp. 247-307, 2007.

Digital Systems Synthesis based on Direct Translation of Petri Net Model

Viorica SUDACEVSCHI, Victor ABABII, Emilian GUTULEAC, Diana PALII
Technical University of Moldova
str. Stefan cel Mare nr. 168, MD-2004 Chisinau
svm@mail.utm.md, ababii@mail.utm.md, egutuleac@mail.utm.md

Abstract — This paper describes a digital system design method based on direct translation of a Petri net model into an FPGA circuit netlist. A proposed CAD tool allows digital system specification, modeling validation and synthesis using ordinary Petri nets. The digital system synthesis is based on Hardware Petri nets that are composed of two kinds of processing elements (Places and Transitions) and data flow path between them. The use of Hardware Petri nets in CAD tools allows the automation of the FPGA implementation process and substantially reduces the design time and cost.

Index Terms — CAD tool, digital system, direct translation, Hardware Petri Net, Petri Net model, system specification.

REFERENCES

- [1] Semiconductor Industry Association, "International Technology Roadmap for Semiconductors, 2005 Edition."
- [2] *A. Bystrov and A. Yakovlev* Asynchronous Circuit Synthesis by Direct Mapping: Interfacing to Environment, Proc. ASYNC'02, Manchester, April 2002.
- [3] *J. Carmona, J. Cortadella, and E. Pastor* A structural encoding technique for the synthesis of asynchronous circuits, *Fundamenta Informaticae*, pp. 135-154, April 2001.
- [4] *J. Cortadella, M. Kishinevsky, A. Kondratyev, L. Lavagno, and A. Yakovlev*: Logic Synthesis of Asynchronous Controllers and Interfaces. Springer Verlag (2002).
- [5] *I. Blunno and L. Lavagno*. Automated synthesis of micro-pipelines from behavioural Verilog HDL, Proc. of IEEE Symp. on Adv. Res. in Async. Cir. and Syst. (ASYNC 2000), IEEE CS Press, pp. 84-92.
- [6] *Murata T.* Petri nets: Properties, analysis and application, *Proceedings of IEEE*, 77(4):541-574, April 1989.
- [7] *Peterson J.L.* Petri Net Theory and the Modeling of Systems, Prentice Hall, 1981.
- [8] *A. Valmari*, Stubborn attack on state explosion, *Formal Methods in System Design*, 1: 297-322, 1991.
- [9] *E. Pastor, O. Roig, J. Cortadella and R. Badia*, Petri net analysis using boolean manipulation, 15th International Conference on Application and Theory of Petri Nets, pages 416-435, Zaragoza, Spain, June 1994.
- [10] *McMillan K.L.*, Symbolic Model Checking, Kluwer Academic Publishers, Boston, 1993.

Hardware realization of Spectral Gamma Ray Probe

Miodrag BRKIĆ¹, Viktor DOGAN¹, Miloš ŽIVANOV¹, Nemanja VUKOJE¹, Goran MANČIĆ²

¹ University of Novi Sad, Serbia

² Hotwell Ges.m.b.H, Klingenbach

Abstract—This paper presents hardware realization of spectral gamma ray probe. This tool measures mineral composition of formation by detecting energy of gamma rays radiated in the disintegration of the radionuclide in the formation. Advantages on this probe is increased number of measurement channels and improved pile-up rejection system (pulses overlap). This probe can detect short lived radioactive isotopes in formation. Probe was realized and tested in laboratory conditions, as well in field boreholes.

Index Terms - boreholes, logging, gamma rays spectrum, pile-up

REFERENCES

- [1] G. Mančić, St. Martinović, M. Živanov, “Geofizički karotaz – osnovni fizički principi”, DIT Naftagas, Novi Sad, 2002.
- [2] L.Bertalot, B.Esposito, Y.Kaschuck, D.Marocco, M.Riva, A.Rizzo, D.Skopintsev, “Fast digitizing techniques applied to scintillation detectors” Proceedings of the 9th Topical Seminar on Innovative Particle and Radiation , Volume 150, January 2006, Pages 78–81
- [3] Sing C. Pang, Sebastian Genna: Pulse pile-up discrimination system, United states patent number:4953198
- [4] <http://stephan.win31.de/capdist.htm>- Capacitor Distortion Mechanisms
- [5] O.Serra, “Fundamentals of well-log interpretation”, ELSEVIER SCIENCE PUBLISHERS 1993

Emotional Speech Classification for Romanian Language - Preliminary Results

Silvia Monica FERARU
Romanian Academy of Iași
str. T. Codrescu nr.2, RO-700481 Iași
monica.feraru@gmail.com

Abstract — The paper reports preliminary results of emotional classification in speech, with focus on distinguishing the emotions (joy versus neutral speech, joy versus sadness speech, joy versus fury speech). We compared the results given by Weka (SMO, RBF) and Matlab (KNN) software. We use SROL emotional database which contains recordings from 18 speakers expressing four emotional states. The results indicate that joy and sadness utterances can be distinguished as well as joy and neutral.

Index Terms — classification rate, emotional speech database, Romanian language

REFERENCES

- [1] R.W. Picard, *Affective computing*, The MIT Press, 1997
- [2] Picard R.W., Vyzas E., Healey J., *Toward machine emotional intelligence: Analysis of affective physiological state*, IEEE Transactions on Pattern Analysis and Machine Intelligence, 23(10):1175–1191, 2001
- [3] Takahashi K., *Comparison of emotion recognition methods from bio-potential signals*, The Japanese Journal of Ergonomics, 40(2):90–98, 2004
- [4] H.N. Teodorescu, M. Zbancioc, M. Feraru, “The analysis of the vowel triangle variation for Romanian language depending on emotional states”, ISSCS Conference, Iasi, Romania 30June-1Jul.2011, ISBN 978-1-4577-0201-3, pp. 331-334
- [5] H.N. Teodorescu, M. Zbancioc, M. Feraru, “Statistical characteristics of the formants of the Romanian vowels in emotional states”, International Conference on Speech Technology and Human-Computer Dialogue SPeD 2011, 18-21 may 2011 Brasov, Romania, ISBN 978-1-4577-0439-0, pp. 13-22, IEEE publication, http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=5940725
- [6] S.M. Feraru, “The comparisons between the formants values in French and Romanian Languages”, Proceedings of the International Conference on Languages, E-Learning and Romanian Studies, 3-5 Iunie 2011, Isle of Marstrand, Sweden– to be published
- [7] S.M. Feraru, “Emotional expressiveness in the Romanian and German language”, Gr. T. Popa University of Medicine and Pharmacy, Publishing House, 2011, ISBN: 978-606-544-078-4, pp. 61-65, http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=6150420
- [8] S.M. Feraru, “Emotional expressiveness in Romanian language”, WSEAS/INEEE International Conferences, 2012, April 18-20, Rovaniemi, Finland, ISBN: 978-1-61804-085-5, pp. 208-212
- [9] Feraru S.M., Teodorescu H.N., *The Emotional Speech Section of the Romanian Spoken Language Archive*, 5th European Conference on Intelligent Systems and Technologies, Iași, Romania, 2008
- [10] Teodorescu H.N., Pistol L., *Using Graphs to Improve the Structure of a Web Site*, 2st International Conference on Electronics, Computers and Artificial Intelligence, Pitești, România, 2007
- [11] R. Barra, J.M. Montero, J. Macías-Guarasa, L.F. D’Haro, R. San-Segundo, R. Córdoba, *Prosodic and segmental rubrics in emotion identification*, ICASSP, 2006
- [12] D. Ververidis, C. Kotropoulos, *Automatic speech classification to five emotional states based on gender information*, European Signal Processing - Eusipco, 2004, pp. 341-344
- [13] Klaus R. Scherer, R. Banse, Harald G. Wallbott, *Emotion inferences from vocal expression correlate across languages and cultures*, Journal of cross-cultural psychology, vol. 32 no. 1, pp. 76-92, 2001
- [14] V. Hozjan, Z. Kacic, *Context-Independent Multilingual Emotion Recognition from Speech Signals*, International journal of speech technology, no. 6, pp. 311–320, 2003
- [15] S. Can, B. Schuller, M. Kranzfelder, H. Feussner, *Emotional factors in speech based human-machine interaction in the operating room*, IJCARS, Vol. 5 (Suppl. 1) 2010
- [16] Klaus R. Scherer, *A cross-cultural investigation of emotion inferences from voice and speech: implications for speech technology*, ICSLP 2000 (http://www.isca-speech.org/archive/icslp_2000/i00_2379.html)

Software for modeling spatial and temporal evolution of river-type systems

Galina MARUSIC¹, Ion SANDU², Vasile MORARU¹,

Violeta VASILACHE³, Ana-Monica CREȚU³, Constantin FILOTE³, Calin CIUFUDEAN³

¹Technical University of Moldova, Stefan cel Mare Blvd., nr.168, MD-2004, Chisinau, Republic of Moldova

²Al.I. Cuza Univeristy of Iasi, ARHEOINVEST Interdisciplinary Platform, Blvd. Carol I, nr. 22, Corp G Demisol, 700506, Iasi, Romania

³Stefan cel Mare University of Suceava, str.Universitatii nr.13, RO-720229 Suceava
galinamarusic@yahoo.com, sandu_io3@yahoo.com, moraru@mail.utm.md,violetaren@yahoo.com,
cretu_monika@yahoo.com, filote.constantin@gmail.com, ciufudean.calin@gmail.com

Abstract - The paper discusses the problem of dynamic modeling of river - type systems using software packages. iThink, Simulink, Surface-water Modeling System (SMS) are analyzed. The research results are applied to modeling hydrodynamics and pollutants transport on a sector of the river Prut in the Ungheni town.

Index Terms - continuity equation, Navier-Stokes equations, two-dimensional dispersion of pollutants, software packages, Surface-water Modeling System (SMS)

REFERENCES

- [1] R.S. Lozba-Stirbuleac, C.R. Giurma-Handley, I. Giurma, Water Quality Characterization Of The Prut River, ENVIRONMENTAL ENGINEERING AND MANAGEMENT JOURNAL, 10, 3, 411-419, MAR 2011
- [2] Iu. Florescu, Fluids mechanics, Bacau University press, 2007
- [3] N. Nirmala Khandan, Modeling Tools for Environmental Engineers and Scientists, CRC Press, 2001
- [4] V.Beșliu, C.Ciufudean, C.Filote, G.Marusic, V.Moraru, B.Ștefănescu, Mathematical modeling of hydrodynamics and pollutant dispersion in rivers, Proceedings of the 7th International Conference on Microelectronics and Computer Science ICMCS – 2011. Chișinău: The Technical University of Moldova, vol.I, p. 160 -165, 2011
- [5] K. Modenesi, L.T. Furlan, E. Tomaz, A CFD model for pollutant dispersion in rivers, BRAZILIAN JOURNAL OF CHEMICAL ENGINEERING, 21, 4, 557-568, OCT-DEC 2004
- [6] C. Leupi, M. Altinakar, Finite element modelling of free-surface flows with non-hydrostatic pressure and k-epsilon turbulence model, INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN FLUIDS, 49, 2, 149-170, SEP 20, 2005
- [7] *** „SMS Tutorials”, SMS v.10.1.11, AquaVeo, 2011
- [8] *** „Surface Water Modeling System - RMA2”, US Army Engineer Research and Development Center, 2009
- [9] H.W. Fang, G.Q. Wang, Three-dimensional mathematical model of suspended-sediment transport, JOURNAL OF HYDRAULIC ENGINEERING-ASCE, 126, 8, 578-592, AUG 2000
- [10] S.A. Socolofsky and G.H. Jirka, Special Topics in Mixing and Transport Processes in the Environment (5th Ed.), A&M University, College Station, Texas, 2005
- [11] *** „Surface Water Modeling System - RMA4”, US Army Engineer Research and Development Center, 2009

Gait in Parkinson's Disease - signal processing and modeling

Oana Geman, Ioan Ungurean, Valentin Popa, Cornel Octavian Turcu, Nicoleta-Cristina Găitan

"Stefan cel Mare" University of Suceava

str.Universitatii nr.13, RO-720229 Suceava

{geman, ioanu, cturcu, valentin, cristinag}@eed.usv.ro

Abstract — The Parkinson is placed on the second position of the most frequent neurodegenerative illnesses, after Alzheimer and consist of slowly and progressive neurons damage.

Parkinson's Disease (PD) is characterized by motor dysfunction, including tremor, speech disorders, rigidity, slowness, and postural instability.

The time series specific to gait signals in Parkinson Disease were firstly analyzed, by tools derived from linear and chaotic analysis. We investigated the gait time series data with tools derived from chaotic analysis such as correlation dimension, recurrence quantification analysis, recurrence plot, and Lyapunov exponent as well. This paper emphasized the importance of nonlinear dynamics specific parameters in Parkinson gait analysis.

By analyzing gait, or other signals (tremor, hand recognition, speech) for patients with PD, this paper brings an approach over the most important information used for signals modeling and for PD Expert Systems.

Index Terms — gait, Parkinson's Disease, modeling, signal processing

REFERENCES

- [1] National Parkinson Foundation, <http://www.parkinson.org>
- [2] <http://www.europarkinson.net>
- [3] <http://www.physionet.org/physiobank/database/gaitpdb/>
- [4] S. Frenkel-Toledo, N. Giladi, C. Peretz, T. Herman, L. Gruendlinger, J.M. Hausdorff, Treadmill walking as a pacemaker to improve gait rhythm and stability in Parkinson's disease. *Movement Disorders*, 20(9):1109-1114, 2005.
- [5] J.M. Hausdorff, J. Lowenthal, T. Herman, L. Gruendlinger, C. Peretz, N. Giladi, Rhythmic auditory stimulation modulates gait variability in Parkinson's disease, *Eur. J Neuroscience*; 26: 2369-2375, 2007.
- [6] G. Yogev, N. Giladi, C. Peretz, S. Springer, E.S. Simon, J.M. Hausdorff, Dual tasking, gait rhythmicity, and Parkinson's disease: Which aspects of gait are attention demanding?, *Eur J Neuroscience*, 22:1248-1256., 2007.
- [7] S.A. Makhortykh, R.A. Semechkin, Study of magnetic field of the brain in Parkinson's disease, *Bulletin of Experimental Biology and Medicine*, vol. 147, no. 3, 375:377, 2009.
- [8] Chaos Data Analyzer, <http://sprott.physics.wisc.edu/cda.htm>
- [9] NLyzer (Nonlinear Analysis in Real Time), <http://www.iap.tu-darmstadt.de/NLyzer/>
- [10] TISEAN (Nonlinear Time Series Analysis), <http://www.mpipks-dresden.mpg.de/~tisean/>
- [11] H.-N. Teodorescu, A. Kandel, Nonlinear Analysis of Tremor and Applications, *JJME Japanese Journal of Medical Electronics and Biological Engineering*, vol. 13 (5), 11:19, 1999.
- [12] O. Geman, C. Zamfir, Nonlinear Dynamics Parameters and K-means Clustering Algorithm Used in DBS Treatments Analysis Results, *Advances in Intelligent Systems and Technologies*, Proceedings ECIT2010 - 6th European Conference on Intelligent Systems and Technologies, 2010.
- [13] O. Geman, Data Processing for Parkinson's Disease Tremor, Speech and Gait Signal Analysis, *Proceedings IEEE International Conference E-Health and Bioengineering Conference*, ISBN 978-606-544-078-4, 2011.
- [14] O. Geman, Data Mining Tools used in deep Brain Stimulation – Analysis Results, *IFIP Advances in Information and Communication Technology series*, volum 364 (Series Editors: Turner, J.A., Hinchey, M., Meyer, B., Tatnall, A., Waxman, R., Leduc, G., Henry, J., Pries-Heje, J., Phahlamohlaka, J., Prinetto, P., rennenberg, K., Dillon, T., Pejtersen, A.M., Nakatsu, R.), ISSN: 1868-4238, pp. 259-264, (<http://www.springer.com/series/6102>), 2011.

Heuristic Clustering Algorithm for Nonlinearly Separable Data

Vasile PURDILĂ, Ștefan-Gheorghe PENTIUC
"Ștefan cel Mare" University of Suceava
str. Universitatii nr.13, RO-720229 Suceava
vpurdila@stud.usv.ro, pentiuc@usv.ro

Abstract—There are several types of clustering algorithms that can differ significantly in their notion of what constitutes a cluster. In this paper we propose a new heuristic clustering algorithm based on distance connectivity and having the complexity $O(n^3 \log n)$. Although this order of complexity is high the algorithm has the advantage that it can be used for nonlinearly separable data. Besides this, the number of clusters is not required as input parameter. The experimental results show these advantages.

Index Terms—cluster, algorithm, hierarchical, distance, connectivity, nonlinear, separable

REFERENCES

- [1] Sergios Theodoridis, Constantinos Koutroumbas, *Pattern Recognition*, 4th edition, ISBN 978-1-59749-272-0
- [2] St. Gh. Pentiuc, *Recunoasterea formelor. Metode, programe, aplicatii*. Ed. Universitatii Suceava, 1996, ISBN 973-97787-5-5.
- [3] I.C. Lerman, *Aspects theoriques sur la classification automatique*, MSH, Paris, 1969.
- [4] http://en.wikipedia.org/wiki/Cluster_analysis
- [5] Pang-Ning Tan, Michael Steinbach, Vipin Kumar, *Introduction to Data Mining*, Addison-Wesley, 2006, ISBN-10: 0321321367
- [6] A. Sadr, A. K. Momtaz, "Application of Rosette Pattern for Clustering and Determining the Number of Cluster," *Advances in Electrical and Computer Engineering*, vol. 11, no. 3, pp. 77-84, 2011. [Online]. Available: <http://dx.doi.org/10.4316/AECE.2011.03013>

Anti-counterfeiting ISO 15693 RFID Solutions Involving Authentication and Traceability Using Symmetric and Asymmetric Cryptography

Marius CERLINĂ, Cristina TURCU, Tudor CERLINĂ, Remus PRODAN, Valentin POPA
Stefan cel Mare University of Suceava, 720229, Romania
mariusc@eed.usv.ro

Abstract — When dealing with subjects as anti-counterfeiting of goods using authentication and traceability it seems that RFID technology has all the advantages over traditional barcode technology. While in shops and supermarkets it seems that the barcode technology is still a winner and hard to replace due to it's current spread and low cost advantages, the RFID solutions seems to be more adequate for supply-chain management specific issues. Current RFID solutions for supply-chain management are using the new EPC Gen2 RFID standard that uses UHF and is not available to ISO15693 or any other RFID standard. In this paper we will describe how an anti-counterfeiting solution can be implemented using the ISO15693 standard and symmetric/asymmetric cryptography.

Index Terms — RFID, anti-counterfeiting, authentication, traceability, cryptography.

REFERENCES

- [1] Industrial Privacy in RFID-based Batch Recalls, Leonardo Weiss Ferreira Chaves, SAP Research, Karlsruhe, Germany, leonardo.weiss.f.chaves@sap.com, Florian Kerschbaum, SAP Research, Karlsruhe, Germany, florian.kerschbaum@sap.com.
- [2] HL7 Messaging Engine with Customizable Translation System, Advances in Electrical and Computer Engineering, Volume 10, Issue 2, Year 2010, On page(s): 98 - 101, ISSN: 1582-7445, e-ISSN: 1844-7600 Marius CERLINCA, Cristina TURCU, Tudor CERLINCA, Remus PRODAN.
- [3] The Real Potential of an RFID_B2B Integrated Application, Development and Application Systems, 22-24 May, 2008, SUCEAVA, Romania, Pages: 253-260, Marius CERLINCA, Cornel TURCU, Tudor CERLINCA, Remus PRODAN, Felicia GIZA, Alexandru GOLOCA.
- [4] Securing RFID systems by detecting tag cloning, Mikko Lehtonen, Daniel Ostojic, Alexander Ilic and Florian Michahelles.
- [5] Current State of Cryptography and Design of an Online Storage System, December 14, 2009, Master's Thesis in Computing Science, Tommy Jonsson
- [6] The security of EPC Gen2 compliant RFID protocols, Mike Burmester (Department of Computer Science, Florida State University, Tallahassee) and Breno de Medeiros (Information Security Consultant, Santa Clara)
- [7] Implementation of ID-Based Signature in RFID System, Piseth Ith, Yoshihito Oyama, Atsuo Inomata and Eiji Okamoto

A Bio Inspired Alternative to Huffman Coding

Natalia TATAR, Stefan HOLBAN
"Politehnica" University of Timisoara
Pta. Victoriei nr. 2, RO-300006 Timisoara
tatar.natalia@gmail.com , stefan@cs.utt.ro

Abstract — In the domain of data compression, the Huffman algorithm is one of the most used and referenced algorithm. Since it was published in 1952 by its author David A. Huffman until today, it is still used in a large area of fields. It was constantly changed during the time to improve performance in accordance to the field demands. We are proposing in this article a new approach to generate the Huffman codes and also to encode and decode data information. The proposed Huffman algorithm will use the Artificial Bee Colony algorithm to generate the codes. It shows that by using the bio inspired algorithm, the performance of the encode process is significantly better. By this approach we eliminate the drawbacks of using the tree data structure to generate the Huffman codes in terms of lookup time by using the Artificial Bee Colony.

Index Terms — algorithms, artificial intelligence, data compression, data structures, Huffman codes.

REFERENCES

- [1] Wang Pi-Chung, "A Memory-efficient Huffman Decoding Algorithm", The 19th International Conference on Advanced Information Networking and Applications, pp. 475-479, 2005.
- [2] Shukala Piyush Kumar, "Multiple Subgroup Data Compression Technique Based on Huffman Coding", First International Conference on Computational Intelligence, Communication Systems and Networks, pp. 397-402, 2009.
- [3] Chen Kuo-Nan, "Embedding Secret Messages Using Modified Huffman Coding.", Fifth International Conference on Intelligent Information Hiding and Multimedia Signal Processing, pp. 278-281, 2009.
- [4] Zheng Ruijuan, Wu Qingtao and Zhang Mingchuan. "An Intelligent Packet Marking Algorithm based on Extended Huffman Coding.", Second International Symposium on Intelligent Information Technology Application, pp. 60-64, 2008.
- [5] Yuanbin Mo, "A data compression algorithm based on adaptive Huffman coding for Wireless Sensor Networks." Forth International Conference on Intelligent Computation Technology and Automation, pp. 3-6, 2011.
- [6] Kavousianos X., Kalligeros, E. and Nikolos, D. "Efficient Test Data Compression for IP Cores using multilevel Huffman Coding.", Design, Automation and Test in Europe, 2006. DATE '06. Proceedings , pp. 1-6, 2006. 3-9810801-1-4 .
- [7] Wikipedia. Huffman coding. [Online] [Cited: 02 08,2012.] Available: http://en.wikipedia.org/wiki/Huffman_algorithm
- [8] Karaboga Dervis. "Artificial bee colony algorithm." [Online] 5(3):6915, 2010. [Cited: February 08, 2012.] Available: <http://mf.erciyes.edu.tr/abc/publ.htm>.
- [9] Chong Chin Soon, "A Bee Colony Optimization Algorithm to job shop scheduling.", Winter Simulation Conference, pp. 1954-1961, 2006.
- [10] Wong Li-Pei, Low Malcolm Yoke Hean and Chong Chin Soon, "A Bee Colony Optimization Algorithm for Traveling Salesman Problem.", Second Asia International Conference on Modelling & Simulation, pp. 818-823, 2008.
- [11] Karaboga Dervis and Basturk Bahriye, "A powerful and efficient algorithm for numerical function optimization: artificial bee colony (ABC) algorithm.", Journal of Global Optimization, pp. 459-471, 2007.
- [12] D.T. Pham, A. Ghanbarzadeh, E. Koç, S. Otri, S. Rahim, M. Zaidi. "The Bees Algorithm – A Novel Tool for Complex Optimisation." , In Proceedings of the 2nd International Virtual Conference on Intelligent Production Machines and Systems (IPROMS 2006), pp. 454-459, 2006.
- [13] Dušan Teodorovic, Mauro Dell' Orco. "Bee colony optimization– A cooperative learning.", In Proceedings of the 16th Mini-EURO Conference on Advanced OR and AI Methods in Transportation , pp. 51-60 , 2005
- [14] Mark Nelson, Jean-Loup Gailly – "The Data Compression Book", Second edition, M&T Books, New York, pp 16, 1995, 1558514341.

Multi-Agent Scheduling using Constraint Satisfaction Problem

Ioana COBEANU, Vasile COMNAC
Transilvania University of Braşov, Romania

Abstract — In multi-agent systems, allocating resources to each activity of the agents is very important. The allocation of resources must be done so that all agents can accomplish their given tasks and at the same time a resource must not be allocated to more than one agent. The decision making process whose goal is to allocate optimally resources to certain tasks in a given timeframe is named scheduling. This paper presents the comparison of two scheduling problem implementations, which extend the traveling salesman scenario. The first implementation was realized using ASP (*Answer Set Programming*) system DLV, the second one using the CP (*Constraint Programming*) solver Choco.

Index Terms — Answer Set Programming, Constraint Satisfaction Problem, mobile agents, scheduling, Travelling Salesman Problem

REFERENCES

- [1] M. L. Pinedo, "Scheduling. Theory, Algorithms, and Systems", 3rd edition, Springer Science+Business Media, LLC, 2008.
- [2] F. Rossi, and P. Van Beek and T. Walsh, "Handbook of Constraint Programming", Elsevier, 2006.
- [3] R. Dechter, "Constraint Processing", Elsevier Science USA, 2003.
- [4] F. Focacci, A. Lodi, and M. Milano, "A hybrid Exact Algorithm for the TSPTW", *INFORMS Journal on Computing*, vol. 14, issue 4, pp. 403-417, October 2002.
- [5] M.L. Ibanez, and C. Blum, "Beam-ACO for the travelling salesman problem with time windows", *Computers & Operations Research*, vol. 37, pp. 1570-1583, 2010.
- [6] E. Alba, and B. Dorronsoro, "Solving the Vehicle Routing Problem by Using Cellular Genetic Algorithm", *Evolutionary Computation in Combinatorial*, Coimbra, Portugal, vol. 152, issue 2, pp. 11-20, 2004.
- [7] J.F. Cordeau, G. Laporte, and A. Mercier, "A unified tabu search heuristic for vehicle routing problems with time windows", *Journal of the Operational Research Society*, vol. 52, pp. 928-936, 2001.
- [8] P. Surekha, and Dr.S. Sumathi, "Solution To Multi-Depot Vehicle Routing Problem Using Genetic Algorithms", *World Applied Programming*, vol. 1, no. 3, pp. 118-131, August 2011.
- [9] N. Policella, A. Cesta, A. Oddi, and S.F. Smith, "From precedence constraint posting to partial order schedules: A CSP approach to Robust Scheduling", *Journal AI Communications – Constraint Programming for Planning and Scheduling*, vol. 20, issue 3, pp. 163-180, August 2007.
- [10] R. Bartak, "Constraint Programming: In Pursuit of the Holy Grail", *Proceedings of the Week of Doctoral Students (WDS99)*, Part IV, MatFyzPress, Prague, pp. 555-564, June 1999.
- [11] Choco, <http://www.emn.fr/z-info/choco-solver/>, accessed in January 2012.
- [12] V. Lifschitz, "Introduction to Answer Set Programming", unpublished draft, 2004.
- [13] DLV, <http://www.dlvsystem.com/dlvsystem/index.php/Home>, accessed in November 2011.
- [14] I. Cobeanu, et.al., "Real-time Scheduling of Mobile Agents Using Answer Set Programming", to be published.
- [15] N. Beldiceanu, P. Flener, X. Lorca, "The tree Constraint", *International Conference on Integration of AI and OR Techniques in Constraint Programming for Combinatorial Optimization Problems*, LNCS vol. 3524, 2005, pp. 64-78.

A Study about the Statistical Parameters Used in the Emotion Recognition

Marius ZBANCIOC^{1,2}, Monica FERARU¹

¹ Institute of Computer Science Romanian Academy of Iasi
str. T. Codrescu nr.2, RO-700481 Iasi

² Technical University "Gheorghe Asachi" of Iasi
monica.feraru@iit.academiaromana-iasi.ro

Abstract — The purpose of this research is to find a set of relevant parameters for the emotion recognition. In this study we used the recordings from the emotion database SROL which is part of the project "Voiced Sounds of Romanian Language". The database was validated by human listeners. The recognition accuracy of the correct expressed emotion (neutral tone, joy, fury and sadness) for the entire database was 63.97%. We used for the classification of input data the Recurrent Fuzzy C-Means (FCM) algorithm. We compared the cluster position with the statistical parameters extracted from vowels in order to establish the relevance of each parameter in the recognition of the emotions.

Index Terms — emotional database, FCM, recurrent coefficient, statistical parameters.

REFERENCES

- [1] K.R. Scherer, "Vocal communication of emotion: A review of research paradigms", *Speech Communication*, 40, 227-256, 2003.
- [2] W. Hess, "Pitch Determination of Speech Signals: Algorithms and Devices", Berlin, Springer-Verlag, Germany 1983.
- [3] S. McGilloway, R. Cowie, E. Douglas-Cowie, S. Gielen, M. Westerdijk, S. Stroeve, "Approaching automatic recognition of emotion from voice: a rough benchmark", *Proceedings of the ISCA Workshop on Speech and Emotion*, Belfast, Northern Ireland, 200-205, 2000.
- [4] G. Klasmeyer, "An automatic description tool for timecontours and long-term average voice features in large emotional speech databases", *Proceedings of ISCA Workshop on Speech and Emotion*, Belfast, Northern Ireland, 66-71, 2000.
- [5] M. Slaney, G. McRoberts, "Baby Ears: A Recognition System for Affective Vocalization", *Proceedings of ICASSP 1998*
- [6] S. Steidl, M. Levit, A. Batliner, E. Noth, H. Niemann, "Of all things the measure is man" automatic classification of emotions and inter-labeler consistency, *ICASSP 2005*. 0-7803-8874-7, pp. 317-320
- [7] R.O. Duda, P.E. Hart, D.G. Stork, "Pattern Recognition", 2nd edition. New York, John Wiley & Sons Inc., 2001.
- [8] F. Dellaert, Th. Polzin, A. Waibel, "Recognizing emotion in speech", *ICSLP 1996*. 1996.608022, vol. 3, pp. 1970 - 1973
- [9] Xi Li, Jidong Tao, Michael T. Johnson, J. Soltis, A. Savage, Kirsten M. Leong, John D. Newman, "Stress and emotion classification using jitter and shimmer features", *ICASSP 2007/1-4244-0728-1*, pp. 1081-1084
- [10] A. Noam, "Classifying emotions in speech: a comparison of methods", 7th European Conference on Speech Communication and Technology, Aalborg, Denmark, September 3-7, 2001, pp. 127-130
- [11] H.N. Teodorescu, M. Zbancioc, M. Feraru, "The analysis of the vowel triangle variation for Romanian language depending on emotional states", *ISSCS Conference*, Iasi, Romania 30June-1Jul.2011, ISBN 978-1-4577-0201-3, pp. 331-334
- [12] H.N. Teodorescu, M. Zbancioc, M. Feraru, "Statistical characteristics of the formants of the Romanian vowels in emotional states", *International Conference on Speech Technology and Human-Computer Dialogue SPeD 2011*, 18-21 may 2011 Brasov, Romania, ISBN 978-1-4577-0439-0, pp. 13-22, IEEE publication, http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?arnumber=5940725
- [13] Teodorescu, H.N (2004), *Recurrent Rules-Based Fuzzy Decision-Making and Control*, WSAS Conference, Udine, Italy
- [14] Teodorescu H.N., *Fuzzy systems with recurrent rules in population and medical models*, Proceeding MATH'08 Proceedings of the American Conference on Applied Mathematics World Scientific and Engineering Academy and Society (WSEAS) Stevens Point, Wisconsin, USA 2008, ISBN: 978-960-6766-47-3, pp. 343-349
- [15] Teodorescu H.N., *Fuzzy Systems with Recurrent Rules. A new type of fuzzy systems and applications*, *Intelligent Systems, Selected papers from ECIT 2004*, pag 157-166, Editors: H.N.Teodorescu, Iași, Ed. Performantica, ISBN 973-7994-85-X.
- [16] Zbancioc M. (2005a), "Recurrent Fuzzy Rules (Teodorescu's Fuzzy Systems) in Economic Process Modelling", 15th International Conference on Control Systems and Computer Science, CSCS-15, 25-27 May, 2005, București, România

Distributed Systems and Artificial Intelligence in Programming (Proof of Concept)

Stefano-Niko ORZEN
Politehnica University of Timisoara
Pta Victoriei No. 2, RO-300006 Timisoara
niko.orzen@cs.upt.ro

Abstract — In order to edify the application of a organization methodology for a computing system in a network, that is logically maintained through the guidance of the Open Systems Interconnection Model, the theoretical formulation and implementation of Amdahl's Law depicted in this paper, is mentioned with its redundancy with computer topologies. The Goal of the present work is to present the contexts which impose the resolution of state of the art problems solved with methodologies defining the programming scope and application.

Index Terms — Computer Language, Amdahl's Law, Semiotics, Syntax, Semantics.

REFERENCES

- [1] E. D. Sacerdoti, What Language Understanding Research Suggests About Distributed Artificial Intelligence, Artificial Intelligence Center, SRI International;
- [2] M. Kayri, I. Kayri, A Proposed “OSI Based” Network Troubles Identification Model, Department of Computer and Instructional Technology, Yuzuncu Yil University, Van, Turkey, Department of Electric Education, Batman University, Batman , Turkey, IJNGN Vol. 2, No. 3, September 2010;
- [3] A. S. Tanenbaum, R. van Renesse, Research Issues in Distributed Operating Systems, Department of Mathematics and Computer Science, Vrije Universiteit, Amsterdam, The Netherlands;
- [4] M. D. Hill, M R. Marty, Amdahl’s Law in the Multicore Era, Computer Sciences Department, University of Wisconsin—Madison;
- [5] Sangyeun Cho, Member, IEEE Rami G. Melhem, Fellow, IEEE, Corollaries to Amdahl’s Law for Energy, Sangyeun Cho, Member, IEEE Rami G. Melhem, Fellow, IEEE, Dept. of Computer Science, University of Pittsburgh;
- [6] L. Kleinrock, Creating A Mathematical Theory of Computer Networks, University of California at Los Angeles, Computer Science Department, 405 Hilgard Avenue, Los Angeles, California 90095-1361, Operations Research2002 INFORMS, Vol. 50, No. 1, January–February 2002, pp. 125–131;
- [7] Tommy M. McGuire, Correct Implementation of Network Protocols from Abstract Specifications, March 22, 2000;
- [8] James G. Anderson, Evaluation in health informatics: computer simulation, Sociology and Anthropology Department, Purdue University, 1365 Stone Hall, 353 Stone Hall Office, West Lafayette, 1365, USA

A new access control method for cryptographic processing using logical approaches

Dimitris C. VOUKALIS

*Technical University of Pireous, Greece. Dept of Computer Science
Thivon 250 & P. Ralli 12244 Aegaleo- Athens, GREECE
dvouk@in.gr*

Abstract — In this paper we use modal mathematical tricks or whiffs constructed in logic methods using the Hellenic philosophical language and definitions to explain mandatory access control for a system working in a toxic environment. The methods followed here are: A) Text cryptography as Hellenic language mixed with English. B) Public key cryptography (PKC) and C) channel cryptography using error control coding and modulation coding. Also in this paper we provide an example for software model system implementation for access mandatory control.

Index Terms — cryptography, algorithm, public key cryptography, access control

REFERENCES

- [1] Pantazidis I. Dictionary of Homeric era. Athens. 1845.
- [2] Patakis, S., Patakis, A., Dictionary of Ancient Hellenic Language. Patakis. 1948.
- [3] Patsis, Ch., Ancient Hellenic Dictionary . Patsis X. Athens. 1998.
- [4] Papandropoulos, J., Ancient Hellenic Language Dictionary. J. Rossis.
- [5] Savallas. Big Modern Dictionary of the Hellenic Language.1968.
- [6] Kiharas, Em. Dictionary of Byzantine Era. Thes/ki. 1968.
- [7] Notara Anna. Etymological Dictionary of Hellenic Language. Little and Scott. Athens.
- [8] Babiniotis, G., Dictionary of Modern Hellenic Language. Athens. 1998.
- [9] Chin, S. K., Oler, S., Access control, security and trust (A logical approach). CRC press.
- [10] Menexes et al. Handbook of applied cryptography. CRC press 1997.
- [11] Stallings W. Cryptography and network security. Principles and practices. 3rd ed. Prentice Hall N. Y. 2003.
- [12] Grawr A., Voukalis, D. Applied channel cryptography (theory and applications). Media Mira. Chise-Napoce Romania. 2008.
- [13] Meizon E. English-Hellenic dictionary. Pelecanos.
- [14] Meizon. Hellenic-English dictionary. Pelecanos.
- [15] Dictionary of modern Hellenic language (*spelling, translating, etymological, synonymes, derived, composite, opposite). Pelecanos.

INDEX OF AUTHORS

ABABII Victor.....	10, 30
ALEXANDRU, Nicolae Dumitru.....	11
ARSLAN, Emre.....	23
BALMUS, Ion.....	10
BOTH, R.	5, 8
BRKIĆ, Miodrag.....	31
CEBAN, Gheorghe.....	10
CERLINCĂ, Marius.....	29, 36
CERLINCĂ, Tudor.....	36
CHIUCHISAN, Iuliana.....	29
CICEKOGLU, Oguzhan.....	23, 25
CIOBOTARIU, Razvan.....	16
CIUFUDEAN, Calin.....	33
COBEANU, Ioana.....	38
COJUHARI, Irina.....	6, 7
COMNAC, Vasile.....	38
CREȚU, Ana-Monica.....	33
De STRYCKER, Lieven.....	12
DENIEFFE, David.....	13
DIMIAN, Mihai.....	26
DOGAN, Viktor.....	31
FERARU, Monica.....	32, 39
FESTILA, R.....	5
FILOTE, Constantin.....	33
FINIS, Ilie.....	14, 20
FITIGAU, Ioan.....	21
FRUNZĂ, Mircea-Daniel.....	19
GAITAN, Adrian M.....	18
GAITAN, Nicoleta-Cristina.....	34
GAITAN, Vasile G.....	4, 17, 18
GEMAN, Oana.....	34
GHERASIM, Simona Anda.....	4, 17, 18
GOEMAERE, Jean-Pierre.....	12
GRAUR, Adrian.....	20, 22, 29
GUBERNATOROV, Volodymir.....	2
GUTULEAC, Emilian.....	30
HERENCSAR, Norbert.....	23, 25
HOLBAN, Stefan.....	37
IDA, Nathan.....	28
IZVOREANU, Bartolomeu.....	6, 7
KASTRATI, Zenun.....	13
KOKRIATSKAIA, Nataliya.....	1, 2
KOTON, Jaroslav.....	23, 25
KUTAEV, Yuriy.....	2
LAVRIC, Alexandru.....	14
LEFTER, Constantin.....	26
MANČIĆ, Goran.....	31
MANTA, Vasile.....	16
MAODUŠ, Nikola.....	24

MARGINEAN, Ana Maria	3
MARGINEAN, Calin.....	3
MARUSIC, Galina.....	33
MELNIC, Radu.....	10
MESAROSIU, A. R.	8
METIN, Bilgin.....	23, 25
MIHAJLOVIĆ, Živorad.....	24
MILOSAVLJEVIĆ, Vladimir.....	24
MOISE, Ilona Madalina.....	27
MORARU, Vasile.....	33
MORARU, Dumitru.....	7
MRUGALSKI, Marcin.....	9
NEMȚOI, Lăcrămioara-Mihaela.....	27
OBRADOVIĆ, Đorđe.....	24
ORZEN, Stefano-Niko.....	40
OTTOY, Geoffrey.....	12
PALII, Diana.....	30
PENTIUC, Ștefan-Gheorghe.....	35
PETRARIU, Adrian I.....	14, 20
PETROVSKYI, Mycola.....	2
PICOVICI, Dorel.....	13
POPA, Adrian.....	15
POPA, Valentin.....	14, 20, 34, 36
PORUMB, I.....	8
POTORAC, Alin-Dan.....	29
PRODAN, Remus.....	36
PURDILĂ, Vasile.....	35
RAJS, Vladimir.....	24
ROMANOV, Alexei.....	7
ROTARIU, Cristian.....	16
SANDU, Ion.....	33
SCRIPCARIU, Luminița.....	19
SFICHI, Ștefan.....	14, 20
SIMION, Daniel.....	18, 22
SMOLENIC, Andrei Valeriu.....	4, 17
SPEIAN, Aurel.....	7
STANCIU, Alina Elena.....	27
STEVENS, Nobby.....	12
SUDACEVSCHI, Viorica.....	30
TATAR, Natalia.....	37
TĂTULESCU, Elisabeta.....	4, 17, 18
TODEREAN, Gavril.....	21
TRIFA, Viorel.....	3
TULBURE, M.....	5
TURCU, Cornel Octavian.....	34
TURCU, Cristina.....	36
TYMCHENKO, Leonid.....	1, 2
UNGUREAN, Ioan.....	34
URSULEANU, Mihai Florentin.....	4, 17, 18, 22
VASILACHE, Violeta.....	33
VOUKALIS, Dimitris C.....	41
VRBA, Kamil.....	25
VUKOJE, Nemanja.....	31
WIELANDT, Stijn.....	12
WITCZAK, Marcin.....	9
YAROVYY, Andriy.....	1
ZBANCIOC, Marius.....	39
ŽIVANOV, Miloš.....	24, 31

The Design and Implementation of an HF RFID System for Warehouse Management

Ilie FINIȘ, Valentin POPA

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
University Street, nr.13, 720229, Suceava, Romania
ifinis@eed.usv.ro, valentin@eed.usv.ro

Introduction— Using the RFID systems within the management of warehouses has allowed the performance of accurate inventorying with low error rates. Besides these strong points, data about the products location or trace within a warehouse can be achieved by using RFID systems. This paper emphasizes an original proposed architecture of shelves that uses HF RFID, in order to identify, monitor and track the products within a warehouse. In order to reduce the implementation costs, a multiplexer is proposed and implemented, so that it allows the connection of 16 antennas to one RFID reader. The advantages of such architecture are emphasized, as well as a series of tests that have been carried out.

Method— The effectiveness and automation of processes applied within warehouses has been more and more emphasized lately. Considering the moment when entities are located for a short period of time within the warehouses, their controlling and inventorying might face crucial issues. Using the RFID systems in such cases will bring a series of advantages, among the most important strong point is represented by reducing the processing times and data validation. If such systems are used in warehouses of large areas, the costs of implementation and maintenance will be as reduced as possible for the entire system. The architecture of a smart shelves system, used on identifying, monitoring and tracking of products within a warehouse is formed of:

- RFID readers, which operates on 13.56 MHz and uses tags compatible to the ISO 15693 and ISO 18000-3 standard;
- multiplexers, by whom the connection of more antennas to one reader is possible fact that brings to reducing the implementation costs;
- antennas that operate in the proximity of metallic environments;
- the software application used in order to view data received from readers, and the automatic generating of reports, respectively.

Results—An essential issue of the intelligent shelves systems is represented by achieving a reading volume as higher as possible, taking into account the sizes of entities included within the warehousing locations. The advantages of the proposed architecture are the following:

- automatic identification and tracking of products;
- reducing the necessary time of inventorying;
- drastically reducing the implementation costs, by decreasing the number of readers;

Conclusion—The paper describes a method used to determine the magnetic field generated by a rectangle loop antenna when it is positioned in the proximity of a metallic environment. The implemented antenna provides a maximum detection range of up to 25 cm and proves to be very efficient when it is positioned in the vicinity of metallic environments.

Another important advantage is emphasized by the reduction of the implementation costs with 75% for such architecture, for a large size warehouse. Inventorying is carried out in a faster and more accurate way, thus achieving information about the location of entities within a warehouse. An essential part in reducing the implementation costs for such architecture is represented by using the proposed multiplexer model.

Index Terms— RFID, Metal environments, tag, loop antenna, warehouse management.

RFID Data Flow Monitoring using OPC Servers

Adrian-Mihai GĂITAN, Valentin POPA

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
13, University Street, 720229, Suceava, Romania
agaitan@eed.usv.ro, valentin@eed.usv.ro

Introduction— RFID applications for high-capacity storage require a large number of readers. They must be connected to the enterprise intranet using an internal network of switches organized in one or more levels, or using VPN. In the context of doctoral research is proposed a simulation model used to analyze RFID network traffic which is organized into blocks that are based on real-world testing on a small number of equipments. PhD. thesis research takes into consideration the tasks that have been done for ATPROD project. The informatics system built in ATPROD project must assure identification, tracing and authentication of trade mark products, at high performances and at a very low cost.

Method—The present paper proposes a system architecture for managing a local network infrastructure with a large number of RFID tags. This architecture uses as main components RFID readers, eBox 2300 (or eBox PDX) embedded systems that runs OPC (OLE for Process Control) classic servers with Windows CE, switches and a router with firewall facilities. Low costs and small size of the entire assembly, with Windows CE real-time operating system, were the basic attributes in implementation the mentioned architecture.

Results— To analyze the traffic generated by RFID tags in an Intranet LAN network is used the architecture described in Figure 1a. The eBox embedded systems generate a 96 bit file, equivalent to an RFID UHF tag. This file is written in the object dictionary and from there periodically is sent to the reader client, which using a sniffer can see this informations. Figure 1b relates the traffic generated by three OPC servers. All the traffic generated from the server is visible to the transport layer of DCOM, which is DCE/RPC.

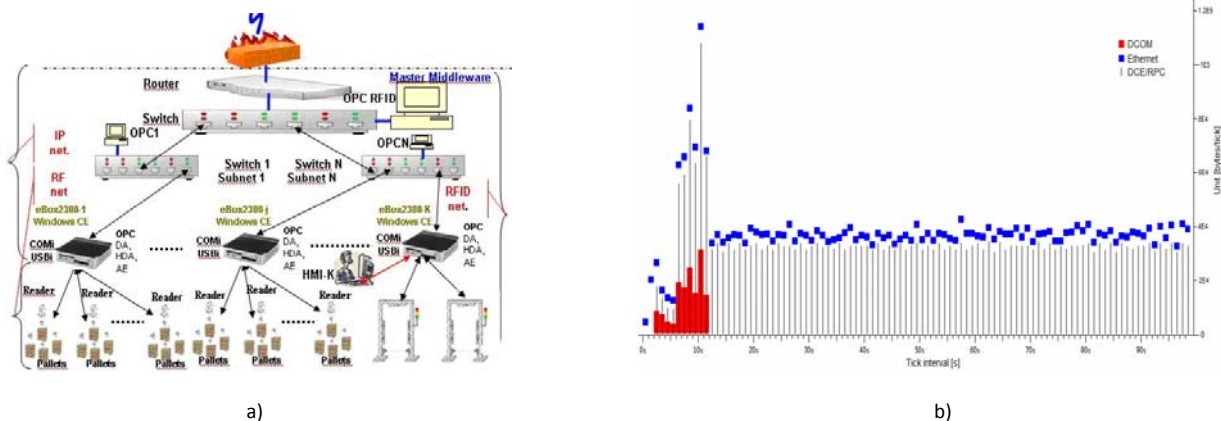


Figure 1. a) RFID System Architecture b) Network traffic for three OPC servers

Conclusion— The present paper describes a structure of an architecture used to simulate an RFID network for a warehouse management. Because in a real world such a network design requires high resources, and the results may not be accurate, such an approach is crucial. OPC servers with Windows CE are very flexible and they represents the main part of this approach. The traffic obtained for this simulated network is relatively constant in a timeframe and depends on the number of readers connected. If those are in large numbers and in that network exists other devices that in some periods of time can generate large amount of traffic, the final result may be a network congestion.

Index Terms—OPC Servers, RFID network, RFID traffic analyze, DCOM, Windows CE

Study of organic light-emitting devices based on new phenanthroline derivatives and poly(*p*-phenylenevinylene)

Marius PRELIPCEANU¹, Mihai DIMIAN², Adrian GRAUR³, Valentin POPA⁴

^{1,4}Ștefan cel Mare University Suceava, Faculty of Electrical Engineering and Computer Science
Str. Universitatii nr.13, 720229 Suceava, Romania,
mprelipceanu@eed.usv.ro, dimian@eed.usv.ro, adriang@eed.usv.ro, valentin@eed.usv.ro

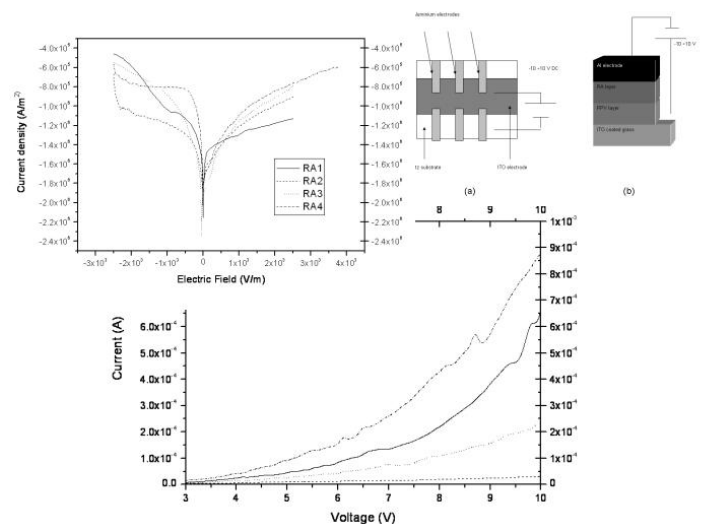
Introduction—The film-forming properties, as well as the optical, electrical and electroluminescent characteristics of a series of recently synthesized soluble pyrrolo[1,2-*a*][1,10]phenanthroline derivatives (RA compounds) are preliminary investigated. The examined materials are promising candidates for organic light-emitting diodes (OLEDs) manufacturing. In experiments various device structure and thickness have been studied, with poly(*p*-phenylenevinylene) (PPV) as hole transporting layer and RA derivatives as emitting layer. All devices show clear rectification behavior with a turn-on voltage between 3 V and 7 V. The best results were obtained for the OLED based on a 50 nm PPV/50-60 nm RA structure, emitting in the yellow-green with a luminance of 0.56 cd·m⁻², for a double layer device.

Method—The thin films were obtained by spin-coating using solutions of the phenanthroline derivatives of various concentrations, at various speeds to optimise the film thickness. Indium-Tin-Oxide (ITO)-coated glass has been used as substrates. The film thickness was measured by surface profiler, and further confirmed by ellipsometric measurements. The UV-VIS absorption and photoluminescence (PL) spectra of the films were obtained using luminescence spectrometer. Single layer EL cells were fabricated by spin-coating the organic materials onto an ITO-coated glass substrate, and an aluminium electrode was vacuum-deposited at a chamber pressure of 1x10⁻⁶ Torr onto the organic layer. The emitting area of EL cells was 2x2 mm². The luminance-current-voltage characteristics have been measured using a luminance spectrometer, and a current-voltage (I-V) measuring unit. On one substrate, six individual OLED samples have been prepared simultaneously. EL measurements were made under forward bias (ITO positive) and the emission was registered in the forward direction through the transparent ITO.

Results—The current density versus electric field characteristics for the device structures are measured (see figure). All examined structures show a clear rectification. It is indication of good injection efficiencies. The shape of respective curves can be influenced by the by the use of aluminium as the cathode electrode. Devices have a turn-on voltage of around 4 V. They were seen to emit in the yellow-green with a luminance of 0.50 cd·m⁻² and 0.56 cd·m⁻², respectively. It can improve the electron injection as the holes can accumulate at the PPV/RA interface. This could decrease the turn-on voltage, and consequently improve the power efficiency.

Conclusion—The soluble phenanthroline derivatives and PPV are promising candidates for use in organic light-emitting devices, despite the fact that several parameters still need to be optimised to get efficient devices. The characteristics of single layer (ITO/PPV/organic-RA compounds/Al) organic light-emitting devices have been studied.

Index Terms—phenanthroline derivatives; electroluminescence, film-forming properties, emissive layer, OLED.



Contributions concerning the use of Wavelet Transform in defining the main electric power quantities towards increasing energy efficiency to industrial customers

Viorel APETREI¹, Adrian GRAUR², Constantin FILOTE³

Ștefan cel Mare University of Suceava, Electrical Engineering and Computer Science Faculty
University Street no. 13, 720029 Suceava, Romania

¹viorela@eed.usv.ro, ²adriang@eed.usv.ro, ³filote@eed.usv.ro

Introduction—Electric power components definitions contained in the IEEE Standard 1459–2000 for unbalanced single-phase/three-phase systems with nonsinusoidal situations are represented in the frequency domain based on Fourier transform (FT). However, FT suffers from the high computational effort especially when the number of phases increases and it is unable to provide information concerning time content because it provides only an amplitude-frequency spectrum. To overcome these limitations, definitions of power components are reformulated in the wavelet domain using the discrete wavelet transform (DWT) which preserves the information concerning time and frequency and also reduces the computational time and effort by dividing the frequency spectrum into bands or levels.

Method—The process of calculating the wavelet coefficients at every scale and position involves a high computational effort. In wavelet packet decomposition (WPT), the computational burden increases as the number of decomposition levels increases. To overcome this limitation, the frequency spectrum is divided into a limited number of selected subsets of scale based on powers of two called dyadic scales when calculating the wavelet coefficients thus obtaining the DWT.

In DWT, the original waveform is decomposed into approximation “A” and detail “D” at the first stage then successive decompositions are performed on the approximation only with no further decomposition for the details, hence obtaining the multiresolution analysis (MRA). With careful choice of the number of decomposition levels and suitable choice of the wavelet family along with suitable mother wavelet the problem of spectral leakage can be reduced. The number of levels depends on the harmonic order contained in the original waveform that is required to be calculated separately.

Results—The results obtained from applying the IEEE Standard definitions and the DWT-based definitions to balanced and unbalanced single-phase/three-phase systems under nonsinusoidal operating conditions, indicate that the DWT-based definitions are very accurate and the problem of spectral leakages can be reduced by suitable choice of the mother wavelet and the wavelet family. The reformulated definitions could be very useful for setting tariffs and evaluating the electric power quality especially in case of transients and nonstationary waveforms where frequency-domain-based approaches fail.

The advantage of using the DWT for formulating power components is to represent these components in a time-frequency spectrum to preserve time and frequency information. Also calculating these components at levels or bands has the effect of reducing the computational burden and saving time. Moreover the computational effort is reduced when using DWT since the calculations is performed into frequency bands and their number decrease as the number of decomposition level decrease which is very important when the number of phases increase.

Conclusion—In this paper, definitions of electric power components contained in the IEEE Standard 1459–2000, which were based on the frequency domain, are reformulated in the time-frequency domain using the DWT which preserves time and frequency information. The DWT is successfully applied to formulating the electric power components definitions for unbalanced single-phase/three-phase systems with nonsinusoidal situations.

Index Terms—wavelet transform (WT), power quality, electric power components, nonsinusoidal conditions, multiresolution analysis (MRA).

Contributions concerning the development of middleware applications

Simona-Anda GHERASIM, Vasile GĂITAN

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
Street Universitatii nr.13, RO-720229, Suceava, Romania
sgherasim@stud.usv.ro, gaitan@eed.usv.ro

Introduction — With the continued need for large scale production of various products, researchers have developed a range of equipment and automation applications. In the industrial automation, the data exchange between applications (or applications and peripherals) has an important role. Because of that, researchers have tried different solutions for the exchange of information to be made in a reliable manner by another application.

The objectives underlying the research “*Contributions concerning the development of middleware applications*” are: Achieving an integrated and distributed acquisition system for storage, processing and access to information; The data transfer must be the most reliable mode by another application; Analysis of information and specific interactions of the main applications; Providing facilities for continuing education of specialists in these fields and the formation of new professionals by involving research.

Method — A SCADA (Supervisory Control and Data Acquisition) system is developed within the research laboratory, so as to monitoring and controlling the industrial processes; this system includes two applications: a data server, on which the acquisition of data within local industrial networks is accomplished, and a HMI (Human Machine Interface) application that allows the graphical visualization of data taken from the data server. The data exchange between the two applications (within a local network or within the Internet network) is performing by means of a middleware. As middleware, an OPC Data Access was tested, OPC Alarm & Events, for the data exchange within a local network, and also an ACE CORBA, in the view of data exchange within the Internet network.

The data server has a defined interface, by which new drivers for the local industrial networks can be added, without the recompilation of the data server. The devices of local industrial networks are described by the help of some EDS (Electronic Data Sheet) text files. These files are organized within a database of devices, by adding a new type of devices and assuming only the writing the EDS description file.

Results — The address space is a remarkable improvement of the OPC Unified Architecture, to the old specifications. Through this model, providers may expose a rich and extensible data model using object oriented techniques.

Application developed for the case study, consists in an OPC client ported on the embedded system eBox-2300SX.

Conclusion — Application development presented before, will continue with performing different tests to analyze the network overload performance and data traffic. Also, we will try to use the proposed architecture with RFID tags and readers to make a complete inventory of existing products from a different container or warehouse, with lower costs.

Index Terms — Address space, hierarchical types, informational model, middleware application, OPC specifications.

Contributions to the development of transcranial magnetic stimulation devices and the methods of diagnostics and concomitant therapies

Elena GROSU (Hopu)¹, Mihai DIMIAN², Adrian GRAUR³

^{1,2,3} Ștefan cel Mare University of Suceava, Faculty of Electrical engineering and computer science
University Street , nr.13, 720229 Suceava, Romania

¹ elena.grosu@usv.ro, ²dimian@eed.usv.ro, ³Adrian.Graur@usv.ro

Introduction— Transcranial electromagnetic stimulation (TMS) presents a useful non-invasive modern technique for investigation and treatment of neurological diseases. The technique of TMS is based on the phenomenon of electromagnetic induction. Intense pulses of current flow through a coil located at the surface of the head. This current creates a time-varying magnetic field, which induces an electric field in the brain. Magnetic nerve stimulators consist of two distinct parts: a high current pulse generator producing discharge currents and a stimulating coil producing magnetic pulses. TMS has numerous applications in the study, diagnosis and therapy of the brain. The parameters used in TMS varies between different studies.

Method— A very important role in this research area is the focus of stimulation. So far three types of magnetic stimulation have proven effective in medical applications: single pulse stimulation, double pulse stimulation and repetitive stimulation. Each of them has its usefulness in a particular field. Considering that a very important role in this research area is the focus of stimulation, computer assisted design should be very helpful. By combining TMS with other analysis methods such as electromyography, the results of research for motor disabilities significantly increases.

Results— There are two types of electromagnetic stimulator: single-pulse devices and repetitive (rTMS) devices. There are many designs of Transcranial electromagnetic stimulators. It is important to understand which one is better depending on the area of its application. I proposed to make a comparison between the three commercial equipment of stimulators : Tamas, Neuro-MS and Magstim 200.

Conclusion— Multiple central collaborative studies are necessary to establish optimum stimulation parameters, such as stimulus frequency, intensity, number of stimuli, train duration, intertrain interval, coil type, and stimulation sites for treatment of neurological diseases. With study going on, it is probable that rTMS will be an effective therapeutic tool and be widely used in clinical practice. Even TMS is in the research stage, it has proven its effectiveness in the most of the applications. However it is clear that TMS begins to be crucial in future neurological treatment of diseases. Further research is needed to decide in which area TMS may be best used, but the research undertaken so far is very encouraging.

Index Terms—TMS, therapeutic tool, nerve stimulators, medical applications, neurology.

Contributions to Cyberinfrastructure Development for Remote Visualization and Control of Research and Education Equipment

Mihai-Florentin URSULEANU¹, Adrian GRAUR², Mihai DIMIAN³

^{1,2,3} Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
University Street, nr.13, 720229 Suceava, Romania

¹ursuleanum@usv.ro, ²Adrian.Graur@usv.ro, ³dimian@eed.usv.ro

Introduction— This research presents the framework of cyberinfrastructure and the state of the art in this area of research, as well as a case study of a remote laboratory using iLab shared architecture. References have been made to the cyber-tools and methods, such as high-performance computing, communication technologies, and simulation models, enabling progress in cyberinfrastructure development. The goal of cyberinfrastructure is to unite various distributed-knowledge communities in an integrated collaboration environment that will provide broad access to multiple scientific resources. Here, we present the main requirements for cyberinfrastructure development and the key components of a working cyberinfrastructure.

Method—To meet the creating of a local Cyberinfrastructure a preliminary study was conducted to assess the ability of the hardware component level: medium for data communications – video communications; and of the high performance computing. To this end was rated the transmission capacity on video streams from a building outside the “Ștefan cel Mare” University of Suceava and a university laboratory. To highlight these elements we present a case study conducted using a video server and dedicated software. For the testing of the high performance computing resources we tested the performance of our IBM cluster computer. In order to help with this new paradigm in research collaboration we have developed a new software tool called Cybertek for instrument sharing. Together with a research team from Technische Universität Ilmenau, Ilmenau, Germany, headed by Dr.-Ing. Heinz- Dietrich Wuttke we have implemented iLab Shared Architecture (ISA) and integrated in it a client connected to a Lift Combined Virtual / Remote Laboratory as a part of a case study involving research and eLearning integration into the learning environment at Technische Universität Ilmenau.

Results— This study comes to the aid of creating a Cyberinfrastructure at the “Ștefan cel Mare” University of Suceava as well as to the development of Cyberinfrastructure around the world. The result of the research helps by setting some minimum boundaries for a fluent video communication between two users, one from within the University and another from outside of it, and the capacity for high performance computing of our Cyberinfrastructure, as well as resource provisioning for Cybertek scientific collaboration tool. Together with the research team from Technische Universität Ilmenau, we have successfully implemented ISA with the integration of a new client, and now researchers and students from all over the world can run their experiments on the Lift Combined Virtual / Remote Laboratory.

Conclusion— The main purpose of the Cyberinfrastructure is to gather and integrate resources often geographically scattered in a framework for high grade research that is functioning smoothly. Our research and studies help students and researchers reach their scientific goals and enhance the overall research productivity to generate more breakthroughs in their research paradigms.

Index Terms— cyberinfrastructure, e-learning, iLab, simulation, collaboration tools.

Contributions to automatic meter reading using power line communications

Codrin MALEȘ¹, Valentin POPA²

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
Street Universitatii, no 13, Suceava, Romania

¹cmales@eed.usv.ro, ²valentin@eed.usv.ro

Introduction— Power Line Communications (PLC) is the technology that uses as the communication medium the electric power lines. Most used power lines are Low Voltage (LV) and Medium Voltage (MV) in narrowband and broadband applications. Broadband applications use the 2-30 MHz frequency band for high speed data transfer network applications and narrowband use the 3-500 kHz frequency band for meter reading and last mile power equipments. An Automatic Meter Reading (AMR) system can be implemented in an entire structure of a power network of distribution and supply using the LV, MV and HV (high voltage) power lines. Solutions developed to date, using PLC communication, mainly use LV and MV power lines. Power Line Communications are settled by the international standard IEEE P1901 which has been published at the beginning of the year 2011. A standard that settles the narrowband PLC will be published as IEEE P1901.2. For its development two proposals have been sent to the project group: PRIME and PLC-G3.

Method— The research focuses on PLC communication over the outdoor power grid with the use of LV and MV power lines. The main aspect studied is the communication between the two power grid segments through power transformers without the use of bypass equipments. For this purpose a series of field tests have been made with the use of LV PLC modem, and comparative studies have been made of last generation proposed protocol as PLC-G3 and PRIME and early used ones with results presented by other authors. Based on the necessity of an AMR system, a PLC architecture has been proposed that uses the LV and MV power lines only. Future work will focus on improving PLC communication between multiple segments of the grid over multiple power transformers.

Results— Advantages of the proposed architecture are: the ability to easily expand AMR system because communication is achieved through the existing grid structure, the architecture allows integration of a large number of meters manageable by a single concentrator, standalone operating system can be made when a segment of the power grid is damaged, the architecture can be extended for control and supervision of problems that can occur in the power grid, monitoring of transformer and distribution lines, low cost because the power network is used and no third parties solution are necessary, reducing travel costs for meter reading by human operators, low error rate in automatic generation of invoices to customers.

Conclusion— In this presentation a state of the art in narrowband PLC was made and presented field test on transformer communication issue. We have analyzed possibilities of using the power grid for an AMR system that use only PLC technology for data transfer and tested proposed protocols for this purpose. Power line communication is a good candidate for future Smart Grid and can ensure communication between grid segments although with some difficulties in particular cases. Last presented results of field tests at international IEEE symposiums and present result show the potential of the use of OFDM for meter reading. The proposed architecture is a possible future implementation of an AMR PLC system that can ensure communication with power, water and gas meters from a command center connected to a LV power line through a PLC modem.

Index Terms— AMR, architecture, Narrowband, PLC, transformer

Solutions Regarding Improvement of HF RFID System Performances in Metallic Environments

Adrian-Ioan PETRARIU, Vasile-Gheorghită GĂITAN

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
13, University Street, 720229, Suceava, Romania
apetrariu@eed.usv.ro, gaitan@eed.usv.ro

Introduction—RFID systems are sensitive to metallic environments in the proximity of the reader antenna. These environments produce shifting of the resonance frequency, causing performances degradation for the entire RFID system (decreasing of the transmitted power that is send to the tag which causes diminution of the reading distance). In order to limit these effects, we must ensure innovative solutions to bring the resonance frequency of the RFID antenna circuit all the time to its working frequency. These solutions can be taken into account when it's necessary to implement a HF RFID system that can offer good performances even if the metallic environments in the proximity of the antenna are constantly changing.

Method—One of the most reliable solutions is using ferrite as absorbing material. This kind of material is used especially for RFID tags, acting as a barrier between the metal surface and the tag. Thus, the appearance of eddy currents produced by a magnetic field is drastically reduced, making possible the communication with the reader. For the RFID reader antenna, one of the most approached solution assumes implementing a “static” antenna pattern with a metal plate as a support on one side. This pattern is tuned to the system resonance frequency once when the system is first implemented, offering some kind of immunity from the metallic environments. Another solution, which is proposed by the authors, assume to implement a tuning system (that can be automatically or manually) for the RFID antenna circuit which always ensure to this the 13.56MHz frequency.

Results—Figure 1.a presents the influence of the metal plate on the circuit resonance frequency. Thus, the resonance frequency is shifted up, reaching 15.12MHz for only 2cm between the antenna and the metal plate. Figure 1.b shows the experimental results for the $|S_{11}|$ parameter when is used a tuning circuit. We can observe that for any distance between the metal plate and the RFID antenna no shift in the resonance frequency is detected. Figure 1.c depicts the reading distance when the reader antenna is in the proximity of the metallic environment. This reading distance is taken with and without the tuning circuit. We can see that the reading distance increases significantly when the tuning circuit is used.

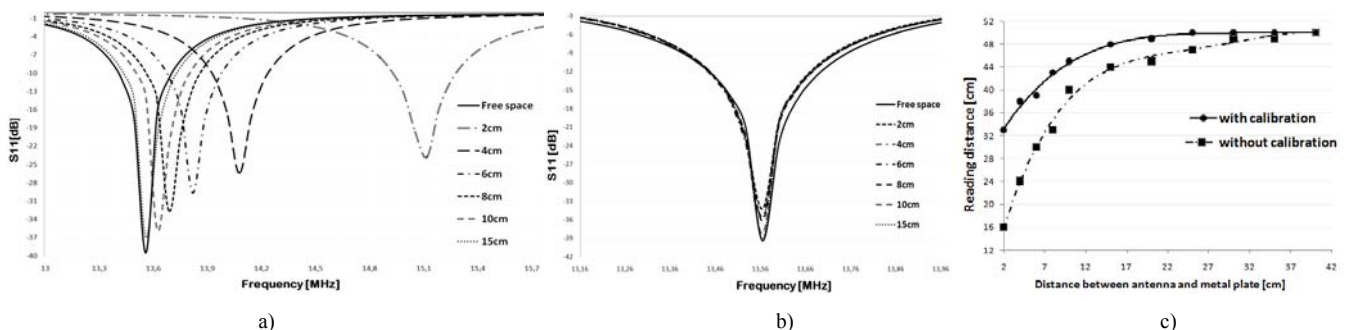


Figure 1. a) Influence of metallic environment over the RFID antenna; b) $|S_{11}|$ with the tuning circuit; c) Reading distance of the RFID system

Conclusion—Test results show that using a tuning circuit the reading distance for the RFID tags will increase significantly, although the reader antenna is closed to the metallic environment. Using the proposed solution at a small distance between the RFID reader antenna and the metal plate (2cm), is obtained a reading distance of 75% from the reference reading distance, which is 50cm, towards only 25% when this circuit is not used.

Index Terms—13.56MHz RFID system, automatic tuning circuit, metallic environments, matching unit, HF antenna.

Contributions in data servers development for distributed applications

Elisabeta TĂTULESCU¹, Vasile Gheorghită GĂITAN²

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
University Street, nr.13, 720229 Suceava, Romania

¹elisabetat@eed.usv.ro, ²gaitan@eed.usv.ro

Introduction— One of the biggest challenges in distributed systems is communication between objects situated on different platforms or written in different programming languages. This is the reason why OPC (OLE for Process Control) specifications have been defined, based on the DCOM standard (Distributed Components Object Model). This standard was developed by Microsoft to describe the object model required to implement applications in a distributed environment built on the client - server principle. Another standard developed to guide and facilitate the integration of separately developed systems into a single heterogeneous distributed environment is CORBA (Common Object Request Broker Architecture), developed by a consortium of over 700 developers, called OMG (Object Management Group).

My main objective in the PhD thesis is to develop a server based on CORBA standard by adapting OPC Data Access specifications. Server-client communication will be achieved using TAO middleware (The ACE ORB) which is based on the templates contained in the ACE framework (ADAPTIVE Communication Environment).

Method— To demonstrate the portability of the OPC DA specifications from DCOM to CORBA, a data server will be developed based on the OPC specifications. Although both DCOM and CORBA middleware describe interfaces that can be accessed by clients through an interface description language (IDL), the definitions found in the DCOM IDL files use the data types of the C programming language, while in CORBA IDL files are used only data types that are common to many programming languages. This enhances interoperability between objects written in different programming languages. In order to obtain the necessary files in the servant implementation, the IDL file will be compiled using the TAO_IDL compiler, a real-time implementation of the CORBA standard based on the ACE components. The IDL file contains the object's interface and the functions that can be called by the client. After obtaining the IDL files, the servant will be implemented in C++ using ACE framework.

Conclusion— Introducing the ACE programming environment in distributed systems for monitoring and process control offers a new solution in data server development. Because it is based on the CORBA specification, using the ACE components offers several benefits to distributed software developers, such as increased portability, the ability to pass through the firewall, reusable patterns and components, etc.

Index Terms— ACE, CORBA, distributed systems, OPC, SCADA.

Advanced Modeling and Simulation Techniques using High Performance Computing

Ionela RUSU¹, Stefan-Gheorghe PENTIUC²

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
Street no 13, 720229 Suceava, Romania

¹ionelar@eed.usv.ro, ²pentiuc@eed.usv.ro

Introduction— An important concept in computer science has been represented by the virtual reality, which signifies a sum of all efforts used to simulate the real world. The high progress of computer technology has determined the simulation of complex systems of high accuracy. The purpose of a simulation system consists in issuing a series of predictions concerning the behavior and performance of real world systems. Such system will be built in accordance to a set of information about parameters or variables specific to the progress of a simulation system. The system's complexity and physical phenomena that characterize the proposed simulation system will certainly require intensive computing resources and advanced computing methods.

The main objective of this project is to design and to develop a simulation environment for the propagation of high energy particles through a multilayered medium with applicability in medical science. Our work is concentrated in developing a dose calculation system for radiotherapy treatment planning using a parallel Monte Carlo method. This system will be optimized to exploit the HPC resources provided by the IBM cluster from our HPC laboratory. For the radiotherapy treatment planning procedure to achieve results with a high accuracy it needs to model a huge number of events that involve large-scale computational resources and significant amounts of time.

Method—The most important part of this project is to develop a CBEA-based Monte Carlo algorithm optimized to be executed on IBM Roadrunner cluster from our HPC Laboratory. In its simplest definition, Monte Carlo method achieves a mathematical model of the system evolution based on probabilistic laws. The Monte Carlo method offers a great accuracy of solution, but has a big disadvantage: the method is high time-consuming. For this reason, the majority of research in this area has focused on the development the techniques based on high performance computing. Currently, we are working on a parallel Monte Carlo algorithm optimized for Cell/B.E processors which is based on a well known Monte Carlo model – MCML (Monte Carlo modeling of light transport in multi-layered tissues).

Results—The first experiments showed us encouraging results on the IBM Roadrunner cluster comparing with similar results of GPU-accelerated Monte Carlo methods. The challenge that remains is to reduce the computational time of the simulation to achieve a higher performance, but maintain the accuracy. In this scope, we design few optimization strategies concerning the load-balancing problem, optimizing the memory usage or the Monte Carlo variance reduction techniques.

Conclusion— The originality of the project is emphasized by optimizing the Monte Carlo simulation method on the CBEA-based clusters and using the computing resources towards the radiation propagation.

Index Terms—modeling, simulation, Monte Carlo, High Performance Computing, Cell/B.E.

Analysis of hybrid pattern recognition system with HMM and SVM methods

Ștefania – Iuliana ȘOIMAN¹, Ștefan Gheorghe PENTIUC²
Ștefan Cel Mare University of Suceava, 13 University Street, Suceava, Romania
¹stefania_soiman@hotmail.com, ²pentiuc@eed.usv.ro

Introduction— Our main area of research is the design and analysis of statistical learning algorithms for pattern recognition. In the last years, parallel computing has produce a tremendous impact on a variety of areas ranging from computational simulations for scientific and engineering applications to commercial applications in data mining. The cost benefits of parallelism, coupled with the performance requirements of applications, imply compelling arguments in favor of parallel computing.

Markov chain is a kind of probabilistic finite state automaton, where input can go from one state to another with a probability. The Markov property makes the assumption that the probability of a state transition only depends on the previous state. HMM is Markov chain with outputs produced after a state transition. Three fundamental algorithms of hidden Markov Model: forward, Viterbi and Baum Welch is the object of our study.

The support vector machine is a robust tool for data mining classification. The algorithm which is based on the structural risk minimization principle, find a separating hyperplane with maximum margins to separate patterns.

Probabilistic model such as Hidden Markov Models (HMM) and Support Vector Machine (SVM) classifier are representing the main objective. By combining the two above classifiers, in order to realize a pattern recognition system, we could obtain a better classification performance.

Method— Our study presents an overview of Hidden Markov Models and Support Vector Machine classifiers and illustrate their into a pattern recognition system. The goal is to highlight the method in which HMM and SVM can be merged together.

Results— Parallel algorithm that implement message passing are tested on an IBM Cluster BladeCenter HS21 with 56 Intel Xeon processors quad core at 2.33 GHz. Very good results of testing matrix – matrix multiplication was obtained. Data mining cases that we are studying (HMM, SVM) needs parallel matrix multiplication. The utilization of a cluster computer to parallelize HMM and SVM algorithms working as part of the pattern recognition system is the scope on this project.

Conclusion— We propose to identify/develop parallel data mining algorithms in order to get a performance enhancement using HPC resources. High performance computing had very complicated programming environments and it is necessary to develop some applications.

Index Terms—HMM, SVM, data mining, parallel, MPI.

New Human Computer Interface for Simulation of Assembly Operations in Virtual Environments

Elena-Gina CRACIUN, Stefan-Gheorghe PENTIUC

*Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
Street Universitatii , no.13, RO-720229 Suceava, Romania
ginac@eed.usv.ro, pentiuc@eed.usv.ro*

Introduction - Designing of a human computer interface for assembly simulation requires the conception and development of several instruments which allows interaction with the virtual environment. To improve the current practices in virtual assembly simulation, we have developed a user gesture interface, capable to provide intuitive interaction for selection, manipulation and control of any virtual component and to express the constrained behavior for the manipulated components. This interface it is in accordance with the current tendency in technology development. The user can interactively learn an assembly task by simulating the real process through hand gesture. During assembly or disassembly the user is able to find details about components and observe the relationships between components. The merit of this interface lies in its ability to express all the functionality of an assembly simulator using and interpreting in an intuitive way the specific human gestures.

Method—The interface design is composed by three components: the input tool - user hand, the tools for selection and manipulation - hand posture and the assembly command - hand gestures. The input tool is referring the instrument which allows the communication between the user and the application. For the hand detection we build a supervised classifier, based on Haar features and AdaBoost algorithm. Inside the virtual environment we map the real hand through a cursor. The selection and manipulation tools permit for the object inside virtual environment to be grabbed, rotate, positioned and released. We propose to use the hand posture like instrument for the operation of selection and manipulation. Hence, based on the Hu image moments like features extracted from the hand shape, we developed a posture classifier. The last step in the assembly process is to validate the assembly command. The hand trajectory is extracted and recognized using a gesture classifier based on Hidden Markov Models.

Results— The accuracy of detection module hit almost 90%, good results taking into account the working environment and the low cost device. The evaluation for the posture classifier provided an average accuracy rate of almost 90%, with the maximum value for the selection posture $\approx 95\%$. For testing the gesture for assembly command we use a total number of 1600 gestures. The mean recognition rate hit 94%, with the best value for fix gesture, 96%, and a low value for replace gesture 88%.

Conclusion— Throughout this paper we have presented the development of a vision-based human computer interface used in an assembly simulation environment. The solution we propose is based on image processing for selection and manipulation operation. The assemblies' commands are based on a 3D HMM-based classifier for gesture recognition. The interface we propose has support for operation of assembly, disassembly, replace or delete components from a product. Our interface is an efficient method for assembly operations and a competitive approach for the current assembly simulation techniques.

Index Terms—assembly simulation, gesture recognition, interface, hand posture, virtual environment .

The Design and Development of a Street Lighting Monitoring and Control System

Alexandru LAVRIC¹, Valentin POPA²

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
Street Universitatii, nr.13, 720229, Suceava, Romania

¹lavric@eed.usv.ro, ²valentin@eed.usv.ro

Introduction—Increasing the efficiency and automation of street lighting systems is a very important issue. The energy consumption of a public lighting system in a Romanian town accounts for about 20% of the total energy consumption of that town. Energy saving and environmental protection have lately become highly debated topics. Public lighting is designed to meet the needs of local communities, such as: increasing comfort, the quality of life and increasing road traffic safety. The on-off street lamp command depending on chronological time is more often insufficient and even inflexible. Thus, for increased efficiency, one must consider other factors as well, such as: the presence of daylight and the road or pedestrian traffic in that specific area. After taking these factors under consideration, such a system should also adequately adjust the luminosity level so as to ensure the safety of road traffic and maintain an optimum energy consumption level. The traditional street lamp control systems have photoelectric cells that may malfunction and thus endanger the proper functioning of the entire lighting system, most likely because of improper installation, calibration or impurity build-up.

Method—In order to reach a high performance level in a street lighting monitoring and control system, some important aspects must be taken into account such as:

- performance evaluation of the state-of art street lighting control systems,
- selection of the adequate communication protocol, so that the implementation costs to be low,
- selection of the street lighting lamps in order to reach an optimum energy consumption,
- selection of the network topology to achieve the highest number of nodes,
- assessing the coexistence problem of the IEEE 802.15.4 sensor networks with other devices that function within the same 2.4 GHz band,
- design and implementation of an original street lighting control system.

Results—Our research results show that in order to integrate a high number of devices installed in a relatively large geographical area is recommended to use a WSN (Wireless Sensor Network) communication protocol (IEEE 802.15.4-based) such as ZigBee or JenNet. Another important advantage of using WSN is that specifically addresses low-cost, low energy consumption and low transfer of highly reliable data. As a result of the simulations that have been conducted, the data reveals that the tree topology is much cheaper and efficient than the mesh topology from throughput point of view. After doing a carefully cost efficiency study, the LED based street lamps were selected and integrated in our system. One of the main problems that occurred during the development process is the coexistence problem, of the (WSN) IEEE 802.15.4 sensor networks with IEEE 802.11g (Wi-Fi) wireless networks and ad-hoc Bluetooth networks that function within the same 2.4 GHz band. Our measurements show that the performance level can critically decrease, because of that we propose some separation distances limits and channel allocation requirements in order to increase the performance level. Furthermore, the street lighting control system integrates a vehicle detection algorithm in order to achieve the energy-efficiency goal.

Conclusion—The issues related to the efficiency, and the automation level of the lighting system must be further addressed. The main advantages of the proposed system mainly consist in a significant reduction of the energy consumption costs by at least 20% and of the maintenance costs by at least 5%. Finally, the proposed system achieves the energy savings and environmental protection goals.

Index Terms—WSN, street lighting control, IEEE 802.15.4, vehicle detection, monitoring architecture

The Design and Development of an Movement Monitoring System using a WSN Protocol

Stefan SFICHI, Adrian GRAUR and Valentin POPA

Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
str. Universitatii nr.13, RO-720229 Suceava, Romania

Introduction— In this poster we present an implementation of the combination between two different kinds of technology, like PIR and ZigBee. The passive infrared intrusion detection system is a quite old and used technology invented in the beginning of the 80's. By now, it has got pretty cheap, because it is used on massive scale on house alarm systems and in industry. Nowadays, PIR is also used to measure surface temperature (as a sensor in industry). The ZigBee however, is not as old as the PIR technology. ZigBee devices work on batteries and last up to years using primary cells (this means low cost) without any kind of chargers, so we deduce: low cost and easy installation also. The ZigBee standard offers many new wings among which ZigBee Health Care also. This can enable health and fitness monitoring for the project.

One of the motives of using ZigBee is that this technology is low cost, just like passive infrared.

The SOC (System on Chip) is a very good innovation, because there are many ways of using it. These sensors combine sensing, signal processing, decision capability and wireless networking capability in a very small and low cost power system.

The system should have to detect and localize persons inside a living area.

Method— There are other systems that use PIR and wireless detection. They have been tested many times. Still ZigBee offers one major benefit, which is low power consumption. The innovation of this article is the use of passive infrared with ZigBee detection, unlike the active infrared used before. There is also the SOC technology that will help a lot in this future project.

There's a good opportunity on using this mix for the future of detection and localization. We intend to make a low cost system that has very low power consumption, and can be easily installed by people with little calification.

Results— Our implementation has reached to the stage where it could successfully localize and supervise one person inside a living area. The next step is to do the same with more persons inside a building. That means porting the programing system onto a PC so that the computing increases.

Conclusion— This poster highlights the benefits of mixing two different kinds of technologies, that of ZigBee and that of PIR in order to implement a new movement monitoring system. The logical diagram of this system is opening a way to building a high sensitivity server that shall manage different persons inside a living area. The diagram could be upgraded to some other working processes, like extracting reports for different kind of results from the database (information about the evolution of a person/patient).

There's a good opportunity on using this mix for the future of detection and localization.

There is one major benefit on using this combination: low power consumption. This will generate more benefits like: cutting the costs with service (that doesn't have to be too often), easy installation. Because the technology is not expensive, we will have cheap systems for sale.

The system can also be implemented with other passive systems like RFID and is considering satisfying a wide area of activities, like healthcare institutions, old age institutions and also of private houses or even business centers.

Index Terms— detection system, PIR, logical diagram, low power, ZigBee.

Computer Network Security

Ovidiu STRUGARU

*Ștefan cel Mare University of Suceava, Faculty of Electrical Engineering and Computer Science
tr. Universitatii 13, 720229 Suceava, ROMANIA
ovidiu.strugaru@gmail.com*

Introduction—Since the inception of the Internet in the early 80s, the Internet Protocol sustained its rapid growth. It is a robust protocol that supported the evolution of today's Internet network architecture and transported transparently the application data.

The rapid growth of today's Internet, which expanded to be a mega network and, with the rapid adoption of the technologies such as 3G/4G/LTE wireless devices and other wireless appliances, and the diversity of applications and electronic transactions, some of which requires a high level of assurance, brought a series of security problems. Because the early Internet was fairly friendly, it lacked the security mechanisms in the original architecture.

Threats to data privacy are powerful tools in the hands of attackers that could use the vulnerabilities of a network to corrupt, destroy, and steal sensitive information or simply disrupting the normal activities and operation. Threats to data privacy concern business and private users alike. To prevent such threats, security measures should be deployed so that that would protect personal and sensitive data, and a privacy framework should be adopted.

Method—Important new techniques have been developed to overcome some of the security deficiencies (IPSEC, SSL, firewalls, etc.). To address some security issues and the rapid depletion addresses of IPv4 the Network Working Group of the Internet Engineering Task Force (IETF) introduced in 1998 a new protocol called Internet Protocol version 6 (IPv6). This protocol solves some of the problems that affect the IPv4 networks, including the small address space and the lack of security. Even though, there have been great improvements and innovations in the network security field since the inception of the Internet, no one can guarantee more than 99.999% protection.

Results—IPv6 security is in many ways the same as IPv4 security. The basic/underling mechanisms for transporting packets across the network infrastructure is mostly unchanged, and the upper-layer protocols that transport the payload, the actual application data, are mostly unmodified. However, because IPv6 mandates the inclusion of IP Security (IPsec), it has often been stated that IPv6 is more secure than IPv4. Although this may be true in an ideal environment, in reality the same problems that plague IPv4 IPsec deployment will affect IPv6 IPsec deployment. Therefore, IPv6 is usually deployed without cryptographic protections of any kind.

We analyzed and compared security attacks that affected IPv4 protocol with the ones that IPv6 protocol brings. Even though, IPv6 protocol solves some of them and improves local network security, the underling problems still remains; distant attacks are still present and can be carried out.

Conclusion—Based on the analysis results of how different threats and risk influence different network protocols and different topologies, we will try to find a security model that can help alleviate some of the issues. This model must be able to respond to the security policies needs of a company and in some instances must impose some the policies.

Index Terms—computer network, security, Internet Protocol, network attacks, cyber threats