



**Editors: Vladimir Vasek, Yurly S. Shmally, Denis Trcek,
Nobuhiko P. Kobayashi, Ryszard S. Choras, Zbigniew Klos**



Recent Researches in Automatic Control

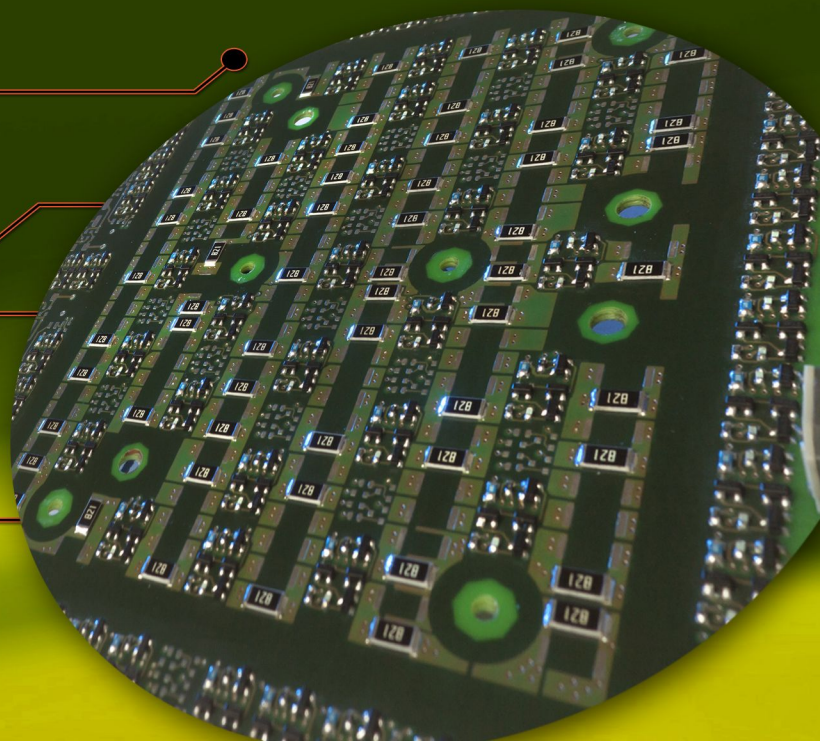
Recent Researches in Automatic Control

**13th WSEAS International Conference on Automatic Control,
Modelling & Simulation (ACMOS '11)**

Lanzarote, Canary Islands, Spain, May 27-29, 2011



**ISSN: 2223-2907
ISBN: 978-1-61804-004-6**





RECENT RESEARCHES in AUTOMATIC CONTROL

**13th WSEAS International Conference on AUTOMATIC
CONTROL, MODELLING & SIMULATION (ACMOS '11)**

**Lanzarote, Canary Islands, Spain
May 27-29, 2011**

RECENT RESEARCHES in AUTOMATIC CONTROL

**13th WSEAS International Conference on AUTOMATIC
CONTROL, MODELLING & SIMULATION (ACMOS '11)**

**Lanzarote, Canary Islands, Spain
May 27-29, 2011**

Published by WSEAS Press
www.wseas.org

Copyright © 2011, by WSEAS Press

All the copyright of the present book belongs to the World Scientific and Engineering Academy and Society Press. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Editor of World Scientific and Engineering Academy and Society Press.

All papers of the present volume were peer reviewed by two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: <http://www.worldses.org/review/index.html>

ISBN: 978-1-61804-004-6
ISSN: 2223-2907



World Scientific and Engineering Academy and Society

RECENT RESEARCHES in AUTOMATIC CONTROL

**13th WSEAS International Conference on AUTOMATIC
CONTROL, MODELLING & SIMULATION (ACMOS '11)**

**Lanzarote, Canary Islands, Spain
May 27-29, 2011**

Editors:

Prof. Vladimir Vasek, Tomas Bata University in Zlin, Czech Republic
Prof. Yuriy Shmaliy, Guanajuato University, Mexico
Prof. Denis Trcek, University of Ljubljana, Slovenia
Prof. Nobuhiko P. Kobayashi, University of California Santa Cruz, USA
Prof. Ryszard S. Choras, University of Technology & Life Sciences, Poland
Prof. Zbigniew Klos, Poznan University of Technology, Poland

International Program Committee Members:

Elsayed Atlam, JAPAN
Caner Akuner, TURKEY
Ognjen Kuljaca, UNITED STATES
Muhammed A. Ibrahim, IRAQ
Ismail Temiz, TURKEY
Bahadtin Ruzgar, TURKEY
Mawahib Sulieman, UNITED ARAB
EMIRATES
Hossein Shayeghi Moghanlou, IRAN
Abdullah Mamun, SINGAPORE
Keylan Alimhan, JAPAN
Luminita Giurgiu, ROMANIA
Andreas Terzis, GREECE
Onsen Toygar, TURKEY
Sina Khorasani, IRAN
Stefania Popadiuc, ROMANIA
Refik Samet, TURKEY
Mehmet Onder Efe, TURKEY
Francklin Rivas, VENEZUELA
Addison Rios-Bolivar, VENEZUELA
Victoria Rodellar, SPAIN
Mehmet Hakan Karaata, KUWAIT
Ichirou Takahashi, JAPAN
Kai Li, CHINA
Hwang-Cherng Chow, TAIWAN
Georgi Gluhchev, BULGARIA
Francesco Muzi, ITALY
Sajjad Mohsin, PAKISTAN
Yong Woo Lee, KOREA
Nasser Shahtahmasebi, IRAN
Saeed-Reza Sabbagh-Yazdi, IRAN
Frangiskos Topalis, GREECE
Boumchedda Khaled, ALGERIA
Kalle Kantola, FINLAND
Ismail Musirin, MALAYSIA
Helen Catherine Leligou, GREECE
Slobodan Babic, CANADA
Lambros Ekonomou, GREECE
Nam Tran, AUSTRALIA
Dorin Cismasiu, ROMANIA
Pooia Lalbakhsh, IRAN
Shabiul Islam, MALAYSIA
Florin Dragan, ROMANIA
Pelin Yildiz, TURKEY
Stelios Zimeras, GREECE
Rafic Bachnak, UNITED STATES
Hong-Tzer Yang, TAIWAN
Norman Mariun, MALAYSIA
Oscar Camacho, VENEZUELA
Chang-Biau Yang, TAIWAN
Sylvia Encheva, NORWAY
Rafic Bachnak, UNITED STATES
Samir Nejm, TUNISIA
Nicolae Popoviciu, ROMANIA
Yaw-Ling Lin, TAIWAN
PooGyeon Park, KOREA
Dana Petcu, ROMANIA
Yoonsik Choe, KOREA
Ioan Salomie, ROMANIA
Abdel-Latif Elshafei, EGYPT
Baki Koyuncu, TURKEY
Ouahdi Dris, ALGERIA
Zakir Husain, IRAN
Krishna Busawon, UNITED KINGDOM

Preface

This year the 13th WSEAS International Conference on AUTOMATIC CONTROL, MODELLING & SIMULATION (ACMOS '11) was held in Lanzarote, Canary Islands, Spain, May 27-29, 2011. The conference provided a platform to discuss circuits and electronics for control, hybrid systems, digital control, intelligent control, man-machine interaction, cybernetics, simulation, optimization problems in control engineering, decision support systems, fault tolerance, virtual reality for automation, microprocessors, control education, signal processing systems for control, unmanned vehicles etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

Table of Contents

Computation of Predictions in Multivariable Predictive Control	15
<i>Marek Kubalcik, Vladimir Bobal</i>	
Adaptive Variable Structure Control Law for a Variable Speed Wind Turbine	21
<i>Oscar Barambones, Jose Maria Gonzalez De Durana, Patxi Alkorta, Jose Antonio Ramos, Manuel De La Sen</i>	
Controllability of Nonlinear Systems	28
<i>Jerzy Klamka</i>	
Easy Communication Approach for Data Exchange in Distributed Simulation Environment	34
<i>Artis Aizstrauts, Egils Ginters, Dace Aizstrauta</i>	
Training Scenario Operations Realization in Virtual Reality Environment	39
<i>Arnis Cirulis, Egils Ginters</i>	
Nonlinear Adaptive Control of a Chemical Reactor	45
<i>Petr Dostal, Frantisek Gazdos, Vladimir Bobal, Monika Bakosova</i>	
Adaptive Digital Smith Predictor	51
<i>Vladimir Bobal, Petr Chalupa, Petr Dostal, Marek Kubalcik</i>	
Polynomial Approach to Robust Control of Unstable Processes with Application to a Magnetic System	57
<i>Frantisek Gazdos, Petr Dostal</i>	
Situational Awareness Based Flight Control of a Four-Rotor Type UAV	63
<i>Igor Astrov, Andrus Pedai</i>	
Stochastic Controllability of Nonlinear Systems	69
<i>Jerzy Klamka, Elzbieta Ferenstein</i>	
Agent-Based TemPerMod Simulator Cell Architecture	75
<i>Ieva Lauberte, Egils Ginters</i>	
The Nyquist criterion for LTI Time-Delay Systems	80
<i>Libor Pekar, Radek Matusu, Petr Dostalek, Jan Dolinay</i>	
Analysis of a Simple Quasipolynomial of Degree One	86
<i>Libor Pekar, Roman Prokop</i>	
Real Experiences of Pilot Operation of the Photovoltaic System	92
<i>Hruska Frantisek</i>	

Project of Control System of Thermal Comfort <i>Hruska Frantisek</i>	96
Behavioral Modeling in System Engineering <i>Radek Silhavy, Petr Silhavy, Zdenka Prokopova</i>	100
Requirements Gathering Methods in System Engineering <i>Radek Silhavy, Petr Silhavy, Zdenka Prokopova</i>	106
Adaptive Control of Tubular Chemical Reactor <i>Jiri Vojtesek, Petr Dostal</i>	111
The Numerical Simulation of the Rubber Diaphragm Behavior <i>Jakub Javorik, Michal Stanek</i>	117
The Specimen Optimization for the Equibiaxial Test of Elastomers <i>Jakub Javorik, David Manas</i>	121
Comparison of Energy Modeling and Laboratory Tests on Green Roof Potential to Decrease the Cooling Demand for North European Office Buildings <i>Hendrik Voll, Teet-Andrus Koiv</i>	125
Utilization of the EASI Model in the Matters of Critical Infrastructure Protection and its Verification via the OTB SAF Simulation Tool <i>Ludek Lukas, Martin Hromada</i>	131
Modeling of the Microflow Sensor <i>Milan Adamek, Miroslav Matysek, Petr Neumann</i>	137
One of Possible Methods of Control of Multivariable Control Loop <i>Pavel Navratil, Libor Pekar</i>	140
Segmentation of Production and Security Areas with SICK LMS 400 <i>Pavel Neckar, Milan Adamek, Lubos Necasal</i>	145
Prediction of Technological Parameters during Polymer Material Grinding <i>David Samek, Ondrej Bilek, Jakub Cerny</i>	148
Comparison of Artificial Neural Networks using Prediction Benchmarking <i>David Samek, David Manas</i>	152
Teaching Platform for Lessons of Embedded Systems Programming <i>J. Dolinay, P. Dostalek, V. Vasek, P. Vrba</i>	158
Tracking and Disturbance Attenuation for Unstable Systems: Algebraic <i>Roman Prokop, Natalia Volkova, Zdenka Prokopova</i>	161

A Novel Principle for Relay-Based Autotuning	167
<i>Roman Prokop, Jiri Korbel, Ondrej Liska</i>	
Modelling of Thermal Stresses in Printed Circuit Boards	173
<i>Oldrich Suba, Libuse Sykorova, Stepan Sanda, Michal Stanek</i>	
Stress - State Modelling of Injection-molded Cylindrical Bosses Reinforced with Short Fibres	177
<i>Oldrich Suba, Libuse Sykorova, Stepan Sanda, Michal Stanek</i>	
Temperature Field Simulation of Polymeric Materials During Laser Machining Using COSMOS / M Software	180
<i>Libuse Sykorova, Oldrich Suba, Martina Malachova, Jakub Cerny</i>	
Counterfeit Electronic Components Detection Possibilities	185
<i>Petr Neumann, Milan Adamek, Petr Skocik</i>	
MIMO Model Predictive Control with Local Linear Models	189
<i>Jakub Novak, Petr Chalupa, Vladimir Bobal</i>	
Modeling of Hydraulic Control Valves	195
<i>Petr Chalupa, Jakub Novak, Vladimir Bobal</i>	
Data Analysis: Tools and Methods	201
<i>Prokopova Zdenka, Silhavy Petr, Silhavy Radek</i>	
Improvised Shelters - Projecting Methodology and Chosen Aspects of Building Materials	207
<i>Jakub Rak, Lucie Juoikova, Milan Adamek</i>	
Optimization of Injection Molding Process by MPX	212
<i>Michal Stanek, David Manas, Miroslav Manas, Oldrich Suba</i>	
Chemical Resistance of Polymers Modified by Beta Radiation	217
<i>Zdenek Holik, Michal Danek, Miroslav Manas, Jakub Cerny, Martina Malochova</i>	
The Influence of Cross-linking Agent on Mechanical Properties of Polyamide Modified by Irradiation Cross-linking	222
<i>Zdenek Holik, Michal Danek, Miroslav Manas, Jakub Cerny</i>	
Diffusion Model of Washing Process	226
<i>Dagmar Janacova, Hana Charvatova, Karel Kolomaznik, Vladimir Vasek, Pavel Mokrejs, Rudolf Drga</i>	
Simulation of Injection Molding Process	231
<i>Michal Stanek, David Manas, Miroslav Manas, Jakub Javorik</i>	
Suggestion of Improvised Shelter Design	235
<i>Lucie Jurikova, Jakub Rak, Milan Adamek</i>	

ANN Synthesis for an Agglomeration Heating Power Consumption Approximation	239
<i>Pavel Varacha, Roman Jasek</i>	
Design of the Multichannel Measurement System for Strain Gauge Sensor Evaluation	245
<i>Petr Dostalek, Jan Dolinay, Vladimir Vasek</i>	
There Are More Locally Brunovsky Systems than Constant Ones	249
<i>Miguel Carriegos, Montserrat Lopez-Cabeceira</i>	
The Energetic Balance of the Friction Clutches used in Automotive	252
<i>Ion Silviu Borozan, Inocentiu Maniu, Veronica Argesanu, Raul Miklos Kulcsar</i>	
USB MIDI Lights Device	257
<i>Dalibor Slovak</i>	
Neural Network Classification of Gunshots using Spectral Characteristics	262
<i>Milan Navratil, Vojtech Kresalek, Petr Dostalek</i>	
The Mobile Ordering System with the PDA	268
<i>M. Matysek, M. Adamek, P. Neumann, T. Matulik</i>	
Computer Modeling of Non-Stationary Conduction of Heat in Two-Layer Plate	272
<i>Hana Charvatova, Vladimir Vasek, Pavel Mokrejs, Miloslav Fialka</i>	
Non-Stationary Temperature Field in a Plane Plate for Symmetric and Asymmetric Problem	277
<i>Hana Charvatova, Dagmar Janacova, Karel Kolomaznik</i>	
The Application of Concrete Nonlinear Model Exposed to Impact Load	283
<i>Petr Hradil, Jiri Kala, Vlastislav Salajka, Petr Vymlatil</i>	
Solving of Non-Stationary Heat Transfer in a Plane Plate	287
<i>Dagmar Janacova, Hana Charvatova, Karel Kolomaznik, Vladimir Vasek, Pavel Mokrejs</i>	
Raman Spectroscopy as an Innovative Method for Material Identification	292
<i>Hana Vaskova</i>	
Hide Soaking Controlled by Microcontroller with Ethernet Interface	296
<i>Petr Dolezel, Vladimir Vasek, Karel Kolomaznik, Dagmar Janacova</i>	
USB MIDI Pulse Width Modulation Software	300
<i>Dalibor Slovak</i>	
Management of Protection of Czech Republic Critical Infrastructure Elements	306
<i>Ludek Lukas, Martin Hromada</i>	

Uncertainty Modelling in Time-Delay Systems: Parametric vs. Unstructured Approach	310
<i>Radek Matusu, Roman Prokop, Libor Pekar</i>	
Fractional Order Calculus in Control Theory	314
<i>Radek Matusu</i>	
Municipal Heating Network Simulation Experiments Based on Days with Similar Temperature	318
<i>V. Dolinay, L. Vasek</i>	
Simulation Model of Heat Distribution and Consumption in Practical Use	321
<i>L. Vasek, V. Dolinay</i>	
Advanced Voltage Controlled Amplifier for Volume Expanders	325
<i>Martin Pospisilik, Milan Adamek</i>	
Logarithmic VU Meter Driver	331
<i>Martin Pospisilik, Milan Adamek</i>	
Identification of Arrhenius Equation Parameters for Control Purposes	337
<i>Lubomir Macku</i>	
Pole Placement Controller with Compensator Adapted to Semi-Batch Reactor Process	341
<i>David Novosad, Lubomir Macku</i>	
Identification of Time Series Model of Heat Demand using Mathematica Environment	346
<i>Bronislav Chramcov</i>	
Control of the Serial Production System	352
<i>Robert Bucki, Bronislav Chramcov</i>	
Raman Spectroscopy of Epoxy Resin Crosslinking	357
<i>Hana Vaskova, Vojtech Kresalek</i>	
Infrared Radiation, Sensor, Source and Infrared Camera Measurement	362
<i>Rudolf Drga, Dagmar Janacova</i>	
A Real Models Laboratory and an Elevator Model Controlled through Programmable Controller (PLC)	365
<i>Tomas Sysala, Ondrej Vrzal</i>	
The Human Body Behavior under Vehicle Vibrations	368
<i>Raul Miklos Kulcsar, Veronica Argesanu, Ion Silviu Borozan, Inocentiu Maniu</i>	
Algorithms in the Examination of the Postural Stability	374
<i>L. Pivnickova, V. Vasek, V. Dolinay</i>	

Neural Network Synthesis Dealing with Classification Problem <i>Pavel Varacha</i>	377
Entities of Critical Infrastructure Protection in the Czech Republic <i>Necosal Lubos, Ludek Lukas</i>	383
Modular Software for Artificial Arms Design <i>Eduard Franti, Gheorghe Stefan, Paul Schiopu, Anca Plavitu, Tiberiu Boros</i>	387
Automotive Active Suspension – Case Study on H-Infinity Control <i>Ales Kruczek, Antonin Stribrsky, Jaroslav Honcu, Martin Hlinovsky</i>	392
Fluid Seismic Modelling Inside Reservoirs Walls and Shipping Channel based on Transport Phenomena <i>Ioan Sorin Leoveanu, Daniel Taus, Kamila Kotrasova, Eva Kormanikova</i>	398
Usage of Peak Functions in Heat Load Modeling of District Heating System <i>Erik Kral, Lubomir Vasek, Viliam Dolinay, Petr Capek</i>	404
Protections of Embedded System Inputs <i>Otahal Jiri, Babik Zdenek, Tomas Surynek, Hruska Frantisek</i>	407
Visualization of Giant Connected Component in Directed Network - Preliminary Study <i>Eva Klimkova, Roman Senkerik, Ivan Zelinka, Tomas Sysala</i>	412
Prediction of the Intensity of Direct Solar Irradiation <i>Martina Svetinska, Lubomir Vasek</i>	417
LED based Ultraviolet Light Source <i>Michal Brazda, Martin Pospisilik, Milan Adamek</i>	421
Object Relation Data Model of Heat Distribution Network <i>Palka Jiri, Vasek Lubomir, Dolinay Viliam</i>	426
Concurrency Control for Mobile Transactions <i>Alaa Alnaimat</i>	429
Computer Fluid Dynamics Application for Establish the Wind Loading on the Surfaces of Tall Buildings <i>Ioan Sorin Leoveanu, Daniel Taus, Kamila Kotrasova, Eva Kormanikova</i>	433
Applications of Multilevel Cellular Automata in Epidemiology <i>Monica Dascalu, Gheorghe Stefan, Adrian Zafiu, Anca Plavitu</i>	439
Authors Index	445

Authors Index

Adamek, M.	137, 145, 185	Fialka, M.	272	Manas, D.	121, 152
Adamek, M.	207, 235, 268	Franti, E.	387	Manas, D.	212, 231
Adamek, M.	325, 331, 421	Frantisek, H.	92, 96, 407	Manas, M.	212, 217
Aizstrauta, D.	34	Gazdos, F.	45, 57	Manas, M.	222, 231
Aizstrauts, A.	34	Ginters, E.	34, 39, 75	Maniu, I.	252, 368
Alkorta, P.	21	Gonzalez De Durana, J. M.	21	Matulik, T.	268
Alnaimat, A.	429	Hlinovsky, M.	392	Matusu, R.	80, 310, 314
Argesanu, V.	252, 368	Holik, Z.	217, 222	Matysek, M.	137, 268
Astrov, I.	63	Honcu, J.	392	Mokrejs, P.	226, 272, 287
Bakosova, M.	45	Hradil, P.	283	Navratil, M.	262
Barambones, O.	21	Hromada, M.	131, 306	Navratil, P.	140
Bilek, O.	148	Janacova, D.	226, 277, 287	Necesar, L.	145
Bobal, V.	15, 45, 51	Janacova, D.	296, 362	Neckar, P.	145
Bobal, V.	189, 195	Jasek, R.	239	Neumann, P.	137, 185, 268
Boros, T.	387	Javorik, J.	117, 121, 231	Novak, J.	189, 195
Borozan, I. S.	252, 368	Jiri, O.	407	Novosad, D.	341
Brazda, M.	421	Jiri, P.	426	Pedai, A.	63
Bucki, R.	352	Juoikova, L.	207, 235	Pekar, L.	80, 86
Capek, P.	404	Kala, J.	283	Pekar, L.	140, 310
Carriegos, M.	249	Klamka, J.	28, 69	Petr, S.	201
Cerny, J.	148, 180	Klimkova, E.	398, 412, 433	Pivnickova, L.	374
Cerny, J.	217, 222	Koiv, T.-A.	125	Plavitu, A.	387, 439
Chalupa, P.	51, 189, 195	Kolomaznik, K.	226, 277	Pospisilik, M.	325, 331, 421
Charvatova, H.	226, 272	Kolomaznik, K.	287, 296	Prokop, R.	86, 161
Charvatova, H.	277, 287	Korbel, J.	167	Prokop, R.	167, 310
Chramcov, B.	346, 352	Kotrasova, K.	398, 433	Prokopova, Z.	100, 106, 161
Cirulis, A.	39	Kral, E.	404	Radek, S.	201
Danek, M.	217, 222	Kresalek, V.	262, 357	Rak, J.	207, 235
Dascalu, M.	439	Kruczek, A.	392	Ramos, J. A.	21
De La Sen, M.	21	Kubalcik, M.	15, 51	Salajka, V.	283
Dolezel, P.	296	Kulcsar, R. M.	252, 368	Samek, D.	148, 152
Dolinay, J.	80, 245, 158	Lauberte, I.	75	Sanda, S.	173, 177
Dolinay, V.	318, 321	Leoveanu, I. S.	398, 433	Schiopu, P.	387
Dolinay, V.	374, 404	Liska, O.	167	Senkerik, R.	412
Dostal, P.	45, 51	Lopez-Cabeceira, M.	249	Silhavy, P.	100, 106
Dostal, P.	57, 111	Lubomir, V.	426	Silhavy, R.	100, 106
Dostalek, P.	80, 158	Lubos, N.	383	Skocik, P.	185
Dostalek, P.	245, 262	Lukas, L.	131, 306, 383	Slovak, D.	257, 300
Drga, R.	226, 362	Macku, L.	337, 341	Stanek, M.	117, 173, 177
Ferenstein, E.	69	Malachova, M.	180, 217	Stanek, M.	212, 231

Stefan, G.	387, 439	Varacha, P.	239, 377	Volkova, N.	161
Stribrsky, A.	392	Vasek, L.	318, 321	Voll, H.	125
Suba, O.	173, 177	Vasek, L.	404, 417	Vrba, P.	158
Suba, O.	180, 212	Vasek, V.	158, 226, 245	Vrzal, O.	365
Surynek, T.	407	Vasek, V.	272, 287	Vymlatil, P.	283
Svetinska, M.	417	Vasek, V.	296, 374	Zafiu, A.	439
Sykorova, L.	173, 177, 180	Vaskova, H.	292, 357	Zdenek, B.	407
Sysala, T.	365, 412	Viliam, D.	426	Zdenka, P.	201
Taus, D.	398, 433	Vojtesek, J.	111	Zelinka, I.	412