DEPARTMENT OF INFORMATION ENGINEERING AND PROCESS CONTROL

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I.   STAFF

Full Professor:
Ján Mikleš, PhD, DSc;

Associate Professors:
Monika Bakošová, PhD; Ján Danko, PhD; Ján Dvoran, PhD; Miroslav Fikar, PhD; Alojz Mészáros, PhD;

Assistant Professors:
Mária Karšaiová, PhD; Magdaléna Ondrovičová; Anna Vasičkaninová; Anna Zemanovičová, PhD;

PhD students:
Anton Andrášik; Jozef Dzivák; František Jelenčiak; Michal Kvasnica; Ľubomír Šperka;

Technical staff:
Eva Fuseková; Andrea Kalmárová; Anna Širicová; Stanislav Vagač;

II.   TEACHING AND RESEARCH LABORATORIES

        A. Teaching Laboratories:

Laboratory of Measuring Instruments and Techniques
Laboratory of Process Control
Laboratory of Gas Analysis
Computer Laboratory (PC 486, Pentium)
Computer Laboratory (LINUX)

        B. Research Laboratories:

Laboratory of Chemical Reactor Analysis and Control
Laboratory of Biochemical Process Analysis and Control
Laboratory of Distillation Column Analysis and Control
Laboratory of Modelling and Simulation
Laboratory of Computer Aided Design (Siemens – SIMATIC S-7 300)

III.   TEACHING

        A. Undergraduate Study

2nd semester (spring)
Informatics   (1-2 h) Ondrovičová, Vasičkaninová
5th semester (autumn)
Computer Based Data Processing   (0-2 h) Dzivák,   Fikar,   Jelenčiak,   Karšaiová, Ondrovičová, Vasičkaninová
6th semester (spring)
Automatic Control Fundamentals   (2-0 h) Bakošová, Danko, Fikar
Laboratory Exercises of Automatic Control Fundamentals (0-2 h) Andrášik,   Bakošová, Danko, Dzivák, Fikar, Jelenčiak, Karšaiová, Kvasnica, Mészáros, Ondrovičová, Vasičkaninová
Bachelor projects   (0-4 h) Bakošová, Dvoran, Fikar, Mikleš, Ondrovičová, Vasičkaninová
7th semester (autumn)
Process Control   (1-2 h) Mészáros
Process Dynamics   (2-0 h) Bakošová
Operating Systems   (1-1 h) Jelenčiak
Control Devices and Systems   (2-1 h) Danko
Computer Programs   (1-2 h) Vasičkaninová

Laboratory Projects   (0-8 h) Bakošová, Danko, Mikleš, Karšaiová, Vasičkaninová
8th semester (spring)
Optimisation   (2-1 h) Dvoran
Control Theory I   (2-2 h) Karšaiová, Mikleš
Laboratory Exercises of Control Theory I   (0-2 h) Mikleš
Experimental Identification   (2-0 h) Fikar
Laboratory Project II (0-6 h) Danko, Dvoran, Mészáros
Modelling and Control of Polymerisation Processes   (2-2 h) Dvoran
Process Dynamics   (2-0 h) Bakošová
Laboratory Exercises of Process Dynamics (0-1 h) Bakošová
9th semester (autumn)
Control Theory II   (2-0 h) Mészáros
Laboratory Exercises of Control Theory II   (0-2 h) Mészáros
Intelligent Control Systems   (2-0 h) Dvoran
Semestral Project   (0-10 h)   Dvoran, Karšaiová, Mészáros, Mikleš, Ondrovičová
CAD Systems (2-0 h) Karšaiová
Industrial Applications of Process Control   (2-0 h) Mikleš
Control of Technological Processes (1-2 h) Bakošová
10th semester (spring)
Diploma Theses   Dvoran, Karšaiová, Mészáros
        B. PhD Study
Topics in Control Theory   (2 h)   Mikleš
Software and Hardware of Control Systems (2 h)   Danko
Intelligent Control Systems   (2 h)   Dvoran
Modelling and Simulation of Processes   (2 h)   Mészáros
IV.   CURRENT RESEARCH PROJECTS
        A. Development of advanced control methods for chemical reactors, distillation columns and other plants in chemical and food technology (Ján Mikleš)
        The main goals of the project can be formulated in the following items:
        - To derive mathematical models of chemical and biochemical processes: an exothermic reactor for decomposition of H_2O_2, a tray distillation column and a stuffed distillation column for separation of binary mixtures, a warm-air drying chamber, a biochemical reactor.
        - To develop methods and algorithms for system identification: closed-loop identification, identification based on artificial neural network, identification of physical system parameters from measured data.
        - To investigate modern optimisation methods and algorithms for nonlinear high-order systems, especially for distillation columns and biochemical reactors.
        - To investigate robust stabilisation and robust feedback control of multivariable systems.
        - To develop adaptive control methods and adaptive control algorithms for systems of the chemical and food technology.
        - To include principles of artificial intelligence (expert systems, fuzzy control, neuro-fuzzy control, artificial neural networks) into control structures for chemical processes.
        - To investigate the predictive control method and to create control algorithms based on the Youla-Kučera parameterisation for solving unconstrained or constrained control problems.

- To verify all theoretical results on laboratory models chemical processes.
- To transform theoretical and experimental results into industrial conditions and to demonstrate benefits and advantages of advanced process control in chemical and food industry.

The most important results of the project are following:
- development of receding horizon iterative dynamic programming with discrete time models,
- using Youla-Kučera parameterisation in control design for decoupled control systems,
- design of a closed-loop identification method based on the Youla-Kučera parameterisation without model reduction,
- pH control in a laboratory fermenter.

B. Adaptive and intelligent control strategies for processes of chemical/biochemical technology (Alojz Mészáros)

The main goals of the project can be listed as follows:
- Design of a new predictive, intelligent control strategy on basis of ANN, (the PID-ANN-P algorithm), and its simulation for linear and non-linear systems.
- Design of a new robust, intelligent control strategy on basis of ANN (the PID-ANN-R algorithm), and its simulation for linear and non-linear systems; without as well as in presence of noise and disturbances; without as well as with constraints on control.
- Testing the PID-ANN-R procedure on non-linear models of chemical processes.
- Design of adaptive λ-tracking control and its verification for non-linear SISO and MIMO systems.
- Implementation of control algorithms introduced using ANN (the PID-ANN, PID-ANN-P and PID-ANN-R algorithms) to computer control of laboratory fermenter LF-3; testing performance for real physical circumstances
- Implementation of control algorithms derived on basis of λ-tracking policy to direct computer control of laboratory distillation column.
- Computer control of laboratory distillation column using adaptive predictive approaches involving low order concentration gradient models.
- Selection of the most „successive" algorithm from the methods proposed and its transformation into software module, suitable for industrial control application.

Original results obtained in the frame of the project are:
- adaptive intelligent PID controller with predictive performance,
- robust and adaptive controller in terms of neural networks,
- application of adaptive λ-tracking for control of MIMO nonlinear chemical processes – chemical reactor and distillation column.

V.   COOPERATION
    A. Cooperation in Slovakia

Department of Automatic Control Systems, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology, Bratislava
Department of Automation and Control, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology, Bratislava
Department of Automation and Measurement, Faculty of Mechanical Engineering, Slovak University of Technology, Bratislava
Institute of Control Theory and Robotics, Slovak Academy of Sciences, Bratislava

Department of Cybernetics and Artificial Intelligence, Faculty of Electrical Engineering and Informatics, Technical University of Košice, Košice

Department of Management and Control Engineering, BERG Faculty, Technical University of Košice, Košice

Slovnaft, Inc., Bratislava

NCHZ, Inc., Nováky

ProCS, Ltd., Šaľa

B. International Cooperation

Department of Process Control and Computer Techniques, Faculty of Chemical Technology, University of Pardubice, Pardubice, Czech Republic
- Control system design

Department of Computing and Control Engineering, Institute of Chemical Technology, Prague, Czech Republic
- Control of bioreactors

Department of Control Theory, Institute of Information Technologies, Tomas Bata University, Zlín, Czech Republic
- Adaptive control
- Robust control

Institute of Information Theory and Automation of the Academy of Sciences of the Czech Republic, Prague, Czech Republic
- Adaptive control
- Predictive control

Trnka Laboratory for Automatic Control, Faculty of Electrical Engineering, Czech Technical University, Prague, Czech Republic
- Adaptive control
- Predictive control

LSGC-CNRS, Ecole Nationale Superieure des Industries Chimiques (ENSIC), Nancy, France
- Dynamic optimisation of distillation columns
- Control of distillation columns

Ecole Nationale Superieure des Ingenieurs de Genie Chimique-Chemin de la Loge (ENSIGC), Toulouse, France
- Neural networks
- Predictive control

Ruhr University, Bochum, Germany
- Closed-loop identification
- Predictive control

Technical University of Budapest, Budapest, Hungary
- Modelling of chemical processes

Technical University of Vienna, Vienna, Austria,
- Optimisation of combustion processes

C. Membership in Domestic Organisations and Societies

Slovak Society of Cybernetics and Informatics, Bratislava (A. Mészáros, J. Mikleš)

Slovak Society of Chemical Engineering, Bratislava (M. Bakošová, J. Danko, J. Dvoran, M. Fikar, M. Karšaiová, A. Mészáros, J. Mikleš, M. Ondrovičová, A. Zemanovičová)

Slovak Union of Industrial Chemistry, Science-Technical Society, Bratislava (M. Bakošová, J. Danko, J. Dvoran, M. Fikar, M. Karšaiová, A. Mészáros, J. Mikleš, M. Ondrovičová, A. Vasičkaninová, A. Zemanovičová)

D. Membership in International Organisations and Societies

International Federation of Automatic Control, Laxenburg, Austria   (J. Mikleš)
European Federation of Biotechnology, Brussels, Belgium (A. Mészáros)
The New York Academy of Sciences, New York, USA   (A. Mészáros)

E. International Scientific Programmes
1. INCO COPERNICUS
   a) No. CP97:7010, The European Network for Industrial Application of Polynomial Design Methods – EUROPOLY
   Coordinator at the FCFT STU: J. Mikleš
   Coordinator of the project: Czech University of Technology, Prague, Czech Republic;
   Participants: Institute of Information Theory and Automation of the Academy of Sciences of the Czech Republic, Prague, Czech Republic; University of Twente, Twente, Netherlands; University of Glasgow, Glasgow, Great Britain; Uppsala University, Uppsala, Sweden; University of Strathclyde, Strathclyde, Great Britain; Politecnico di Milano, Milan, Italy; CNRS – LAAS, Toulouse, France, Tomas Bata University, Zlín, Czech Republic; Department of Information Engineering and Process Control, Faculty of Chemical and Food Technology, Slovak University of Technology, Bratislava, Slovakia; Warsaw University of Technology, Warsaw, Poland; Swiss Federal Institute of Technology, Zurich, Switzerland; ProCS, Ltd., Šaľa, Slovakia; Compureg Plzeň, Plzeň, Czech Republic;
   Period: January 1998 – December 2001
2. LEONARDO
   a) No. RO/00/B/F/PP141028, Eurocompetencies Transfer in Vocational Guidance for Young Specialists in Bioscience Field
   Coordinator at the FCFT STU: V. Báleš
   Coordinator of the project: University Politehnica, Bucharest, Romania;
   Participants: Ost European Centrum, University Hohenheim, Germany; Romanian Society of Biotechnology and Bioengineering, Bucharest, Romania; Research Institute for Chemistry, Bucharest, Romania; University Politehnica, Bucharest, Romania; Pluri Consultants SRL, Bucharest, Romania; University of Agronomic Sciences and Veterinary Medicine, Bucharest, Romania; CERA Foundation, Bucharest, Romania; Department of Chemical and Biochemical Engineering, Faculty of Chemical and Food Technology, Slovak University of Technology, Bratislava, Slovakia; Department of Information Engineering and Process Control, Faculty of Chemical and Food Technology, Slovak University of Technology, Bratislava, Slovakia; Natural Resources Institute, University of Greenwich, Greenwich, Great Britain;
   Period: November 2000 – November 2003
3. Project of Austrian - Slovak Scientific Cooperation: Aktion Österreich – Slowakei
   a) No. 26s12, Optimierung des Verbrennungsprocess von dem Standpunkt des Umweltschutzes (Optimisation of a Combustion Process from the Environmental Point of View)
   Coordinator at the FCFT STU: A. Zemanovičová

Coordinator of the project: Technical University of Vienna, Vienna, Austria

Participants: Department of Information Engineering and Process Control, Faculty of Chemical and Food Technology, Slovak University of Technology, Bratislava, Slovakia; Technical University of Vienna, Vienna, Austria

Period: April 1999 – December 2001

4. Project of Slovak – Czech Scientific Cooperation

    a) No. 112/344 Rozvoj metód moderného riadenia procesov chemickej a potravinárskej technológie (Development of Advanced Control Methods for Processes of Chemical and Food Technology)

Coordinator at the FCFT STU: J. Mikleš

Participants: Department of Information Engineering and Process Control, Faculty of Chemical and Food Technology, Bratislava, Slovakia; Department of Process Control and Computer Techniques, University of Pardubice, Pardubice, Czech Republic

Period: January 2000 – December 2001

F. Visitors from Abroad

Prof. P. Dostál Tomas Bata University, Zlín, Czech Republic, June 2001 (1 day)

F. Dušek, PhD University of Pardubice, Pardubice, Czech Republic, June 2001 (3 days)

D. Honc University of Pardubice, Pardubice, Czech Republic, June 2001 (3 days)

J. Macháček, PhD University of Pardubice, Pardubice, Czech Republic, June 2001 (3 days)

Prof. I. Taufer University of Pardubice, Pardubice, Czech Republic, March 2001 (2 days)

Prof. I. Taufer University of Pardubice, Pardubice, Czech Republic, June 2001 (2 days)

Prof. I. Taufer University of Pardubice, Pardubice, Czech Republic, November 2001 (4 days)

G. Visits of Staff Members and PhD Students to Foreign Institutions

A. Andrášik University of Pardubice, Pardubice, Czech Republic, November 2001 (4 days)

M. Bakošová Tomas Bata University, Zlín, Czech Republic, June 2001 (2 days)

M. Bakošová University of Pardubice, Pardubice, Czech Republic, September 2001 (3 days)

M. Bakošová Conference Information Engineering and Control, Prague, Czech Republic, September 4, 2001

M. Bakošová University of Pardubice, Pardubice, Czech Republic, November 2001 (2 days)

J. Dvoran Conference Information Engineering and Control, Prague, Czech Republic, September 4, 2001

M. Fikar ENSIC, Nancy, France, July 2001 (24 days)

M. Fikar ENSIC, Nancy, France, September - December 2001 (4 months)

M. Kvasnica ENSIGC, Toulouse, France, July 2001 (14 days)

A. Mészáros Technical University of Budapest, Budapest, Hungary, January, 2001 (2 days)

A. Mészáros Technical University of Bucharest, Bucharest, Romania, June 2001 (5 days)

A. Mészáros World MultiConference on Systemics, Cybernetics and Informatics, Orlando, USA, July 22-25, 2001

A. Mészáros Technical University of Budapest, Budapest, Hungary, September, 2001 (2 days)

A. Mészáros Technical University of Budapest, Budapest, Hungary, October, 2000 (1 day)

A. Mészáros Tomas Bata University, Zlín, Czech Republic, October 2001 (2 days)

A. Mészáros University Hohenheim, Stuttgart, Germany, November 2001 (6 days)

J. Mikleš European Control Conference, Porto, Portugal, September 3 – 7, 2001

J. Mikleš Ruhr University, Bochum, Germany, July 2001 (25 days)

J. Mikleš   University Erlangen, Nurnburg, Germany, August 2001 (4 days)

M. Ondrovičová   University of Pardubice, Pardubice, Czech Republic, September 2001 (3 days)

M. Ondrovičová   University of Pardubice, Pardubice, Czech Republic, November 2001 (2 days)

A. Vasičkaninová   Technical University of Vienna, Vienna, Austria, October 2001 (5 days)

A. Vasičkaninová   University of Pardubice, Pardubice, Czech Republic, November 2001 (2 days)

A. Zemanovičová   Technical University of Vienna, Vienna, Austria, February 2001 (1 day)

A. Zemanovičová   Technical University of Vienna, Vienna, Austria, June 2001 (2 days)

A. Zemanovičová   Technical University of Vienna, Vienna, Austria, August 2001 (22 days)

A. Zemanovičová   Technical University of Vienna, Vienna, Austria, September 2001 (1 day)

A. Zemanovičová   Technical University of Vienna, Vienna, Austria, October 2001 (1 day)

A. Zemanovičová   Technical University of Vienna, Vienna, Austria, November 2001 (1 day)

A. Zemanovičová   University of Pardubice, Pardubice, Czech Republic, November 2001 (2 days)

A. Zemanovičová   Technical University of Vienna, Vienna, Austria, December 2001 (1 day)

VI.   THESES AND DISSERTATIONS

A. Graduate Theses (MS Degree) for state examinations after five years of study (supervisors are written in brackets)

Dutková I.:   Identification and control of laboratory fermenter LF3. (A. Mészáros)

Nikodémová L.:   Testing of an optimisation toolbox in MATLAB environment (J. Dvoran)

Skurková M.: Decentralised control of a tray distillation column. (M. Karšaiová)

Tallo M.:   Neuro-fuzzy based control system for a technological process. (J. Dvoran)

Jankovčin J.: Optimisation and control of a chemical reactor. (M. Karšaiová)

Majerník P.:   Application of PLC and SCADA systems for control of real processes. (A. Mészáros)

Šperka Ľ.:   Artificial neural network based system identification and control. (A. Mészáros)

VII.   PUBLICATIONS

A. Journals (*registered in Current Contents)

[1]   Andrášik A., Mészáros A., Šperka Ľ.: Adaptívne inteligentné PID riadenie v prediktívnom zmysle. Adaptive intelligent PID control in predictive form (in Slovak). AT&P Journal 8 (plus1), 39 – 41 (2001).

[2]   Andrášik A., Mészáros A.: Riadenie pH v laboratórnom fermentore LF-3. Control of pH in laboratory fermenter LF-3 (in Slovak). AT&P Journal 8 (4), 63 – 64 (2001).

[3]   Bakošová M., Ondrovičová M., Dvoran J., Debnárová L.: Riadenie rektifikačnej kolóny. Control of a distillation column (in Slovak). AT&P Journal 8 (11), 52 – 53 (2001).

[4]   Dvoran J., Hudáček P.: Simulačné overenie hybridného neuro-fuzzy riadiaceho systému. Verifying of a hybrid neuro-fuzzy control system by simulations (in Slovak). AT&P Journal 8 (plus1), 18 – 21 (2001).

[5]   Mészáros A.: Niektoré otázky riadenia procesov biochemickej technológie. Some

aspects of control of biochemical processes (in Slovak). AT&P Journal 8 (4), 60 – 62 (2001).

[6] Mikleš J., Čirka Ľ., Fikar M.: Adaptívne LQ riadenie CSTR s využitím YK parametrizácie regulátora a modelu objektu. Adaptive LQ control of a CSTR using YK parameterisation of a controller and a process model (in Slovak). AT&P Journal 8 (11), 57 – 59 (2001).

[7]* Rusnák A., Fikar M., Latifi M. A., Mészáros A.: Receding Horizon Iterative Dynamic Programming with Discrete Time Models. Computers Chem. Engng. 25 (1), 161-167 (2001).

[8] Zemanovičová A.: Spaľovací proces. AT&P Journal 8 (4), 65 – 67 (2001).

B. Conferences (*International conferences)

[1]* Andrášik A., Mészáros A.: Identification and computer control of a laboratory fermenter. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 302 (2001).

[2]* Bachmann G., Hofbauer H., Zemanovičová A., Vasičkaninová A.: Determination of the calorific value of heterogeneous materials in a multi-kilogram capacity calorimeter. In: CD ROM of the 40th Int. Petroleum Conf.. Bratislava (Slovakia), Sept. 17-19, 2001. Slovnaft, Inc., Bratislava, CD ROM P-G-57.

[3]* Bakošová M., Dvoran, J.: Laboratory of real processes at the DPC FCFE STU Bratislava. In: Proceedings of the Conf. Information Engineering and Control. Prague (Czech Republic), September 4, 2001. Masaryk Academy of Work, Prague, pp. 87–88 (2001).

[4]* Bakošová M., Mészáros A., Ondrovičová M., Karšaiová M.: Application of adaptive λ-tracking for control of MIMO nonlinear chemical processes. In: CD ROM of full texts of the 28th Int. Conf. of SSCHE. Tatranské Matliare (Slovakia), May 21–25, 2001. SSCHE Bratislava, CD ROM P123 (2001).

[5]* Bakošová M., Mészáros A., Ondrovičová M., Karšaiová M.: Application of adaptive λ-tracking for control of MIMO nonlinear chemical processes. In: Proceedings of the 28th Int. Conf. of SSCHE. Tatranské Matliare (Slovakia), May 21–25, 2001. STU Bratislava, p. 121 (2001).

[6]* Bakošová M., Mészáros A.: Decentralized Adaptive Control of Distillation Columns - A Case Study. In: Proc. World MultiConf. on Systemics, Cybernetics and Informatics SCI 2001. Orlando (USA), July 22-25, 2001. Int. Institute of Informatics and Systemics, Orlando, p. 563-568 (2001).

[7]* Bakošová M., Ondrovičová M., Karšaiová M.: Decentralized Adaptive Control of Distillation Columns. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 316 (2001).

[8]* Bakošová M., Ondrovičová M., Karšaiová M.: Decentralized Adaptive Control of Distillation Columns. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 148 (2001).

[9]* Čirka Ľ., Fikar M., Mikleš J.: A deterministic LQ tracking problem: Parametrisation of the controller and the plant. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 304 (2001).

[10]* Čirka Ľ., Fikar M., Mikleš J.: A deterministic LQ tracking problem: Parametrisation of the controller and the plant. In: CDROM Medzinárodnej konferecie SSKI Kybernetika a informatika. Piešťany (Slovakia), April 5-6, 2001. SSKI Bratislava, CD ROM (2001).

[11]* Čirka Ľ., Fikar M., Mikleš J.: A deterministic LQ tracking problem: Parametrisation of the controller and the plant. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 237 (2001).

[12]* Čirka Ľ., Fikar M., Mikleš J.: A deterministic LQ tracking problem: Parametrisation of the controller and the plant. In: Zborník abstraktov Medzinárodnej konferecie SSKI Kybernetika a informatika. Piešťany (Slovakia), April 5–6, 2001. SSKI Bratislava, pp. 142–143 (2001).

[13]* Čirka Ľ., Mikleš J., Fikar M.: A deterministic LQ tracking problem: Parametrisation of the controller. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 303 (2001).

[14]* Čirka Ľ., Mikleš J., Fikar M.: A deterministic LQ tracking problem: Parametrisation of the controller. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 236 (2001).

[15]* Danko J., Ondrovičová M.: An approach to the control of a laboratory tank system. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 319 (2001).

[16]* Danko J., Ondrovičová M.: An approach to the control of a laboratory tank system. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 216 (2001).

[17]* Dvoran J., Dvoranová J., Tallo M., Jelenčiak F., Dzivák J.: Design of Neuro-Fuzzy Control for a Stirred Tank Reactor. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 192 (2001).

[18]* Dzivák J., Mikleš J., Jelenčiak F.: Nonlinear feedback control of a continuous stirred tank reactor. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 310 (2001).

[19]* Dzivák J., Mikleš J., Jelenčiak F.: Nonlinear feedback control of a continuous stirred tank reactor. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 48 (2001).

[20]* Halldorsson U., Fikar M., Unbehauen H.: Multirate approach to nonlinear predictive control. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 199 (2001).

[21]* Halldorsson U., Fikar M., Unbehauen H.: Multirate approach to nonlinear predictive control. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 29 (2001).

[22]* Jelenčiak F., Mikleš J.: Process identification: Nonlinear systems. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 311 (2001).

[23]* Jelenčiak F., Mikleš J.: Process identification: nonlinear systems. Identifikácia procesov: nelineárne systémy (in Slovak). In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic. p. 80 (2001).

[24]* Karšaiová M., Bakošová M., Ondrovičová M.: Control of Distillation Columns. In: Proc. 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. KIRP CHTF STU Bratislava, CD ROM 318 (2001).

[25]* Karšaiová M., Bakošová M., Ondrovičová M.: Control of Distillation Columns. In: Summaries Volume of the 13. Int. Conf. Process Control'01. Štrbské Pleso, High Tatras (Slovakia), June 11-14, 2001. Slovak University of Technology Bratislava, Slovak Republic.

p. 215 (2001).

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