

2021 IV International Conference on Control in Technical Systems (CTS 2021)

**Saint Petersburg, Russia
21 – 23 September 2021**



**IEEE Catalog Number: CFP21M83-POD
ISBN: 978-1-6654-2455-4**

**Copyright © 2021 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***** *This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP21M83-POD
ISBN (Print-On-Demand):	978-1-6654-2455-4
ISBN (Online):	978-1-6654-2454-7

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

Content

I. Modern Methods of Control in Technical Systems

<i>Implementation Options of Control Systems for a Cantilever Calibration Device</i>	
Cherkasova V.A., Froehlich Thomas	3
<i>Synthesis of Control Algorithms for Technical Losses of Electricity in Distribution Networks</i>	
Omorov T.T., Takyrbashev B.K., Zakiriaevev K.E., Koibagarov T.D.	7
<i>Parametric Identification of Unsteady Heat Conduction Processes Under Conditions of Bounded Uncertainty</i>	
Diligenskaya A.N., Pleshivtseva Yu.E., Samokish A.V.	11
<i>Design and Evaluation of a High-performance Support System for Credibility Tracing of Agricultural Products</i>	
Qiude Li, Wenlong Yi, Xiaomin Zhao, Yingding Zhao, Hua Yin, Yilu Xu	15
<i>Automatic Diagnosis of COVID-19 Medical Images based on Graph Attention Network</i>	
Yingxin Lai, Wenlong Yi, Hongyu Jiang, Tingzhuo Chen, Wenjuan Zhao, Ke Liu	19
<i>Heat-technological Devices Energy-saving Management</i>	
Artemova S.V., Ladynin A.I., Shmeleva N.M., Kamenskaia M.A., Mityakov E.S.	24
<i>Technological Processes Operational Assessment Frame Model in Automated Control Systems</i>	
Artemova S.V., Ladynin A.I., Shmeleva N.M., Tri Vu Chien, Kamenskaia M.A.	27
<i>Robust Pole Assignment in a Problem of State Observer-based Modal Control</i>	
Dobroskok N.A., Vtorov V.B.	30
<i>Research of the Hydrogeological Objects' Connection Peculiarities</i>	
Martirosyan A.V., Kukharova T.V., Fedorov M.S.	34
<i>Implementation of Neuro-fuzzy Control Systems</i>	
Morozov S.M.	39
<i>Determining the Optimal Number of Wells during Field Development</i>	
Nosova V.A., Pershin I.M.	42
<i>Synergetic Synthesis of Nonlinear Adaptive Control for Pneumatic Drives</i>	
Obukhova E.N., Popov A.N.	45
<i>Control of Switching the Dynamical Modes of a Memristor Based Chaotic Circuit</i>	
Ostrovskii V.Y., Zubarev A.V., Rybin V.G., Karimov T.I.	49
<i>Application of Neural Network Algorithms at a Gas Metering Station</i>	
Petrova A.K.	53
<i>Chaotic Oscillations Suppression in Chua's Circuit</i>	
Prikhodko I.A., Vtorov V.B., Skakun A.D., Vasiliev E.A.	56
<i>Mathematical Model and Control System for a Linear DC Motor</i>	
Spitsyn I.Y., Sinitca A.M., Gulvanski V.V., Perevertailo D.A., Volkov A.V.	60
<i>Application of Machine Learning Methods to Control the Process of Defectoscopy of Railway Tracks</i>	
Subbotin A.N., Zhdanov V.S.	64

II. Modeling of Complex Control Systems

<i>Automation of the Control of Ceramic Tiles Surface Defects</i>	
Kadhim M.H., Rusinov L.A.	68
<i>Russian Approach to Interoperability Formalization of Network-Centric Systems</i>	
Gulyaev Yu.V., Oleinikov A.Ya., Makarenko S.I.	72
<i>Reversive Approach to the Design of Industrial Process Automation Systems</i>	
Kashirskaya I.I., Voronina I.E., Desyatirikova E.N., Mager V.E.	76
<i>Modeling and Simulation of Surge Phenomenon in Natural Gas Pumping Compressor Line</i>	
Korablev Yu.A., Imaev D.H., Smirnov R.I.	80
<i>Development of a Mathematical Model of a Methanol Stripper</i>	
Abramkin S.E., Dushin S.E.	83
<i>Modeling Biological Treatment Processes in a Three-zone Bioreactor</i>	
Brikova O.I., Dushin S.E.	87

<i>The Concept of Engineering and Control the Development of a Cyber-physical Complex</i>	
Volkova V.N., Loginova A.V., Shirokova S.V., Leonova A.E., Chernyy Yu.Yu.	90
<i>Resource-energy Efficiency of ESP-equipped Wells Operation Management (Approaches, Models, Methods)</i>	
Solovyev I.G., Govorkov D.A., Konstantinov I.V.	94
<i>Factor Model of the ESP Operational Resource Dynamics and it's Identification Scheme with the Use of the Field-measured Data</i>	
Govorkov D.A., Solovyev I.G., Konstantinov I.V.	97
<i>Approaches to Modeling Development Scenarios of Multistep Social Engineering Attacks</i>	
Khlobystova A.O., Tulupiyev A.L.	100
<i>Control of Soft Architecture of Distributed Complex Information Security Systems</i>	
Ptitsyna L.K., Zharanova A.O., Belov M.P., Ptitsyn A.V.	103
<i>Modeling of a Hydroelectric Unit with a Kaplan Turbine</i>	
Ivanova K.A., Karuna E.N., Sokolov P.V.	107
<i>System Foundations of Natural Classification</i>	
Fomin B.F., Fomin O.B., Kachanova T.L., Turalchuk K.A.	111
<i>Modeling the Optimization Process of 2-Dimensional Models of 3-Dimensional Microelectronic Objects</i>	
Mironov S.E., Zibarev K.M.	116
<i>Design Concept of Organizational Automated Information Control System based on System Algorithms Information Technology</i>	
Smelkov S.N., Sychev I.O., Loseva D.M.	120
<i>Control Panels: Methods for Optimizing the Interface Layout</i>	
Predtechenskii D.V., Volosiuk A.A., Balkanskii A.A.	123
<i>Development of Information System Simulation Model Based on Virtual Machines</i>	
Livshits M.V.	127
<i>Development of Mathematical Model and Subordinate Control for Nonlinear Electric Drivers of Exoskeleton</i>	
Dinh Dang Truong, Belov M.P., Tran Huu Phuong	131
<i>Formation of the Control Action of the Ventricular Assist Device Sputnik to Increase Hemocompatibility</i>	
Romanova A.N., Telyshev D.V.	135
<i>Analysis and Regulation of the Biotechnical System of the Mechanical Support of Blood Circulation</i>	
Galiastov A.A., Porfiryev A.O., Denisov M.V., Selishchev S.V.	138
<i>Technology of Hardware and Software Modeling of Spacecraft Attitude Sensors Based on STM32 Microcontrollers</i>	
Kulakov A.Yu., Smirnov A.V.	142
<i>Synthesizing an Adaptive Controller to Enhance Movement Quality of a Flight Control Actuator under External Load</i>	
Nguyen Dinh Khanh, Kuznetsov V.E., Cao Nhu Vung	146

III. IT in Education

<i>Model of Adaptive Educational and Methodological Complex for E-learning Systems</i>	
Verkhova G.V., Akimov S.V., Prisyazhnyuk S.P.	150
<i>Monitoring Software for Project Based Learning Tasks</i>	
Desyatirikova E.N., Minakova O.V., Golikov A.S., Chernenkaya L.V., Khripunov Yu.V.	154
<i>Expansion of the Students Educational Indicators Activity Interface in the Moodle Environment by Means of Intelligent Agents</i>	
Kotova E.E., Pisarev I.A.	158
<i>Management of Cognitive Load in Integrated Educational Environment taking into account the Factor of Visual Uncertainty</i>	
Kotova E.E.	162
<i>Applying Smart Document Technology for Teaching and Research</i>	
Pisarev A.S.	167
<i>The Use of OPC UA Technology in the Study of Models of Control Objects</i>	
Krylova E.L., Nemudruk M.L., Shchurov D.A., Novozhilov I.M., Fedorov M.S.	171
<i>Application of Cognitive Technologies for Practice-oriented Education</i>	
Dubrovskaya Yu.A., Novozhilov I.M., Pikhkonen L.V.	174

IV. Methods of Information Processing Control

Evaluation of Statistical Forecast Method Efficiency in the Conditions of Dynamic Chaos

Yusupov R.M., Musaev A.A., Grigoriev D.A. 178

Cognitive-synergetic Analytical Platform for Adaptive-variable Proactive Control of Synergistic Resources of Onboard Systems of Automatic Spacecraft

Kovtun V.S., Sokolov B.V. 181

Computer System for Processing Industrial Information for Controlling the Production of Multi-Assortment Polymeric Films

Chistyakova T.B., Teterin M.A., Polosin A.N., Kleinert Frank 184

Optimal Planning Software Package for Use in the Control System of Flexible Extrusion Production of Polymer Materials

Chistyakova T.B., Shashikhina O.E., Kornienko I.G., Plekhanov A.A. 188

Ensuring Diagnosability of the Technological Process with a Minimum Number of Sensors Based on the Entropy Criterion

Kurkina V.V., Sirinova M.S., Aleksandrov D.A. 192

Problems of Using Bluetooth Tags with low Power Consumption for Identifying and Determining the Position of Objects

Stepanov P.V., Sokolov B.V. 195

Reductive Clustering of High-dimensional Data

Dorogov A.Yu. 199

Distortion Level Analysis of a 2D Median Filter with a Weighted Central Element

Kiladze M.R., Lyakhov P.A., Voznesensky A.S., Kaplun D.I. 203

Research of the Adaptive Subsampling Effectiveness for Image Preprocessing in Neural Network Models

Gubin A.N., Litvinov V.L., Filippov F.V., Zlobin O.N. 208

Development of a Method for Extracting Coefficients of Spectrograms of Electrofacies based on MFCC

Ruigo D.D., Litvinov V.L. 211

Formation of Attributes of Processes Mining in Heterogeneous Systems

Bekeneva Ya.A. 214

Processing of Multispectral Survey Materials based on Machine Learning Methods for Forest Management

Mochalov V.F., Khabarov R.S. 217

Feature Selection for Attacker Attribution in Industrial Automation & Control Systems

Jha Ashish, Novikova E.S., Tokarev D., Fedorchenco E.V. 220

Security Decision Support in the Control Systems based on Graph Models

Doynikova E.V., Fedorchenco A.V., Novikova E.S., Ushakov I.A., Krasov A.V. 224

Nested Constructions in Restricted Move no-code Smart Contracts Descriptions

Spiridonov R.E. 228

Improving Collaborative Filtering

Morozov Ju.A., Saradgishvili S.E. 232

Intellectual Analysis of Text Data for Solving the Problem of Information Categorization

Loseva D.M. 235

Ways of Forecasting Cyber-Physical Systems Characteristics

Plakhotnikov D.P. 238

Explainable Artificial Intelligence Methods Based on Feature Space Analysis

Popov N.V., Shevskaya N.V. 242

Comparison of the parametrically optimized implementation of ViolaJones object detection method and MTCNN

Egorov A.D., Idiyatullin A.F., Zakirov A.D. 246

Selection of Hyperparameters and Data Augmentation Method for Diverse Backbone Models Mask R-CNN

Egorov A.D., Reznik M.S. 249

Control of an Autonomous Energy Complex with Renewable Energy Sources, taking into Account the Type of Input Information Uncertainty

Simankov V.S., Buchatskiy P.Yu., Shopin A.V., Teploukhov S.V., Buchatskaya V.V. 252

Mobile Application-based Approach for the Measuring of Internal Nasal Structures

Stancheva O.A., Gindryuk A.F., Kaplun D.I., Sinitca A.M., Efimenko G.A., Tselobanov N. 256

Investigation of an Initial Data Set for Decision Support System Development of a lower Leg Prosthesis Individual Prosthetic Socket Selection

Sufelfa A.R., Kaplun D.I., Chernikova M.V. 261

V. Robotic Systems and Complexes

New Approach for Use of the Potential Fields Method in Mobile Robotics

Filimonov A.B., Filimonov N.B. 264

Development of a Radio-Controlled Tentacle Robot

Dautov A.M., Kopets E.E., Karimov A.I., Rybin Vy.G., Khafizova A.M., Sigaeva M.S. 268