

# **2022 6th European Conference on Electrical Engineering & Computer Science (ELECS 2022)**

**Bern, Switzerland  
21-23 December 2022**



**IEEE Catalog Number: CFP22N07-POD  
ISBN: 978-1-6654-9780-0**

**Copyright © 2022 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:	CFP22N07-POD
ISBN (Print-On-Demand):	978-1-6654-9780-0
ISBN (Online):	978-1-6654-9779-4

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2022 6th European Conference on Electrical Engineering & Computer Science (ELECS) **ELECS 2022**

## Table of Contents

Preface .....	ix
Organizing Committee .....	x
Technical Program Committee .....	xi

### Applied Mathematics

Note on the Stability Property of the Boundary Equilibria of a Prey-Predator Model with a Refuge-Stage Structure Prey Population .....	1
<i>Li Xiaoran (College of Finance and Mathematics West Anhui University Lu An, China), Yue Qin (College of Finance and Mathematics West Anhui University Lu An, China), and Chen Fengde (College of Mathematics and Statistics Fuzhou University Fuzhou, China)</i>	
Permanence and Periodic Solution of a Non-Autonomous Stage-Structure Prey-Predator Model with Cannibalism .....	7
<i>Deng Hang (School of Mathematics and Statistics Xidian University Xi'an, China), Chen Shangming (College of Mathematics and Statistics Fuzhou University Fuzhou, China), and Chen Fengde (College of Mathematics and Statistics Fuzhou University Fuzhou, China)</i>	
Safety and Observability of Distributed Broadcast Algorithms .....	17
<i>Mehmet Hakan Karaata (Kuwait University, Kuwait) and Aisha Tharwat Dabees (Kuwait University, Kuwait)</i>	
Supply Chain Infrastructure Co-Investments: Locating A Balanced Growth Path .....	21
<i>Konstantin Kogan (Bar-Ilan University, Israel)</i>	

### Biomedical Engineering

Diabetic Retinopathy Classification using Vision Transformer .....	25
<i>A.M. Mutawa (Kuwait University, Kuwait) and Sai Sruthi (Kuwait University, Kuwait)</i>	
Structural Equation Modeling for Stroke Risk Assessment of the Common Carotid Artery Based on Texture Analysis .....	31
<i>Christos Loizou (Cyprus University of Technology, Cyprus), George Eoripides (Cyprus University of Technology, Cyprus), and Paul Christodoulides (Cyprus University of Technology, Cyprus)</i>	

## Circuits and Systems

Approach to The Development of a Conceptual Model of a Sociotechnical System Based on Digital Technologies .....	36
<i>Egils Ginters (Riga Technical University, Latvia), Murathan Ali Aytekin (Riga Technical University, Latvia), Peteris Ecis (Riga Technical University, Latvia), Martins Cirss (Riga Technical University, Latvia), Rudis Rozitis (Riga Technical University, Latvia), Jamal Mohamed Husamudeen (Riga Technical University, Latvia), Feleena Xavier (Riga Technical University, Latvia), Aleksandrs Aleksejevs (Riga Technical University, Latvia), Daniels Millers (Riga Technical University, Latvia), Elina Rozenberga (Riga Technical University, Latvia), Linards Frijars (Riga Technical University, Latvia), Ķitija Vita Gaidele (Riga Technical University, Latvia), Ricards Grinbergs (Riga Technical University, Latvia), Hatuna Halvasa (Riga Technical University, Latvia), Antons Jekarasevs (Riga Technical University, Latvia), Andrejs Arturs Kocetoks (Riga Technical University, Latvia), Lina Korobova (Riga Technical University, Latvia), Martins Krumins (Riga Technical University, Latvia), Darina Lurina (Riga Technical University, Latvia), Janis Platacis (Riga Technical University, Latvia), Edvards Seve (Riga Technical University, Latvia), Nadina Tarnovska (Riga Technical University, Latvia), Roberts Veinbergs (Riga Technical University, Latvia), and Artjoms Zerebkovs (Riga Technical University, Latvia)</i>	
Damage Detection using EMI .....	47
<i>Musa Abdalla (The University of Jordan, Jordan) and Mohammad Qtaishat (The University of Jordan, Jordan)</i>	
Design and Implementation of a Wireless Charger Based on WPT Technology .....	53
<i>F. D. Trujillo-Aguilera (University of Malaga, Spain), E. B. Blázquez-Parra (University of Malaga, Spain), and A. Delgado-Expósito (Center for Industrial Electronics Technical University of Madrid, Spain)</i>	
Design of High-Reliability LDO Regulator with SCR Based ESD Protection Circuit using Dual Buffer Structure for low-Voltage Applications .....	59
<i>Sang Wook Kwon (Dankook University, Korea), Byung Seok Lee (Dankook University, Korea), Seung Hwan Baek (Dankook University, Korea), and Yong Seo Koo (Dankook University, Korea)</i>	
Exponential Function Generator with Fourth-Order Approximation .....	66
<i>Cosmin Radu Popa (University Politehnica of Bucharest, Romania, Faculty of Electronics, Telecommunications and Information Technology, Romania)</i>	
Impact of Digitalization of Public Transport and City Mobility on Traffic Structure and on-Road Emissions .....	71
<i>Nikolay Netov (Sofia University, Bulgaria) and Boyan Lomev (Sofia University, Bulgaria)</i>	
Improved Linearity CMOS Differential Amplifier with Low-Voltage Low-Power Operation .....	75
<i>Cosmin Radu Popa (University Politehnica of Bucharest, Romania)</i>	
Low-Voltage Improved Accuracy CMOS VGA Circuit .....	79
<i>Cosmin Radu Popa (University Politehnica of Bucharest, Romania)</i>	
Performance Analysis of a Solar Tracker Driven by a Microcontroller-Embedded Computer Program .....	83
<i>Gilbert Bop (Cheikh Anta Diop University of Dakar, Senegal), Djamel Abdoul Nasser Seck (Cheikh Anta Diop University of Dakar, Senegal), Allé Dioum (Cheikh Anta Diop University of Dakar, Senegal), Mamadou Simina Dramé (Cheikh Anta Diop University of Dakar, Senegal), Fabé Idrissa Barro (Cheikh Anta Diop University of Dakar, Senegal), and Bassirou Lo (Cheikh Anta Diop University of Dakar, Senegal)</i>	

Preliminary Study on the Shape of Speech Data Manifold in Linear Signal Subspace .....	88
<i>Xiaodong Zhuang (Electronic Information College, Qingdao University, China) and Nikos E. Mastorakis (Technical University of Sofia, Industrial Engineering Department, Bulgaria; Hellenic Naval Academy, Sector of Electrical Engineering and Computer Science, Greece)</i>	
The Road Map of Digitization and The Art of Convergence .....	93
<i>Iris Mihajlović (University of Dubrovnik, Croatia) and Cvijeta Djevojić (University of Dubrovnik, Croatia)</i>	
Change Detection by Masking Reversible Areas .....	103
<i>Soltana Achour (Djillali Liabès University Sidi Bel Abbes, Algeria), Amina Guidoum (Djillali Liabès University Sidi Bel Abbes, Algeria), M. Chikr El Mezouar (Djillali Liabès University Sidi Bel Abbes, Algeria), and N. Taleb (Djillali Liabès University Sidi Bel Abbes, Algeria)</i>	

## Communication Networks

Attacks Against Machine Learning Models in 5G Networks .....	106
<i>Mikhail Zolotukhin (Magister Solutions Ltd., Finland), Di Zhang (Magister Solutions Ltd., Finland), Parsa Miraghaie (Magister Solutions Ltd., Finland), Timo Hämäläinen (Magister Solutions Ltd., Finland), Wang Ke (Huawei Technologies Co., Ltd., Finland), and Marja Dunderfelt (Huawei Technologies Co., Ltd., Finland)</i>	
Cellular Offloading of eMBB and URLLC Services in Multiple UAV-Aided Communication Networks .....	115
<i>Yerra Prathyusha (National Sun Yat-Sen University, Taiwan) and Tsang-Ling Sheu (National Sun Yat-Sen University, Taiwan)</i>	
Towards Seamless Communication in Capillary Networks .....	121
<i>Aliaa Walid (The British University in Egypt, Egypt) and Samy S. A. Ghoniemy (The British University in Egypt, Egypt)</i>	
WiFi and BLE Fingerprinting for Smartphone Proximity Detection .....	130
<i>Tomaž Javornik (Jožef Stefan Institute, Slovenia), Stefan Kalabakov (Jožef Stefan International Postgraduate School, Slovenia), and Aleš Švigelj (Jožef Stefan Institute, Slovenia)</i>	
Enhancing Performance AODV Routing Protocol to Avoid Congestion .....	140
<i>Amina Guidoum (Djilali Liabes Sidi Bel ABBES University, Algeria), Soltana Achour (Djilali Liabes Sidi Bel ABBES University, Algeria), and Mhamed Tayeb (Relizan University, Algeria)</i>	

## Computational Intelligence

Analysis and Development of an Algorithm to Increase the Energy Efficiency of Electrical Street Lighting Systems using an Artificial Neural Network .....	145
<i>Ekaterina Gospodinova (Technical University of Sofia, Bulgaria)</i>	
Anomaly Detection using Deep CNN-ELM in Semiconductor Manufacturing .....	151
<i>Jaegyong Cha (Sungkyunkwan University, Republic of Korea), Hyeonjong Ha (Sungkyunkwan University, Republic of Korea), Seokhyun Gong (Sungkyunkwan University, Republic of Korea), and Jongpil Jeong (Sungkyunkwan University, Republic of Korea)</i>	

Comparison between Environmental Condition Parameters and Attack Degree of Vine using IoT Sensors System .....	158
<i>Mihaela Hnatiuc (Constanta Maritime University, Romania), Savin Bogdan-Cristian (Constanta Maritime University, Romania), and Dina Ionica (Murfatlar Research Station, Romania)</i>	
Improved HVDC Reactive Power Control using Fuzzy PI .....	162
<i>Mitchell Boswell (Engineering Institute of Technology, Australia) and Ehsan Gatavi (Engineering Institute of Technology, Australia)</i>	
Performance Comparison of Different Visual Odometry Architectures to Improve ATDN vSLAM .	168
<i>György Richárd Bogár (Budapest University of Technology and Economics, Hungary), Mátyás Szántó (Budapest University of Technology and Economics, Hungary), and Márton Szemenyei (Budapest University of Technology and Economics, Hungary)</i>	
Periodic Attractors in GRN and ANN Networks .....	177
<i>Diana Ogorelova (Daugavpils University, Latvia) and Felix Sadyrbaev (University of Latvia, Latvia)</i>	
<b>Author Index</b> .....	<b>181</b>