



**Automation, Robotics & Communications
for Industry 4.0 (ARCI' 2022):
2nd IFSA Winter Conference**

Conference Programme

2-3 February 2022

Organized by:



Message from Chairman

On behalf of Organizing Committee I would like to welcome you to the Second IFSA Winter Conference on (ARCI '2022), 2-3 February 2022.

According to the modern market study, the global Industry 4.0 market will reach US\$ 165.5 Billion by 2026 growing at the CAGR of slightly above 20.6% between 2021 and 2026. The Industry 4.0 means the usage of an integrated system, which consists of an automation tool, robotic control and communications. The key factors fueling the growth of the industry 4.0 market include rapid adoption of Artificial Intelligence (AI) and Internet of Things (IoT) in manufacturing sector, increasing demand for industrial robots, rising government investments in additive manufacturing, and growing adoption of blockchain technology in manufacturing industry.

The Industry 4.0 holds a lot of potentials and is expected to register a substantial growth in the near future. There are several conferences on automation, robotics and communications, but they are not meet the Industry 4.0 challenges. The series of annual ARCI Winter IFSA conferences have been launched to fill-in this gap and provide a forum for open discussion of state-of-the-art technologies related to control, automation, robotics and communication - three main components of Industry 4.0.

The ARCI' 2022 conference are covering research and development in a broaden range in automation, robotics and communication, and united by the Industry 4.0 challenges. However it will be not a conference only about the future concepts and new visions. It will be also to discuss how to adopt the current R&D results for the Industry 4.0 and to customize products under the conditions of highly flexible (mass-) production. The ARCI' 2022 conference is organized by the IFSA - one of the major professional, non-profit association serving for sensor industry and academy more than 20 years.

The purpose of ARCI' 2022 is bring together leading international researchers, developers and practitioners to attain synergetic exchanges of ideas and practices. We trust that you will find the ARCI 2022 conference professionally rewarding and stimulating as well as enjoyable. Welcome to ARCI' 2022 !

Prof., Dr. Sergey Y. Yurish
ARCI' 2022 Conference Chairman

Conference web site:

<http://www.arci-conference.com/>

Language

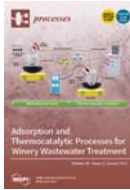
The official language of the Conference is English. There will be no simultaneous interpretation.

Post-Conference Publications

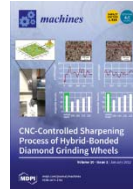
Selected and extended papers presented at the conference will be published in one of the following open access journals:



Sensors & Transducers
(ISSN 2306-8515,
e-ISSN 1726-5479)



MDPI Processes
(ISSN 2227-9717)



MDPI Machines
(ISSN 2075-1702)

Authors of full-page articles published in journals will be invited to extend their articles into the book chapters for the open access Book Series '*Advances in Robotics and Automatic Control: Reviews*', Vol. 3 or '*Advances in Networks, Security and Communications: Reviews*', Vol. 3. Both books will be submitted to the Book Citation Index by Clarivate Analytics. These open access books will be published in 2022.

Conference proceedings and books published by IFSA Publishing, S.L. are indexed in the Conference Proceedings Citation Index (CPCI) and Book Citation Index respectively by Clarivate Analytics (former Thomson Reuters).



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Keynote Speaker I



Prof., Dr. Subhabrata Banerjee
*Institute of Engineering and Management,
Kolkata, India*

Impact of Bio-Inspired Algorithms on Modern Communication System

Abstract

A comprehensive research has been carried out in the arena of computation intelligent techniques since early nineteenth century. Researchers have used these algorithms successfully to enhance the performance of the contemporary communication systems. Various existing linear programming approaches neither can minimize the inherent intricacies in real world engineering difficulties nor can provide stable optimum values for multi-optima based rough surfaces.

On the other hand error control coding scheme helps to elevate the immunity of noisy communication channel. Proper unification between mathematical modelling and efficient algorithms and more importantly the implementation of this idea in practical systems meets the demand of efficient and reliable data transmission. Turbo Code (TC) is considered as one of the significant channel coding scheme which approaches the Shannon limit. Existing turbo codes offer a considerable degree of improvement in Bit Error Rate (BER) performance either in waterfall or error-floor or in both regions. However, most of the forward correcting codes suffer from the problem of flattening effect. Hence designing of more efficient TCs like Four Dimensional Turbo Code (4D-TC) has been emerged as an important area of research over last few decades.

Now, design of robust nature-inspired meta-heuristic algorithm like Modified Ant Lion Optimizer (MALO) algorithm and its application in modern communication system has been emerged as important area of research. Its ensemble analysis has drawn a significant attention due to its astonishing BER performances over the entire SNR region which is the most essential factor for modern communication systems.

Short Biography: Dr. Subhabrata Banerjee is a Professor in the department of Electronics and Communication Engineering, Institute of Engineering and Management, Kolkata, India. He was awarded National Scholarship by WBED,

West Bengal Government. He received his M.Sc. and PhD degrees in Electronics and Telecommunication Engineering from renowned Jadavpur University, Kolkata, India. He initially worked as Programmer Analyst in Cognizant Technology Solution and then was working as Assistant Professor in the Department of Electronics and Communication Engineering at Future Institute of Engineering and Management, Kolkata, India and as Associate Professor in the same institution thereafter. He is now working as Professor in Institute of Engineering and Management, Kolkata, India since 2021. He was authored numerous articles published in prestigious journals including Wireless Personal Communication (Springer), Personal and Ubiquitous Computing (Springer), International Journal of Communication Systems (Wiley) and Institution of Engineering and Technology (IET, UK). He has published more than 30 papers in International Conferences and International Journals of repute. He also published book chapter under IET, UK publication. His current research interests include Communication and Coding Theory, Machine Learning, Robotics, IOT, Control System, and Evolutionary Algorithms, Soft Computation.

Keynote Speaker II



Prof., Dr. Svetlana Prokopchina
*Moscow State University & Financial University
of Government of Russian Federation, Russia*

Intelligent Sensor Networks for Monitoring and Controlling Complex Systems under Conditions of Uncertainty

Abstract

Within the framework of the Industry 4.0 concept, intensive development of the processes of intellectualization of sensor systems is envisaged.

Among the most important specific properties of real measuring processes in complex systems is, first of all, their implementation under conditions of considerable uncertainty. The uncertainty is caused by a priori incompleteness, inaccuracy, vagueness of information about a complex measuring object and its functioning environment, which does not allow to build an adequate model of the object before the measurement experiment, to identify and formalize the influencing

factors of the external environment and to develop effective algorithms for the functioning of information and measurement systems.

The presentation proposes an approach to the intellectualization of measurement systems in conditions of uncertainty by creating intelligent sensor networks based on Bayesian intelligent technologies (BIT) and means of their implementation. Typical modules of such networks are considered, which are integrated sets of various sensors and intelligent measurement information processing systems. The results of the networks are comprehensive assessments of the state of complex objects and recommendations for providing of their sustainable functioning. An important part of such systems is the built-in means of a complete metrological justification of all received solutions. The systems have a hierarchical architecture, according to the levels of management of complex objects, which has the possibility of self-development based on newly received information. This is achieved thanks to models and scales with dynamic constraints on which all BIT algorithms are built. The report provides examples of the use of intelligent sensor networks for monitoring and control of power generation and water supply systems.

Short Biography: Dr. Svetlana Prokopchina is a professor of Moscow State University and Financial University of Government of Russian Federation. She is an academician of the International Academy of Informatization, International Academy of Ecology and Life Safety Sciences, International metrological Academy, Russian ecological Academy, International Academy of information processes and technologies. Since 2001 Dr. Prokopchina is a member of the Board of Directors of 'ROSNEFTEGAZSTROY'. She is a president of the interregional scientific public Association «Scientists for ecology» (since 1992). Dr. Prokopchina is the author of about 250 scientific papers and 11 monographs. Specializes in the field of fundamental and applied works of Measurement Science and Artificial Intelligence. Main directions of scientific researches are Bayesian Intelligent Technologies and Measurement for the creation of monitoring systems, audit, management decision-making, risk management, classification of objects and situations, intelligent geoinformation systems, socio-economic systems in conditions of significant information uncertainty. Dr. Prokopchina S. V. was awarded with state awards, has the gratitude of the Ministry of science and education of the Russian Federation. She is an international expert of the UNECE Energy Commission on information systems, energy and natural resources. Since 1998 she has co-chaired the annual International conference on *Soft Computing and Measurement (SCM)*. Since 2017 Dr. Prokopchina is the editor-in-chief of the scientific journal 'Soft measurements and computing'. Since 1990 she has been managing international and Russian projects on creation of systems for monitoring and management of complex systems, support for management decisions, environmental protection, management of specially protected natural areas, maintenance of inventories of natural resources, as well as information- analytical centers for industrial enterprises, agro-industrial systems, energy systems and networks, oil and gas systems.

Programme at Glance

Date Time (GMT+1)	2.02.2022 Wednesday	3.02.2021 Thursday
9:00-9:30	Opening Session (Sergey Y. Yurish, Chairman)	-
9:30-10:30	Keynote Speaker I <i>Impact of Bio-Inspired Algorithms on Modern Communication System</i> (Prof., Dr. Subhabrata Banerjee)	Keynote Speaker II <i>Intelligent Sensor Networks for Monitoring and Controlling Complex Systems under Conditions of Uncertainty</i> (Prof., Dr. S. V. Prokopchina)
10:30-12:30	Regular Session 1: <i>Robotics and Intelligent Traffic Control</i>	Special Session: <i>Intelligent Measurements and Soft Sensors</i>
12:30-14:00	<i>Break</i>	<i>Break</i>
14:00-16:00	Regular Session 2: <i>Manufacturing Systems and Processes Control</i>	Regular Session 3: <i>Automation, Control and Monitoring</i>
16:00-17:00	-	Round Table: <i>Industry 5.0 – the Future or Today's Realities?</i>
17:00-17:30	-	Closing Session (Sergey Y. Yurish, Chairman)

The time in the table and in the technical programme below is the local time in Barcelona (Spain): CET — Central European Time, UTC/GTM+1.

Technical Conference Programme

Day 1

2 February 2022, Wednesday

Regular Session 1:

Robotics and Intelligent Traffic Control

- 1. Multi-Robot Cooperative SLAM Using Panoramas**
Jiayi Feng and Zhe Xuanyuan
(China)
- 2. Switching Propulsion Mechanisms of Tubular Catalytic Micromotors**
Paul Wrede, Mariana Medina-Sánchez, Vladimir M. Fomin and Oliver G. Schmidt
(Germany)
- 3. Obstacle Segmentation for Autonomous Guided Vehicles Through Point Cloud Clustering with an RGB-D Camera**
Micael Pires, Pedro Couto, António Santos and Vítor Filipe
(Portugal)
- 4. Measure of Complexity of the Spatial Environment of a Mobile Object**
Alexander Karkishchenko and Viacheslav Pshikhopov
(Russia)
- 5. Simulation of a Collision and Obstacle Avoidance Algorithm for Cooperative Industrial Autonomous Vehicles**
Juliette Grosset, Alain-Jérôme Fougères, Moïse Djoko-Kouam, Christophe Couturier and Jean-Marie Bonnin
(France)
- 6. Management and Path Planning Solution for Parking Facilities Using Dynamic Load Balancing**
Florin-Daniel Sandru, Vlad-Ilie Ungureanu and Ioan Silea
(Romania)

Regular Session 2: ***Manufacturing Systems and Processes Control***

- 1. A Model Driven and Hardware Agnostic Approach of Virtual Commissioning**
Sylvain Marchand
(France)

- 2. Virtual Commissioning of an Automotive Station for Door Assembly Operations**
Rafael Balderas Hill, Jesus Hiram Lugo Calles, Junior Tsague, Tobiah Master and Nicolas Lassabe
(France)

- 3. Development of an AI Maturity Model for Small and Medium-sized Enterprises**
Boris Schmidgal, Melanie Rentzsch and Sebastian Häberer
(Germany)

- 4. Simulation of Automated Handling in Textile Manufacturing of US Military Apparel to Improve Efficiency and Quality**
Zoe Rosenberg, Jeff Joines and Jess Jur
(USA)

- 5. Competency-based Education of the Mechatronics Engineer in the Transition from Manufacturing 3.0 to Industry 4.0**
Eusebio Jiménez López, Francisco Javier Ochoa Estrella, Gabriel Luna Sandoval, Flavio Muñoz Beltrán, Francisco Cuenca, Jiménez and Marco Antonio Maciel Monteón
(Mexico)

Day 2
3 February 2022, Thursday

Special Session:
Intelligent Measurements and Soft Sensors

Chairman: S. V. Prokopchina,
*Moscow State University & Financial University of Government
of Russian Federation, Russia*

- 1. Artificial Intelligence and Measurements**
*Roald Taymanov, Kseniia Sapozhnikova and Anastasiya Shutova
(Russia)*
- 2. The Examples of Applications of Soft Sensors Systems**
*V. V. Alekseev, S. S. Sergeev
(Russia)*
- 3. Convolutional Neural Networks for Thermal Image Analysis
for Tasks of Industry 4.0**
*I. A. Logachevsky
(Russia)*
- 4. Methods for Constructing a Model of a Dynamic System
Based on Experimental Data for Control Problems
of Bionic Prostheses**
*Meshchikhin I. A., Minkov S., Lichkunov A. A., Koroleva M. N.
(Russia)*
- 5. Methods and Technologies of Bayesian Intelligent Measurements
for Human Resources Management in Industry 4.0**
*S. V. Prokopchina, E. S. Tchernikova
(Russia)*

Regular Session 3:
Automation, Control and Monitoring

1. **Stability Margins for Linear Periodically Time-Varying Systems**
Xiaojing Yang
(China)

2. **Identification and Discrete Inversion of Multi Order Systems as Part of a Disturbance Observer**
Chris Schöberlein, Mei Yun Liu, Armin Schleinitz, Holger Schlegel and Martin Dix
(Germany)

3. **Development and Validation of a Model for Online Estimation of Process Parameters for Adaptive Force Control Algorithms**
Manuel Norberger, Andre Sewohl, Stefan Sigg, Holger Schlegel and Martin Dix
(Germany)

4. **“They got my keys!”: On the Issue of Key Disclosure and Data Protection in Value Chains**
Aintzane Mosteiro-Sanchez, Marc Barcelo, Jasone Astorga and Aitor Urbieta
(Spain)

5. **The Autonomous Pollination Drone**
Dries Hulens, Wiebe Van Ranst and Toon Goedemé
(Belgium)

16:00 – 17:00, 3 February 2022

Round Table:

Industry 5.0 – the Future or Today's Realities?

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processes
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and Computing
Scientific journal



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