

## Keynote Speakers for SYROM & ROBOTICS 2022

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**Prof. Karsten BERNES** has studied computer science with a special focus on artificial intelligence at the University of Kaiserslautern (1982 to 1988). For his research on "Neural Networks for the Control of a six-legged Walking Machine" he received his PhD from the University of Karlsruhe in 1994. As head of the IDS (Interactive Diagnosis and Service Systems) department of the Research Center for Information Technology (FZI), Karlsruhe (till 2003) he examined adaptive control concepts for different types of service robots. Since 2003 he is a full professor at the University

of Kaiserslautern.

Present research activities are the realization of reliable, complex autonomous robotic systems. Therefore, he and his research group are developing the robotic middleware Finroc, the behavior-based control architecture iB2C as well as different validation and verification methodologies. The main application is off-road robotics, in which autonomous or semi-autonomous vehicles like small a truck, an excavator, a shuttlebus, tractors, and rescue robots are under development. In the range of humanoid robots, the social robot ROMAN, ROBIN and EMAH is developed for the investigation of human robot interaction. Also a biological inspired biped locomotion is under development including soft actuators and the mechatronics system of the biped.

Prof. Bernes is frequently reviewer and associated editor of several journals and robotic conferences like ICRA, IROS, Humanoids. Furthermore, he is editor of the ELSEVIER journal Robotics and Autonomous Systems a member of a number of editorial boards. He also acts as reviewer for several national and international funding organizations. He was general chair of several national and international conferences. He is member of the IEEE and the Gesellschaft für Informatik (GI).

He is a member of the executive committee of the German Robotics Association (DGR) and is leader of the technical committee for robotic systems of the GI. He was Dean of the department of computer science at the University of Kaiserslautern (2007 – 2010) and was member of the scientific directorate Schloss Dagstuhl - Leibniz Center for Informatics (2008-2014). From 2010 till 2020 he was spokesperson of the Center for Commercial Vehicle Technology (ZNT) at the University of Kaiserslautern and the Commercial Vehicle Cluster, Kaiserslautern.

### Keynote Presentation

#### *Multimodal Perceptual Cues for Context-aware Human-Robot Interaction*

#### Abstract

Human-Robot Interaction (HRI) is a major challenge in the development of complex humanoid robots. The presentation focuses on the relevance of context awareness and the understanding of intention in Human-Robot Interaction. After a short summary of the findings

of the RRLab in HRI during the last years our humanoid robots ROMAN, ROBIN and EMAH are introduced. For the generation of a context-driven interaction a large number of situational gestures, postures and facial expressions have been implemented to provide situational reactions. In the presentation these aspects are discussed in detail including several experiments, which show the performance of the system.

The use of such robots in a social ecosystem aims to create a more intelligent interaction mechanism capable of adapting to the scenarios they are confronted with and responding in accordance to the context of the dialogue. In the presentation it will be shown how such interaction mechanism are implemented and how they are used. For the validation of our system the social interacting robot is applied to several interaction scenarios. The evaluation of the system shows very positive results due to its social interaction skills.

### **Prof. Marco CECCARELLI**

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**Prof. Marco CECCARELLI** (Rome, 26 May 1958) received his Ph.D. in Mechanical Engineering from La Sapienza University of Rome, Italy, in 1988. He is Professor of Mechanics of Machines at the University of Rome Tor Vergata, Italy, where he chairs LARM2: Laboratory of Robot Mechatronics.

His research interests cover subjects of robot design, mechanism kinematics, experimental mechanics with special attention to parallel kinematics machines, service robotic devices, mechanism design, and history of machines and mechanisms whose expertise is documented by several published papers in the fields of Robotics and Mechanical Engineering. He has been visiting professor in several universities in the world. He is ASME fellow. Professor Ceccarelli serves in several Journal editorial boards and conference scientific committees. He is editor-in-chief of the MDPI journal Robotics and of the SAGE International Journal on Advanced Robotic Systems for the area on Service Robotics He is editor of the Springer book series on Mechanism and Machine Science (MMS) and History of MMS. He has been the President of IFToMM, the International Federation for the Promotion of MMS in 2008-11 and 2016-19. He has started several IFToMM sponsored conferences including (HMM) Symposium on History of Machines and Mechanisms, MEDER (Mechanism Design for Robotics) and MUSME (Multibody Systems and Mechatronics). More information at the web page: LARM2 webpage: <https://larm2.ing.uniroma2.it/>

### **Keynote Presentation**

***Robot Design in Italy: historical backgrounds, achievements, and challenges***

### **Abstract**

Robots are designed and applied in more and more application filed in helping or substituting humans in their labour tasks and diary life. Italian community has contributed and still give challenging solutions. Achievements in Robot Design are developed in theoretical, numerical, and design works that once implemented in engineering practice or in science applications

they contribute to innovation or even they are innovation themselves both in technical-scientific and social frames.

In the lecture past and modern achievements and results in Robot Design are presented through significant examples in order to stress the variety of solutions and creativity that the Italian community has provided and still provides in terms of theory and practice of technological developments as well as in terms of knowledge acquisition and formation of next generations.

## **Prof. Mircea IVANESCU**

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**Mircea IVĂNESCU** is professor at the Mechatronics Department of the Faculty of Automatics, Computers and Electronics, University of Craiova. He is a well-known personality in the country and abroad through his scientific activity in the field of hyper-redundant robot control systems with distributed parameters, through his research in the widely topical fields of man-machine interfaces and complex "living world-mechanical world" mechanisms. He made a major contribution in the fields of: artificial intelligence, unconventional robot control, multi-robot systems, fuzzy systems etc. His activity, from the beginning of the 8th decade, regarding "tentacle-trunk" type robots are still today reference elements in specialized studies. He was the president of the Romanian Robotics Society between the 2000s and 2021s. He is now the honorary president of this society. He is a member of the International Federation of Robotics. He is a member of the Romanian Academy of Technical Science.

## **Keynote Presentation**

### ***Hyper-Redundant Robots***

#### **Abstract**

The presentation tries to introduce you a special class of robots, a fascinating class that focused the research activity of a large number of scientific researchers during the last decade, the hyper redundant robots.

The hyper redundant robots (HR) have been developed to reach into confined spaces, to avoid obstacles, to snake into cluttered environments without disturbing or damaging the environment.

The examples from nature that were the source of inspiration for this class of robots are presented.

The mechanical architectures used in the design of robots with these characteristics, the actuation and sensory systems are discussed. The associated kinematic and dynamic models are analysed and the difficulties of controlling these systems are emphasized. Some representative HR models and their applications are presented.

## **Prof. Doina PISLA**

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Prof. **Doina PISLA** is currently the Director of Council for University Doctoral Studies within the University of Cluj-Napoca, Romania and the Director of the Research Center for Robots Simulation and Testing - CESTER within the same university.

Professor Doina PISLA obtained her PhD within the Technical University of Cluj-Napoca in 1997. Following an academic carrier she became full professor at the Department of Mechanical Systems Engineering in 2005, teaching lectures in Parallel Robots and Medical

Robotics.

Prof. Pislă's research activity is focused mainly on the field of Robotics and Mechatronics, with emphasis on the kinematics and dynamics of parallel robots, development of innovative medical robots, reconfigurable structures. As a result of her scientific activity, Prof. Pislă published over 200 peer-reviewed full papers in scientific journals and conferences, co-authored over 10 patents.

She has been director or key member of more than 50 international and national projects. In the meanwhile, she served in boards and program committees of various international conferences and congresses, being currently member of the Technical Committee for Computational Kinematics and for Biomechanical Engineering of International Federation for the Promotion of Mechanism and Machine Science (IFTOMM).

She serves also as reviewer in various journals and funding agencies and Editor of the Series "New Trends in Medical and Service Robotics" (Springer) .

### **Keynote Presentation**

#### ***Recent Advances in Medical Robotics***

#### **Abstract**

In parallel with the continuous evolution and discovery of new medical techniques, the evolution of technology has enabled the introduction of robotic systems in the medical applications.

Rehabilitation robotics is one of the most important subdomains of the medical robotics, with a highly potential worldwide, and its development is correlated with the increased life expectancy and the growing number of elderly persons. The already achieved robotic systems for rehabilitation of upper and lower limbs have shown a continuous evolution in this challenging and difficult research field.

Stroke is one of the leading causes of motor disability and a post stroke patient must undergo rehabilitation exercises to gain back its ability to perform daily life activities. The main problem here is that in the future, more precisely in the next 20 years, there is a crisis projected because the incidence of stroke will rise due to the ageing of the population and the survival rate of stroke will also increase due to medical innovation, which in turn will lead to an increased number of post stroke patients relative to the number of kineto-therapist, creating an unbalance in the healthcare system. Therefore, it is important to develop innovative robotic systems which allow physical therapists to develop patient-oriented rehabilitation programs

that can maximize the therapeutic effects aiming towards an increased quality of life in the framework of Activities of Daily Living.