

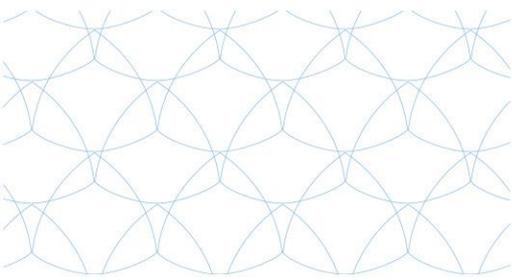
EXCELLABUST
EXCELLING LABUST IN MARINE ROBOTICS

INVITED TALK

29th September 2016

Bio-Hybrid Systems: Challenges and Potentials

Dr. Serge Kernbach
Cybertronica Research



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1. INVITED TALK DETAILS

Date: 29th September 2016
Time: 15:00 – 16:00
Location: Gray Hall, University of Zagreb Faculty of Electrical Engineering (UNIZG-FER)
Unska 3, Zagreb, Croatia

Title: Bio-Hybrid Systems: Challenges and Potentials
Name: Dr. Serge Kernbach
Affiliation: Research Center of Advanced Robotics and Environmental Science “Cybertronica Research”

2. ABSTRACT

Bio-hybrid systems represent a new area of biological and technological developments. These systems vary from advanced bio-/phyto- sensors up to establishing an interface between natural and artificial ecosystems. In many cases, the biological part is presented by microbiology, plants, insects and animals; technological part uses mobile and stationary robots, sensor networks and smart artifacts. Current developments show the emergence of bio- and chemo-hybrid systems on micro- and macro-scales and in different organizational forms: individual and collective/network systems, techno-symbiosis, interconnected complex objects with feedback loops. Several research projects focus on integration of human/animal brain and technical devices in neuro-hybrids. Bio-hybrid systems demonstrate many specific features as a high sensitivity to ultraweak environmental and biophysical interactions, extended bio-techno homeostasis, embodied intelligence and other issues. In particular, some phenomena are expected to have the nature of quantum effects in macroscopic systems, which can be measured by precise physical and biochemical methods. The talk overviews the concepts bio-hybrid systems, some European projects on this topic and accurate measurement techniques.

3. BIOGRAPHY OF LECTURER



Dr. Serge Kernbach

Email: serge.kernbach@cybertronica.co

Serge Kernbach, Dr.rer.nat., is a director of the Research Center of Advanced Robotics and Environmental Science “Cybertronica Research”. He graduated in electronic engineering and computer science in 1994. In 1996 he was awarded Presidential Fellowship as a young researcher, in 1997 – the DAAD fellowship, he was a guest scientist in the center of Synergetics led by Prof. H. Haken, who also co-supervised his PhD work. In 2007 his doctoral thesis won the faculty-award

as the best dissertation of the year at the University of Stuttgart, where he worked as a head of group until 2013. Since 2004 he has been a coordinator of several European research projects on the field of bio-hybrid systems and collective robotics. In 2016 he was elected as a Foreign Member of the Russian Academy of Natural Sciences. Serge's main research interest is focused on biological and technological collective systems, weak bio-physical interactions, he is an author and co-author of 4 books and over 150 articles in international journals and conferences with best paper awards. Since 2000 he acquired more than 6.0 M Euro in different research projects.

4. DESCRIPTION OF THE INSTITUTION:



Research Center of Advanced Robotics and Environmental Science
"Cybertronica Research"

Address: Melunerstr. 40, 70569 Stuttgart, Germany

Website: <http://cybertronica.co/>

Cybertronica Research is a research center of advanced robotics and environmental science. It is a high-tech spin-off SME from the University of Stuttgart. After successful European projects such as I-SWARM, GOLEM, ANGELS, CoCoRo, EvoBody SYMBRION, REPLICATOR, we accumulated a number of innovations with a high application potential. Since the research center was grounded by scientists, we target an open research approach; however our aim is to convert fundamental research into innovative business concepts and real-world applications. Cybertronica Research specialises in the area of cognitive robotics, intelligent mechatronics, environmental sensing and bio-technological systems. The company targets a close-loop development and design cycle, where all necessary scientific knowledge as well as mechanical, electronic and embedded programming skills and equipment are concentrated in one area and closely integrated with each other. This allows a rapid prototyping of complex electronic, micro-mechanical, mechatronic and bio-hybrid systems.

Researchers of CYBERTRONICA developed ground and underwater autonomous robot systems, provided a critical infrastructure for cooperative applications, manufactured small-series solutions for power management, sensors and communication, microprocessor systems. Company performs research and technological development towards own solutions related to remote sensing approaches, environmental monitoring in agricultural and livestock areas. Lately new advanced photonic technologies, and corresponding LED devices, are developed for application in horticulture production.