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**IEEE Galveston Bay Section**

Joint Sensor Council Chapter

Presents

**"SENSOR WEEK"**

**with special Webinars**

**on**

**TUESDAY-July 19, THURSDAY-July 21 and FRIDAY-July 22**

**TUESDAY, July 19th, 11:00 AM US-Central**

**TOPIC:** [**Human-Robot Interaction and Human-Robot Teams**](http://ieee-sensors.org/wp-content/uploads/2017/08/Abstract-Lumelsky-DL-2017.pdf)

**SPEAKER: Prof Vladimir Lumelsky,** Professor Emeritus, University of Wisconsin-Madison, Madison, WI, USA

**PRESENTATION:** <http://ieee-sensors.org/wp-content/uploads/2017/08/Abstract-Lumelsky-DL-2017.pdf>The ability of a robot to operate in an uncertain environment, such as near humans or far away under human control, potentially opens myriad uses. Examples include robots preparing the Mars surface for human arrival; robots for assembly of large space telescopes; robot helpers for the elderly; robotic search and disposal of war mines. So far advances in this area have been coming slowly, with a focus on specific tasks rather than a universal ability typical in nature. Challenges appear both on the robotics side and on the human side: robots have a hard time adjusting to an unstructured environment, whereas human cognition has serious limits in adjusting to robots and grasping complex 2D and 3D motion tasks. As a result, applications where robots operate near humans – or far away under their control – are exceedingly rare. The way out of this impasse is to supply the robot with whole-body sensing - an ability to sense surrounding objects at the robot’s whole body - and algorithms capable of utilizing these data in real-time. This calls for large-area flexible sensing arrays - sensitive skin covering the whole robot body akin to the skin covering the human body. Whole-body sensing brings interesting, even unexpected, properties: powerful robots become inherently safe; human operators can move them fast, with “natural” speeds; robot motion strategies exceed human spatial reasoning skills; it becomes realistic to utilize the natural synergy of human-robot teams and allow a mix of supervised and unsupervised robot operation. We will review the cognitive science, mathematical, algorithmic, and hardware (materials, electronics, computing) issues involved in realizing such systems.

Human-robot

**PRESENTER:**

Vladimir Lumelsky is a Professor Emeritus at the University of Wisconsin-Madison. His Ph.D. in Applied Mathematics is from the Institute of Control Sciences, Russian National Academy of Sciences, Moscow. He has held engineering, research, administrative, and faculty positions with Ford Motor Research Labs, General Electric Research Center, Yale University, University of Wisconsin-Madison, University of Maryland, NASA-Goddard Space Center, and National Science Foundation. Concurrently he held visiting positions with the Tokyo Institute of Science, Japan; Weizmann Institute, Israel; USA-Antarctica South Pole Station. Dr. Lumelsky has served аs IEEE Sensors Council President; Founding Editor-in-Chief of IEEE Sensors Journal; chair and co-chair of major conferences; on Editorial Boards of IEEE Transactions on Robotics and Automation and other journals; on various governing committees of IEEE; and served as guest editor for special journal issues. He has authored over 200 publications (books, journal papers, conferences, and reports); is an IEEE Life Fellow, and is a member of ACM and SME.

**Complimentary Registration on VTool**

**https://events.vtools.ieee.org/event/register/318482**

**Deadline: July 17th, 5:00 PM**

**GBS Website r5.ieee.org/gb**

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**THURSDAY, July 21st, 11:00 AM US-Central**

**TOPIC:** [**Wearable Computing Systems based on Body Sensor Networks: State-of-the-art and Future Research Challenges**](https://ieee-sensors.org/wp-content/uploads/2021/01/DL-Lecture-1_abstract_Giancarlo-Fortino.pdf)

**SPEAKER: Prof. Giancarl Fortino,** University of Calabria, Italy

**PRESENTATION:** Wearable computing is a relatively new area of research and development that aims at supporting people in different application domains: health-care (monitoring assisted living), fitness (monitoring athletes), social interactions (enabling multi-user activity recognition, e.g. handshake), videogames (enabling joystick-less interactions), factory (monitoring employees in their activity), etc. Wearable computing is based on wearable computing devices/interfaces such as sensor nodes (e.g. to measure heart rate, temperature, blood oxygen, etc), common life objects (e.g. watch, belt, etc), and smartphones/PDA. Wearable computing has been recently boosted by the introduction of body sensor networks (BSNs), i.e. networks of wireless wearable sensor nodes coordinated by more capable coordinators (smartphones, tablets, PCs). Although the basic elements (sensors, protocols, coordinators) of a BSN are available (already from a commercial point of view), developing BSN systems/applications is a complex task that requires suitable design methods based on effective and efficient programming frameworks. In this DL, we will first discuss the state-of-the-art of currently available wearable computing systems based on BSNs. Then, we will focus on the main results achieved in the SPINE project (http://spine.deis.unical.it), currently led by Prof. Fortino’s research group, in terms of defined models, methodology, algorithms, and real prototypes (e.g. activity/gesture recognition systems, fall detection systems, mobile ECG processing systems, elbow/knee rehabilitation systems, emotion recognition systems, etc.). Based on SPINE, we also developed C-SPINE to support the development of collaborative systems based on BSNs and able to detect/classify multi-user activity. Examples will be given in the area of COVID-19 tracing and support platforms. Finally, the DL will enumerate and discuss future research challenges along with possible solutions in such exciting research domains. Learning points: • Body sensor networks: sensors (physiological sensors, inertial sensors, pressure sensors), architectures and communications patterns/protocols • Body sensor networks programming and management issues • The SPINE (Signal Processing In-Node Environment) framework: basic concepts (sensors hardware adaptation, drivers addition, sensors programming, data collection, in-node data processing) • SPINE wearable sensor-based prototypes: from Human Activity recognition to Cardiac Defense Response detection and Limb Rehabilitation. • C-SPINE for the Development of Collaborative BSNs and its application for humans’ tracing/distancing platforms • Future research challenges in BSNs: from wearable stretchable sensors to autonomic sensor platforms.

**PRESENTER:**

Giancarlo Fortino (SM’12) is a Full Professor of Computer Engineering at the Dept. of Informatics, Modeling, Electronics, and Systems (DIMES) of the University of Calabria (Unical), Rende (CS), Italy. He has a Ph. D. degree and Laurea (MSc+BSc) degree in Computer Engineering from Unical. He is a High-end Foreign Expert in China (term 2015-2018), Adjunct and Guest Professor at the Wuhan University of Technology (China), High-end Expert of HUST (China), CAS PIFI Visiting Scientist in Shenzhen (2019-2021), Distinguished Professor of Huazhong Agricultural University (China) and Associated Senior Research Fellow at the Italian National Research Council - ICAR Institute. He has been also Visiting Researcher and Professor at the International Computer Science Institute (Berkeley, USA, 97-99) and at the Queensland University of Technology (Australia, 2009), respectively. He is on the list of Top Italian Scientists (TIS) by VIA-academy and Guide2Research, with h-index=52 and 10000+ citations according to GS. According to the SciVal tool based on the Scopus database, in the last 5 years (2015-19), he is ranked N. 39 in the Computer Science field in the ranking of Top 500 authors, by Scholarly Output in the World, based on the FWCI index, is N. 1 in the Research Area “Hardware and Architecture” and N. 1 in the topic “Body Sensor Network; Smart Object; Interoperability”. According to WoS, he has currently 12 highly cited papers and has been recently nominated candidate for Highly Cited Researcher 2020. He is the director of the SPEME (Smart, Pervasive and Mobile Systems Engineering) Lab at DIMES, Unical, and co-director of three joint labs on Smart IoT technologies established with Wuhan University of Technology, Shanghai Maritime University, and Huazhong Agricultural University, respectively. He is also the director of the postgraduate master's in “INTER-IoT: Integrator of Internet of Things Systems” and the Rector’s delegate to international relations at Unical. His main research interests include Human-Machine Systems, Wearable Computing, Internet of Things computing and technology, agent-based computing, body area networks, wireless sensor networks, pervasive and cloud computing, multimedia networks, and mobile health systems. He participated in many local, national, and international research projects and was also the deputy coordinator and scientific & technical project manager of the EU-funded (8M) H2020 INTER-IoT project. He authored 450+ publications in journals (200+ in ISI-impacted journals), conferences, and books. He chaired 100+ Int'l conferences/workshops (he is the general chair of the 1st edition of the 2020 IEEE Human-Machine Systems conference), organized 60+ special issues in well-known ISI-impacted Int'l Journals, and participated in the TPC of about 500 conferences. He is the founding editor in chief of the IEEE Book Series on “Human-Machine Systems” and of the Springer Book Series on "Internet of Things: Technology, Communications, and Computing”, and currently serves (as associate editor) in the editorial board of IEEE Transactions on Human-Machine Systems, IEEE Transactions on Affective Computing, IEEE IoT Journal, IEEE Sensors Journal, IEEE SMC Magazine, IEEE Access, Information Fusion, Engineering Applications of Artificial Intelligence, Journal of Networks and Computer Applications and others. He is the recipient of the 2014 Andrew P. Sage SMC Best Transactions Paper Award. He is a Distinguished Lecturer of the IEEE Sensors Council for the period 2021- 2023. He is the Chair of the IEEE SMC Italian Chapter, Member-at-large of the IEEE SMCS BoG, Member of the IEEE Press Board of Directors, and founding chair of the IEEE SMC Technical Committee on “Interactive and Wearable Computing and Devices”. He is co-founder and CEO of SenSysCal S.r.l., a spin-off of Unical, developing innovative human-oriented IoT-based systems for e-health and domotics.

**Complimentary Registration on VTool**

**https://events.vtools.ieee.org/event/register/318483**

**Deadline: July 19th, 5:00 PM**

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**FRIDAY, July 22nd, 11:00 AM US-Central**

**TOPIC:** **"Mobile robot olfaction"**

**SPEAKER: Prof Lino Marques,** University of Coimbra, Portugal

**PRESENTATION:**

Mobile robot olfaction studies the integration and application of the sense of smell into mobile robots. This widely multidisciplinary research area deals with a variety of problems such as chemical sensing, odour dispersion and environmental state estimation, optimal sampling, wide area searching, path planning, and machine learning. This talk provides an overview of the field, introducing the odour dispersion phenomenon and the problems of finding its parameters from the inversion of concentration measurements. Then, a brief survey of the existing odour sensing technologies and their corresponding limitations is provided. The main methods to search odour sources with mobile robots are reactive strategies, heuristic search, and probabilistic inference methods. These approaches are frequently dependent from the environment characteristics, but this dependence may be mitigated by machine learning approaches.

**PRESENTER:**

Lino Marques received the Ph.D. degree in Electrical Engineering from the University of Coimbra, Portugal. He is Associate Professor at the Department of Electrical and Computer Engineering at the University of Coimbra and Senior Researcher at the Institute of Systems and Robotics, where he heads the Field Robotics group. He has been involved in several national and European research projects involving field and service robotics and robotics for hazardous environments, including humanitarian demining. He is Editor-in-Chief for Robots and Multi-Robot Systems of the International Journal of Advanced Robotic Systems and Associate Editor of Frontiers in Robotics and AI. His primary research interest is in mobile robot olfaction, although he has concurrent research in multiple robotics sub-areas, including multi-robotic systems, robotics for hazardous environments and field and service robotics.

**Complimentary Registration on VTool**

**https://events.vtools.ieee.org/event/register/318485**

**Deadline: July 20, 2022**

GBS "Sensor Week" Coordinator:

Dr Zafar Taqvi, Chair GBS Sensor Council Joint Chapter

GBS website //r5.ieee.org/gb