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Special Session Call for Papers SMC2016 Special Session on **Knowledge-based and Intelligent Control Solutions for Medical Cyber-Physical Systems**

Special Session organizers

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Introduction/Call for Papers

Cyber-Physical Systems (CPS) are engineered systems built from and depend upon the seamless integration of computational algorithms and physical components. Medical CPS (including all rehabilitation robots, surgical aids, patient monitoring devices, hospital information systems, etc.) are becoming an integrated part of modern healthcare.

Advances in Medical CPS will enable improved capability, adaptability, safety, security and usability that will far exceed the simple embedded medical systems of today.

However, from the technological point of view, there are still major barriers exist to make these experimental devices reliable, safe and affordable. Traditional analysis tools are unable to cope with the full complexity of the human body or adequately predict CPS behavior. The goal of the community is to advance science and technology, share best practices and know-how to overcome crucial issues concerning medical devices, software and systems. Major challenges affecting the design and integration could be overcome with the help of cutting-edge, customized control algorithms. Latest results in CPS control are to be presented at this special session: new relationships between the cyber and physical components, new architectural models that redefine form and function.

Aims and potential impact of the Special Session

- Identify specific gaps in existing CPS control practices, as well as future needs;
- Identify related efforts (best practices) outside of the medical CPS research community that we may leverage as a group;
- Explore future potential scientific domains to continue to support shared knowledge infrastructure for the CPS community;
- Discuss collaboration and communication mechanisms along our key research topics, their benefits and shortcomings.

Organizational details

The Special Session will feature two keynote presentations and 7-10 regular papers. All accepted papers will be requested to submit a 1-slide teaser of the research which will be featured at the website of the session. During this session, we will stimulate audience participation by providing adequate time for questions and discussion.

Special Session announcements will be distributed by means of the following mechanisms: targeted email invitations to principal investigators at leading research labs worldwide that are engaged in medical CPS research. At present, there are at least 50-60 active university groups in this field. An initial starting point for this mailing list will be the list of groups that have participated in past SMC events on CPS and advanced control. Advertisements will be submitted to various LinkedIn groups and online groups, and the organizers will promote this special session during their own presentations to relevant audiences between now and the SMC date.

We expect approximately 40-50 active participants based on attendance observed at recent related events. The program committee will award a best presentation prize, voted by the audience.

Organizers

Tamas Haidegger (haidegger@irob.uni-obuda.hu, +36-1-6665729; Obuda University BARK, Kiscelli u. 82. Budapest, H-1032) is an adjunct professor at the Óbuda University, serving as the deputy director of the newly founded ABC Center for Intelligent Robotic. Besides, he is a research area manager at the Austrian Center of Medical Innovation and Technology (ACMIT), working on minimally invasive surgical simulation and training, medical education and the technological improvement of gynecological brachytherapy. His main field of research is control/teleoperation of surgical robots, image-guided therapy and supportive medical technologies. Tamás is an active member of various other professional organizations as well, including IEEE, SPIE and MICCAI. He is a national delegate to an ISO/IEC standardization committee focusing on safety for medical robots. He is the author of more than 140 peer reviewed papers published at various scientific meeting and conference proceedings, refereed journals and books in the field of biomedical/control engineering and computer-integrated surgery.

Gernot Kronreif (gernot.kronreif@acmit.at, +43-2622-22859-0; Austrian Center for Medical Innovation and Technology (ACMIT),) Cum-laude doctors degree in Technical Sciences – Special subject: Robotics; 1995–1996: Employed with „Department of Systems Engineering and Automation“ at the Scientific Academy of Lower Austria, Krems / Austria; 1996–1999: Teaching Assistant at the „Institute for Handling Devices and Robotics“ at the Vienna University of Technology; 2000–2007: Employed with ARC Seibersdorf research GmbH – Special subject: Robotics for medical applications. 2007 - 2010: Employed with PROFACTOR GmbH; Head of Department “Advanced Service Robotics”; development of robotic/mechatronic systems for rehabilitation and medicine. Since 2010: Chief Scientific Officer at "Austrian Center of Medical Innovation and Technology", ACMIT GmbH. Lecturer at several “Universities of Applied Sciences” (“Fachhochschulen”). More than 130 papers and presentations at scientific conferences. Member of several scientific organisations and steering committees, e.g. IEEE, iSMIT, ISCAS, CURAC, IFAC.

Emmanuel Vander Poorten (emmanuel.vanderpoorten@kuleuven.be, +32 16 32 25 28; KU Leuven, Department of Mechanical Engineering) Current position: Assistant Professor, Assist. Prof. Fac. Engineering Technology. Key research domains: Surgical Robotics, Haptic Interfacing, Surgical Training. Specialties: teleoperation – haptic interfacing – surgical robotics – mechanisms. Spent over a year at Kyoto University as a visiting scholar.

Focus Areas of the Session

Original contributions are sought in the areas including but not limited to:

- Applied control of medical CPS
- Knowledge based and intelligent control algorithms
- Advanced control of human–machine interfaces for medical applications
- Medical robot control
- Human-centered robot control
- Foundations for integration of medical device systems/models
- Component-based technologies for accelerated design and verifiable system integration
- Enabling control technologies for future medical devices
- Implantable regulatory devices, networked biosensors, tele-surgery,

	<p>robotic surgery, physiologic signal QoS</p> <ul style="list-style-type: none"> • Distributed control & sensing of networked medical CPS • Robust, verifiable, fault-tolerant control of medical CPS • Medical CPS Plug-and-Play: requirements for interoperability in the clinical environment • High-confidence medical CPS software development & assurance
<p>The special session is submitted to Section: B B: Human-Machine Systems</p>	<p>Important Dates</p> <p>April 15, 2016: Deadline for submission of full-length papers</p> <p>May 25, 2016: Acceptance/Rejection Notification.</p> <p>July 9, 2016: Final camera-ready papers due in electronic form.</p> <p>Submission</p> <p>Manuscripts for a Special Session should NOT be submitted in duplication to any other regular or special sessions and should be submitted to SMC2016 main conference online submission system on SMC2016 conference website.</p> <p>All submitted papers of Special Sessions have to undergo the same review process (three completed reviews per paper). The technical reviewers for each Special Session paper will be members of the SMC2016 Program Committee and qualified peer-reviewers to be nominated by the Special Session organizers.</p>