Introduction to the Workshop on Methods for Safer Surgical Robotics Procedures

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Surgical Robotics

- Extend capabilities of the human through
  - Higher dexterity
  - Better precision
  - Comprehensive vision
  - Higher sensitivity

- Extract knowledge from previous surgeries
- Semiautonomous procedures
- Patient and procedure models
- Decision support functions

- Increase patient safety
Safety in the Surgical Context

WHO Definition of *Patient Safety:*

- Patient safety is the reduction of the risk of unnecessary harm associated with healthcare to an *acceptable minimum.*

- An *acceptable minimum* refers to the collective notions of
  - given current knowledge,
  - given resources available and
  - the context in which care was delivered weighed against the risk of non-treatment or other treatment.
Goals of our Workshop

We all work to achieve an increase in Patient Safety

- Where are the most painful frontiers of current knowledge and how can we expand them?

- How do we measure our achieved safety increases?

- Safety and costs?
Sessions

- Simulation and Modelling (Rainer)
- Haptics, Force Feedback and Human Robot Interaction (Paolo)
- Operating Room Sensing and Reasoning (Stefan)
Session on Simulation and Modelling

- Robotic Surgery learning requirements: Simulation Based & Schoolhouse Training to Improve Safety
  Nikhil L. Shah DO
  MPH Director of Minimally-Invasive and Robotic Surgery, Department of Surgery
  Saint Joseph’s Hospital, Atlanta

- Robotic System Simulation and Modelling
  Stefan Jörg
  Robotics and Mechatronics Center, DLR, Germany

- Tissue modeling for Safer Robotic Interventions
  Prof. Allison Okamura
  Mechanical Engineering Dept., Stanford University

- Balancing Safety and Cost in Robotically Assisted Surgery
  Ph.D. Louai Adhami
  SimQuest LLC, Silver Spring
Session on Haptics, Force Feedback and Human Robot Interaction

- **Safe Human-Robot Interaction**  
  Dipl.-Ing., MSc. Sami Haddadin  
  Robotics and Mechatronics Center, DLR, Germany

- **Multimodal Haptics for Improved Safety in Robotic Surgery**  
  Prof. Hannes Bleuler and Laura Santos-Carreras  
  École Polytechnique Fédérale de Lausanne (EPFL), Robotic Systems Laboratory

- **Toward safe endonasal surgery using teleoperated continuum robots**  
  Dr. Jessica Burgner  
  Vanderbilt University, Medical & Electromechanical Design Laboratory, Nashville

- **Hybrid Actuation Approaches for Robotic Systems and Haptic Interfaces**  
  Ph.D. Francois Conti  
  Force Dimension / Stanford University, Artificial Intelligence Laboratory, Department of Computer Science
Session on Operating Room Sensing and Reasoning

- Operation Room Supervision for Safe Robotic Surgery with a Multi 3D-Camera Setup
  Dipl.-Inform. Philip Nicolai and Dr.rer.nat. Jörg Raczkowsky
  KIT, Institute of Process Control and Robotics, Medical group (MeGI)

- Vision-based Analysis of Conventional Surgical Procedures
  Prof. Darius Burschka and Oliver Ruepp
  TUM, Machine Vision and Perception Group, Germany

- Real-time 3D reconstruction: applications to collision detection and surgical workflow monitoring
  Prof. Dr. Nassir Navab and Dipl.-Inf. (FH) Stefan Holzer, M.Sc.
  TUM, Computer Aided Medical Procedures & Augmented Reality

- Human-machine Cooperation in the Operating Room
  Prof. Greg Hager and Ph.D. Nicolas Padoy
  The Johns Hopkins University, Department of Computer Science

- A Data Revolution for Robotic Surgical Safety
  Dr. Marco A. Zenati
  MD Harvard Medical School, Boston, MA
Schedule

8:45 - 10:25 Session on Simulation and Modelling

10:25 - 11:05 Coffee Break

11:05 - 12:45 Session on Haptics, Force Feedback and HRI

12:45 - 14:30 Lunch Break

14:30 - 15:45 Session on OR Sensing and Reasoning (1)

15:45 - 16:15 Coffee Break

16:15 - 17:30 Session on OR Sensing and Reasoning (2)

Each presentation: 20 Minutes + 5 Minutes discussion