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Robot assisted retinal surgery

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Modern patient health care involves maintenance and restoration of health by medication or surgical intervention. This research talk focuses solely on surgical procedures, like retinal surgery, where surgeons perform necessary high-risk treatments while facing significant technical and human limitations in an extremely constrained environment. Inaccuracy in tool positioning and movement are among the important factors limiting performance in retinal surgery. The challenges are further exacerbated by the fact that in the majority of contact events, the forces encountered are below the tactile perception of the surgeon. Inability to detect surgically relevant forces leads to lack of control over potentially injurious factors that result in complications. This situation is less than optimal and can significantly benefit from the recent advances in robot assistance, sensor feedback and human machine interface design. Robotic assistance may be ideally suited to address common problems encountered in most (micro) manipulation tasks, including hand tremor, poor tool manipulation, resolution and accessibility to open up surgical strategies that are beyond human capability. Various force sensors have been developed for microsurgery and minimally invasive surgery. Optical fibers, strain sensors, specifically fiber Bragg gratings (FBG) are very sensitive, capable of detecting sub-micro strain chances are very small in size, light weight, biocompatible, sterilizable, multiplexable and immune to electrostatic and electromagnetic noise. In retinal surgery, FBG based force sensing tools can provide the necessary information that will guide the surgeon through any manoeuver, effectively reduce forces with improved precision and potentially improve the safety and efficacy of the surgical procedure. Optical fiber-based sensorized instruments in correlation with robot-assisted (micro) surgery could address the current limitations in surgery by integrating novel technology that transcend human sensory-motor capabilities into robotic systems that provide both, real-time significant information and physical support to the surgeon, with the ultimate goal of improving clinical care and enabling novel therapies.

Biography

Iulian Iordachita received his bachelor's degree in Mechanical Engineering in 1984, Masters in Industrial Robotics in 1989 and PhD degree in Mechanical Engineering in 1996 all from the University of Craiova, Romania. Currently, he is a Research Faculty at the Mechanical Engineering Department, Whiting School of Engineering, Johns Hopkins University, Faculty Member of the Laboratory for Computational Sensing and Robotics (LCSR) and the Director of the Advanced Medical Instrumentation and Robotics Research Laboratory (AMIRo). His current research interests include medical robotics (with a specific focus on robot-assisted retinal surgery), image guided surgery, robotics, smart surgical tools and medical instrumentation.

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