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Topic: Next Frontier of Medical Intervention: Union of Surgeon and Robot

Abstract:

Over the past decade, medical robotic technologies have crossed the chasm that lies between laboratory bench-top prototypes and commercial products, and made a significant clinical impact to the field of medical intervention such as the Accuray CyberKnife and the Intuitive Surgical da Vinci robots. Through the adoption of these technologies, a synergetic union of surgeon and robot has established and helped surgeons to overcome many limitations of the traditional treatment. Next-generation medical robotic systems are now on the horizon and can significantly extend surgeons' ability to plan and carry out medical interventions more accurately and less invasively.

In this talk, we will review the background of the surgical robot, its present capabilities, limitations, and acceptance. We will discuss some of our research efforts to extend the boundaries of medical intervention through advanced sensing, flexible robotic technology, and intelligent control algorithms. This talk will also share some of the challenges in taking research concepts and prototypes toward final, deliverable products.

Biography:

Samuel Kwok-wai Au received the B.Eng. and M.Phil degrees in Mechanical and Automation Engineering from The Chinese University of Hong Kong in 1997 and 1999, respectively. He completed his Ph.D. degree in Mechanical Engineering at MIT in 2007. During his PhD study, he invented (with Prof. Hugh Herr) the MIT Robotic Ankle-foot Prosthesis, which mimics the action of a biological ankle and, for the first time, provides transtibial amputees with a natural gait. This invention was named one of the Best Inventions of Year by TIME magazine in 2007 and was later commercialized by iWalk, Inc.

Dr. Au is an Associate Professor of the Department of Mechanical and Automation Engineering at The Chinese University of Hong Kong (CUHK) since Sept, 2017. Before joining CUHK, he was the manager of Systems Analysis of the New Product Development Department at Intuitive Surgical, Inc. At Intuitive Surgical, he co-invented and led the product development (SW/Control) of the FDA approved da Vinci Si Single-Site surgical platform (2012), Single-Site Wristed Needle Driver (2014), and da Vinci Xi Single-Site surgical platform (2016). da Vinci Single-Site platform was the first FDA approved robotic platform to support single incision surgery. Since the official launch at Dec 2012, over 100K patients have received the single incision surgery through this platform and many clinical centers/hospitals around the globe have been using this platform for research

studies as well as their clinical practice. Between 2008-2012, he was also the core team member for developing the da Vinci flexible catheter-based technology for early stage lung cancer biopsy.

Dr. Au is the author and co-author of over 12 peer-reviewed manuscripts and conference journals, and has more than 20 patents pending. His inventions/works featured in numerous magazines such as New York Times and Technology Review. He has won numerous awards including the first prize in the American Society of Mechanical Engineers (ASME) Student Mechanism Design Competition in 2007, Intuitive Surgical (ISI) Problem Solving Award in 2010, and Intuitive Surgical (ISI) Inventor Award in 2011.