Concentric Tube Robots for Minimally Invasive Surgery

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Abstract:
A novel approach to constructing robots is based on concentrically combining pre-curved elastic tubes. By rotating and extending the tubes with respect to each other, their curvatures interact elastically to position and orient the robot’s tip, as well as to control the robot’s shape along its length. In this approach, the flexible tubes comprise both the links and the joints of the robot. Since the actuators attach to the tubes at their proximal ends, the robot itself forms a slender curve that is well suited for minimally invasive medical procedures. In this talk, I will describe our work developing design principles, mechanics-based kinematic models and real-time control strategies for this technology. I will also describe tip-mounted tools and implantable devices we are developing for applications in beating-heart intracardiac surgery.

Biography:
Professor Pierre Dupont received the B.S., M.S. and Ph.D. degrees in Mechanical Engineering from Rensselaer Polytechnic Institute. He held a postdoctoral position at Harvard University before joining Boston University where he is currently a Professor in the Mechanical Engineering and Biomedical Engineering Departments. He is also on the Scientific Staff of Cardiovascular Surgery at Children’s Hospital, Boston. Professor Dupont conducts research in image-guided minimally invasive surgery. This includes the design of medical robots, the modeling of tool-tissue interaction, the development of multi-modal imaging techniques and the automation of instrument motion. For more information, please visit http://biorobotics.bu.edu.

Date: Friday, April 3 at 2:00 pm
Place: 1202 EGR (Glenn L. Martin Hall)

Host: Dr. Jensen will be hosted by Professor Jaydev Desai of Mechanical Engineering