HUMANITY CENTERED ROBOTICS INITIATIVE

BROWN

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"Getting in Touch: Online Mobile Manipulator Self-Calibration Through Visual and Contact Sensing"

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12:00-12:50
CIT 477 Lubrano

Abstract: Mobile manipulators are versatile platforms that have a multitude of applications. These robots often carry a variety of sensors on board, including cameras and depth cameras, for navigation and for manipulation. To be used effectively, the positions and orientations of the cameras relative to the robot end effector must be known. The process of determining these calibration parameters is typically carried out offline using specialized equipment and manual intervention.

In this talk I will describe our recent work on mobile manipulator self-calibration through contact sensing. Our method, based on point cloud registration, can be applied to estimate the extrinsic transform between a fixed vision sensor mounted on a mobile base and an end effector. Beyond sensor calibration, we demonstrate that the method can be extended to include manipulator kinematic model parameters, which involves a non-rigid registration process. Our procedure uses on board sensing exclusively and does not rely on any external measurement devices, fiducial markers, or calibration rigs. Further, the method is fully automatic in the general case. I will present results which demonstrate sub-centimeter-level post-calibration accuracy in positioning of the end effector using visual guidance only. Our overall goal is to make mobile manipulators more versatile, flexible, and less expensive to operate.

Dr. Jonathan Kelly is Dean's Catalyst Professor at the University of Toronto Institute for Aerospace Studies (UTIAS) and the Director of the Space & Terrestrial Autonomous Robotic Systems (STARS) Laboratory. Before joining the University of Toronto, he was a postdoctoral researcher at the Massachusetts Institute of Technology. Dr. Kelly received his PhD degree from the University of Southern California, where his dissertation work focused on sensor fusion for robust robot navigation. Prior to graduate school, he was a software engineer at the Canadian Space Agency in Montreal, Canada. His research interests lie primarily in the areas of estimation and machine learning for navigation, mapping, and manipulation tasks.

Host: Stefanie Tellex/HCRI