HUMANITY CENTERED ROBOTICS INITIATIVE

BROWN

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"Context Aware Shared Autonomy for Robotic Manipulation Tasks"

Friday, September 20, 2013
11:00am
Barus and Holley Room 190

In this talk I will briefly present on-going robotic projects at Robert Bosch LLC (autonomous lawnmower, robot for organic farming, hospital transport assistant system, activities from the PR2 Beta Program) and then go deeper into our upcoming IROS 2013 paper. This paper describes a collaborative human-robot system that provides context information to enable more effective robotic manipulation. We take advantage of the semantic knowledge of a human co-worker who provides additional context information and interacts with the robot through a user interface. A Bayesian Network encodes the dependencies between this information provided by the user. The output of this model generates a ranked list of grasp poses best suitable for a given task which is then passed to the motion planner. Our system was implemented in ROS and tested on a PR2 robot. We compared the system to state-of-the-art implementations using quantitative (e.g. success rate, execution times) as well as qualitative (e.g. user convenience, cognitive load) metrics. We conducted a user study in which eight subjects were asked to perform a generic manipulation task, for instance to pour a bottle or move a cereal box, with a set of state-of-the-art shared autonomy interfaces. Our results indicate that an interface which is aware of the context provides benefits not currently provided by other state-of-the-art implementations.

Dejan Pangercic pursued a PhD at the Technical University of Munich between January 2009 and October 2012 under the supervisory of prof. Michael Beetz, PhD and is expected to graduate in October 2013. During his PhD he, on the one hand, developed a comprehensive system for creation of semantic object maps of indoor environments that enable personal robots to e.g. robustly operate kitchen containers. On the other hand he developed a system for an interactive segmentation of objects of daily use in clutter where he leveraged robots' manipulation skills to improve their perception skills. For the above research he released several open source code repositories within ROS. He organized several summer schools, conference workshops and has co-written two successfully accepted large European research projects called RoboHow and SHERPA. He spent the summer of 2011 at Bosch Research and Technology Center, Palo Alto as a visiting researcher where he is since October 2012 also working as a full time research scientist. At Bosch he is investigating three areas of research: architectural design for the 2nd generation of autonomous lawnmower robot, shared autonomy for collaborative human-robot work and interactive perception. He is regularly publishing at the major robotic conferences and journals (IROS, ICRA, Humanoids, ICAR, IJRR) and has co-edited a JVCI special issue on Visual Understanding and Applications with RGB-D Cameras. The paper "Tracking-Based Interactive Segmentation of Textureless Objects", which he co-authored, was selected as finalist for the Best Service Robotics Paper Award at ICRA 2013.

This presentation is part of the HCRI's multidisciplinary speaking program that showcases diverse and groundbreaking research undertaken by leaders in science, technology, design, and impact of robotics on society.

For more information on this talk and the HCRI Speaker Series,
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