University of Rochester
Department of Electrical and Computer Engineering Colloquia Series

An adaptive human-robot collaboration approach through perception-based real-time adjustments of robot behavior in industry

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12:00PM – 1:00PM
Computer Studies Building 523

Abstract:
With the current market trend resulting in short product lifespan and increasing demand, the complexity in automation using robots has also increased. This has increased the need for having human robot collaboration. The biggest concerns of human robot collaboration are human safety, human compliance and human trust in automation. Collaborative robots, with build in protective stops have been introduced that reduce the risk of injury in the event of human robot collision. However, the underlying idea of suspending robot motion to avoid human injury is still the convention, as there is no inherent robot intelligence. This affects the overall productivity negatively. To address these challenges and concerns, I will present a novel framework for a system that will supervise the robot's action and behavior in the human-robot shared workspace. The function of the robot supervision system is to adaptively control the robot motion based on the human actions in order to optimize the productivity of a task while ensuring human safety and develop human trust in automation. The real-time perception of the human action and environment will be done using a motion capture setup. I will explain the inspiration for the framework that was based on a Skill, Rule and Knowledge based human behavior model. The aspects of human robot interaction in an industrial setup will also be presented. I will show some preliminary results and simulation setups that have been done in the lab. An evaluation criterion of the proposed system in terms of safety, performance and productivity will also be presented.

Bio:
Dr. Ferat Sahin received his M.Sc. and Ph.D. degrees from Virginia Polytechnic Institute and State University. In September 2000, he joined Rochester Institute of Technology, where he is a Professor. He is also the director of Multi Agent Bio-Robotics Laboratory and Collaborative Robotics Laboratory at RIT. His current research interests are Collaborative Robotics, Human Compliant Robotics Systems, System of Systems Simulation and Modeling, Machine Learning, Biological Signal Processing, Fault Analysis and Systemic Health Evaluation, MEMS Materials Modeling, MEMS-based Microrobots, Micro Actuators, Distributed Computing, Decision Theory, Pattern Recognition, Distributed Multi-agent Systems, and Structural Bayesian Network Learning. In addition to conference and journal publications in these areas, he is also the co-author of two books: "Experimental and Practical Robotics" and "Intelligent Control Systems with an Introduction to System of Systems Engineering" by CRC Press. Dr. Sahin has been a reviewer for leading journals and conferences in both the IEEE and other organizations. He serves as the Deputy Editor-in-Chief for International Journal of Computers and Electrical Engineering and as an Associate Editor for IEEE Systems Journal, AutoSoft Journal, and IEEE SMC Magazine. He is a member of the IEEE Systems, Man, and Cybernetics Society, Robotics and Automation Society, and Computational Intelligence Society. Currently, he is the member of Board of Governors and VP Finance of IEEE SMC Society. Locally, Dr. Sahin has served as Secretary (2003) and section Vice-chair (2004 and 2005) in the IEEE Rochester Section. He has also been the Faculty Advisor of IEEE student chapter at Rochester Institute of Technology from 2001 to 2003. He has served as the Student Activities chair for the IEEE SMC Society in 2001, 2002, and 2003. He was the Secretary of the IEEE SMC Society from 2003 to 2006. Dr. Sahin received an "Outstanding Contribution Award" for his service as the SMC Society Secretary in 2007 and 2015. He also served as the Treasurer of the IEEE SMC Society in 2011. He is a member of the SMC Strategic Opportunities and Initiatives Committee and the SMC Technical Committee on System of Systems Engineering. He was the Publication Co-Chair for the IEEE SMC International Conference on System of Systems Engineering (SOSE 2007), as the Technical Co-chair of the IEEE International Conference on System of Systems Engineering (SOSE 2008 and SOSE 2009), and the general chair of SOSE 2011 conference and is the general co-chair of SoSE2013, SoSE 2015, and SoSE 2017.

Pizza and soda provided