ME Seminar

Embracing Contacts for Dexterous Manipulation

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ABSTRACT

The last decade has seen remarkable progress in the fields of deep learning, artificial intelligence (AI) and reinforcement learning (RL). However, similar progress has largely eluded feedback control of physical robots - robots still operate in highly structured and engineered environments that are designed so that robots can avoid contact with their environment. Contacts play a central role in manipulation. Planning and feedback control in the presence of contacts remain very challenging problems, making design of closed-loop manipulation systems elusive. In this talk, I will present several robotic tasks with different degrees of complexity. Each of these systems present unique challenges with regards to modeling, learning, sensing and optimization. I will highlight how we address these challenges in order to achieve efficient and generalizable performance for these robotic systems. The techniques proposed in these problems could be instrumental in creating next-generation robotic systems that can (possibly) plan in simulation and operate in the real world with real-time sensing and perception. Based on these results, I will present a vision toward creating next-generation robotic systems which can perceive and interact with their environment with higher degrees of autonomy. These research problems will enable a principled way to feedback robotic manipulation which will find applications in factory automation, manufacturing, home assistance and human-robot collaborative environments.

ABOUT THE SPEAKER

Devesh K. Jha is currently a Principal Research Scientist at Mitsubishi Electric Research Laboratories (MERL) in Cambridge, MA, USA. At MERL, he has been working on fundamental problems in the areas of robot learning and manipulation, with applications to factory automation, e-commerce and manufacturing. He received PhD in Mechanical Engineering from Penn State in December 2016. He also received M.S. degrees in Mechanical Engineering and Mathematics from Penn State. His research interests are in the areas of Robotics, Machine Learning and Deep Learning. He is a recipient of several best paper awards including the Kalman Best Paper Award 2019 from the American Society of Mechanical Engineers (ASME), Dynamic Systems and Control Division (DSCD). He is a senior member of IEEE and an associate editor for IEEE Robotics and Automation Letters (RA-L).

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