PLANNING AND DECISION MAKING FOR AUTONOMOUS SPACECRAFT AND SPACE ROBOTS

Marco Pavone -- Stanford University

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Computer Science & Engineering building room 1242

Abstract: In this talk I will present planning and decision-making techniques for safely and efficiently maneuvering autonomous aerospace vehicles during proximity operations, manipulation tasks, and surface locomotion. I will first address the "spacecraft motion planning problem," by discussing its unique aspects and presenting recent results on planning under uncertainty via Monte Carlo sampling. I will then turn the discussion to higher-level decision making; in particular, I will discuss an axiomatic theory of risk and how one can leverage such a theory for a principled and tractable inclusion of risk-awareness in robotic decision making, in the context of Markov decision processes and reinforcement learning. Throughout the talk, I will highlight a variety of space-robotic applications my research group is contributing to (including the Mars 2020 and Hedgehog rovers, and the Astrobee free-flying robot), as well as applications to the automotive and UAV domains.

Dr. Marco Pavone is an Assistant Professor of Aeronautics and Astronautics at Stanford University, where he is the Director of the Autonomous Systems Laboratory and Co-Director of the Center for Automotive Research at Stanford. Before joining Stanford, he was a Research Technologist within the Robotics Section at the NASA Jet Propulsion Laboratory. He received a Ph.D. degree in Aeronautics and Astronautics from the Massachusetts Institute of Technology in 2010. His main research interests are in the development of methodologies for the analysis, design, and control of autonomous systems, with an emphasis on autonomous aerospace vehicles and large-scale robotic networks. He is a recipient of a PECASE Award, an ONR YIP Award, an NSF CAREER Award, a NASA Early Career Faculty Award, a Hellman Faculty Scholar Award, and was named NASA NIAC Fellow in 2011. His work has been recognized with best paper nominations or awards at the Field and Service Robotics Conference, at the Robotics: Science and Systems Conference, and at NASA symposia.

Hosted by Jorge Cortes