MAE Seminar Series

Using Cones for Motion Planning

Thursday, January 25
206 Furnas
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ABSTRACT

In this presentation, we discuss how cones represent a geometrical entity that can be used as fundamental constructs for several motion planning applications for autonomous vehicles. We begin by introducing the notion of a collision cone and demonstrating its applicability to facilitate collision avoidance between moving objects in dynamic environments, which is an important problem that appears in several diverse fields including robotics, air vehicles, underwater vehicles and computer animation. We then discuss how the notion of a safe-passage cone can be used to determine safe trajectories for UAVs to pass through narrow, moving orifices, which is an important problem that appears when UAVs are used to assist fire-fighting in buildings, performing ship inspections, and as precision munitions. We subsequently discuss how the notion of a rendezvous cone can be used to generate trajectories that enable footprints of multiple UAVs to overlap with one another while performing sweep operations for intruder detection, or facilitating communication among a network of UAVs. The cones developed have strong analytical foundations, and this is used as a basis to determine analytical guidance laws that enable autonomous vehicles perform a broad spectrum of applications.

BIO SKETCH

Animesh Chakravarthy is an Associate Professor with a joint appointment in the Departments of Aerospace Engineering and Electrical Engineering at Wichita State University. He obtained his Ph.D. in the Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology in 2007, with specialization in Estimation and Control. Before coming to MIT, he was a Scientist at the Aeronautical Development Agency, India in the Flight Mechanics and Control Division and during 2007–2010, he was a Research Scientist at the University of Florida Research Engineering and Education Facility (UF-REEF). He has been a faculty at Wichita State University since 2011. His research interests include developing cones as motion planning constructs, modeling and control of multi-agent systems using partial differential equations, dynamics and control of morphing vehicles, and insect flight dynamics. He has had funding from the NSF, FAA, Air Force and NASA and is a recipient of an NSF CAREER award.

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