Master's Thesis Defense Announcement
Mechanical and Aerospace Engineering Department
University of Texas at Arlington

Probabilistic Risk Assessment and the Path Planning of Safe Task-Aware Autonomous Resilient Systems (STAARS)

By

ULUHAN CEM KAYA

Thesis Advisor: Dr. Atilla Dogan

12pm, Wednesday, May 8

Woolf Hall, 200

Abstract

Recent advancements on the unmanned systems manifest the potential of these technologies to impact our daily life. In particular, the unmanned aircraft systems (UAS) become ordinary for people in almost any area from aerial photography to emergency responses, from agricultural services to even autonomous deliveries. Increased autonomy and advancements in low-cost high-computing technologies made these compact autonomous solutions accessible to any party with ease. However, this widespread availability also resulted in the safety and regulatory concerns in general. In an autonomous flight task over a public space, besides the profits of mission objectives, concerns regarding the public safety, privacy, and the regulations have to be addressed systematically during the mission planning and considered in the decision-making process. Therefore, there is a need for a comprehensive framework that can properly quantify and assess the risks incurred by the UAS operations to these concerns.

This thesis presents the development of a probabilistic risk assessment framework and a path planning implementation of a concept of Safe Task-Aware Autonomous Resilient Systems (STAARS) to address the safety concerns. The aim is to establish a framework that could be used for the path planning of UAS operations to quantify, assess and compare the risks as well as the profits of the mission objectives such that a multi-objective optimization can be achieved with a task-level decision-making capability. Then, a path planning implementation of the proposed framework is demonstrated for simple UAS scenarios.