NGI EXPLORERS

CHALLENGE 47
CMU-AAS-04

Improving Detect & Avoidance Algorithms and Systems

Air Lab Website: theairlab.org/research/

Meet the expectations of this US Node through the technology challenge described below

GOALS

The detect-and-avoid problem is the “holy grail” for small aircrafts and drones that need to fly beyond line-of-sight. Delivery drones in particular need to ensure self-separation from other aircraft to ensure safety. While it may seem that aircrafts could be detected via transponders, they are often not available on many aircrafts and even if they are, the rules and regulations do not make it necessary for them to be switched on at all times. Additionally, other flying objects such as birds, balloons, and other drones don’t have transponders. Therefore it is necessary to detect and avoid these objects for fully autonomous flights. Currently, the only effective sensor for aircraft detection is radar, but it is too heavy and expensive for small drones that have size, weight, and power (SWaP) constraints. These constraints even limit LiDAR ranges to be around 100m. For high-speed obstacle avoidance in dynamic environments, objects must be detected at long ranges (>= 500m) to allow sufficient reaction time.

DETAILS

The aim of this project is to create a vision-based aircraft detection and tracking system that focuses primarily on long-range detection. In this project, the goal is to improve the algorithms, as well as develop prediction, and 3D estimation algorithms. Project URL: http://theairlab.org/aircraft-detection/

SKILLS REQUIRED

Research experience, C++/Python, Linux, OpenCV, Pytorch, Linear Algebra, Machine Learning.

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