MONASH University

MONASH ENGINEERING

Faculty of Engineering

ASPIRE Summer Research Program 2026-2027

Project Title: Lidar-assisted drone stabilisation in GPS-denied environments

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Objective

The primary goal of this project is to develop and evaluate a LiDAR-assisted flight control system that provides active stabilization for multirotor drones operating in challenging, GPS-denied environments.

Project Details

Multirotor drones are increasingly vital for industrial inspections across hazardous, complex infrastructures—such as underground construction tunnels, enclosed processing facilities, and high-rise scaffolding. In these settings, aerial platforms eliminate the need for dangerous human tasks like high-altitude rope access or structural climbing.

However, standard commercial flight controllers rely heavily on global positioning system (GPS) signals or optical flow sensors to hold position and damp velocity drifts. In dark, enclosed, or GPS-denied environments, these systems degrade or fail completely, making manual piloting extremely difficult and prone to collision risks.

In this project, we will focus on three core objectives: 1) Build a high-fidelity physics and sensor simulation incorporating a multirotor drone and a wide-field 3D LiDAR (modeled after the RoboSense Airy Dome LiDAR).2) Develop an onboard state-estimation pipeline that processes raw LiDAR point clouds in real time to estimate critical state information, such as 3D translational velocities 3) Implement a stability-augmentation control loop that utilizes LiDAR-derived state feedback to assist a human pilot in comfortably hovering and maneuvering without GPS.

Project Timeline

TASK	1	2	3	4	5	6	7	8	9	10
Literature review										
Simulation Framework										
Perception & Estimation										
Controller design and testing										
Evaluation and reporting										

Prerequisites

No prerequisites

Student Placement Agreement

A student placement agreement must be signed by the project supervisor and the student prior to commencement of the ASPIRE program.

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Additional Information

Applicants may be required to attend an interview.
Applicants with previous experiences with ROS2 and/or Gazebo simulator (or any other physics-based simulators such as Isaac Sim) will be preferred.