AHS Micro-Air Vehicle Challenge

Group 32:
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Introduction

Project Sponsor:

- Dr. Nancy Squires

CS Team Members:

- Yingshi Huang, Kaiyuan Fan, Justin Sherburne

ME Team Members:

- Alec Denhert, Tyler Barrett, Christopher McBee

ECE Team Members:

- Ian Anderson, Erik Madison, Petar Vukic

Presentation Overview

- Competition Rules
- Competition Arena
- Significant Dates
- Image Processing
- Hardware Selection
- Communication Methods
- Autonomous Implementation
- Retrospective

Competition Rules

Task A: Design Presentation & Poster : 5-10 minutes

Task B: Indoor Package Delivery Mission: 10 minutes

Vehicle Restrictions:

- Vertical takeoff and landing (VTOL) as well as hover capability
- Onboard flight-stabilization
- Standard communication
- Electric-powered vehicle only
- Weight < 500g
- Size < 45cm in any dimension

Safety control:

Kill Switch and remotely-piloted mode override all autonomous

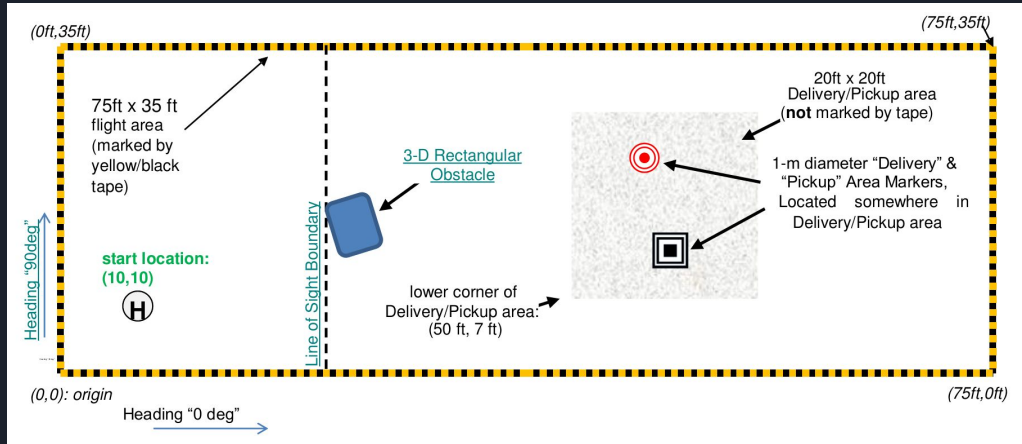
Competition Arena

75ft x 35ft mission boundary (marked by yellow black tape)

1m diameter circle (Home base)

1m length square (Pickup position)

1m diameter circle (Delivery area)



Significant Dates

Gate 1: Paper Submission (Due by January 31, 2018)

Gate 2: Video Evidence of Competition Readiness (Due by 16 March 2018)

Finalists Teams Selection (Announced by 8 April 2018)

Image Processing

Open CV

- Open Source
- Well documented
- Integrates with Pi Camera streaming program

Data Analysis

- Object detection
- Distance calculation
- Active avoidance

Hardware selection

Raspberry Pi zero w

Two camera sensors

Ultrasonic sensors

Wifi Pineapple router

Communication Methods

2.4GHz wireless channel between base station and vehicle

GPIO pins between ESC motor controllers and Raspberry Pi

GPIO pins between Ultrasonic sensor and Raspberry Pi

Camera module connect with cable at camera port on the Raspberry Pi board

Problems and Solutions

Design changes from Mechanical Team

Competition rules announced late.

Delay on part orders

Sensor placement

Autonomous Implementation

Packages:

- Found by cameras, flight based on camera data

Landing Areas:

- Found by cameras, flight based on camera and sensor data

Obstacles:

- Found by Ultrasonic sensors, flight based on sensor data

Elevation Control:

- Based on ultrasonic measurement, controlled by Raspberry Pi

Retrospective

- A lot of documentation
- Coordinating between groups
- Waiting for parts to arrive
- Design changes and challenges
- Research
- … And a bit of coding mixed in