ELC 495 Design Review 1

Autonomous Drone

with Thermal Imaging Capabilities

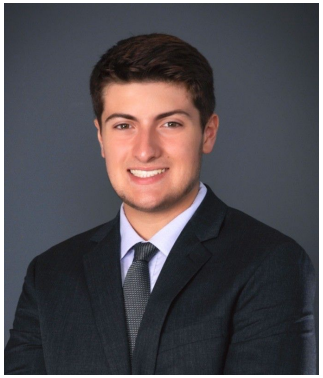
Fall Semester 2022

Advisor: Dr. Deese

Team Members

Sean Burtnett

Mike Bond



Jack Delvecchio

Darion Parks

Agenda

- Goals/Detail Specifications
- Project Plan
  - Roles
  - Task details
- Project Status
  - Schedule
  - Budget
  - Open AIs
- Summary

Goals/Detailed Specifications

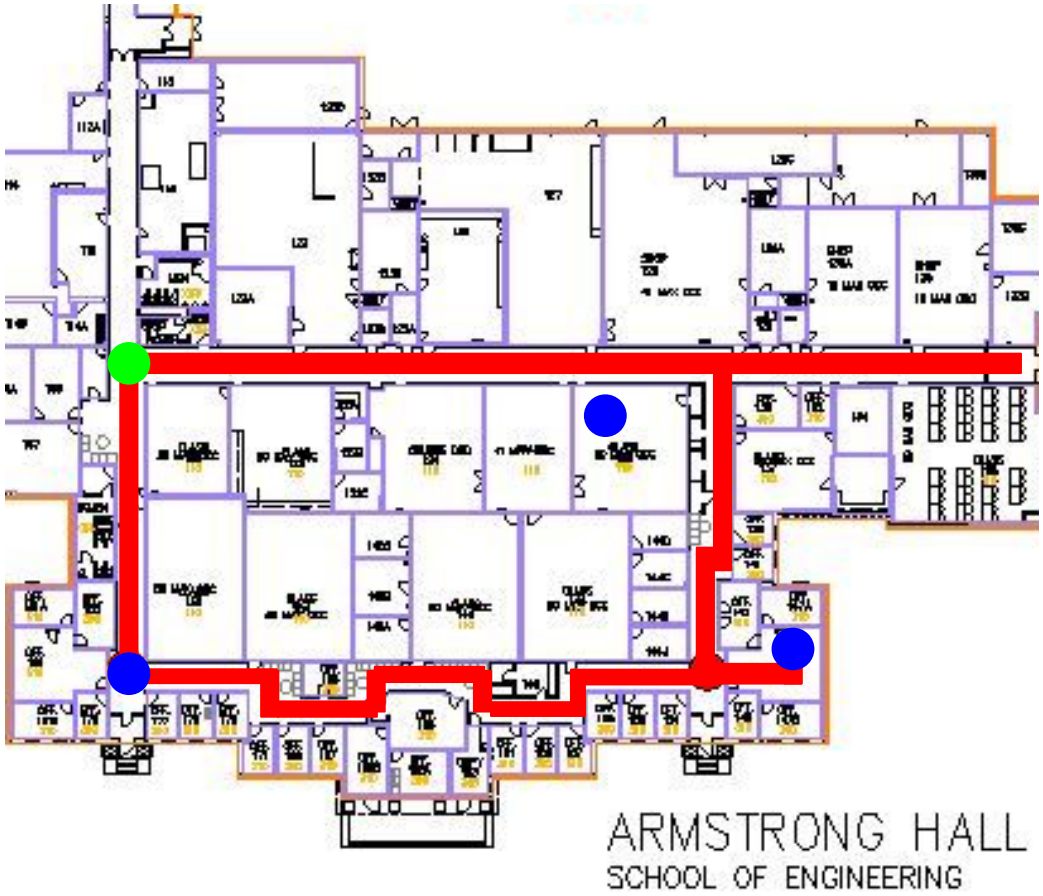
- Goal
  - Build a quadcopter for the purpose of autonomously maneuvering in both an indoor and outdoor environment to relay data on thermal recognition and location to the user
- Detailed Specifications
  - A run will be deemed ‘successful’ if the drone can:
    - Detect at least 3 human heat signatures in one run
    - Search an area of at least 1000 sq. ft
    - Have zero collisions with objects along the route
  - Quadcopter approx dimensions
    - Height: 8in
    - Length: 12in
    - Width: 12in

Goals/Detailed Specifications

- Starting Point
- Human

*The drone will first be tested in an open outdoor environment by the end of the fall semester

**This is a potential indoor test case to be done 2nd semester



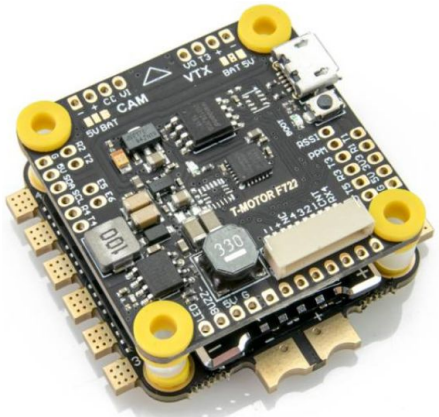
Outdoor Testing → Indoor Testing

Goals/Detailed Specifications

Rough Schematic

← Brushless DC Motors

← Speed Controllers



← Flight Controller

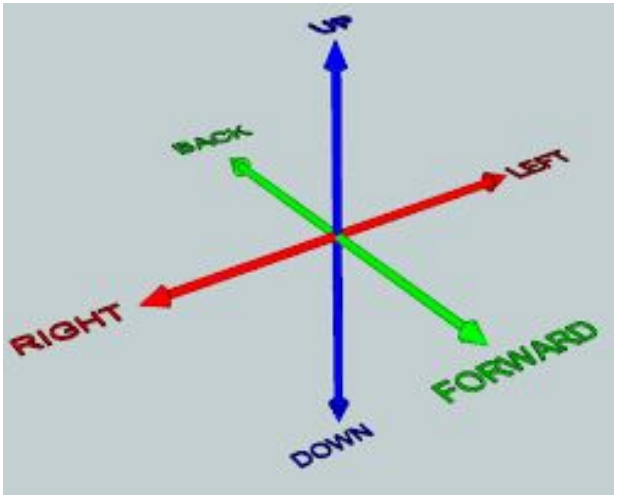
← Power Distribution Board

← Battery Pack

Goals/Detailed Specifications

1 Thermal Sensor

6 Proximity Sensors



Project Plan: Roles

ALL

System architecture, part selection, drone construction

Sean (Software)

Outdoor Traversal (GPS), Flight Control

Mike (Software)

Indoor Traversal, Flight Control

Darion (Hardware)

Flight Control Hardware

Jack (Hardware)

Proximity and Thermal Sensor Design

Project Plan

First Semester (Fall '22)

Task 1: Define the System Architecture

Task 2: Develop Website

Task 3: Select/Order Components

Task 4: Drone Assembly

Task 5: Modify Flight Control for Autonomous Capability

Task 6: Implement the Thermal Sensor

Task 7: Outdoor Flight and Thermal Recognition Testing

Task 8: Documentation

Project Plan

Second Semester (Spring ‘22)

Task 1: Implement the Proximity Sensors

Task 2: Develop Website

Task 3: Modify Flight Control for Obstacle Detection

Task 4: Adding GPS Enabled Features

Task 5: Indoor Testing and Proximity Sensor Testing

Task 6: Documentation

Project Plan: Schedule

Task	TASK TITLE	START	END	LENGTH OF TASK	PCT OF TASK DONE	Phase 1: Preliminary Design					Phase 2: System Integration					Phase 3: Testing/ Evaluation			
						1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	System Architecture	8/31/22	9/28/22	4	75%														
2	Develop Website	9/21/22	12/6/22	11	0%														
3	Select/Order Parts	9/7/22	10/5/22	4	50%														
4	Drone Assembly	10/5/22	10/19/22	2	0%														
5	Modify Flight Control	10/12/22	11/9/22	4	0%														
6	Thermal Sensor	10/12/22	11/9/22	4	0%														
7	Outdoor Testing	11/9/22	12/6/22	4	0%														
8	Documentation	8/31/22	12/6/22	14	20%														

Task 1: Define the System Architecture

- Determine what tasks the drone should be able to accomplish and necessary features to meet our goals
- Research necessary components and desired characteristics

Task 3: Select/Order Components

- Compare components involved in building the drone in terms of
  - Cost
  - Quality
  - Functionality
  - Compatibility

Task 4: Drone Assembly

- Assemble selected components
  - Due to budget constraints, components may be in the form of a kit or components we buy separately
  - Test to ensure drone is capable of flight

Task 5: Modify Flight Control for Autonomous Capability

- Determine how to interface with selected flight controller
  - This functionality is a priority during flight controller selection
- This will allow for software-based control of flight

Task 6: Implement the Thermal Sensor

- The thermal sensor will be mounted with a fixed orientation
  - The sensor is stationary and the drone will move

Task 7: Outdoor Flight and Thermal Recognition Testing

- Ensure functionality of GPS
  - Search within an area specified using GPS coordinates
  - Recognize target using thermal sensor
  - Relay final GPS coordinates upon completion

Task 8: Documentation

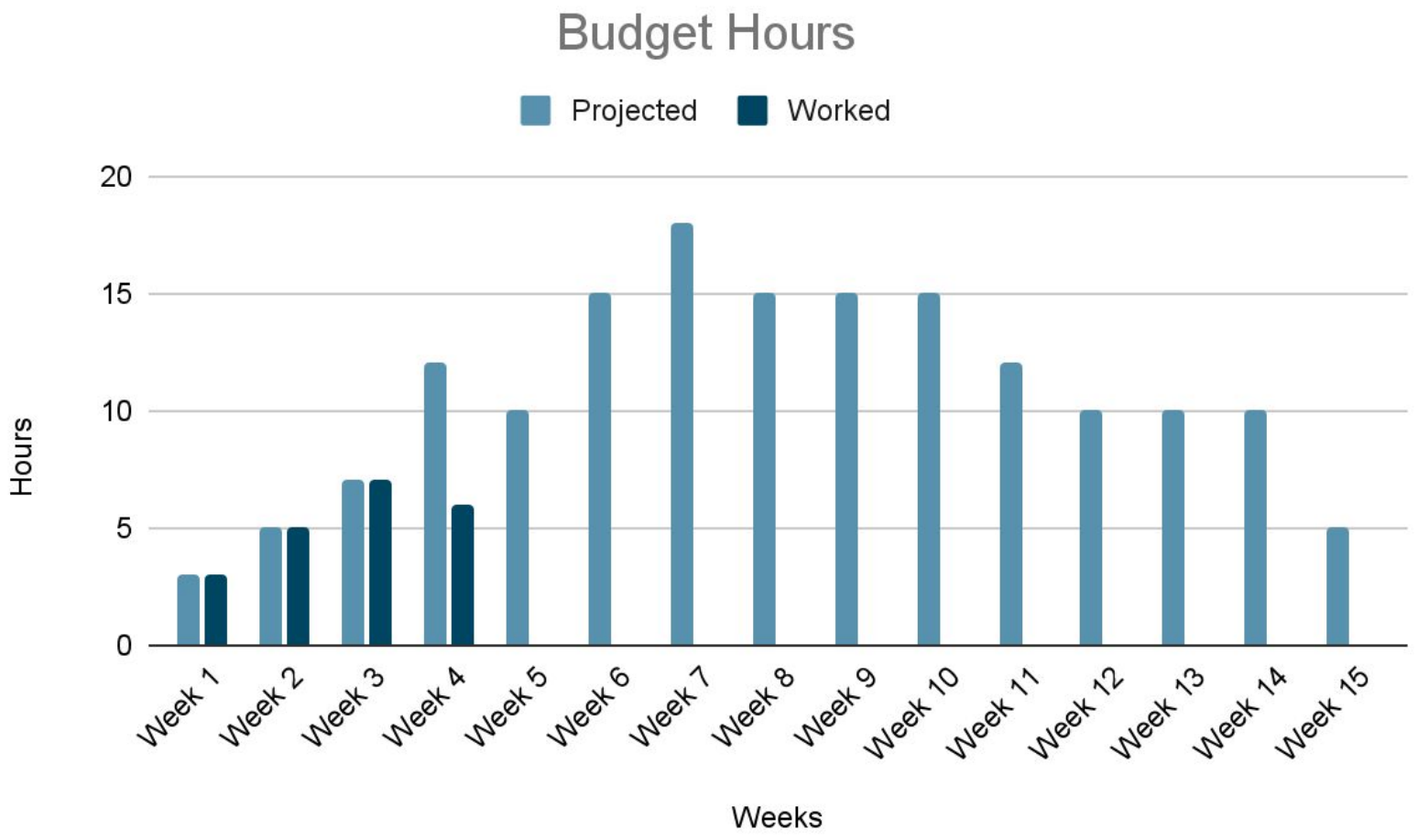
- Documentation will be done throughout the semester to ensure proper tracking of project progress
  - To be done both semesters

Project Status: Budget

- Our Budget: $100 * 4 Members = $400
- Some items may already be available

Component	Cost
Brushless DC Motors	~$20 Each
Electronic Speed Controller	~$17 Each
Power Distribution Board	~$10
14.8v Battery	~$40
Drone Frame	~$80
Drone Propellers	~$15
NAVIO2	~$200
Proximity Sensor	~$3
Thermal Camera	TBD

Project Status: Budget



Project Status: Open AIs

- May buy a “drone kit” that will come with unassembled parts (reduces time but cost has to be compared)
- The flight controller is essential!
  - Needs to come with pre programmed flight controls in order to fit our realistic timeline
  - Flight controls need to be accessible and modifiable

Summary/Conclusion

- We aim to build a drone capable of navigating an environment, locating a target, and relaying relevant information upon completion
- Our hope is to create a drone that can be operational in various search and rescue emergency situations

Questions?