First Class Flights

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Overview

- Introduction to Project
- Motivation & Problem
- Timeline
- Features
- Materials
- Progress
- Blockers
- Conclusion

Introduction

- F450 drone frame kits
  - Sensors
  - Cameras
- Microcomputers or microcontrollers
  - Trained machine learning models
- Remote control system
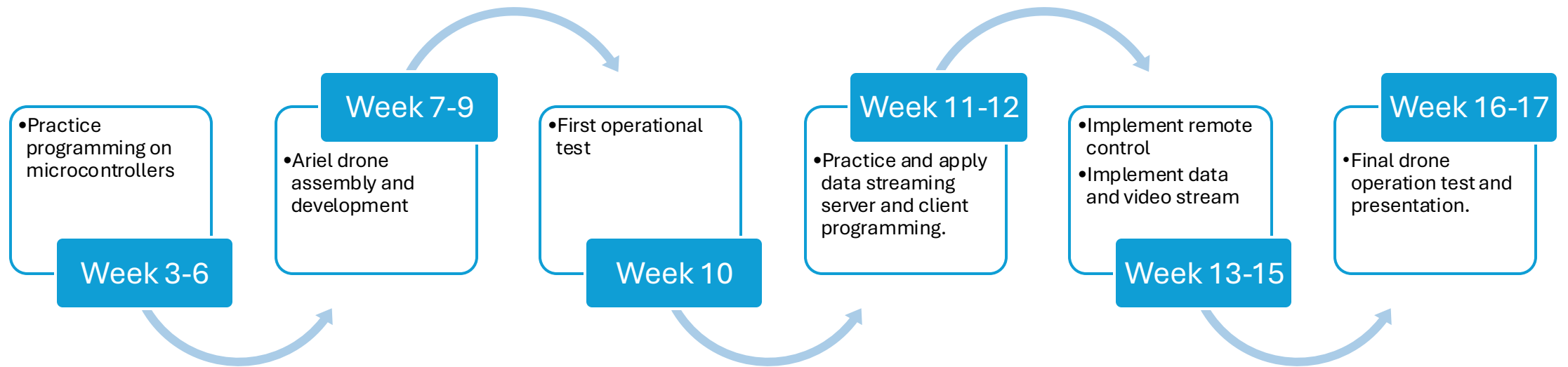 - Python programming
- 3D design and printing

Motivation and Problem

- The proliferation of Unmanned Ariel Systems (UAS) has had a profound effect on commercial practices and in individual entertainment worldwide.

- The remote nature of UAS permits a ratio of drones to pilots that is far greater than one. It becomes necessary to move away from a traditional controller scheme and innovate.

- How do you control several drones as one person?

- What sacrifices must be made to allow this functionality?

- How do we overcome these shortcomings?

Materials

- 1x Raspberry Pi
- 1x NodeMCU ESP8266
- 1x PixHawk Flight Controller
- 1x F-450 Drone Body
- 4x Brushless Motors
- 4x Motor Electric Speed Controllers
- LiPo Battery + Dis/Charge Controller

Timeline

Week 3-6
- Practice programming on microcontrollers

Week 7-9
- Ariel drone assembly and development

Week 10
- First operational test

Week 11-12
- Practice and apply data streaming server and client programming.

Week 13-15
- Implement remote control
- Implement data and video stream

Week 16-17
- Final drone operation test and presentation.

Features

- Commands issued from a ground control station
  - TCP commands will be encrypted via RSA
- Autonomous Flight
  - Along pre-planned routes
  - Allow deviations to the flight plan as needed
  - Follow a target once identified
  - Collison avoidance
  - Airspace awareness
- Tracking
  - Camera vs drone following

Progress Made

- We have done preliminary research on potential sensors that we might want to use:
  - Camera
  - Range/distance sensor
  - Thermal imager
  - IR camera w/beacon
- We have looked at 3d printing and other materials that we may need to construct some of the housing.
- Familiarization with some of the computing techniques and components that we will be using.

Blockers

- We are unsure of how to acquire all of these components
    - Do we need to submit funding for VCUR?
    - If so, do we need to attend the conference in March?
    - When will we be able to get hands on with the drone kit? Flight Controller?
- We are not sure of what sensor to get.
    - What does our specific F-450 Drone kit include for sensors?
    - How many auxiliary components
- Unsure which environment we want to program in.
    - VSCode remote extension with RPGPIO in python looks promising so far

Conclusion

- Our goal is to construct and program an aerial drone to identify and track an object. Using a variety of sensors, microcontrollers, a raspberry pi, the RPI.GPIO Python library, and 3d printed pieces and bases, we will construct a drone with a TCP-based control system to implement autonomous flight with mapping and route planning