Senior Design

Boston University Electrical & Computer Engineering

EC463 Senior Design Project

First Prototype Testing Report

Team 4: Pizzair

Team Members:
Compton Bowman compton@bu.edu
Yafei Chen yafeic@bu.edu
Usman Jalil ujalil@bu.edu
Ahmet Caliskan aeclskn@bu.edu
Quentin Clark qtcc@bu.edu

1.0 Prototype Test Results

Due to logistical constraints, we were not able to demonstrate the stated objectives in our testing plan. However, in our prototype test, we demonstrated significant project progress which is enumerated below.

1.1 Drone Construction

We assembled the main drone parts including motors and landing gears. We also wired it with the Pixhawk flight controller, GPS module, radio telemetry, as well as a safety switch and a buzzer for testing. We didn't put propellers on yet to avoid unnecessary safety issues. Below is a picture of the present status of the drone.

1.2 Drone Electronics

1.2.1 Flight Controller

We are using Pixhawk for our flight controller which is widely used in drone projects. It will be communicating with the microcontroller and the computer to handle flights. It also has a bunch of ports we can use for additional hardware such as GPS and safety switches. Once the battery is assembled to the drone, we will be calibrating the Pixhawk through a software called QGroundControl which will be used for MVP autonomous flight missions as well.

1.2.2 Drone Microcontroller

We were successfully able to install the required libraries (Python 3.5, Numpy, PyTorch, OpenCV, Github, etc.) onto the NVIDIA Jetson Nano.

We were successfully able to demonstrate a PyTorch model running, using USB camera input, on the Jetson's GPU. We were also able to run a model trained on another computer, but not with acceptable real-time performance, due to the model trained externally being too large for the Jetson to run efficiently (after the prototype we were able to load a smaller model onto the Jetson trained externally).

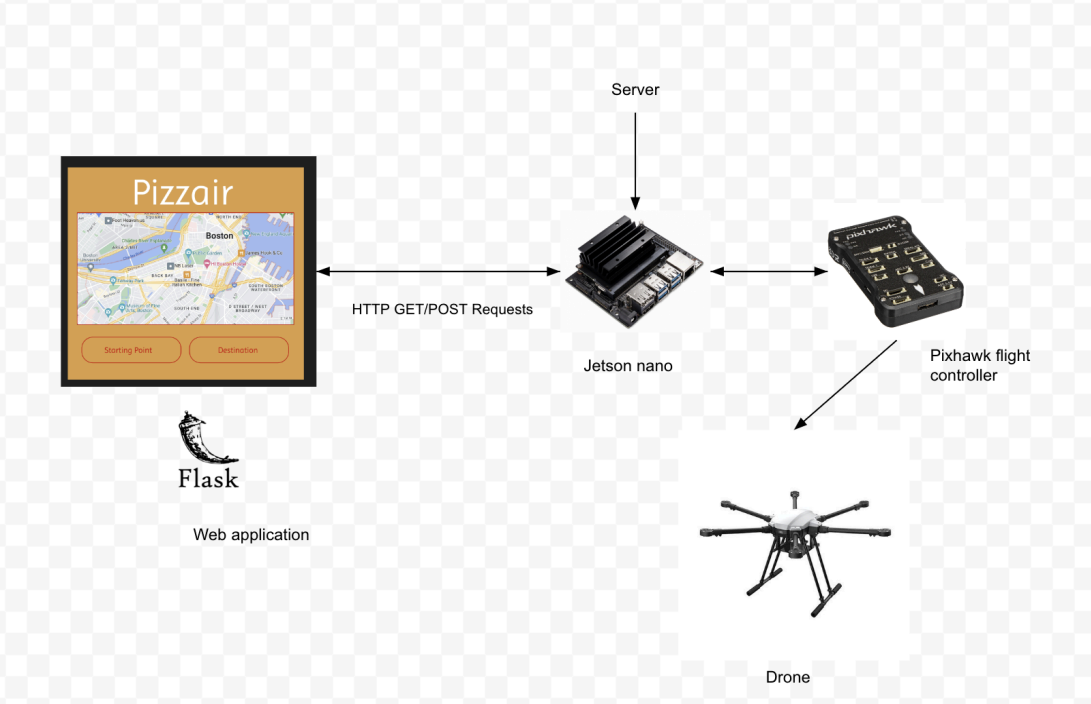
1.3 Control Software Development

1.3.1 Imitation Learning Recording: We demonstrated our labeling script and showed some samples of the drone flight clips we recorded in the simulation.

1.3.2 Imitation Learning Network Training: We showed our software infrastructure made to date, including a video clip training loader, training scripts, and inference scripts. We were not able to show a trained model.

1.4 Webapp Software Development

Although a physical demonstration of the web application was not feasible, we have successfully finalized the software architecture diagram with guidance from Professor Osama. The core functionality involves the web application establishing communication with a server on the Jetson Nano through a REST API. To enable communication, the integration of a 5G wifi chip will be needed as it will ensure high-speed data exchange between the web app and server. Below is the software architecture diagram to aid in visualization.



1.5 Final Remarks

Our prototype test was greatly hampered by logistical constraints; namely, that our battery had not arrived due to customs issues, preventing us from showing our drone in deployment and dampening our progress. We have convened with our project supervisors at Spinnaker recently to discuss the next steps, especially with regard to overcoming these constraints impeding our progress.