BU College of Engineering 464 Memo

To: Professor Pisano, Professor Osama, Professor Hirsch

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Team: 4: Pizzair

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Subject: Final Prototype Testing Plan

1.0 Required Materials

1.1 Hardware

- Workstation with GPU
- Another computer
- Assembled HawksWork FT450 drone
- Charged JIPower 4200 mAh Battery

1.2 Software

- Common [open-sourced, publicly available software]
    - Microsoft AirSim
    - Amazon AWS (pre-configured)
    - [other stuff?]
- Bespoke [written by the team, available on our GitHub here: https://github.com/ujalil101/Pizzair]
    - Web Application
    - Drone control scripts for AirSim

2.0 Pre-testing Setup Procedure

- Simulation Testing:
    - Ensure that the DynaDB server is hosted on our AWS instance, and that all local agents have access keys.
    - Launch Unreal Engine, open up our testing map, and launch the in-engine preview to launch AirSim. When prompted, select “no” for using car mode.
    - On the GPU-enabled workstation, navigate to the airsim_scripts section of the repository. Run pizzairnet_test.py.
    - On the other computer, launch the web application.
- Physical Drone Safety:
    - Preflight Briefing: Brief your team on the test plan, safety procedures, and emergency protocols.

- Carefully examine the drone for any physical damage, loose parts, or wear and tear. Ensure that propellers, motors, and other components are securely attached.
- Ensure propellers are correctly mounted and balanced.
- Charge the drone's batteries fully and inspect them for any signs of swelling or damage.
- Wait for GPS lock before "takeoff".
- Confirm that the compass is calibrated.

3.0 Testing Procedure

1] Physical Drone Tests

- **Construction Completion Tests:** investigate/confirm that the drone is physically constructed, including the following:
  - All rotors are assembled
  - Following parts are mounted: PixHawk, NVIDIA Jetson Nano, Battery
  - Following peripherals are mounted and connected: camera, USB data internet adapter, compass, geolocation module, payload mechanism
- **Motor starts and output test:** Connect the drone to a power source and use the FS-i6S remote control to start the motors. Check the motor spin direction and propeller installation. Adjust the throttle and observe the motor output and sound. Use a tachometer to measure the motor speed and compare it with the expected values. Stop the motors and disconnect the power source

2] Simulation Tests

- Input a set of coordinates (corresponding to a destination we selected beforehand) into the web client.
- The drone in AirSim, seen on the workstation, should begin to move towards its destination while avoiding obstacles. Observe flight, and if the drone gets stuck on obstacles, use intervention commands to set the drone back on delivery trajectory.
- Continue to observe it complete its delivery route and return home.
- Observe data from the drone being reflected on the web client on the other computer.

4.0 Measurable Criteria

The criteria for successful running and output are as follows:

1] Physical Tests:

- The drone is physically complete, including
- The drone successfully turns on, acquires compass and GPS lock,

2] Simulation Tests:

- The web application is successfully able to upload a navigation destination and the command to begin flight to the web server.
- The simulation drone begins flight once the web application tells it to begin flight.
- The drone successfully navigates to its destination without crashing into obstacles.
- The drone lands at its destination, then navigates back to its starting location without crashing into obstacles.
- The web application shows information communicated from the drone.