 Robotics Final Proposal

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**Introduction:**

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Quadcopters are multirotor helicopters that are lifted and propelled by four rotors. They are also known as drones, which are generally quadcopter with filming equipment. Quadcopters are different from traditional fixed wings aircrafts and also helicopters. I believe that quadcopters are better for unman industrial uses. They are easy to maneuver in air and can also carry sensors and cargo. Quadcopters are also durable and versatile in that they can even fly properly with only two functioning propellers. They are used in many industries, from general aerial research to search and rescue. Building a good, durable quadcopter can have any purposes.

**Problem Statement:**

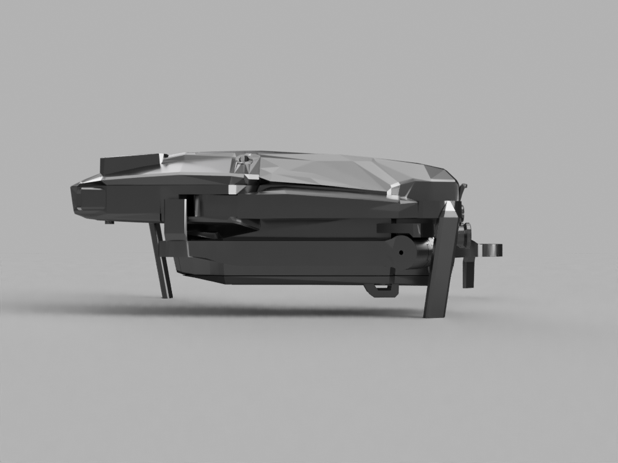
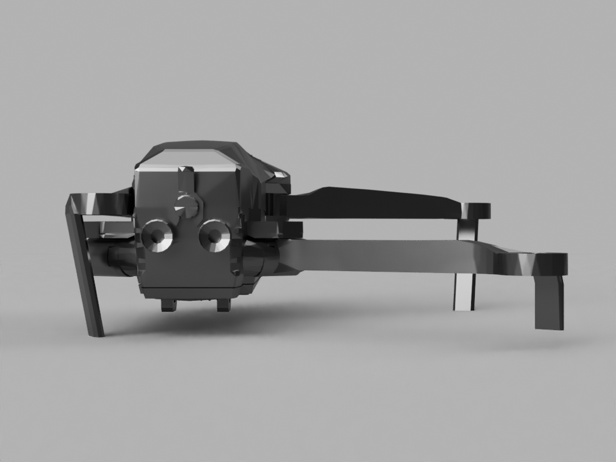
One of the biggest challenges of creating quadcopters is keeping balance in air. I will design and create a PID algorithm that allows the aircraft to balance in air and not be disturbed by small winds and turbulences. Controlling a quadcopter can also to finicky, therefore, I will create an iOS application as the controller of the quadcopter. The application should also provide information such as speed, altitude, GPS locations. Last but not least, if times allows, the user will be able to plan out a route send it that information to the quadcopter via the controller software.

**Objectives:**

The goal of the project is to create a quadcopter that can balance in air. Minor wind and turbulence shouldn’t damage or impact the movement of the quadcopter. The quadcopter will also be remote controlled by an iPhone. Ideally, it will be able to avoid large obstacles. If time allows, I will create a program that allows the quadcopter to follow a given path and deliver some goods.

**Proposed Approach**

The frame of the quadcopter will be custom designed and 3d printed. The parts will also be printed with durable, biodegradable material. More importantly, the frame will be able to fold in, just like the DJI drone Mavic Pro. I will not design the frame, instead, I will find open source stl files that I can use.

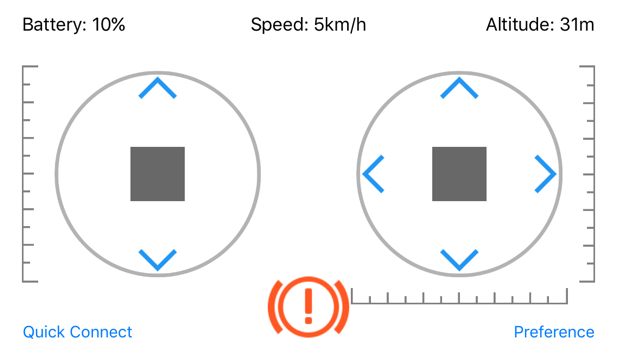


The quadcopter will be propelled by four 1000kv brushless motors. These motors should provide enough thrust and are generally used in small quadcopter projects like this. To control the speed of these motors, I will use four electronic speed controller (ESC). The combination of those parts will make sure that the quadcopter can lift up, change speed, and also maneuver.



Arduino will function as the main processor of the plane. It will control all the motors and sensors. There are many types of Arduinos, my options are Arduino Uno, or Arduino Mega. Both platforms could support this project.

The quadcopter will be controlled by an iPhone, ideally via Bluetooth. I will write an iOS application for the project. The app will also provide the pilot information such as altitude, speed and battery life. The extension of the project is to create a program so the quadcopter can fly autonomously by follow a preset path.



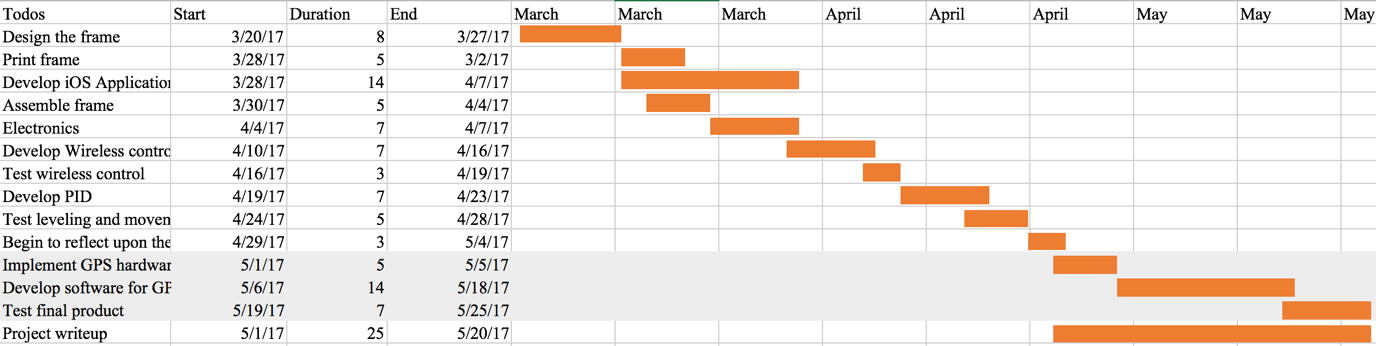
One of the most important component of the project is the software. I will design and write a PID program for the Arduino for self-balancing purposes. A wireless communication program is also required for the Arduino.

**Project Management**

The project will span from Mid-March to the end of May. During this one and half month period, I have to complete numerous task. Following a schedule is critical, otherwise, there is the high risk of not completing this project on time.

The project can be divided into three major sections.

1. Hardware & electronics
2. Bluetooth control software
3. PID software
4. (Extension) GPS related software



There are some parallels in the schedule. It’s very difficult to estimate the construction time for the quadcopter. If everything goes according to plan, I can even finish ahead of time. However, if there is any hardware failure, I will slow down the process tremendously. My goal is to have the frame and electronics finished by April 10. If software and testing also goes according to schedule, I will have a finished quadcopter with Bluetooth control and PID by May 10th.

**Deliverables**

The final project will be a finished quadcopter that can balance in air. The quadcopter should be able to lift up, move in all direction and safely land. It should be remote controlled by an iPhone. Ideally, the quadcopter should be able to follow GPS data (This is not required, just an extension). The final presentation may have to be done outdoors.

**Learning Goals**

Building a quadcopter from group up is a very challenging topic.

**Budget**

This is the shopping list for the project. The total cost should be 91.92 dollars (not including taxes). The last two items are needed. However, I also own these sensors, therefore, the cost is zero.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item | Cost | Quantity | Total | Link |
| Brushless Motor + ESC + Prop | 38.33 | 1 | 38.33 + 1.99 | https://goo.gl/pLBi8c |
| LiPo Battery | 13.99 | 1 | 13.99 | https://goo.gl/B8RMCZ |
| Bluefruit LE | 19.95 | 1 | 19.95 | https://www.adafruit.com/products/1697 |
| GPS | 17.66 | 1 | 17.66 | https://goo.gl/uzLDEF |
| MPU 6050 | 6.94 | 1 | 0 | https://goo.gl/CF6eBZ |
| BMP 180 | 9.95 | 1 | 0 | https://goo.gl/3W5iQx |
| Total |  |  | 91.92 |  |

**Special Topics**