# Drone\_DOF

**By**

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# Declaration of Joint Authorship

We, Gursehaj Harika, Jay Jadav and Arman Velani confirm that this breakdown of authorship represents our contribution to the work submitted for assessment. The contribution of work by all other authors, individual and separate to the work group, in any form (ideas, equation, figures, texts, tables, programs), are properly acknowledged at the point of use. A list of the references used is included. Arman Velani, designed the PCB, casing. Gursehaj Harika, developed the android application, general UI. Jay Jadav, created the database and its communication with the sensors.

Authors Signed on

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# Proposal

2019-01-17

***Proposal for the development of IoT for SensorsEffectors***

Prepared by Jay Jadav, Arman Velani, and Gursehaj Harika  
*Computer Engineering Technology Students*<https://github.com/GursehajHarika/Drone_DOF>

**Executive Summary**

As students in the Computer Engineering Technology program, we will be integrating the knowledge and skills we have learned from our program into this Internet of Things themed capstone project. This proposal requests the approval to build the hardware portion that will connect to a database as well as to a mobile device application. The internet connected hardware will include a custom PCB with the following sensors and actuators,

* MAG3110 3 axis magnetometer
* MS5611 barometric pressure sensor
* MMA8451 3 axis accelerometer

The database will store user's information, height from the barometric pressure sensor and GPS location with combination of magnetometer and accelerometer. The mobile device functionality will include measuring the Height/elevation and the GPS location of the Device using multiple sensors which are connected to Raspberry Pi using a PCB. The measured data is then sent to the database for storage purposes. And will be further detailed in the mobile application proposal. I will be collaborating with the Prototype lab and Prof's for power management. The hardware will be completed in CENG 317 Hardware Production Techniques independently and the application will be completed in CENG 319 Software Project. These will be integrated together in the subsequent term in CENG 355 Computer Systems Project as a member of a 2 or 3 student group.

**Background**

The project that we are working on uses the height of the device attached to it to measure the altitude and record it to the database. This data is then used by user using an android application to modify their flight course and gives a sense of security to the user. The mobile devices such as a drone tends to get lost easily. The moderately priced product usually have a GPS built in to find it still they face some connectivity issues due to different factors such as trees or buildings . The built in GPS tracker in our project does not uses satellite to get GPS signals thus gives the user full access to its position and elevation.

A barometric sensor senses the height of device attached to it and can even tell what the altitude of the device is. The barometric pressure sensor is paired with a GPS Receiver (it can be made using Accelerometer and Magnetometer). It will give the position and height of the device the product is attached to.

Existing products on the market include Maboshi. (2018, November 07). Arduino GPS Drone RC Boat. Retrieved from <https://www.hackster.io/maboshi/arduino-gps-drone-rc-boat-45d6f4> . I have searched for prior art via Humber’s IEEE subscription selecting Barometric sensor project and have found and read “Sung-Hyun and Han-Bai, "A study on the fabrication and electrical characteristics of barometric sensors for USN” which provides insight into similar efforts.

In the Computer Engineering Technology program we have learned about the following topics from the respective relevant courses:

* Java Docs from CENG 212 Programming Techniques In Java,
* Construction of circuits from CENG 215 Digital And Interfacing Systems,
* Rapid application development and Gantt charts from CENG 216 Intro to Software Engineering,
* Micro computing from CENG 252 Embedded Systems,
* SQL from CENG 254 Database With Java,
* Web access of databases from CENG 256 Internet Scripting; and,
* Wireless protocols such as 802.11 from TECH152 Telecom Networks.

This knowledge and skill set will enable me to build the subsystems and integrate them together as my capstone project.

**Methodology**

This proposal is assigned in the first week of class and is due at the beginning of class in the second week of the fall semester. My coursework will focus on the first two of the 3 phases of this project:  
 Phase 1 Hardware build.  
 Phase 2 System integration.  
 Phase 3 Demonstration to future employers.

*Phase 1 Hardware build*

The hardware build is completed in the fall term. It fits within the CENG Project maximum dimensions of 12 13/16" x 6" x 2 7/8" (32.5cm x 15.25cm x 7.25cm) which represents the space below the tray in the parts kit. The highest AC voltage that will be used is 16Vrms from a wall adaptor from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will be 20 Watts.

*Phase 2 System integration*

The system integration will be completed in the fall term.

*Phase 3 Demonstration to future employers*

This project will showcase the knowledge and skills that I have learned to potential employers.

The brief description below provides rough effort and non-labor estimates respectively for each phase. A Gantt chart will be added by week 3 to provide more project schedule details and a more complete budget will be added by week 4. It is important to start tasks as soon as possible to be able to meet deadlines.

**Concluding remarks**

This proposal presents a plan for providing an IoT solution for Drone\_DOF. This is an opportunity to integrate the knowledge and skills developed in our program to create a collaborative IoT capstone project demonstrating our ability to learn how to support projects such as the initiatives described. I request approval of this project.

**Citation:**

1. Maboshi. (2018, November 07). Arduino GPS Drone RC Boat. Retrieved from <https://www.hackster.io/maboshi/arduino-gps-drone-rc-boat-45d6f4>
2. Autonomous High Altitude Glider. (n.d.). Retrieved from <https://create.arduino.cc/projecthub/53982/autonomous-high-altitude-glider-055aa3?ref=tag&ref_id=drones&offset=9>
3. Vignesh. (2018, December 17). Intelligence Monitoring Drone System. Retrieved from <https://www.hackster.io/enigma-plasma-8/intelligence-monitoring-drone-system-727470>
4. Velani, A. (n.d.). November 27th, 2018 (Week 13). Retrieved from <https://armanvelani.github.io/3-AxisAccelerometer/>

# Abstract

The Drone\_DOF is a drone attachment unit comprising of various sensors that allows user to know their precise location as well as the change in the pressure that it faces with the changes in the altitude. By integrating the drone \_DOF we are able to address the problem of locating your mobile drone with minimal to less error in its position with the help of magnetometer sensor(MAG3110) and accelerometer sensor(MMA8451); so that the user is always updated with its accurate position. Moreover the barometric pressure sensor(MS5611) help user to know the elevation as well as the safety height above which flying of the drone would be dangerous and out of the connectivity zone from the android as well as the firebase database. The device also includes a 5000 mAh additional power source (battery) that powers itself and avoids having any loose wiring to the whole unit. The device also has the option to supply power directly to the raspberry pi. If user is interested to use the Drone\_DOF attachment for commercial purpose he/ she should contact with the sales department of the company. If user is looking to get the Drone\_DOF attachment manufactured on an industrial scale for resale or other purposes he/she should contact CEO of the company. In order to use it as an educational tool please contact the Director of the company, Drone DOF team will be grateful to support any such cause.

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# List of Illustrations or diagram

# Introduction

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The Drone\_DOF is a drone attachment unit comprising of various sensors that allows user to determine their precise location as well as the change in the pressure that it faces with the changes in the altitude. Our effort is to provide a normal but an effective solution to the drone industry. The problem that we are addressing is that the products that move or fly have a high risk of getting lost, crashing or even getting destroyed when being used or being controlled by amateurs. If lost they are hard to find. So if we are able to address this problem and possibly tackle it, we can implement the same process for numerous other industry such as marine exploration, automotive industry, aviation industry, also for defense and military purposes. Over our course of time in integrating the project, we came across numerous different ideas that we wanted to add to our project to make it one of its kind. Some of them being: ( a) adding an alert system that would notify the user on his application once there is a drastic change of altitude or position. (b) Adding a LCD screen to show the data on the raspberry pie. (c) Research and test a shock-proof casing for the sensor to make sure it does not get damaged. We decided to add all this possible feature at the starting of the project, but because of the time constraint of the course we were not able to catch up with the shockproof case, LCD screen and the alert system. The different approaches used by us were to make the whole unit light in weight, easily compatible, user-friendly and also make it clear as well as easily accessible for the development and research team.

# Project Description

## Requirements

### Hardware

Designing the printed circuit board for all 3 sensors i.e. MAG3110 3-Axis magnetometer, MMA8451 3 Axis accelerometer and MS5611 Barometric pressure sensor and a 10,000 MAH power source to power the Raspberry Pi3 and test the casing design that was printed using acrylic sheet with a3-D printer for durability, **Arman *Velani*** *will be responsible for this requirement.* Forsoldering all the three sensor using a Soldering Iron provided by Humber College to the PCB along with the battery cells being used in the 10,000 MAH power source as well as testing the PCB designed on fritzing application for short circuiting ***Jay Jadav*** *will be responsible for this requirement.* Designing the casing and assembled the PCB and casing together along with testing everything as a whole is ***Gursehaj Harika’s*** responsibility.

### Software

For software, android studio version 3.3 will be used to make the mobile application and its J-unit testing and saving user selections using shared preference is on ***Arman Velani***’s shoulders. Android application’s portrait as well as landscape design and its real-time permissions is what ***Jay Jadav*** is responsible for. Application general UI and its logical error corrections, break points to check functions functionality and user credentials with offline authentication (Combining database and android application) as well as work on publishing the application to the Google play store is on ***Gursehaj Harika.***

### Database

Firebase database design and making sure the CRUD (Create, Read, Update, and Delete) will be ***Arman velani***’s responsibility. Reading values from the sensor and storing it in the database as well as setting up database permission for vulnerabilities and security is what ***Gursehaj Harika*** is responsible for. Reading values from the database to the application as well as the time–stamp of when the reading was stored and save it in the application along with the user’s activity and login time for administrative purposes.

# Conclusion

# Recommendation

# Bibliography