TECHNICAL PROJECT PROGRESS REPORT MEMO

NAIT

**To**: Marc Anderson, CNT Instructor, CMPE 2960

Kelly Shepherd, English Instructor, CMPE 2960

**From**: Ervin Hernandez, CMPE 2960 Student

**Date**: 11-02-2015

**Subject**: 3-axis self-stabilizing Camera Mount \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Introduction**

As per our 3-axis self-stabilizing Camera Mount proposal, this report is to set up and discuss the challenges and successes that my partner Gabriel Natividad and I have had while building our 3-axis self-stabilizing Camera Mount proposal.

**Summary of Deliverables**

We are currently ahead of schedule to completed project by the end of thirteenth week of CMPE semester (April 4th). In the proposal we had stated that we would have the following completed:

* Ordered the components.

(Completed by Gabriel Natividad and Ervin Hernandez)

* Research the required I2C, IMU Broad, Arduino, servos libraries.

(Completed by Gabriel Natividad and Ervin Hernandez)

* Power and control for the Arduino and servos.

(Completed by Gabriel Natividad and Ervin Hernandez)

* Establishing connection between the Arduino, servos and IMU Broad.

(Completed by Gabriel Natividad and Ervin Hernandez)

* Researching and learning the mechanics of using a 3d printer.

(Completed by Ervin Hernandez)

* Designing and prototyping a frames for the servos and Arduino.

(Completed by Ervin Hernandez)

* Researching the formula for acquiring the pitch, yaw and roll off the IMU board.

(Completed by Gabriel Natividad)

**Status of Deliverables**

Ordered the Components – Originally, stepper motors were first proposed for the project. They were difficult to locate as I scavenge the entire city. After consulting with our instructors and researching, we settled with servos since they were much more manageable with an Arduino broad. Most of the components required to build the project were easy to locate. I bought two type of servos: micro size, and standard size. We both settle on the standard size for reasons that will explain further below. I recover an Arduino board and tested if any of the components are damage. The only product missing was an IMU broad that we order online. The IMU came a couple days late.

Research the Required Libraries – The libraries for the Arduino, servos, and IMU broad were provided by the manufacture companies and were easy to integrate into the capstone project. We solder pins into the IMU broad and attach the libraries into the Arduino. To be able to code the arduino board, gabe learn new interface. Having past experience with the arduino board I was able to guide gabe through the interface. This task was finish a few day earlier.

Power and Control for the Arduino and Servos – I ask one of our instructor to install the Arduino IDE (the Arduino interface) to a school computer. I built and test the capabilities of the servos with the Arduino broad. I hook up one of the servo to the Arduino and another part hook up to a joystick. With both the Arduino, servo and a joystick, Gabe was able to build a simple test code to run them. It was a success. With one of the servos connected we attempted to add additional servos to the Arduino. First with an outside power source, which unfortunately gave an irregular current to the servos that gave out jitters during the run. Second, the Arduino powering the three servos. It work, but the Arduino didn’t provide sufficient amount of current to the servos. We concluded a need to build a filter that could product the correct amount of current without any of the jitters. This task was finish on time.

Establishing Connection between the Arduino, Servos and IMU Broad - Once the servos were running with the Arduino board. We integrated the IMU board with the Arduino and servos. We hooked up the IMU board via I2C connection. Using the provided libraries, we successfully retrieved data from the IMU board and send it to the Arduino board. This task was done on time with no issues.

Researching and Learning the Mechanics of using a 3d Printer – While Gabe was creating the code for the IMU board. I set out to create a prototype frame for the servos. During the creation of the prototype, I’ve encounter a problem with the servos. They tend to draw more current from the source when the servos are under heavy load. I conclude that the frames needs to be built from lighter material so it will reduce the amount of current drawn from the servos. After researching I found out that the MakerBot Replicator – a 3d printer provided by our instructor – creates a lightweight objects that uses a plastic filament. The problem was I didn’t have access to a 3d modeling program that could export STL files needed for the 3d printer. So I spent a couple days finding a free open source program that could create a STL file. After a sufficient amount of research, I settle with OpenSCAD. I chose OpenSCAD over other programmes because: it’s free, it directed toward a programming style of modeling, and it could export into a STL file. With that I spent the week learning how to use the 3d modeling program. This task was successful.

Designing and Prototyping a Frames for the Servos and Arduino –After measuring and designing the frame for the servos, a prototype was made within a week. When I build the prototype, I notice that the frame dimension where larger than the require specification. Even with sanding out some of the hole to be able to fit the servo, it was penetrating into the honeycomb casing of the frame. I conclude that I didn’t account for the size of the filament, thus I adjusted the frame and holes size to compensate for the filament error. It extended the expected process by a week, but manage to create and fit 3 servos in their own cases.

Researching the formula for acquiring the Pitch, Yaw and Roll off the IMU Board – While the 3d printer was printing the 3 case of the frame, I aided Gabe with researching and testing the IMU board with the Arduino and servos. Gabe research and coded the formula for the Arduino, and I hook it up to test the orientation of the board. It took several tries to pinpoint the yaw, pitch and roll of the IMU board. It took several days to understand and test the formula.

**Deliverables to be completed**

The following task still need to be completed by both Gaberiel and I. Through effective communication, we are able to work on different segments of the same task, and achieving results quicker and more efficiently than working alone.

* Constructing a circuit that power all 3 servos at the same time.
* Finish writing the code for *yaw* angle estimation.
* Connecting the frames together into a one working prototype
* Filter through the program and debug any issues that may occurred.
* Attend to any issues or unknown risks that arise.

**Revisions to Scope**

There are no revisions to the scope at this time, although we have both thought about additional features in case of an early finish.

**Conclusion**

With the current pace we are working at, I am optimistic that we will be able to complete our 3-axis Self-Stabilizing Camera Mount on schedule. If there are any inquiry, point of interest or motivations that you would like to give, please contact me at ervinlubi@gmail.com.