PROGRESS REPORT

For the Direct Interference System for Coordination Limitation by Amplified and Stimulated Emission of Radiation (DISCo LASER)

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Introduction

DISCo is currently building the prototype of the DISCo LASER, which will change future warfare and security by providing combatants with a non-lethal system of fighting each other. Historically, the military has had to be constantly prepared for combat, even during non-combat missions. As a result, they have had to carry cumbersome lethal weapons everywhere they went. Most importantly, there has been a constant risk of violence and death among the soldiers and innocent civilians who occupy the theater of battle. DISCo LASER provides soldiers with the ability to complete missions while reliably and non-lethally incapacitating all other enemies and civilians within visible range, drastically reducing the risk of death on the battlefield. This product works by using light to incapacitate an area of people using facial recognition for targeting, effectively creating a shield of light around a squadron, functioning to protect them across all areas of a battlefield as a safe, non-lethal, and autonomous weapon.

Schedule

The original implementation schedule is given in Figure 1. Aside from the due dates of the required documentation, it provides the projected dates for the completion of the project's major milestones: the parts testing, turret implementation (motor and processor unit implementation), software development, hardware-software interfacing, test plans, and final prototype. Due to some concept changes and decisions on materials, the team has deviated from this schedule. To date, the parts have been tested, the initial implementations of the separate modules (motor, lighting, processing, and sensor units) are underway, and the test plan is complete. The software development portion of the project has not yet been completed, nor has the hardware-software interfacing. This puts the project at approximately two weeks behind the anticipated schedule. However, as the original schedule was based on an early demonstration date, the project's later demonstration date of April 22 has helped the team account for this loss of time.

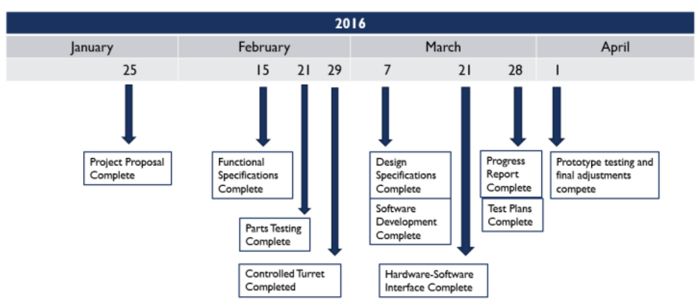

Figure 1: Original Implementation Schedule.

Financial

The company's primary source of funding has come from ESSEF, which provided a sum of $513.00. The team has made this funding our roof and have effectively managed to stay under it by making changes to the product's original concept design (removing the infrared camera, and opting for a high-quality camera module instead). The total cost of materials to date is $400.70, which consisted of the processing unit (Raspberry Pi 2), the camera, the LED array, the stepper motors, and miscellaneous electronic components. In addition to this order, the team will be doing one more order within the next week that will consist of a solder-able breadboard, some small electronic components, as well as a 3D-printed enclosures for the device. The estimated cost of this order should amount to approximately $80, which keeps the project within budget, and with some funding to spare for any other miscellaneous items.

Progress

The current progression schedule of the project is given in Figure 2. In order to stay on schedule, the team has had weekly meetings and continuous communication on nearly a daily basis. Within these meetings, tasks are discussed and roles are divided up to appropriately match each person's interests and skill levels. This method has worked well for primary testing, initial prototype construction, and documentation. The first major step taken in developing this project was deciding on the processing unit required to sufficiently accomplish the product's goal. The team decided on the Raspberry Pi 2, which led to the decisions to use Raspberry Pi compatible parts such as the Raspberry Pi Camera module, the stepper motors, and the LED array. As soon as the parts arrived, the team began individually testing them within their functioning units to ensure that they were working as expected. The motor unit required the creation of a driver circuit in order to test, so this was designed, constructed, tested, and then used to execute a test demonstrating the correct function of the stepper motors. The lighting unit, including the LED array, was testing using a voltage source and simple resistor-circuit to ensure its functionality. In addition to this, the Raspberry Pi and Camera were set-up and initially tested, without the final software implemented. On the software portion of the product, the team has set up OpenCV and has begun initial code blocking for the two main units of the product: the motor unit and the sensor unit. What now remains for the software development is the coding of facial recognition, generating the co-ordinates for the faces, creating a queue for which faces should be targeted, and the conversion of pixel co-ordinates into angular co-ordinates which the stepper motors will use to rotate into position. In addition to this, the team will need to create test scripts for the code with the physical prototype and do any necessary debugging before the prototype is finalized. Once this is complete, the circuit will be soldered and the finishing touches will be implemented.

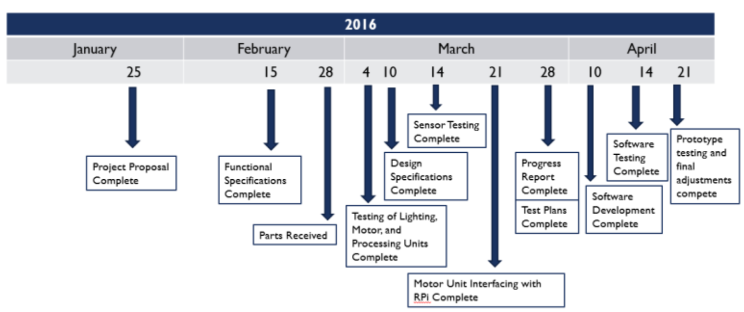

Figure 2: Actual Implementation Schedule.

Conclusion

There is no present concern with the team's set-back in schedule. The companies that the team has used to order parts from are reliably quick, and none of the required parts thus far have been difficult to locate. In addition to this, the team requires only a few more parts for the final prototype, and none of them are particularly difficult to find. The team actively communicates and does their best to maintain weekly meetings to ensure that everybody is on-task and informed on the state of the project and each other's progress, which has helped to quickly debug issues and work through difficult parts of the project together (such as the initial implementation of the motor driver circuit). The largest and most difficult remaining task is the development of the facial recognition software. The team anticipates that using OpenCV will make this an easier task, but has allocated three people to work and debug it together, in order to ensure it is completed efficiently. Through effectively distributing the work-load across the group and maintaining consistent communication, the project has been consistently progressing, and the team expects it to be tested and ready for their Demonstration Date of April 22.