Haptic Feedback Gaming System

Written Progress Report

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Revision 1

1.Introduction

Since the beginning of September, RealSimTech has researched and designed the required software and hardware for the 360-NS-HS, a haptic feedback gaming system, which can be used to achieve the utmost excitement in gaming. This product is an alternative to current recreation activities such as paintball and laser tag. The device utilizes an RFID system, an Arduino Mega board, and a feedback system all mounted onto a rugged tactical vest to produce the physical and visual effect of a shooting game. This document summarizes the current status of the project and provides detailed explanation of what has been done.

2.Schedule

We have completed pre-planned milestones according to the original Gantt chart of this project. With respect to the our original Gantt chart we are currently 1 week behind schedule, for we should be in the debugging stage of the final product. This is expected as the set deadlines in the chart are projections. However, since our demo is scheduled on December 8, we are able to take advantage of the extra week.

Currently, the design of the device has been completed and all of the circuit testing is complete, thus we are now in the assembly and integration phase of our project. We plan to have the final product constructed by November 31, with a week left to debug any remaining issues before the project demo on December 8. One week has been assigned to the testing and debugging stage to ensure enough time for any unexpected problems.

3.Finances

For our source of funding, we received $350 through the ESSEF. The current expenditure as of today is $343.34. A change in microcontroller in order to accommodate 2 RFID readers increased our cost by an additional $35. We have purchased all the enclosures and electronic components that are required for our project. Our last purchase will be the vest which will cost $60. This will push our total expenditure to $403, well below our initial budget of $480 but exceeding the ESSEF funding we received. Subtracting the total expenditure from the ESSEF funding, the remaining $50 will be split among our team members to cover. Table 1 shows the summary of our expenditures to date.

TABLE 1: EXPENDITURES TO DATE

Item	Quantity	Cost ($)
Arduino Mega 2560	1	77.41
Parallax RFID Reader Serial	2	105.13
Parallax RFID Transponder Tags	15	37.35
Vibration Motors	8	28.80
Foam Blaster	1	16.79
Electronic Components (BJTs, FETs, diodes, jumpers)		25.21
Non electronic components (enclosures, battery holders, PCB, Velcro, screws/nuts/washers, tape)		52.65
Total Cost		**343.34**

4. Hardware Progress

4.1 Feedback system

The LED circuit for the health system has been fully tested with the Arduino, RFID readers, and battery pack and is currently being assembled and soldered onto a PCB. The motor circuit's functionality has also been fully tested together with the Arduino, RFID readers, and battery pack and all the motors have been enclosed in PVC pipe fittings. We are currently confirming the placements of the BJTs and MOSFETs onto the switching circuit's PCB before soldering the components onto the board. Once completed, we will modify the enclosure for the switching circuit to accommodate the toggle switch and the reset button for the game mode and game reset respectively.

4.2 RFID system

The RFID system has been tested with the Arduino. We have two RFID readers connected to the microprocessor board and the outputs respond to both readers. We are now in the process of enclosing both readers in their respective casing. One problem we encountered with the RFID readers is that when placed in close proximity, the readers will interfere with each other causing them to be unable to scan for RFID tags. We have come up with two solutions to this problem and it will be mentioned in the remediation section.

5.Software Progress

5.1 CPU Module System

Our Arduino board is currently programmed with one game mode. It can successfully read an input from the RFID reader and send the correct outputs to the motors and LEDs. By November 22, we plan to have game mode 2 implemented which will involve a health system. We have had problems with the communication between the Arduino IDE and the Arduino board, but this has been solved by using the correct serial port on the Arduino board.

6.Remediation

To accommodate for any delay in our schedule, we have 2 members working on the assembly and integration stage and 2 members working on the game mode to speed up progress on our final product. As mentioned previously, we have left one week for debugging to iron out any potential flaws or issues.

Because our RFID readers are low frequency readers, they will not have sufficient amount of time to read an incoming projectile imbedded with an RFID tag. Therefore for the demo, we will be utilizing Velcro so that the projectile will stay onto the vest and giving the reader enough time to read the tag. This design change is included in our Design Specification document

To solve the problem of RFID reader interference due to close proximity of each other, we have come up with two solutions. First is to place an aluminum foil between the two readers to block them from scanning each other. A problem this may have is that it may also affect the tag scanning. Second solution is to alternate the enable state of the reader with an enable time of half a second. The drawback to this is that if the tag arrives at the reader when the reader is at a disabled state, it may take an extra second for the motors and LEDs to receive the input. We will be testing both solution within the next two weeks to decide which will have the best possible performance.

7.Conclusion

The project is currently being assembled and integrated according to the design specifications. Since all the modules have been tested separately and they are all functional, the integration will likely be relatively simple. Although there is a considerable work left to completely implement and test the device, we are currently on track with the schedule given the date of our presentation. Thus, we expect to be able to meet the deadline and provide a demonstration of our product on December 8.