Debriefing for the Haptic Glove, Spring 2014

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The purpose of this document is to give an overview of the state of our senior design project for CMPEN 482W, Spring 2014. The goal of our project was to design and build a “haptic glove,” one that can be tracked by a virtual environment and receive tactile feedback based on interactions within that environment. More specifically, our goal was to be able to see the user’s movements in the virtual environment, down to the fingers being bent. Then, upon finger contact with a virtual object, the user would feel tactile feedback via their fingers being restricted in the glove. The glove we made would not be tied to a specific virtual reality environment; rather, our glove should be able to output finger/palm positions and receive collision signals from any virtual reality environment designed with our haptic glove in mind.

The **finger restriction** aspect of our glove was very successful in terms of the scope of our project goals. When a collision signal is sent to any of the fingers in the glove, they are immediately restricted. The restriction system is built using a gear-and-pulley set-up: the collision signal is sent through an external power circuit, which then gets passed to a solenoid, causing it to fire its needle into a gear, locking the spring-loaded pulley wire running from the top of the hand to the finger tip being restricted.

The **finger tracking** aspect of our glove wasn’t completed in time for the senior design showcase. Our design plan was to place accelerometers on each finger tip as well as the top of the hand in order to provide enough positional data for the virtual environment to animate a hand. The accelerometer data is passed back to a microcontroller through wiring which is then hooked up via serial port to a virtual environment that processes the data. The issue with our set-up was that accelerometer data was not being brought through the microcontroller correctly. This means there is multiple potential sources of error: the accelerometers themselves aren’t outputting good data; the microcontroller hardware could be screwing up somehow; the code written to process the accelerometer data and pass it to the virtual environment could be incorrect; the connections between these parts could be weak or disconnected entirely. We were unable to go through and double check all of these potential sources of error before the showcase. Therefore, the next group to take on this task should consider starting this part over from scratch before spending too much time debugging what’s in place. With a task as particular as tracking the position of 6 points on the hand (5 finger tips and the top of the hand), it is imperative that each individual part is thoroughly tested as you go in order to be able to quickly identify new errors as they show up. I would say an important beginning task for the new group to work on the haptic glove would be to research the best, easiest accelerometer and microcontroller combinations that would make testing as simple and straight-forward as possible.