

WIELD-CAVE

ABSTRACT

The goal of this project is to design a wireless input device for the CAVE virtual reality environment. The current solutions for this problem are not adequate, due to their high cost and wired nature. By eliminating these two problems, this team hopes to develop a more widely useable device that incorporates all of the functionality that other solutions have included, and more. For ease of use, the device will be housed inside a pair of gloves and will wirelessly communicate to the CAVE. The software driver that accompanies the device will allow users to be able to define a series of hand gestures, which will then execute a program assigned to that gesture – essentially, this will allow users to manipulate the CAVE using only their hands and this device. Hopefully, the applications of this device will eventually expand beyond the researcher demographic to the general public.

CPE426/CS426 SENIOR PROJECTS SPRING 2009
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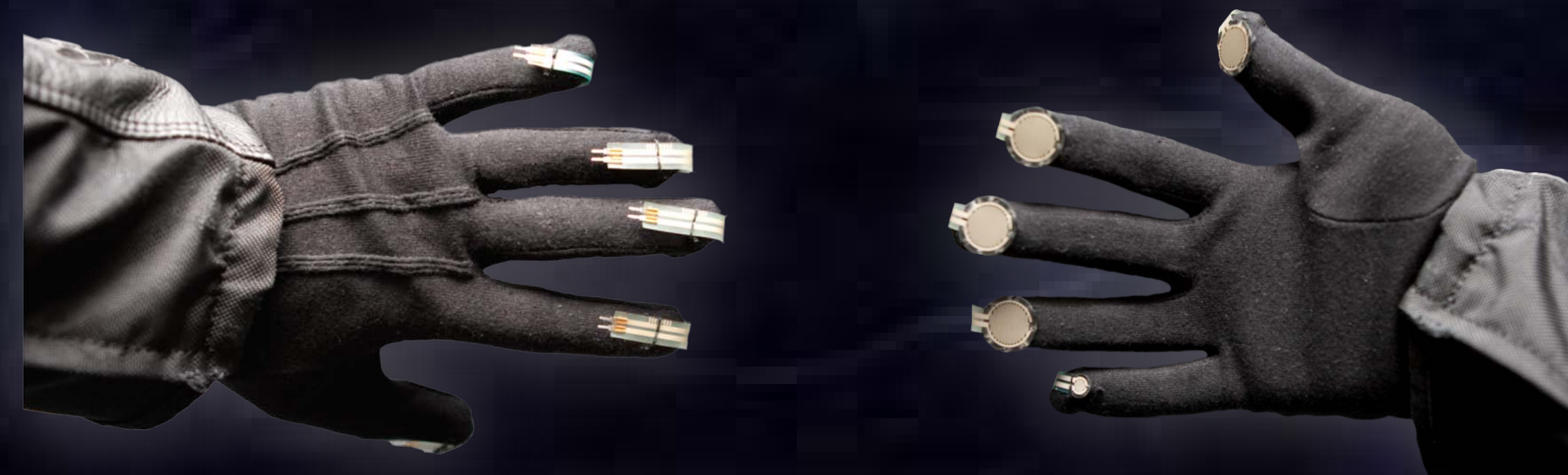


Fig 1. WiELD Gloves as viewed from the front and back

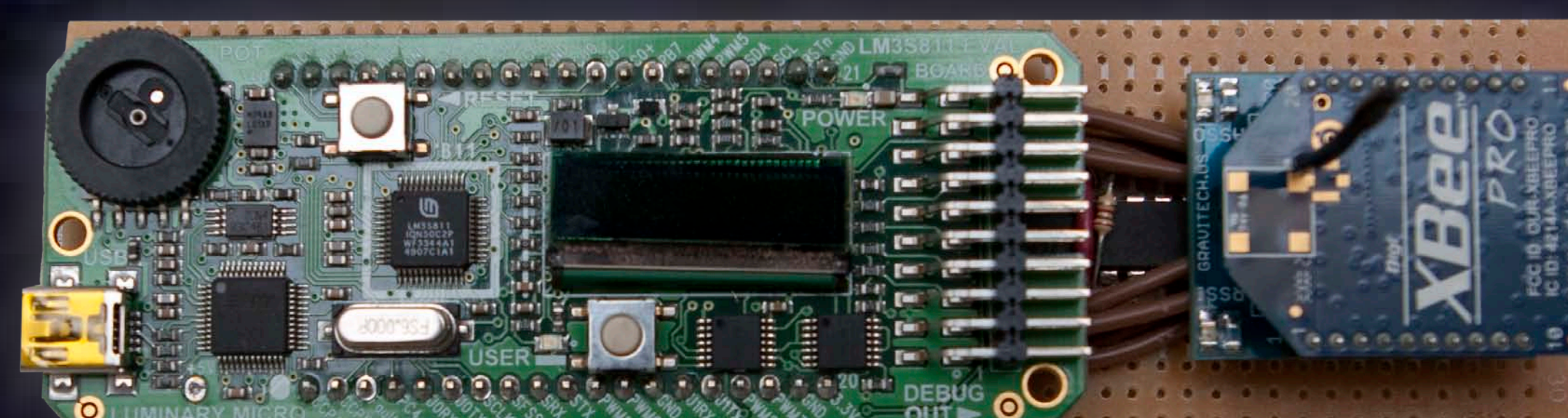


Fig 2. Initial Hardware

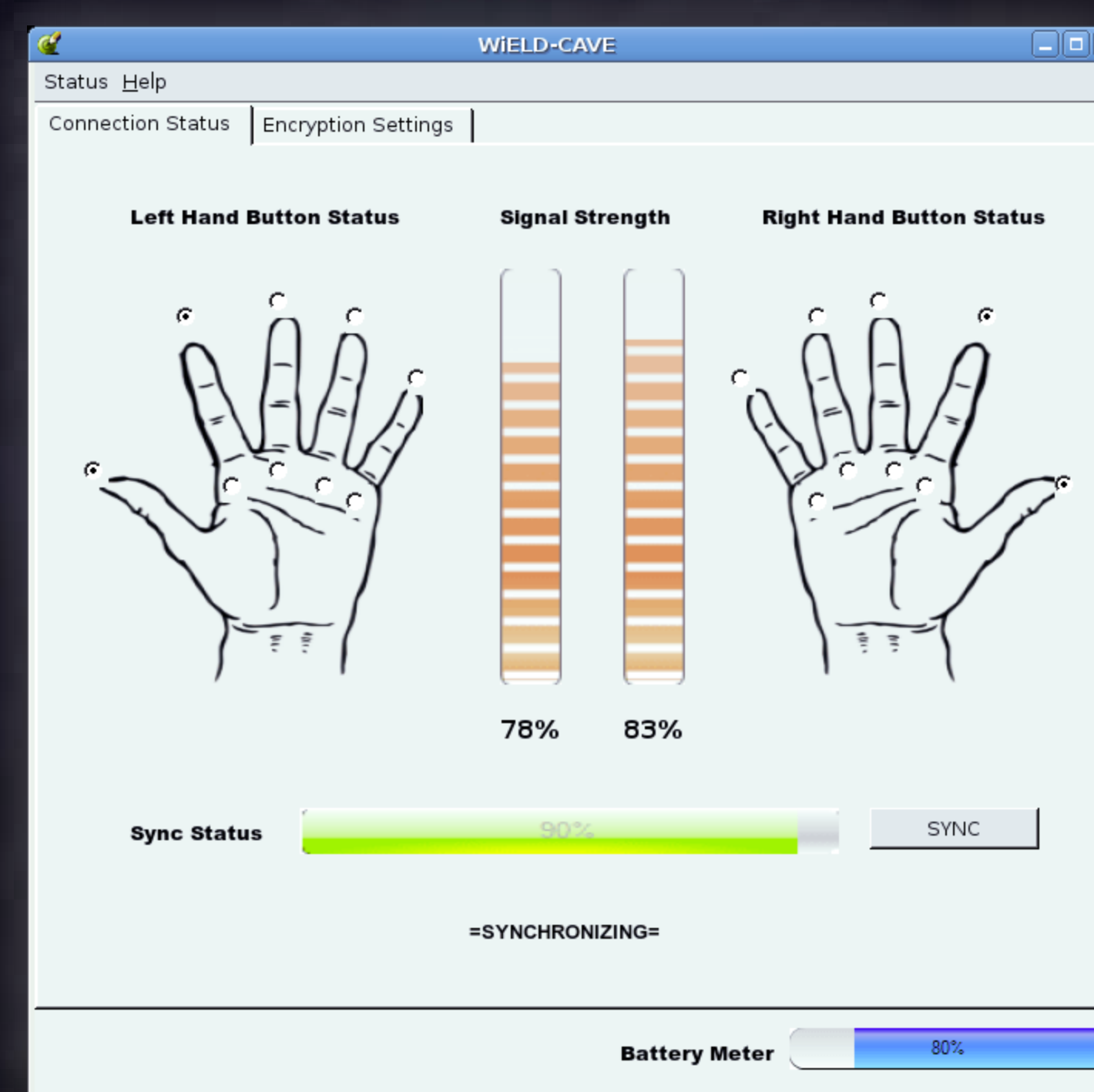


Fig 3. Driver GUI

PROJECT ARCHITECTURE

The main characteristics of this project include: encapsulating the device into a glove, wirelessly communicating with a base station using an XBee wireless chip functioning under an RS232 wireless protocol, the device will run off of a rechargeable lithium ion battery, the device will utilize force sensitive resistors on each “gesture” point, and the corresponding application (or driver) for the device will allow users to define what each gesture will do on the CAVE.

The intended technology for the project: the XBee wireless transceiver platform, the ARM Cortex microcontroller, an Ubuntu Linux computer, various buttons and resistors, lithium ion batteries. The languages that will be used are: C, C++, the GUI will be programmed using the QT windowing toolkit, and perhaps Assembly. Some of the tools that will be used are a soldering iron and a sewing kit for modifying a glove.

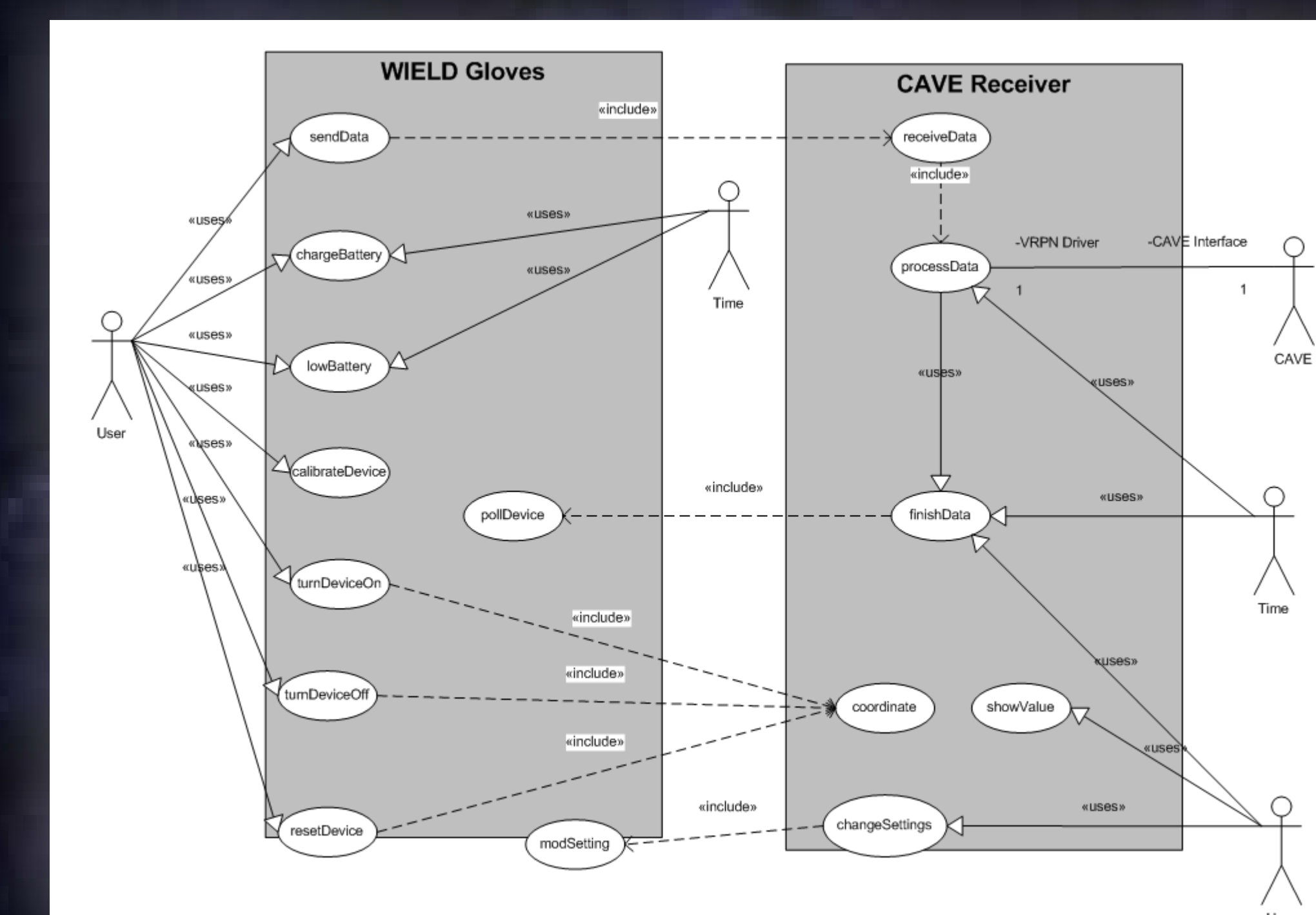


Fig 4. Use Case Diagram

The prototype WiELD gloves (Fig 1) implements only the fingertip sensors, the 4 sensors for the knuckles will be implemented for the final release. Each glove, both the right and left, will interface to a wireless transmitter, shown in Fig 2, that will allow the device to communicate wirelessly with the base station. The driver will output VRPN code, in order to communicate with the systems already in place in the CAVE, as well as update the GUI, shown in Fig 3, to display useful information about the status of the gloves, which contacts are activated and allow the user to modify settings on the device itself.

PROJECT FEATURES

- The WiELD Gloves feature a powerful wireless transceiver
- The WiELD Gloves are lightweight and comfortable to use
- The WiELD-CAVE Driver is streamlined for greater efficiency and ease of use
- The WiELD-CAVE Suite is cost effective

FUTURE WORK

- The system shall have cross-platform compatibility.
- The system shall be designed to run on a multicore/multiprocessor computer with multithreading.
- The device shall have built-in motion tracking.
- The device shall have a built-in accelerometer.