gPod Accessible Blood Glucose Meter

Week 11
April 3-7
David Price

Work Completed

This week I focused my time on the barcode scanner. The scanner will be part of the vial scanner module. The vial scanner module will be used to identify vials of insulin by their National Drug Number. The module will scan the barcode on the vial, compare the number to a database, and speak the type of insulin. This identification is important to visually impaired users so they can effectively manage their diabetes. Diabetics who use insulin injections may require a variety of types of insulin. Certain types of insulin work for long-term control; others are used for more rapid changes.

The barcode scanner we are using communicates with a PC through a USB connection. Figure 1 shows a picture of the barcode scanner.

Figure 1, POS-X, Xi 1000 barcode scanner.

In order to use the barcode scanner with the microprocessor, I need to convert the USB protocol to RS-232. The first idea I tried was a USB to RS-232 converter chip. I prototyped the chip according to a schematic included in the datasheet. The chip was connected to the barcode scanner and the PC. The PC was being used to read the serial data being transmitted by the converter chip. The setup failed to produce any results.

The next idea I tried was to purchase the UC232R ChiPi USB to RS-232 converter from FTDI. The converter needed some modification to work with the scanner and the serial cable. The unmodified converter is shown in Figure 2.

Figure 2, UC232R ChiPi USB to RS-232 converter.

The converter chip was plugged into the PC's USB port and recognized by the Windows Device Manager. This indicated the modifications did not damage the converter, but the drivers installed by the PC showed that the microprocessor may not be capable of communicating with the device. Further testing of the converter also indicated that the USB to RS-232 conversion is more complicated than expected and will need more time to develop.

I also spent time working on the user interface of the meter. The meter's operating instructions are as follows:

1. Insert test strip into meter, making sure the electrodes are facing upward.
2. Turn power switch to ON position.
3. Wait for the voice command: "gPod ready for test."
4. Apply blood to test strip.
5. Wait for glucose measurement to be displayed and spoken.
6. Remove and dispose of test strip.
7. Turn power switch to OFF position.

Code was added to increase the accessibility of the meter by using the speech module to output all of the operating instructions. Some problems were encountered with outputting the units (mg/dL) during the measurement output phrase. More work will be done to solve this problem later.

The final task for this week was finalizing the schematic, board layout, and parts list. Matt and I checked over the schematic to ensure that it matched the protoboard layout exactly. A few minor mistakes were found and corrected. The original board layout used capacitors and resistors that were intended for automated fabrication and were substituted for ones that were more manageable for me to solder to our board. The final parts list and board layout was ordered.

Future Work

This week will be spent finalizing the software and checking for any possible error situations. Assembly of the printed circuit board will start as soon as we receive the boards and parts. We will also start writing the user's manual and the final report. Some more work will be done with the vial scanner as well.

Project Review

The printed circuit board layout is complete and ordered. Final assembly and testing will occur in the next week. Total costs to date are $895.67.

Hours Worked

Hours spent on the project for Week 11: **24 Hours**