gPod Accessible Blood Glucose Meter

Week 11
April 2-7
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Work Completed

This week Matt spent mainly on the final modifications to the PCB board layout and the circuit diagram, while Dave and Mike focused their time on the barcode scanner. Once, Dave finished the whole circuit layout including the switch and voltage regulators I was able to draw up the final circuit schematic, as seen in Figure 1, and the final PCB diagram, as can be seen in Figure 2.

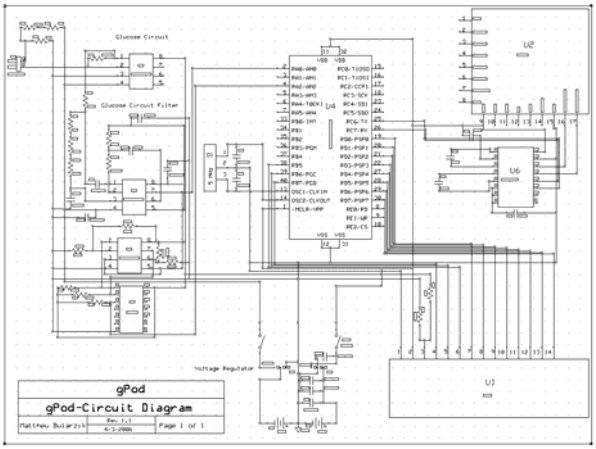

Figure 1: Circuit Schematic

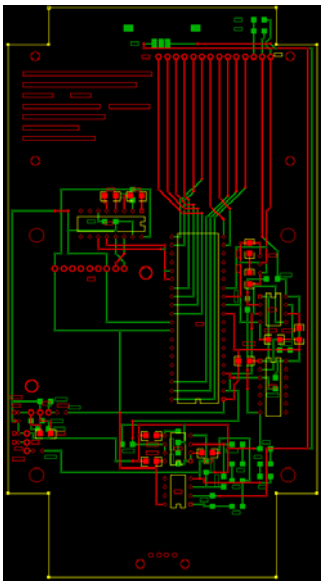
Figure 2: PCB Diagram

The changes that were made to the circuit from the previous design were:

- A 7805 voltage regulator was added for the +5V source along with the necessary capacitors.
- A 7905 voltage regulator was added for the -5V source.
- Place of the switch was corrected.
- Voltage divider on PIC pin 4 was removed.
- The layout of the PCB board was modified to allow for the SP03 module to be mounted to the PCB board.
- A few connections that were incorrect were fixed.
- Labels were added to the board.
- The LCD screen pins were flipped due to it being mounted on the front side of the board.

Matt spent the rest of the week on the casing issues such as the battery case and the casing for the vial scanner. He started by modifying a regular 9V battery holder which in the end still would not fit in the gPod case. Then he tried using the 9V battery leads that were previously tried and then adding a spacer in between the two batteries which worked the keep the batteries in place. Then he started to thing about the casing for the vial scanner. A possible case was found in the lab which should fit the 2 PCB boards from the barcode scanner, a 9V battery since it will need power, and the cylinder insert for the vial to be inserted into. This cylinder insert was created by modifying a container that the test strips were stored in. The plastic lining to the strip container had to be taken out. Then a small strip was cut from the side of the cylinder so that the barcode could be scanned.

The scanner will be part of the vial scanner module. The 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 3 shows a picture of the barcode scanner.

Figure 3, POS-X, Xi 1000 barcode scanner.

In order to use the barcode scanner with the microprocessor, Dave needed to convert the USB protocol to RS-232. The first idea he tried was a USB to RS-232 converter chip. He 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 he 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 4.

Figure 4, 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.

Dave 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.

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 $1219.81.

Hours Worked

Hours spent on the project for Week 11:	Matt 37.5 Hours Dave 24 Hours Mike 13 Hours **Total 74.5 Hours**