

gPod Accessible Blood Glucose Meter

Week 3

February 6, 2006

Matthew Bularzik

Work Completed

This week started with work on the glucose curve. A first attempt at acquiring some sample data from our glucose circuit at different concentrations was successful. Mike acquired the data through diluting the control solution to different concentrations and then checking the concentration through use of the true glucose meter. The raw data was then saved and moved into excel and graphed. Then all the graphs were set so that they started at the same zero point on an arbitrary time scale. A 40 pt moving average was taken so that a smoother line could be seen and the curves can be compared, as can be seen by Figure 1. The curves do line up nice with an approximate linear region that can be seen as the after the peak of each curve. Figure 2 shows a glucose vs. voltage curve for a single time for Figure 2. The curve shows the glucose versus voltage for a single time for Figure 2. The R^2 value shows how close to linear the curve is. This curve demonstrates that it is possible to extract good data from our preliminary curve.

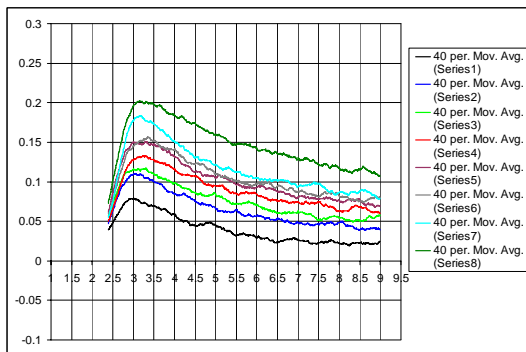


Figure 1: Glucose vs. Time Curve

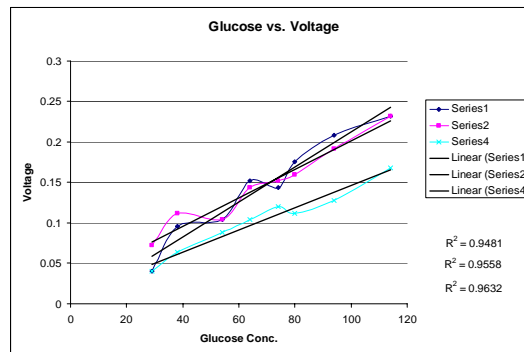


Figure 2: Glucose vs. Voltage Curve per Time

I started to work on the speech chip once Dave had finished soldering the Winbond chip onto the DIP adapter. I first looked over the data sheet for the Winbond chip and examined which pins would need to be connected. The speech chip was then attached to a proto-board and wired up as seen below in Figure 3. Though it was then realized that 2 resonators were needed for the speech chip to run the clocks. A 24.00 MHz resonator was needed for the chip's clock and a 5.00 MHz resonator was needed for the input pin since the chip can handle only 5 MHz at a time. These two resonators were ordered from digi-key. Without these two resonators the work on the speech chip came to a halt since they are necessary for the chip to work. Though, I did attach the speaker also to the speech chip circuit by soldering two wires onto the pads of the speaker.

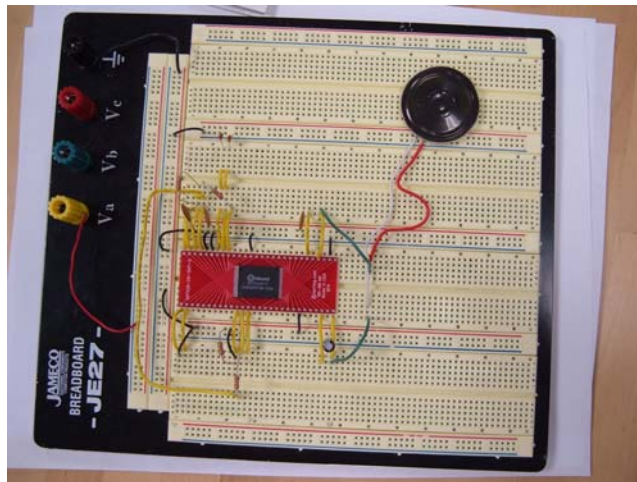


Figure 3: Speech Chip

Once it was discovered that the speech chip was waiting on parts I turned my attention back to the glucose circuit. A filter was added to the glucose circuit in hopes that some noise might be reduced such as noise from cell phone and wireless signals. Though after hooking up the filter to the circuit, as can be seen in Figure 4, there was no noticeable change in the perceived noise at the output of the signal. The Filter was designed using the program FilterPro. The FilterPro design for our filter can be seen below in Figure 5. When examining the FFT of the output signal there was no difference between when the filter was hooked up and not hooked up. Then there was the 5 volt gain that appeared at the output of the circuit. The filter was then redesigned with 2 poles instead of 3 poles as before. The same problems persisted with the output such as the 5 volt offset and the filter not filtering anything. The filter was debugged by grounding the input so that the output should be zero. It was noticed that the output was not zero but slightly above. So the input was examined and then ground itself and it was determined that ground had a few milli-volts. The same happened when a known voltage was applied to the filter. This meant that the filter was working correctly. It was decided that the filter was un-needed since regardless of the gain the filter was not filtering anything from glucose signal.

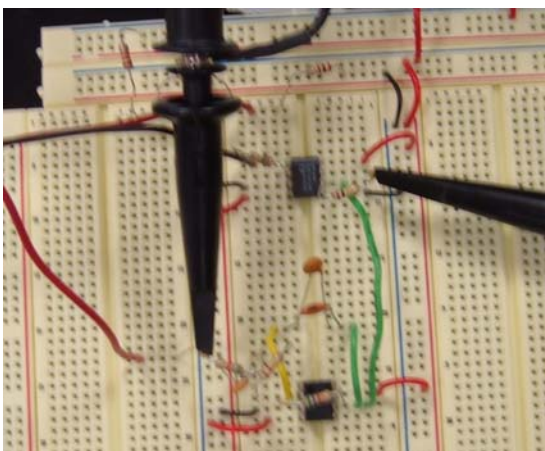


Figure 4: Glucose Circuit with Filter

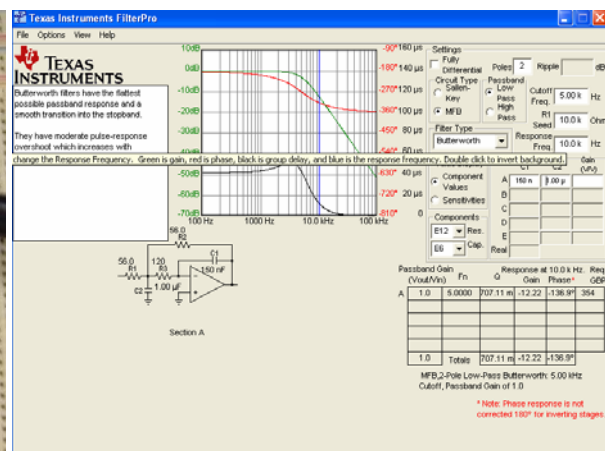


Figure 5: FilterPro Designed Filter

Future Work

This coming week I plan to work on the speech chip more hopefully. The determining factor for my work on the speech chip will be on whether or not the resonators arrive. If they arrive I plan on finishing the prototyping of the circuit and powering the chip up. By the end of the week I hope to have the speech circuit working and successfully converting text to speech.

Dave will continue to work on learning how to write to the microprocessor using the PICC compiler. The A/D configured so that it will use a 0-2 V source instead of +5V source. The code will also be configured to use all 10 bits of the A/D converter. Finally the A/D converter code will be modified to use the input voltage from the glucose circuit.

Dave will also be continuing to work with the LCD screen. He will begin to learn how to use the development board and the LCD screen. By the end of the week he hopes to be able to write values to the LCD screen using the PC.

Mike will continue to work on the glucose circuit. Depending on the delivery date of the concentrated glucose solution an accurate glucose to voltage curve should be developed by the end of the week.

Project Review

So far good progress has been made on the understanding of the microprocessor and the A/D converters. There was progress made also on the speech chip circuit prototyping. Work on the glucose circuit has slowed though results should be seen next week. This week's goals are an accurate glucose to voltage curve, successful text-to-speech conversions, and to get the A/D converter code modified for our project. Total costs to date are \$407.07.

Hours Worked

Hours worked on the project: 19 Hours