Project Identity

Accessible Blood Glucose Monitor Interface
Week # 2 (January 22 – January 29, 2006)
Mike Rivera

Work Completed

Week 2 was primarily spent as a research week. In the upcoming weeks, I will need to make various solutions of different glucose concentrations. These solutions, ranging from very low to very high concentrations, will be used to formulate the voltage-glucose curve that the microprocessor will be using. At present, sample output curves are obtained by using the Lifescan control solution which has a reading of about 114 mg/dL. This control solution can also be diluted to concentrations less than 114 by adding drops of deionized water. By verifying the diluted value with the bought meter, I can make and test any concentration of glucose under 114 mg/dL. However, this value of 114 is in the middle of possible glucose levels, which gives rise to a problem. If there is no feasible way to concentrate the control solution, how can levels above 114 be tested?

After doing some research, I have found a few options. The first, and simplest option is through Lifescan. For use in hospitals, and multiple patient settings, Lifescan offers three levels of control solution. Based on the concentration of glucose, there are High (0.35 %), Normal (0.10 %), and Low (0.04 %). The glucose that these solutions use is D-Glucose which is the natural form of glucose also known as dextrose. Other ingredients include a large percentage of Polyvinylacetate, sodium benzoate, and a viscosity adjusting agent. However, in the owner's booklet for these solutions it says that they can only be used with the OneTouch, OneTouch II, and OneTouch Hospital meters. The meter we have is the OneTouch Ultra. But, when comparing the ingredients of these controls to the control that is offered for the Ultra, there is no significant difference. Based on that, I believe that the High solution would work for our meter, and would also allow me to dilute it to glucose concentrations anywhere below 330.

Another option is to purchase raw dextrose and work from there. Dextrose can be bought as a powder for around a dollar per pound, which is very cheap. If the other ingredients in the manufactured solutions are not essential, I can make glucose solutions of all possible concentrations, with no limitations. This method may prove to be less wasteful as well. When using water to make a diluted sample from the Lifescan control, it requires two test strips each time. One is used to see what the new glucose level is on the meter, and the other to collect the output data from our circuit. If our meter is to be accurate from a range of 20-350 mg/dL, that would require at least 50 test points which is a minimum of 100 test strips. At about a dollar a piece, this can become a very expensive experiment. On the other hand, if I use measured amounts of pure glucose, it may be possible to calculate what the concentration is for a given solution. Not having to test each solution with the meter first can save money as well as time on the whole experiment. Though, it may not be possible to do that. Being as how cheap dextrose is, I plan to try this method in the coming week and hopefully be able to get accurate readings.

Future Work

In the upcoming week, I will be attempting to make usable/measurable solutions out of commercial dextrose. If successful, these solutions will then be used to formulate the voltage-glucose curve that essentially is the heart of our glucose meter. If the curve is not correct, then the meter is inaccurate and useless. If the dextrose is unsuccessful, then I will have to begin formulating the curve with the control solution we have. This will allow me to test up to a concentration of 114 mg/dL, which is a start. It may be necessary to purchase the High control solution made by Lifescan to complete the curve. Providing that this solution is even compatible with our meter. In any case, my work is going to be focused on forming a complete and accurate voltage-glucose curve that will be used to output measurements.

Project Review

Thus far, I feel as though the project is running smoothly. There was a minor set-back this week with the test circuit. One of the outputs was giving a signal that was about half the strength of the other. Figure 1 shows this incorrect output, and Figure 2 shows what it should look like. Although it took much time to figure out, it was a simple fix, and the circuit is working properly again.

The next few weeks need to be very productive to keep up with schedule and not fall behind.

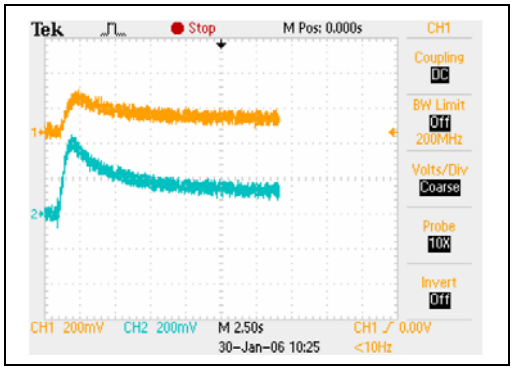

Figure 1. Problem Output

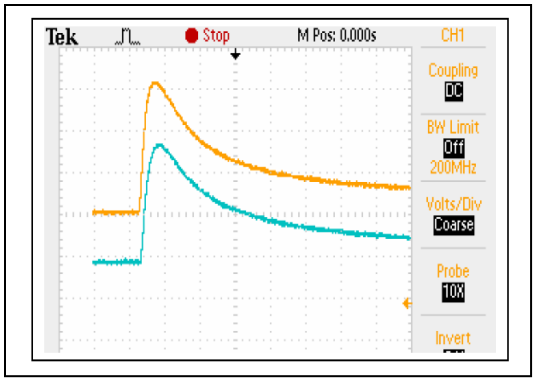

Figure 2: Correct Output

Hours Worked

Hours worked on project: 8