

Sleep Lab Monitor - Progress Report 9

10/31/08-11/7/08

Project Title:

A combined Thermistor, Pressure, and CO₂ device for use in the Sleep Laboratory

Team Members:

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Problem Statement:

There are three measurements taken from each breath during polysomnography. The following devices are used: a thermistor to detect temperature difference between inhaled and exhaled air, pressure sensors that show a flattening pressure profile during upper airway narrowing, and CO₂ sampling tubes to sense exhaled CO₂. These three measurements are taken from two different devices placed under the child's nose, with two prongs going into each nostril. This method can be inaccurate if a nostril was to become obstructed, and each device may not sample from both nostrils as well as the mouth. Moreover, the current apparatus may be uncomfortable for the child as well as insecure on the child's face. This could cause a disruption of sleep and a possibility of the devices becoming unfastened during the night. To solve these problems, the goal is to design and develop a prototype that combines these three measuring devices into one apparatus that samples from both of the nostrils as well as the mouth, and attaches to the child in both a durable and comfortable fashion.

Reinstatement of Team Goals from Last Week:

1. Continue LabView programming
2. Set up a way to test the thermistors that we ordered
3. Begin to test the thermistors in the lab (if they arrive)
4. Bring the thermistors to the polymer lab to see if they can withstand the molding process
5. Get the exact dimensions that we want for the molding process
 - We need 2 different molds for the attachments system
 - One for the ETCO2 part and one for the Pressure part since these parts of the cannula are different sizes
6. Plan the molding process and find out exactly where we will get the plastic
7. Complete solid works design of the exact attachment system with exact dimensions in order to have it molded
8. Reschedule the November 26th meeting
 - Can use our sleep lab visit as our meeting time
 - Or e-mail Dr. Green when we want to find a meeting time
 - Or contact Cindy to reschedule
9. Receive ordered materials

Summary of Team Accomplishments:

1. LabView programming
 - a. Finished the LabView program
 - b. It shows a graph of voltage with respect to time
2. Polymer lab
 - a. Met with the grad students who do research in the polymer lab
 - b. Went to polymer lab and used the injection molding machines
 - c. Injection molded some thermistors and wires
 - d. Covered them completely in silicon plastic
3. Testing the thermistors (they arrived on time)
 - a. Went to bioinstrumentation lab
 - b. Constructed amplifying circuit with 3 thermistors in series which outputs voltage
 - c. Tested thermistors, as well as thermistors which were injection molded
 - d. The thermistors withstood the injection molding process – they worked just as the thermistors not injection molded in plastic
4. Figure 1 (see below) shows a screen shot of a graph of voltage vs. time from the custom LabView program using the amplifying circuit we constructed. We breathed onto the 3 thermistors in series to make the change in voltage.

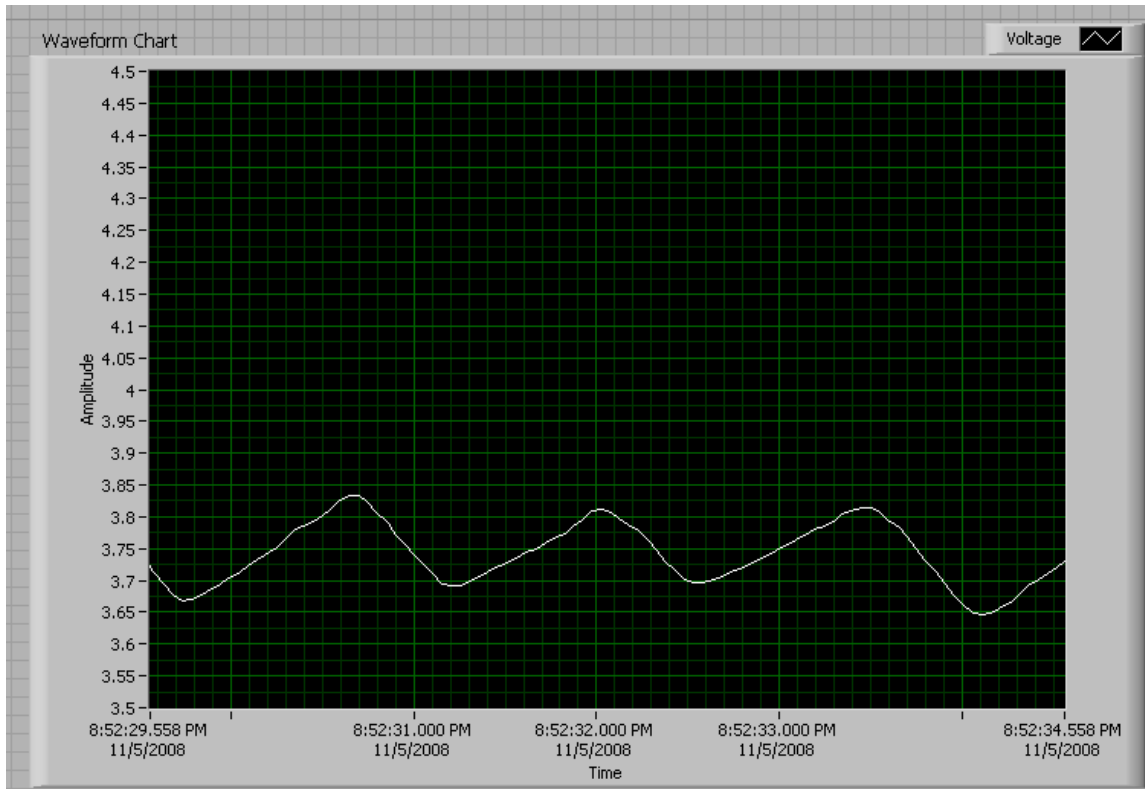


Figure 1: ΔV with Temperature when breathing on thermistors

5. Solid works
 - a. The drawing of the attachment system was completed
 - b. Exact dimensions were used

6. Attachment System Molding
 - a. The solid works drawing is being used to start the constructing of the mold
 - b. Two molds are necessary, one for the ETCO₂ part and one for the Pressure part since they're different diameters

Statement of Team Goals for Upcoming Week

1. Test thermistors with specific temperatures by heating up water
2. Use the LabView program and custom circuit in conjunction with the water boiler and thermometer to test thermistors
3. Continue to tweak LabView program to ideal scale and try to record data in Excel spreadsheet
4. Continue making the mold for the attachment system
5. Pour the plastic into the mold to make the system
6. Acquire the heat shrink tubing

Project Schedule

9/5/08 – 9/12/08: Choose team and project, Meet Client, Get specifications for project

9/13/08 – 9/19/08: Develop PDS, Perform background research
9/20/08 – 9/26/08: Background research, preliminary design ideas
9/27/08 – 10/3/08: Continue to brainstorm for ideas
10/4/08 – 10/10/08: Work on design and choose design alternatives
10/11/08 – 10/17/08: Complete Mid Semester Presentations
10/18/08 – 11/27/08: Develop final design and complete prototype
11/28/08 – 12/12/08: Complete and give Final Presentation, submit notebooks and paper

Team Difficulties:

1. Getting LabView program to record data points in Excel spreadsheet
2. Soldering the surface mount thermistors (they are tiny)

Expenses:

1. Surface mount thermistors
15 X \$0.239/ea = \$3.59
2. Lacquer coated thermistor disks
10 X \$0.51/ea = \$5.10
3. Bead/pearl shaped, ethoxyline resin coated thermistors
10 X \$0.333/ea = \$3.33
4. Other disk thermistors
10 X \$0.277/ea = \$2.77
5. Surface mount coin shaped thermistors
10 X \$0.21/ea = \$2.10

Total thus far = \$16.89

Activities and Individual Accomplishments:

Advisor Meeting 10/31: 1 hour

Team meeting 10/31: 1 hour

- Met with grad students doing polymer research about using the polymer lab

Team meeting 11/2: 2 hours

- Solid works drawing and exact dimensions

Bioinstrumentation Lab meeting 11/5: 3 hours

- Set up program and ELVIS with circuit
- Tested thermistors by breathing on them

Other:

Nicole – 3.5 hours: Polymer lab, set up meetings, soldering surface mount thermistors

Jack – 4 hours: Progress report, polymer lab, soldering surface mount thermistors

Lindsey – 4 hours: Finish Solid works drawing, LabView Program

Robyn – 2.5 hours: polymer lab, updated website

Total hours for this week: 21 hrs

Cumulative hours to date: 178 hrs

Sleep Lab Monitor Gantt Chart Fall 2008												Completed:			
												In Progress/Planned:			
	9/5	9/12	9/19	9/26	10/3	10/10	10/17	10/24	10/31	11/7	11/14	11/21	11/28	12/5	12/12
Propose project	█														
Background research	█	█	█	█											
Client Meetings		█		█	█		█		█				█		█
Meetings with Professors/Techs				█	█	█	█		█	█					
Develop PDS			█	█	█										
Brainstem design ideas				█	█	█	█	█							
Design alternatives/matrix					█	█	█								
Midsemester presentation work						█	█								
Finalize design ideas							█	█	█	█					
Ordering materials process/research								█	█	█	█				
Construct prototype										█	█	█			
Test prototype & Materials										█	█	█	█		
Plan final poster presentation													█	█	
Write final paper														█	
Final advisor meeting															█