

## **Open-source, low-cost, web-guided spirometer**

- Team:** Jeremy Glynn – Team Leader  
Jeremy Schaefer– Communications  
Andrew Dias – BWIG  
Andrew Bremer – BSAC
- Week:** April 17 – April 23, 2009
- Client:** David Van Sickle, PhD  
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### **Problem Statement**

Spirometers are used to diagnose many pulmonary diseases including chronic respiratory diseases that affect approximately 300 million people. Many of these people do not have access to a spirometer because current models are expensive and operation requires the presence of a trained technician. The purpose of this project is to develop a low-cost spirometer capable of measuring lung flows and volumes that can be used by patients without the aid of a trained technician. The project includes the physical design of the spirometer, software development, and designing a universal interface. We envision a first generation device that connects to a computer via a USB port and guides and coaches patients through the testing using digital audiovisual clips. As the procedures are performed, a combination of client and server software will graphically display flow and volume data, monitor and evaluate the quality of the maneuver, and instruct the subject when their performance needs to be corrected. The software should also carry out some rudimentary analysis and interpretation using algorithms that are freely available from the American Thoracic Society. Overall, we hope to develop a tool that would be widely affordable and would standardize pulmonary function measurements by delivering the same instruction and coaching across sites for the first time.

### **Last Week's Goals**

- Complete shop certification
- Complete spirometer and testing apparatus construction
- Begin flow testing and ZMD chip calibration
- Film a portion of the A/V material

### Accomplishments

- All members obtained shop certification
- Near completion of manufacturing spirometer
- Filmed sample A/V clip
- Met with client on 4/22 to update on progress
- Scheduled meeting for 4/24 with David H. of ZMD

### This Week's Goals

- Complete manufacturing of spirometer immediately
- Perform flow and volume testing using anemometer and standardized syringe
- Adjust ZMD signal conditioning chip coefficients to correlate sensor output to known airflows
- Edit A/V filming clip
- Prepare for poster presentation

### Difficulties

- Shop certification was a longer process than originally realized, thus we have had less time than hoped to manufacture the design,

### Team Effort

Team Member	Accomplishments	Time (Hrs)	Running Total (Hrs)
Jeremy Glynn	Class time, client meeting, integration of ZMD chip into design	4	44
Andrew Bremer	Class time, BSAC, A/V coaching design,	5	44
Jeremy Schaefer	Class time, A/V coaching design,	5	44
Andrew Dias	Class time, website development, client meeting, integration of ZMD chip into design	4	44

### Project Schedule

PROJECT TASKS AND PROGRESS	Jan.	February				March				April					May	
	29	5	12	19	26	5	12	19	26	2	9	16	23	30	7	14
<b>WORK</b>																
Brainstorming																
Research																
Designing Prototype																
Selecting Prototype																
Obtaining Materials																
Building Prototype																
Testing Prototype																
Modifications																
<b>DELIVERABLES</b>																
PDS																
Mid-Sem. Report																
Mid-Sem. Presentation																
Final Report																
Final Presentation																
Weekly Reports																
Notebooks																
<b>MEETINGS</b>																
Team Meetings																
Client Meetings																
Advisor Meetings																
BSAC Meetings																
<b>OTHER</b>																
Web Page																
Special Lectures																

### Expenses to Date:

- STMicroelectronics KEIL STARTER KIT      \$189.70
- Pressure sensor order (Mar 1, 2009) – Freescale Semiconductor - \$63.03
- Pressure sensor order (Mar 30, 2009) – Mouser Electronics - \$40.83
- PVC materials for spirometer and test apparatus construction - \$3.50
- Skywatch Explorer II Anemometer - \$65.00