

Team Spirometer Progress Report
July 16, 2009 – July 22, 2009

Team: Jeremy Glynn and Andrew Dias

Client: David Van Sickle, PhD
Dept. of Population Health Sciences
UW School of Medicine and Public Health
Phone: (608) 719-9531
e-mail: vansickle@wisc.edu

Advisor: Mitch Tyler
2156 Engineering Centers Building
Phone: (608) 262-5112
e-mail: metyler1@wisc.edu

Goals for the past week

- Construct new Fleisch spirometer with hematocrit tubes
- Learn how to access all the data in the SQL files
- Run tests on the new prototypes
- Continue I²C code development
- Continue PCB development with Amit
- Improve signal processing/decision flow diagram

Accomplishments

- Performed extensive testing on Honeywell 2401SMT sensor
 - See attached report (July 16 Pressure Correlation) and Excel spreadsheets for full test report and charts. Key results are summarized below:
 - Sensor has exceptional linearity from 0-1 kPa
 - Obtained Pressure to Output Percent correlation
 - Will allow us to convert % output to known pressure in Pa
- Fleisch construction
 - Attempted to make new Fleisch design with hematocrit tubes
 - Fit 152 tubes in 1" PVC (compared to 61 straws)
 - Could not cut to appropriate length
- Updated Product Design Specifications
 - Used information from various ISO and IEC documents
 - New version should be posted to design webpage by tonight
- PIC development board
 - Installed all necessary software and began working through introductory tutorial
 - Could not get first tutorial to build successfully
 - Aside from actual programming, we also learned more about the individual development tools, such as the C compiler and the assembler program
- PIC textbook research
 - Found a textbook at Wendt Library entirely on programming PIC18 microcontrollers

- Contains an enormous amount of information, sample code and example programs
- No USB, but it does have an entire chapter on I²C as well as writing code in C
- Began reading relevant chapters, and will continue to read and learn from the book as well as various programmer contacts
- Algorithm development
 - Interns have been working on generating algorithms that will take an array of data points and generate the various lung function indices (PEF, FVC, etc.)
 - Using NHANES data to test and compare
 - Current difference between our calculated values and the NHANES data ranges from 2-15%.
 - Will continue to develop throughout the upcoming week
- Updated Signal Processing flow chart
 - Attached to the progress report, would also like to discuss tomorrow during our meeting.

Goals for the upcoming week

- Continue trying to build a new Fleisch prototype
 - Options include using alternate cutting method for hematocrit tubes, finding new capillary tube sources (ex. double-barrel stir-straws) and searching for pre-made capillary systems
 - Once built, try to assess the effects of capillary length on resistance and laminar flow
- Learn how to access all the data in the SQL files from David's contact
 - Just received an e-mail from David's SQL contact with more information on using the data
 - Will require us to become familiar with Ruby on Rails and Google Charts
- Continue I²C code development
 - New acquisition of textbook should prove very useful in this task
- Continue PCB development with Amit
- Improve software specifications to include GUI illustrations and flow diagrams
 - This is a suggestion of one of David's contacts that we have not had time to pursue yet

Difficulties

- As we are unfamiliar with MCU programming, we found it very frustrating that we could not get the first tutorial in the development board to build properly. We have submitted a request for help to the official forum as well as to Tom Fleming (who also owns an identical development board).
- Data processing techniques used by NHANES to calculate PEF, FVC, etc. from data points is not very clear. We are working with the interns to determine how the data has been manipulated to produce the results listed, as well as investigating if we can actually use better processing techniques.

Areas we would like assistance/feedback

- Please review the updated flow chart. A work in progress, but feedback is appreciated.