Continuous Monitoring of Asthma Control
Progress Report 6

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Advisor: Dr Chris Brace
Team: Tim Lieb tlieb@wisc.edu (Team Leader/ Communicator)
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Date: Friday, February 24th - Thursday, March 2nd

Problem Statement
Asthma patients often do not experience the the symptoms of asthma exacerbations, such as coughing, wheezing, and increased respiratory rate, for up to 2 days after it has begun. In severe asthma patients, where the exacerbations are more frequent, prolonged detection can lead to more serious symptoms, longer recovery times, and extended tissues destruction. These severe asthma patients only account for 10% of all asthmatics, but they account for a disproportionate amount of health-care costs, hospital admissions, doctor visits, and emergency services. By creating a device that can detect the symptoms of an asthma exacerbation earlier, the patients could be notified to start their asthma action plan (AAP) sooner. This could potentially save significant amounts of time, money and resources while reducing the effects of the exacerbation.

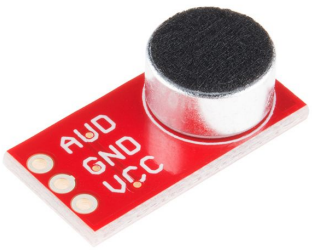
Restatement of Previous Team Goals
- Create visuals of our design ideas
- Finish HIPAA (Luke and Tim have not been granted access to it yet)
- Come up with a plan for testing on asthma patients

Summary of Team Role Accomplishments
- Luke (BSAC) - Attended biweekly BSAC meeting
- Tim (Leader/ Communicator)- Worked on/ submitted the progress report.
- Kelsey (BWIG/ BPAG)- Measured original design and created solidworks images. Uploaded progress report and deliverables to website.

Summary of Design Accomplishments
The team came up with 3 different design ideas: Stethoscope, Diaphragm Microphone, and Encased Microphone. Details can be found in our design matrix, but we will try to describe the motivation for these designs as well as the differences between them.

Stethoscope- This design is very similar to our final design from last semester. It features a stethoscope head that will sit on the patients back to listen to the lungs. A microphone inside and insulated casing will pick up the lung sounds and send it to the DAQ (this would be the same microphone as used last semester). There are two main differences between this design and the final prototype from last semester. Firstly, we would put the microphone as close to the

stethoscope head instead of having the signal travel down the tube before reaching the microphone. This would hopefully eliminate any altercations that the signal would face from interaction with the tubing. In addition, we would reduce the size of the microphone encasing to reduce bulk and make it easier to integrate into a shirt. One large motivator for this design is that we know the system worked last semester, so we would just tweak parts instead of starting a whole new design.

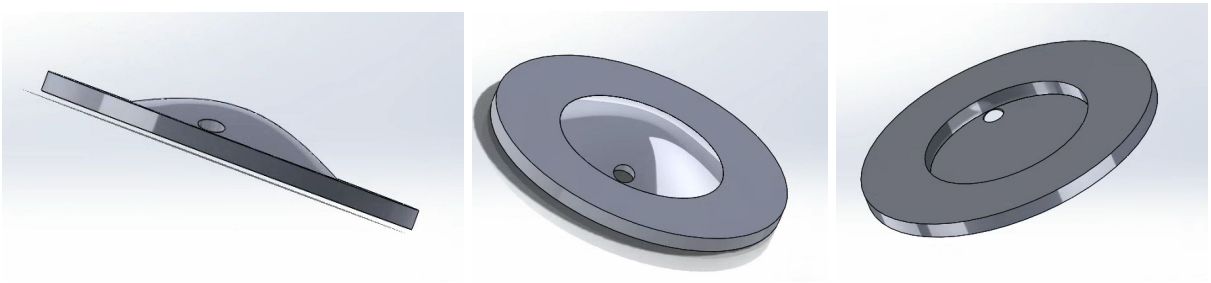


Diaphragm Microphone- This design is centered around using a different microphone than last semester. It would feature a Sparkfun Electret Microphone Breakout (BOB-12758) shown on the right. This microphone picks up amplitude not sounds “by capturing sound waves between two conducting plates (one a vibrating diaphragm and the other fixed) in the microphone and converting them into electrical waves.” The idea behind using this microphone is that is more accurately mimics a stethoscope, which uses a diaphragm to pick up lung sounds. The diaphragm part of this microphone would sit inside of a 3D printed encasing while the red chip part would sit on the outside ot the casing. This design would be smaller/ less bulky than the Stethoscope design while still trying to collect the sounds in a manner similar to a stethoscope.

Encased Microphone- This design implements a little bit of both the previous designs. First, it would feature a 3D printed casing like the Diaphragm Microphone. This helps reduce bulk and increase patient comfort. Unlike that design though, the Encased Microphone would use the same microphone implement last semester/ in the Stethoscope design. The idea behind this is that we know that microphone has worked well and it has been used on our code before. The Electret Microphone above may not be as compatible with our code as the other microphone was. In addition, the microphone would be entirely enclose in our casing, unlike the Diaphragm design. This would produce an even slimmer profile making it fit easier in the shirt as well as against the body.

No changes to the 3 designs ideas were made. After completing the design matrix and talking to our advisor, the team intends to pursue the encased microphone design. We plan our discussing the options in further detail with our client before making any final decisions.

This week our team measured the previous semesters microphone design to get a better idea of the size we should make our design. With these measurements, solidworks designs were created.



Activities

Date	Member	Task	Time (hrs)	Week Total	Sem Total
2/20	All Members	Work on deliverables	6		
		Team meeting	1		
3/1	Tim	Meeting with Client	.5		
3/2	Tim	Worked on progress report	.5	8	17.5
3/2	Kelsey	Measured old design and created solidworks images. Worked on progress report.	2.5	9.5	19
3/1	Luke	Team meeting to discuss microphone casing	1	7	15.5
3/1	Luke	Complete HIPPA training	1	8	16.5
3/2	Luke	Progress Report	.5	8.5	17

Statement of Team Goals

- Get cost estimate for printing microphone casing
- Print microphone casings
- Come up with a plan for testing on asthma patients
- Complete HIPAA training (once given access)
- Begin fabrication of microphone system
- Order cable and shirt

Individual Goals

- Luke: Continue research and begin fabrication of the device.
- Tim: Look into why I haven't been given access to the online HIPAA training. Continue research and work on deliverables for next week.

- Kelsey: Send solidworks designs to the shop to get 3D printing cost estimates. Begin ordering materials.

Difficulties

One potential difficulty might be getting the DAQ software to work with the version of LabVIEW on the laptop for testing. We had issues with the LabVIEW on the instrumentation computers being too old and incompatible last semester, so we might run into similar issues again. Another potential issue could arise with adding more inputs into the DAQ. Although the DAQ is able to handle many inputs, we will have to figure out how to import the different signals into the LabVIEW program.

Project Schedule/Timeline

Task	Jan		February				March					April			
	20	27	3	10	17	24	3	10	17	24	31	7	14	21	28
Deliverables															
Progress Report	X	X	X	X		X									
PDS			X												
Preliminary Presentation					X X										
Preliminary Report/Notebooks					X										
Final Presentation															
Final Report/Notebook/Evals															
Team Goals															
Select 3 final design ideas				X											
Design Matrix				X											
Presentation Powerpoint					X										
Decide on final design						X									

Presentation poster															
Meetings															
Team	X		X	X	X	X									
Advisor	X	X	X	X	X	X									
Client	X					X									
Website															
Update info	X	X	X	X	X	X									

Expenses

Date	Item	Cost
	Digi-Key 2 conductor Shielded Cables with drain wire (W120-50-ND)	