

EE/CprE/SE 492 WEEKLY REPORT 4

3/2/2020 - 3/15/2020

Group 3

Smart Digital Stethoscope

Dr. Khokhar

Team:

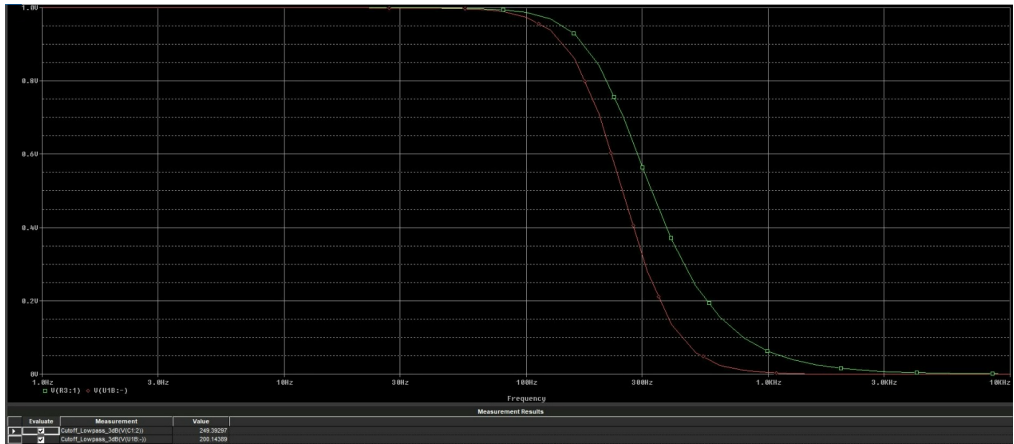
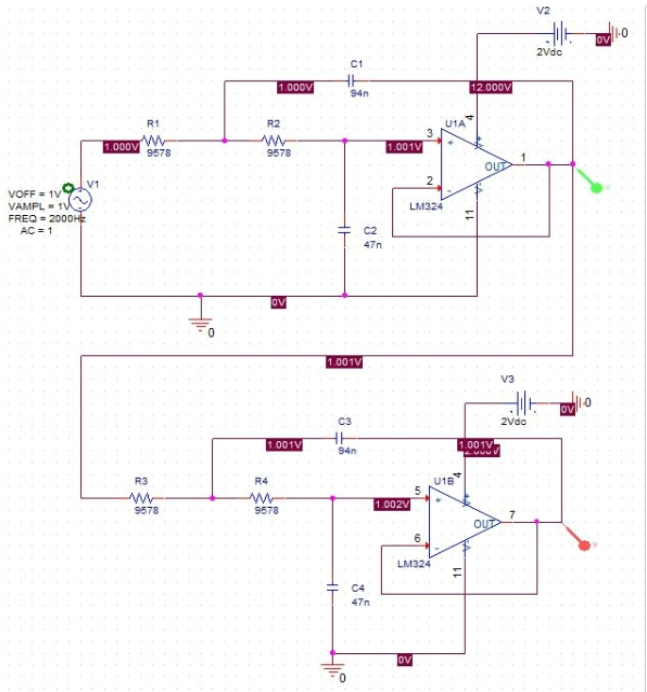
- ***Erik Becker: Chief Hardware Engineer***
- ***Joseph Dobosenski: Scribe***
- ***Margaret Heaslip: Report Manager***
- ***Andrew Holman: Chief Software Engineer***
- ***Megan Kasabian: Meeting Facilitator***
- ***Jordan Spidle: Test Engineer***

Weekly Summary:

This week we continued development on the individual components of the project. For the software we tried to get into contact with someone who could help us better understand the BLE 4.2 software stack so that we can develop our unique profile for our data transmission. We also continued working on the machine learning algorithm. Specially we applied the improvements made last week to our already existing algorithms to test for the best ones. Also we worked on implementing a greater variety of simple algorithms recommended to us in our PIRM meeting. For hardware, the microphones ordered came in (3/10). The datasheets were reviewed so they can be tested. The meeting with Tuttle resolved the filter design issues, and the new design was simulated and tested again. The results were as expected.

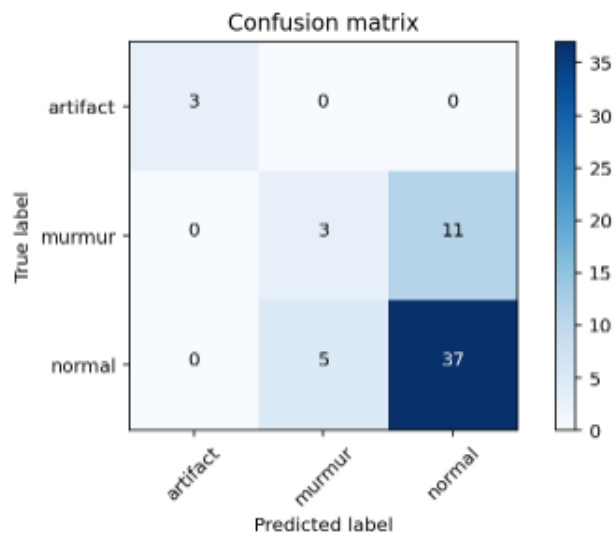
Past Week Accomplishments:

- Erik Becker:
 - Re-tested filter circuit. Behavior works as expected. Filter is ready for integration testing with other components.
 - The microphones came in and the datasheets were reviewed for each.
 - Met with Tuttle to resolve filter design testing issues. Re-simulated the new design, and it worked as expected. Pictures shown below:



The simulated green curve is a second order filter and the red curve is a fourth order filter. It is hard to see the bottom left corner, but it states the -3Db cutoff for the 2nd order and 4th order is read as ~249Hz and ~200Hz, respectively.

- Joe Dobosenski & Margaret Heaslip:
 - Continued researching how to design Bluetooth applications
 - Worked on ironing out specifications for the ADC
- Andrew Holman:
 - Try multiple other methods of machine learning algorithms
 - Improve existing classification algorithms
 - LSTM classification



	precision	recall	f1-score	support
0	1.00	1.00	1.00	3
1	0.38	0.21	0.27	14
2	0.77	0.88	0.82	42
accuracy			0.73	59
macro avg	0.72	0.70	0.70	59
weighted avg	0.69	0.73	0.70	59

- Megan Kasabian:
 - Read through data sheets for the three different ordered microphones.
 - Met with Professor Tuttle about issues with the filter.
- Jordan Spidle:
 - Reviewed data sheet for microphones

Pending issues

- Implement lung sound machine learning classifier.

Individual contributions

<u>NAME</u>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Andrew Holman	6	31
Megan Kasabian	1	10
Erik Becker	4	13
Jordan Spidle	2	7
Maggie Heaslip	1	12
Joe Dobosenski	7	28

Plans for the upcoming week

- Erik Becker:
 - Meet with others to test integrating the filter with the microcontroller ADC
 - Help with getting the soldering done for the microphone breakout pins to begin testing
- Joe Dobosenski:
 - Find a contact for BLE assistance (see weekly advisor meeting notes)
 - Will follow up with Dr. Khokhar this week
 - Continue
 - Refine ADC code so that we can get it operate more in line with the constraints for our project
 - Get with Erik and do some physical testing with the filter inputting into the ADC
- Margaret Heaslip:
 - Do physical testing on ADC and continue exploring the datasheets to complete ADC and BT programming
 - Start working on the website some
- Andrew Holman:
 - Continue experimenting with new methods to improve classification strength
 - Create another ML algorithm with a lung sound database.
- Megan Kasabian:
 - Begin testing with the three microphones.
- Jordan Spidle:
 - Start testing microphones
 - Remove chestpiece from old stethoscope

Summary of weekly advisor meeting:

We met with Dr. Khokhar 3/7 and caught him up to speed with the progress of the project

- Andrew:
 - Improved machine learning algorithm to correctly identify heart murmurs
- Joe:
 - Having issues with the Bluetooth stack and understanding how to implement it for the microcontroller
 - Asked Dr. Khokhar for any resources and he said he would ask around for someone to help
- Erik:
 - Microphones have been ordered but have not arrived yet
 - Physical testing was worked on for the filter
 - There was an issue with the filtering that was resolved after a meeting with a professor