Week 3 Report

For our project, we have teamed up with Dr. Wilman Ortega, a pulmonologist currently working with Mercy Virtual. Mercy Virtual is a company focused on providing remote medical service and care at home and ICU locations across the country. Dr. Ortega has asked our team to help develop a device and system that can play the role of the stethoscope, so that the physician does not physically need to be with the patient to check the conditions of the lungs. Eventually, the goal is to create an algorithm to detect various conditions based on the sounds that are detected. Ergonomic design, sound capturing, signal processing, and machine learning algorithms will need to be considered in approaching this overall problem.

To help accomplish this task, Dr. Ortega has allowed us to borrow a digital stethoscope from Thinklabs. He also provided us with a set of lung sound recordings to better familiarize ourselves with the subject. Using this digital stethoscope, we expect to be able to record sound data. We are also currently researching ways to computationally classify sounds, including various machine learning algorithms. Earlier this week, FFTs were run on the lung sounds to determine the frequency response of the sounds (see “FFTs of Sample Lung Sounds” under Sound Analysis). The results of the FFTs suggest that some classification may be possible. However, given the similarities between different conditions, this classification is likely to have a high chance for errors and other methods should be used.

We have begun to research current methods for measuring and analyzing lung sounds, and using those sounds to diagnose lung diseases. We are hopeful that understanding the current methods for capturing sounds and what quantities are used to characterize lung sounds will help inform us on how we want to structure our device to capture and process lung sounds. In a Journal of Medical Systems article from 2004 entitled “A Simple Computer-Based Measurement and Analysis System of Pulmonary Auscultation Sounds”, we read of a system that was created to digitally record lung sounds, display the sound waveform, and even acoustically reproduce the lung sounds. This system performs similar functions to the device that we will be creating.