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02/15/2016 Progress Report for "Clinical Analysis of Speech Rhythm in Language Development using MATLAB"

The goal of our project is to develop a program that will analyze the rhythm in the speech of children with and without language impairment. Unlike other current methods of speech analysis, our analysis process will exist entirely in one program, MATLAB. This will increase efficiency, decrease time spent on data analysis, and automate the speech analysis process. Ultimately the code will output two scores, for self-synchrony and global-synchrony, determined by Circular Statistics analysis conducted in MATLAB. The scores will be representative of the individual's rhythmic abilities. We have previously started developing our code using MATLAB and Simulink. In a meeting with Dr. Nori Jacoby from MIT past week, we decided to replace the Simulink component of our code with a Scarlett 2i2 soundcard.

Since last week we purchased the Scarlett 2i2 Soundcard, an SM58 microphone and external cords to connect the device to our laptops. These hardware component needs were funded by Vanderbilt Biomedical Engineering Department. We are currently in touch with Dr.Jacoby who is helping us with the implementation of the soundcard into our analysis system. In the meanwhile we have also been working on our peak processing code. We can successfully identify maximum peaks in our data using find peaks function of MATLAB, filter the data with a lowpass butterworth filter, and take the envelope of the maximum peaks using the Hilbert function in MATLAB. This process results in the identification of a single maximum peak in 0.05 second time intervals throughout the recording (the time interval can be adjusted in the code). Furthermore, we were able to locate the 60% point of the peaks, also called "speech beats".

The implementation of the soundcard to our system has proven to be more challenging than we had expected. After installing the soundcard driver and software to a laptop we tried collecting data with the soundcard and inputting it into MATLAB. However further consultations to Dr. Jacoby revealed

that we needed a “Pschyphysics MATLAB Toolbox” for MATLAB to recognize the soundcard. We are currently discovering the Psychphysics Toolbox and translating the MATLAB code Dr. Jacoby uses in his studies with his soundcard to be used in our code. In addition, although we have been able to locate peaks and 60% of peaks in with our peak processing code, we have not yet been able to perfect this process. The code occasionally picks up more than one peak as maximum within the same peak or sometimes skips/doesn’t pick up a peak, which results in a syllable not being recognized by the system.

Moving forward, we will be working on getting MATLAB to recognize our soundcard and collect speech data with the soundcard and input it into MATLAB. Additionally we will try to improve our peak detection code and eliminate the detection of multiple peaks as well as the occasional failure to detect peaks. Furthermore, we have started reading and translating the circular statistics analysis code for Self-Synchrony and Global-Synchrony analysis which has been previously written by members of the Music Cognition Lab and used to analyze the speech data in Dr. Gordon’s lab.

We expect to meet our stage-gates in time with the proposed schedule as depicted in our Gantt Chart. There appears to be no additional hardware or software components that needs to be purchased.