Hello future design team!

First off welcome to the Vobot repository, here you will find all the source code for our applications, the reports submitted for the entire two semester course as well an in depth look at the application source code for the ECE deliverable.

Something to note as you move forward in this project: we have two different application versions on this repo. The first is what we presented on ECE day and what our client indicated was our initial project goal. The second is a customized version of the application that our client requested as a merger with a spectrogram program he developed.

Below we'll outline what features we couldn't implement/could be developed further, the issues we encountered and things to consider if you're interested in continuing or adapting this project.

Microphone/Speaker

One of the main aspects in this project is the ability of users to interact with the robot dog in a way that is natural and comfortable. Our client initially wanted us to use the PRED smart cube speaker (Link) as the module through which audio would be both received by users and recorded for analysis. As we discovered throughout our time with the project, the module recorded very poor audio and also caused several bugs in the code when we attempted to integrate its bluetooth capabilities with the application. Due to its poor recording quality and lack of time, we decided to just use the built in speaker and mic on the cellphone that the application was installed on.

An improvement on this feature can be found via other external bluetooth modules including clip on mics or third party combination modules similar to the PRED.

Speech processing algorithm

By the time you receive this project it is possible that Professor Vyshedskiy would have already developed proprietary software that is capable of analyzing speech and returning a similarity score. At the time of our design we had to use third party software in order to compute a similarity score for the users articulations, we outline some of these options we chose between in our initial design reports. For this project we ended up choosing Speechace as it had the most developed platform and was easy to use through API calls. If you need to contact the CEO who gave us the API key, you can reach Ahmed El-Shimi at *aelshimi@speechace.com*.

While the software works rather well for our current system, there are certainly issues which prevent it from being fault free.

- Speechace returns high scores for words that sound similar to mode word
- Speechace returns scores even when multiple words are spoken at once
- Speechace has trouble understanding unintelligible speech, even on a syllable level

CHiP Robot

WowWee's CHiP robot was the preferred choice due to Professor Vyshedskiy's connection with the CEO. While the robot mainly served the purpose of performing a dance or song, there were some issues to note.

- CHiP will emote unexpectedly after an elapsed time without interaction. This was distracting for our tests and potentially distracting for children using the robot
- We found no way of controlling these "outbursts" in the programming of the system

Overall design

We were very pleased with the outcome of this project, latency is almost a non issue in our current design which was a big concern when we started conceptualizing. The application for ECE day works smoothly and provides a clean user interface for interaction and lesson learning. The second customized application requires some additional modifications to meet Professor Vyshedskiy's requirements but the foundations are set for this project to be further developed or adapted.