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DSP Final Project

Thesis:

The goal of this project is to have a program in matlab that identifies the numbers one through ten by identifying the power bands of each number.

Conclusion

The theory of identifying sounds is fairly simple. Every word has a unique pattern of 'power bands' which can be displayed after running an algorithm called the fourier transform onto the sound file. Matlab has this function built in an is used by the command fft(*file).* Once the power bands are established one must look at noticeable spikes in the pattern. The spikes represents the how often a certain frequency occurs in a sound file. Certain words will have certain sound frequencies occur more, so by looking at which frequencies occur the most, you can distinguish words.

Often, these power bands are spaced evenly because of how harmonics work. Once the power bands are identified visually you have to record the starting value and the ending value for each of the spikes. These values will tell another program where these spikes most likely occur. Because they are large spikes, they have more area under their curve. This area is how we will distinguish the sound files. We then input these files into a program titled '*ComputeEnergyBands'* which looks in-between the specified ranges and returns a value which represents the area under the curve between those two points.

Once we got the energy values we imputed them and the ranges into a preformatted text document which the final program will be used to get the values. The final program we wrote was titled *'IdentifySound_v3'* which analyzed an incoming sound file and compared its data to that of the text documents. The program then looked at each sound file and compared its data to each of the sound files. Whichever sound file had the least amount of errors was guessed. Our program accurately predicted each of the sound files 100% of the time in the end.

Procedure:

First we recorded at least 5 samples of Nick saying the numbers one through ten. We made sure each file was saved as a '.wav' to keep consistency in Matlab. Then we ran the sound files through the provided '*Sound Analysis*' program that we were provided. In order to get the necessary results we edited the program a bit to only display the data we needed. We also edited it display all of the analysis graphs at once to save time. To verify our results we averaged all of the data and displayed that so that we could check the consistency of the sound files. Then we proceeded to record all the data into a

spreadsheet so it can be easily looked at in terms of power bands and where they were very distinguished. We used the ‘ *CompteEnergyBands*’ file to find the total energy in each energy band’s range. After that we updated our data spreadsheet with the corresponding energy values. The final step was to input all of our data into the ‘*IdentifySound’* file to see if the program can distinguish the numbers one through ten with the data that we recorded in our data spreadsheet. It worked with new sound files after modifying the size of some of the variables.