**Hans Kumar**

**Term Project Proposal**

My term project for 15-112 is a drum tutor and collaborative rudiment library for the everyday percussionist. I hope to three main goals in my term project. Firstly, I want to make the home screen of the application an audio visualizer that can take in real time audio and perform analysis on it to display captivating graphics on the screen. Next, I want to create a drum tutor that can play beats for the user, go through exercises, and analyze the player’s performance in real time. Lastly, I want the app to be dynamic. I want the user to be able to add his own beats to the library of beats so that other potential users can learn what beats he has created. I want to perform audio analysis on the user to detect what the user is playing.

**Part 1 Audio Visualizer**:

For this part I will be using the PyAudio module, the Numpy module, the Threading module, and Tkinter to create a graphical representation of real time audio input. To do this I will be taking data from the microphone of my computer through PyAudio’s recording feature, and converting the data into an array with Numpy. From this array I will be able to look at the different values and accurately see change in the amplitude of the sound waves. I will have to perform fourier transformations on these waves to get information about their frequency. My initial thoughts are to use rings of circles which change in radius depending on amplitude, and have their movement and color be changed by frequency. For example, when the bass hits very hard, the ring could begin rotating the opposite way. I will also be using a Threading module to allow me to simultaneously display graphics and record audio. Essentially audio will be on one thread, and graphics will be on another thread. If I have time, I would like to make the visualizer interactive as well. I want the user to be able to create their own visualizer based on the software.

**Part 2 Drum Tutor**:

For this part I will again use the PyAudio module, the Numpy module, the Threading module, and Tkinter. This part of the project will actually be more user interface features. I will allow the user to pick a rudiment/beat that they want to learn. I will then display a sheet music representation of that beat and allow the user to play along to it karaoke style. The computer will play through the rudiments, and highlight notes/stickings on the screen for the user. There will be an option to increase/decrease tempo of the beat which will be done through the Numpy module (decrease/increase sampling rate). This part will provide exercises for the user and record the user live to make sure they are keeping up. It will see if the user lines up with the audio given from the computer and will give feedback. Feedback will be tempo issues as well as incorrect drums/cymbals.

**Part 3 Drum Beat Library**:

Using the same modules and the PyDub Module, I will create a library of rudiments that the user can learn from and expand. I will store information about the beats in strings that can be saved as files. It will include information such as rhythm, tempo, and timbre. In percussion, many times users like to associate a vocal with a particular rudiment. This will also be stored in the file for the particular beat. The PyDub module will be used to cacaphonate different parts of beats and vocals that the user creates.