Project 3 Documentation

The decision to pick music and how it affects mood as our main topic came to us because music is heavily integrated in our lives; we listen to music when we are studying for exams, when we have team meetings, and even when we brainstormed ideas for this project. When we first decided our topic for this project, we were reliant on literature and research articles that were published over ten years ago, which claimed that it was the frequency of the musical notes that determined which mood or emotion was evoked from a particular song (Figure 1).

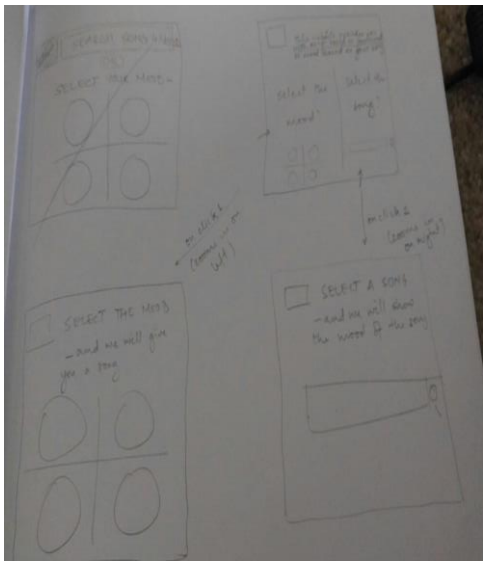

Figure 1.

The first version we created was a visualization that derived the frequency of a song at a certain second in the music. It could only do a second because there were multiple notes that different instruments played at a given second. Naturally, this visualization did not work because we wanted the frequencies of the whole song. So, we tried to code a 3D visualization of a song that showed the frequency range throughout the song while it played in real time. While this visualization worked, we had a hard time understanding how to interpret what the z axis was; we only understood what the y axis (decibel level at a frequency) and x axis (frequency range) were. In addition, it was hard to integrate a program that could derive what mood or emotion this song evoked, instead of first deriving the frequency first and then the mood it evoked (Figure 2).

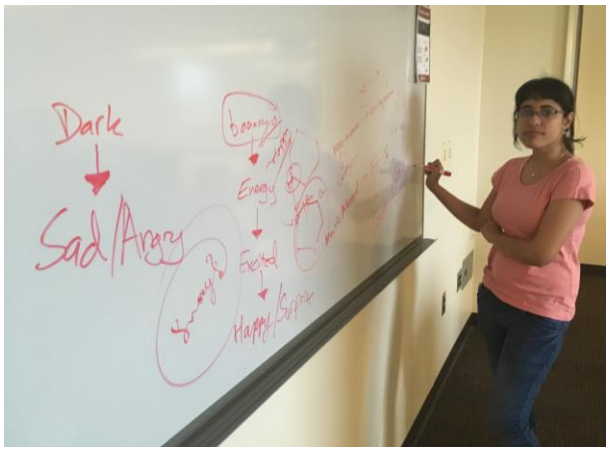

Figure 2.

However, the idea of using a song's frequency determining the mood it evokes was not leading us to a solid visualization. In fact, there have been visualizations created that were supposed to show which moods are evoked by certain songs, but none of them were accurate (i.e., for the same song the site would say it was 'happy', but if you selected it again it would say 'angry'). Only one website, http://musicmood.me/login was accurate in this manner. However, our visualization was based on the six universal emotions (happy, tensed, sad, satisfied, bored, and distressed), while this visualization utilized around 30 moods that were not universal emotions (i.e., 'elegant' or 'bouncy' can be considered a feeling, but it is not a scientifically recognized emotion). We decided to do more research on what the literature said, and we found more recent research that was just made available to IUPUI's library database (these research articles were published in May, 2016). This more current research said that it was not frequency that determined the mood of the song, but the song's energy, valence, and depth (each are explained on

the homepage). With this new information, we sought to design a visualization that can derive moods based on energy and valance.

In order to gain more guidance, we met with both the professor of our class and got in contact with the creator of musicmood.me/login, Jonathan Querubina. Jonathan offered the most help, as he explained how we came up with these 'moods' of his and how Spotify's API (which he based his visualization from) can help us with the variance between emotions that a single song can offer (Figure 3). Learning of Spotify's API and its abilities was extremely useful for the final version of our visualization.

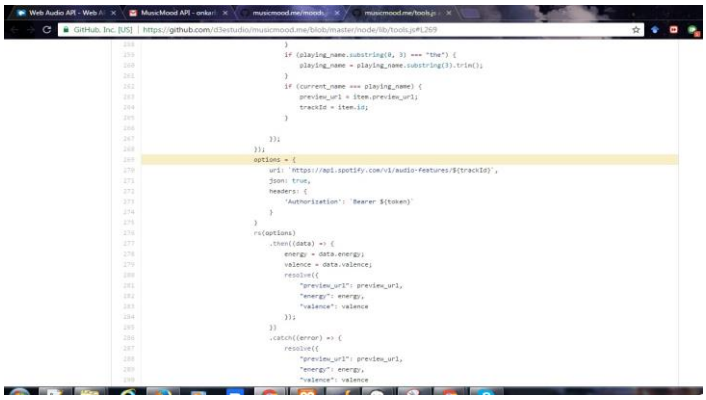

Figure 3.

Finally, with the correct research findings and the right tools to utilize (Spotify's API), for our last version, we created our own database of songs from ten different genres': classic rock, alternative rock, classical music, jazz, soul, country, techno/electronic, heavy metal, pop, and rap. Each genre had ten songs totaling 100 different songs. Each song was unique, and no artist or musician was used twice. Songs also ranged from the 1940's to 2016. With this chosen list of songs, we utilized Spotify's API, a free music platform, to derive each of our 100 songs energy and valence. With every song's energy and valence graphed out, we were able to create three graphs of each song: one of the frequencies per second, one of a radar graph which showed the dimensions of how 'strong' or 'prominent' each of the six emotions are in that given song, and a graph of the energy and valence that a particular song has (i.e., the four quadrant graph essentially shows if a song has low energy and low valence, low energy and high valence, high energy and low valence, or high energy and high valence). These three graphs separately do not convey much useful information, but together they show what, how, and why a song evokes a certain mood (Figure 4). Spotify's API was also utilized to create a search bar so that if a user wants to identify a song not on our list, she or he can do so. This allows the user to find a mood for a new song that is not in our original data base so that the user can create his playlist to evoke a certain mood and not be limited by our 100-song selection.

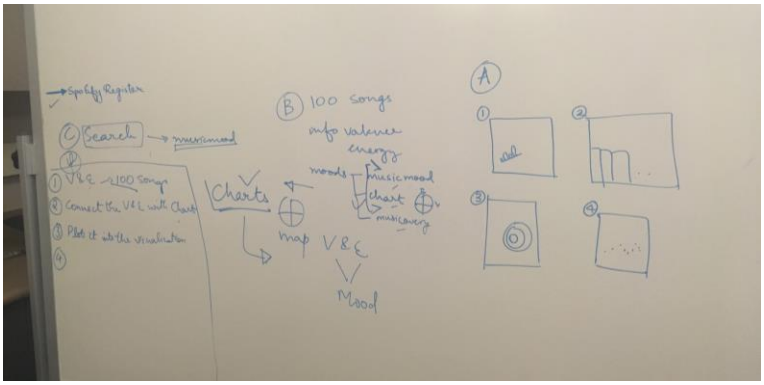

Figure 4.

Now that the design of the website and visualizations were settled upon, we could focus on the color design of the visualizations itself. For the frequencies per second, we used a spectrum of colors from medium purple to very light blue/light green). We chose this because for this particular visualization, we wanted to show a 'curved' line graph of how the frequency changes over the song. Thus, different colors and different hues of that color show how high or low the frequency is at a certain second,

but also how that frequency changes over the length of the song (in seconds). Keeping the color scheme to 'cool' colors helped the curved line be seen and compared to other songs' curved line graphs.

The radial graph has six points to it, each representing one of the six universal emotions (happy, tensed, sad, satisfied, bored, and distressed). For this radar chart, we represented each song with a different color to differentiate the songs and compare easily. There is a compare toggle button on the top right which lets the user view a comparison of at max 3 songs.

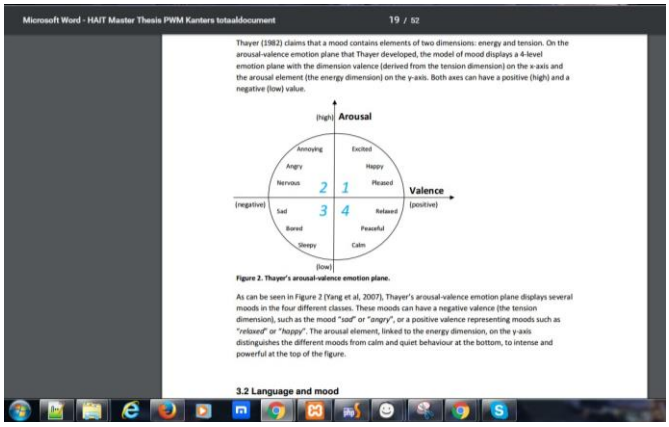

Figure 5.

Finally, the four-quadrant graph chart had simple outlined 'bubbles' that would encompass an area on the graph for one of the four quadrants. We kept this graph white, with the bubbles outlined in different colors and labels for each of the bubbles. When any mood is selected, the songs related to that mood the most, light up. This graph has an axis which helps us determine the reason for the placement of the song. We thought this would be easiest and the most user friendly to interpret the songs. Inspiration for this graph came from a graph in one of the recent research articles (Figure 5).

Figure 6. Late night researching the new literature on what elements of music evoke emotions and/or mood.