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Air DJ

Project Proposal:

I love music. Whether I'm working hard on a CS assignment or just browsing the internet, I am almost always listening to music. As a pretty heavy music listener, I have always wondered to myself if it would be possible to mix a few songs together and create a mashup of my own. After eagerly surfing the web for an app that would let me do just the thing, I quickly realized that using a mouse and keyboard is not the proper interface to work with music. This is exactly why DJ's use expensive instruments with knobs and dials so that they can quickly achieve the effect they are going for. I knew I had to do something related to music for my project, but was I really going to buy thousands of dollars' worth of hardware just to make another clunky app that only professionals would be able to use? No, I had to do something different, something that I could teach someone to use in 20 seconds or less.

Let me introduce you to AirDJ, an intuitive new method of convolving your music with your hands, and literally just your hands. No keyboard. No mouse. Just your hands. I will use a Leap Motion controller, a fancy device that gives me the (x, y, z) positions of every major bone in your hand at smooth 120 frames per second. Using this data, I can increase/lower the volume of a song as you raise and lower your right hand. Audio will be played using the PyAudio library, and system volume will be changed using osascript (AppleScript executer). Moving your right hand across the Z-axis, that is towards and away from your computer, will change the pitch/tone of the song. Your left hand can be used to control another song, or add beats to the current song you are playing. The GUI will display the changes to volume, pitch, and the added beats in an elegant fashion, so that you know exactly what is going on.

The complexity in this project is primarily dealing with the data from the Leap Motion. This data is very sensitive and sometimes inaccurate, so I must implement legality checks (number of hands in frame, type of hand (right/left), etc.) to only analyze accurate data when necessary. Another complex attribute of this project is playing multiple audio tracks at once while animating the GUI interface. This requires multithreading, which I must learn and implement. Changing the pitch when the user moves a hand towards/away from the computer will not be part of the minimum viable product as this would require me to do a Fourier Transform which adds another layer of complexity to this project.

Competitive Analysis:

Features:

1. Intuitive Controls: I will use a leap motion to let the user use their hands to convolve music making this process extremely natural and easy
2. Simple GUI: Other competitors fill every open space in the canvas with an extra feature. No one wants a clunky and confusing interface. By taking all the main controls off the screen (hands are used to control the mix), the screen can have a visualizer of your mix.
3. List of Albums/Songs: Instead of having to use a file manager every time you choose a new song, my program will find the songs in your folder and display them on the bottom. With a simple click, the new song will begin playing
4. Controls Visualization: Most DJ apps just have a simple slider or numeric indicator to show the volume of a track and a button to add a beat. My project will change the size of the song's disk as

you raise a lower your hand to clearly show you the volume of the current track. When you add a beat, the size of the beat's disk will animate to show you a visualization of the beat.

5. Easy to Learn Interface: Simple instructions on how to move your hands can get you started with my application in under 20 seconds. Other DJ apps require you to watch hour-long tutorials before you can use the simplest of features.

Competitors:

1. VirtualDJ: This is a free, professional app that lets you mix music with complicated controls. The app is extremely confusing and hard to use, and even requires you to buy professional DJ hardware if you want to stray away from using your mouse to spin the disks. My project is simple, easy to use, and uses intuitive controls using a cost-friendly Leap Motion controller.
2. Cross DJ: This is another professional DJ software that is marketed to both beginners and experts. The user interface is almost purely text based with fine-tuned controls and effects lacking in visuals. The unintuitive interface requires you to drag your mouse on numerous different knobs surrounding the screen to mix music which is unnatural. Since the user is limited to using the mouse, only one knob can be changed at once. My project enables you to use your hands to change multiple attributes of a song and even add beats, all at the same time.

	Intuitive Controls	**Simple GUI**	**List of Songs**	**Controls Visualization**	**Easy to Learn Interface**
Competitor 1 VirtualDJ	Bad (not present	Bad (not present)	Satisfactory (Present but not intuitive)	Satisfactory (Present but poor/confusing visuals)	Bad (Very hard to learn interface)
Competitor 2 Cross DJ	Bad (not present)	Bad (not present)	Good (Present)	Satisfactory (Present but poor/confusing visuals)	Satisfactory (Tutorials are needed)

Summary:

After researching other DJ apps, I realized that I should make my interface simple, and easy to use while still maintaining a complex level of control over your music. I will remove most of the controls from the screen, as your hands replace them, and illustrate intuitive visuals of the audio. AirDJ will introduce an instinctual method of convolving your music with your hands

Update 1:

Changes in tone/pitch of the song will be too difficult to implement in the constrained time as the feature requires me to do a Fourier Transform which is extremely complex.

Update 2:

I changed the interface slightly. There is one red circle in the center which represents the main track. There are four smaller blue circles in the positions (NORTH, EAST, SOUTH, WEST) which represent the beats. The user aims the left hand around the screen to hit the various beat-circles to overlay that specific beat. I also made a visualizer that reacts to changes in volume.