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EE 267: Virtual Reality
Project Proposal

We will build a project to control and experience audio with the virtual reality headset by integrating audio signal processing with the motion information from our headset. Additionally, we'll create a visual experience complementary to the audio. While there's a great deal of focus on making the VR experience as realistic as possible, we will accept the limitations and constraints of constructing a "realistic" experience and instead will create our own, intentionally non-realistic, visual experience with a focus on new, interesting graphics and interaction.

The main goal of our project is to construct a 3D audioscape. As the user turns their head, we will use the rotation data to change the audio mix of 3D soundscape's projection onto the left and right channels of the headphones. The rotation around different axes will control different parameters of the audio. We propose to break an incoming audio signal into its frequency components and wrap the frequency bins around the Y axis of the world. As the user turns their head left and right, they will hear different strengths of the individual frequency components depending on where they look. The pitch of the head will control the sampling rate of the audio signal, speeding up or slowing down the audio playback. The roll will control another audio parameter, yet to be determined. Some proposed possibilities are audio playback speed or volume.

In addition to the audio mixing, we will generate a visual equalizer in response to the audio and head motion. The user will be at the center of an HSV sphere and the rotation of the head will control the colors rendered to the screen. Additionally, the magnitude and phase of the audio transform will control the graphical renderings.

We'll use the built in `AudioSource.GetSpectrumData()` command in unity to compute the DFT of the incoming audio signal, as well as the `pitch()`, `spread()`, and `volume()` commands to adjust the audio parameters while constructing the 3D audio space. For the visualization, we'll use the Unity color library to render the desired colors onto our objects, with HSV values coming in from the headset position.

We'll have a better sense of the timeline to construct this project upon the completion of Lab 6.

References:

<http://docs.unity3d.com/ScriptReference/AudioSource.html>
<http://docs.unity3d.com/ScriptReference/Color.html>

