

Theodore Daly
Berklee College of Music
Music Technology Innovation

AR for Leap-Rift

I. Introduction

Augmented reality is defined as a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view. It is a layer of virtual reality painted over over reality. With the advent of new virtual and augmented technologies, such as the Oculus Rift or Microsoft Hololens, there is no doubt that this area of technology is gaining clout.

II. Culminating Experience

I am extremely interested in Augmented reality, and its application toward sound – specifically spatial audio. Thus, for my Culminating Experience I made an augmented reality panner in Unity. I did this by mounting a Leap Motion on an Oculus Rift (Leap-Rift), and downloading the Leap Motion assets package for Unity. This allowed me to get my hands in the scene with near zero latency hand tracking.

In Unity 5, one could output sounds in 7.1, 5.1, Quad, Stereo, Mono, and raw. One used to have to program what kind of audio output one wanted (aside from stereo and mono); Now audio all of these output formats are all native to the program, and one just has to choose output in audio settings.

The way I turned this from virtual to augmented reality was by enabling pass through on the Rift, and taking down the virtual walls. I had to do this because I see this as a way to do live spatialization of stems in real time, and thusly being able to see the audience is absolutely crucial.

The panner has multiple kinds of interactive sound objects. As you will see (or have seen) in my quadraphonic spatialized version of The Gorillaz “Clint Eastwood,” there are objects orbiting my head; all of those have sound effects attached to them. These I named in my Unity Hierarchy as “quaternion sounds.” I programmed them to circle around my head because they sit lower in the mix, so they aren’t too distracting while panning around. The actual reason they are circling my head is because of the script I modified from an original script I found on the Unity website. I did this so these specific sounds were “automated”, regardless of how far I hit them away.

The other kind of interactive sound that I have, I named as moveable sounds in my hierarchy. These are the sound objects that I do most of the interaction with during the performance, as they have the lead vocals attached to them. Generally I put these sounds in the corners to get a better mix, or just play around with them in the augmented world.

III. Innovation Factor

As far as innovation, this project is rife with it. Augmented reality is a relatively new concept, and solely making a spatial panner in Unity for AR is essentially unheard of. I have scoured the internet for people controlling spatial audio using augmented (or even virtual reality), and couldn’t find anything besides 4DSound for VR, and Microsoft HoloLens which has 3d sound in its brim already.

It is also a new way of thinking about spatialization. Instead of seeing the panner in ProTools or the GUI in IRCAM’s Spat, one sees the representation of the sound floating right in front of them. Its way more interactive than automating a GUI on one’s screen.

Also, as I will discuss later, as I came across problems – such as leap motion glitches or programming I wasn't capable of – I developed work-arounds. For example, when scripts weren't working the way I wanted them to I would change minor aspects of the programming to suit my needs better.

IV. Skills Developed

I developed many of new skills from this project. First I became a better programmer. Understanding how scripting works is becoming increasingly important in our computer reliant technological age. Unity supports both C# (Unityscript) and JavaScript. I learned a little bit of each language in Ben Houge's App Choir and Advanced topics class. However for these languages suit my project I ended up searching the Internet for scripts, seeing how they operate, and modifying them.

Another skill would be Unity. Knowing how to set up different things within the program's hierarchy was absolutely necessary for me to get my project to work. If I didn't learn these fundamental skills everything would be a lot harder to do with the tools provided.

V. Challenges

There were many challenges for me in this project. The first is that I was an extremely inexperienced programmer. I partially overcame this by taking programming classes with Ben Houge. However this wasn't enough for what I wanted, and for this reason I searched the Internet for different scripts from which I could take any manipulate to suit my interests. This helped me not only to learn more about C#, but also the inner workings of the script at hand.

Another problem I ran into was that I didn't know Unity very well. In the first few prototypes I used Max/Msp, but I couldn't get visual representation of my hands in the world box of the jit.phys world. Furthermore, when I tried to put the world box into the rift the physics the rendered objects would fail. For these reasons I had to abandon Max in favor of Unity.

The program also presented some flaws as I was building. The objects representing the vocal stems aren't tethered to anything, so if one hits the object too hard it will react without stopping and fly off the map. I overcame this by learning how to interact with the program, and to be gentle with the objects by moving them a little bit at a time.

The Leap Motion also provided me with some trouble as well. The skeletal tracking is decent, but not perfect. The hands glitch out and malfunction from time to time – particularly when I am running a lot of programs on my computer, or when I am in a bright place. I overcame this by relentlessly calibrating my Leap Motion and learning how it tracks best. One has to think – where can the leap motion recognize my hands so I can bring them back in the scene.

VI. Future Plans

I have a lot of potential plans for the future of this work. First I want to get it – or something similar - working with the Hololens because it is more applicable to AR than the Leap Rift. I want to be ahead of the curve when optimal AR technology hits the commercial market. Unity recently announced that it is going to support development with the Hololens in the future, so in that sense I am ahead of the curve already.

After that I intend to make a spatial DAW. One that can record, playback, and process live sound in real time. I see this as a market that is going to be huge in

about ten years. Though a program like ProTools or Ableton Live might have to be running in the background, being able to see where the sounds lie within a space, processing, and the levels would bring a whole new dimension to mixing, recording, and production which may give users a different sonic experience, and thusly might affect mixes and production.

Another thing I would like to look into would be new technology such as NimbleVR, and ControlVR. Nimble VR allegedly has better hand tracking than the leap motion, and it seems to be true judging by their promotional videos. Control VR was made partly for music production, and it has great hand tracking. Both of these items would be incredible to try.

VII. Conclusion

Augmented reality has drawn interest from many different industries. It could potentially be revolutionary for the music industry. Musicians and technologists should harness the power of this new technology to push music beyond the real world and into an augmented reality.