Groovin' in Transcendence Demo Description

Concept and Intention

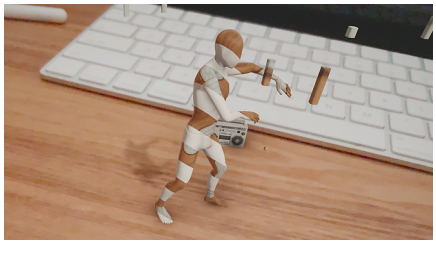
- Groovin' in Transcendence is a MOCAP-Augmented Reality (AR) project showing progressive, generative and interactive visuals on the dancing avatars that explore the idea of body forms in virtual and real spaces.
- Specifically, we aimed to create an audio-visual synthesis, to create new experiences of looking at the dance by making music and visuals sync to the dancers' movements. We Motion Captured of two of our own team members' dance performances as they are very passionate about dancing. The two dance forms that we chose were **Shuffling** and **Street Dancing.** Overall, we intend to present dancing performance engaging with the theme of **music visualisation.**
- The possibility of storing the data of the physical body as a digitalised version using Motion Capture Technique helped in the integration of the two worlds - digital and physical.

The reasoning behind our decision to use AR for our MOCAP project

- We were very specifically interested in AR due to its ability to create a digital extension of our bodies in physical space. That's why we were interested in the capacity of AR to create the illusion of our digital extensions performing in real life.
- We liked the fact that AR could break spatial and temporal limitations, allowing our users to watch and interact with the dance routines whenever and wherever (as long as there's a plane) they want.
- AR with plane tracking facilitates a great degree of flexibility and freedom that enables users to rescale the size of the avatars (they can make it either super large like a building or super small that can be put on the palm of the hand). The users can feel free to get closer to the avatars to enjoy the visual details.

Inspirations and References

a) An AR project called 'Betweener' from WOWAR app was our initial inspiration. This AR piece presents an avatar dancing in the virtual world, with his body textures generated from the real plane. It conveys the message that people welcome the upcoming era where the real and the virtual environments are getting more and more blended.



- This app mainly displays generative imagery based on the beats of the music. Although it does provide an audio-visual feast accentuating body movements, we think it lacks a certain degree of interaction between the virtual world and the user.
- While we took some visual reference from this artwork, as well as the technique of music visualisation, we have also considered adding more interactions that are tailored to the medium of AR.

b) Regarding implementing the technique of music visualisation, we took reference from a YouTube playlist authored by PeerPlay. For music visualisation, we also referred to a video by City of Melbourne Libraries.

c) VFX plays a very important part in our visual presentation. We took reference from a YouTube playlist authored by Gabriel Aguiar Prod.

We specifically referred to:

- Character Effects Tutorial (Skinned Mesh)
- Use SDF to make model particle effects
- Disintegrate Enemies
- Spawn Effect

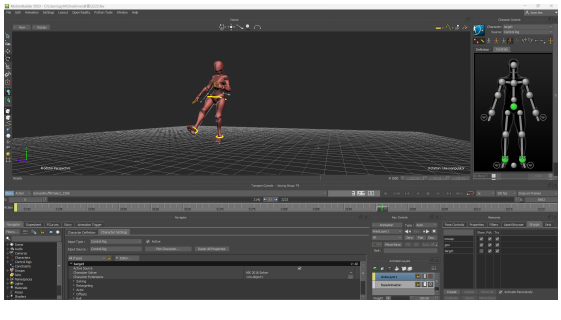
Technical Approach

In this section we have included the technical approach and the reasoning behind our decisions to implement certain effects.

1) Data Recording and Cleaning:

a) Data Recording - Using OptiTrack motion capture system, we focused on recording our dance movements with some compromise so as to minimise glitches. Otherwise we would have had the additional workload of data cleaning for a lot of hours. Recording until we got the MOCAPs that were close to perfect was our go to strategy.

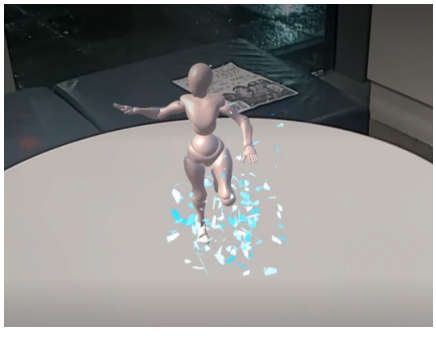
b) Data Cleaning - Since the majority of our data was clean, we just did minimal cleaning in Motive, and some joint rotation adjustments in MotionBuilder.



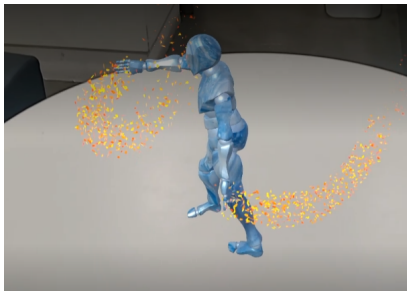
2) Visual Development:

a) Particle Effects

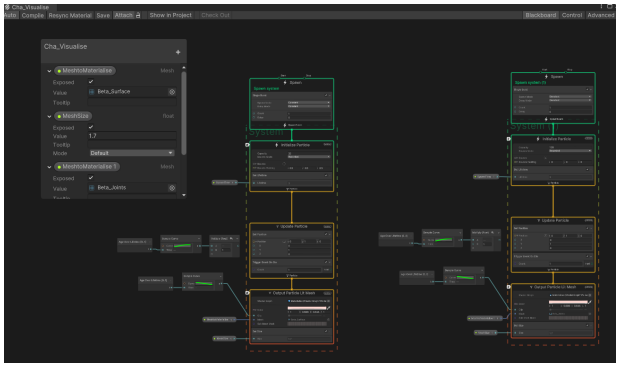
- **Particle Effects (Shuffling) -** We added particle effects to the feet of the digital avatar when it's performing shuffling. The reason was to enhance the movement of the avatar by nudging the user's attention towards the feet of the avatar. We did this because, as a dance form 'Shuffling' mainly focuses on the footwork of the dancer. In Unity, we used the default shuriken particle system to create the visuals, and added a script to spawn the particles when the feet of the avatar collides with the ground.

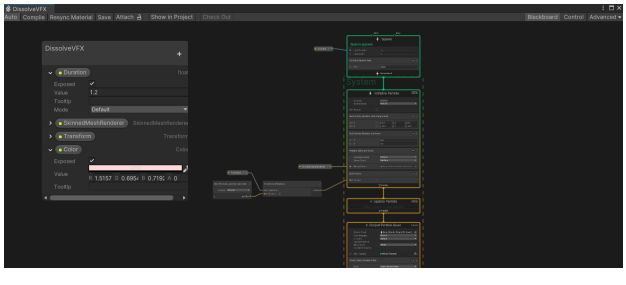


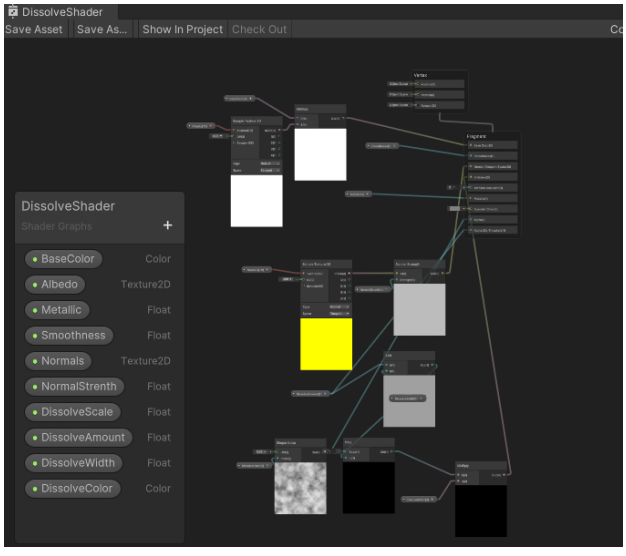
- **Particle Effects(Street Dancing) -** The second dance we motion captured was street dancing. For this particular performance, we wanted the users to focus on the upper body of the avatar. Therefore, in order to enhance the Street Dance MOCAP in our AR experience, we decided to attached specific particle effects to the hands. In Unity, we created the visuals using the default particle system and attached it as the child game object of the hands.



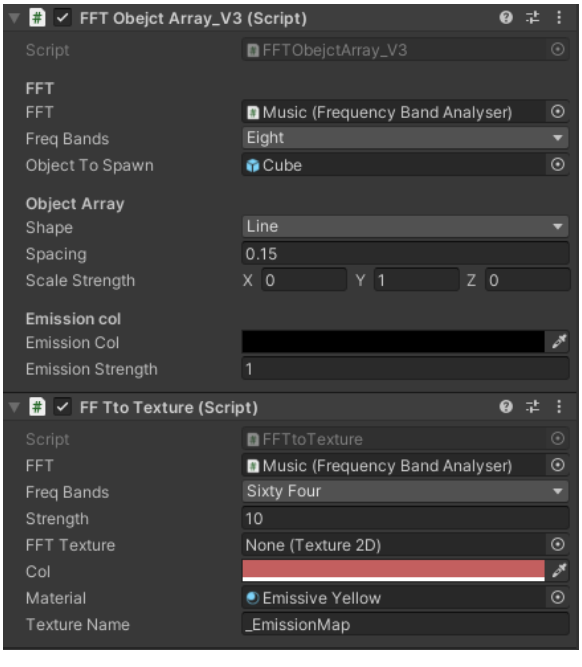
b) VFX - We used Visual Effect Graph for skinned-mesh-related and shader-related effects such as spawning effect and dissolve effect. This is for creating a more natural transition.





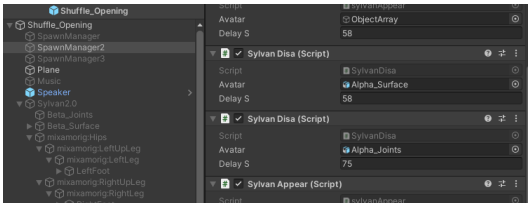


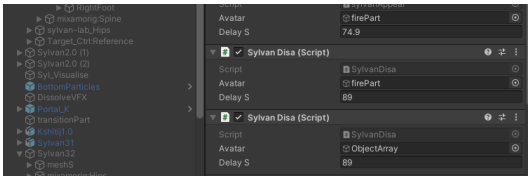
c) Music Visualisation - The initial purpose was to create a audio-visual synthesis. Then we also realised we could use this technique to allow people who have hearing disabilities . We employed FFTs (Fast Fourier Transform) to evaluate and translate audio inputs into frequency domain representations that could be used to generate dynamic and interesting visual effects that respond to music bands.



3) Programming:

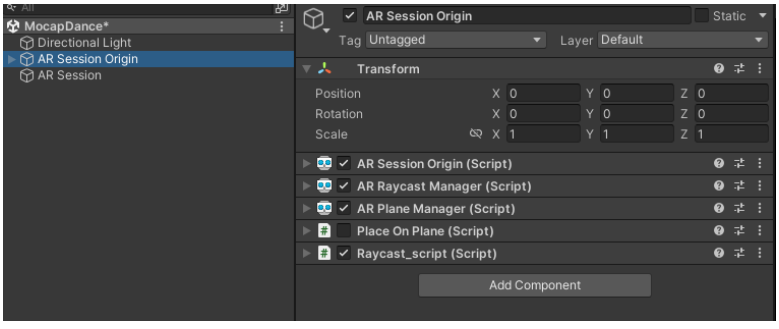
a) Coroutines in C# - To create visuals sequence that is synched to music, we used SetActive(true/false) with coroutines.

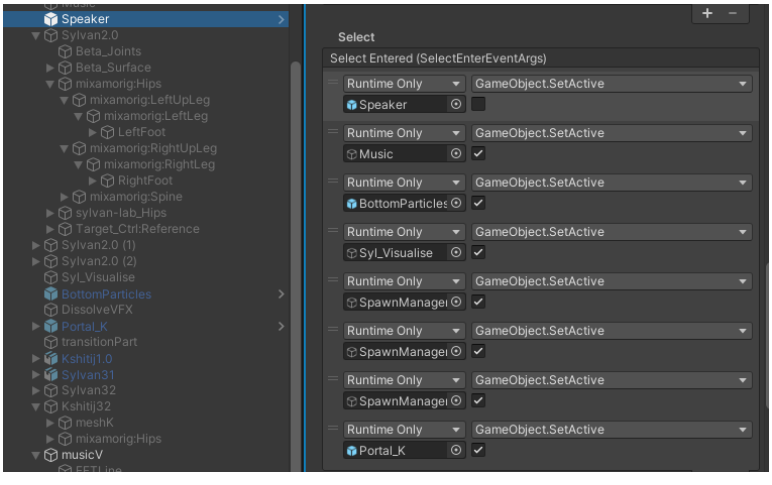


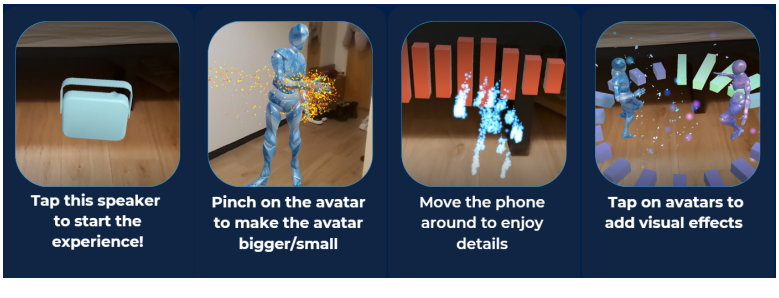


4) AR Deployment:

a) AR Interaction using ARFoundation SDK - The Raycast_script allows users to locate the avatars and scale them with freedom. The AR Selection Interactable script allows users to interact with AR content.







List of Tools and Assets

- We used **Motive** for Motion Capture and **Motion Builder** for Data Cleaning. The data was later imported to **Unity URP** to create the effects. And then **AR Foundation** in Unity was used to for implementation of our project in AR.

- We took the avatar models (X Bot & Y Bot) from **Mixamo.com**. The speaker 3d model is from **Unity Asset store**.
- The two songs that we used were **Casin by Glue** and **Dancin' (Krono Remix) by Aaron Smith.**