Digital Prototyping and Extended Reality
Rapid Prototype 2 – Statement of Delivery

Statement of Originality

I certify that all content (images, drawings and assets) used in the creation of this prototype are my own original work. Icons included in the Miro link were royalty free and obtained from flaticon.com. External sources and assets used in this project are outlined as follows:

- Record player and trash bin assets referenced in works cited
- Audio files used are royalty free and are not my original content
- Online Unity forums on how chare variables between scripts was consulted and is cited in my code and in the works cited.

Concept Recap:

The application that I have chosen to design extended reality (XR) interactions for is Spotify. Spotify is a popular music streaming app that allows users to play songs from their favourite artists, create playlists, listen to podcasts view artist information, and more. I chose Spotify because I believe music streaming applications in general present a prime opportunity for innovation and increased immersion in the XR space. The combination of audio and visual interactions has the potential to enhance the user experience. The 3 tasks I have chosen differ from my previous statement of delivery slightly, they are:

- Opening/closing a playlist
- Removing a song from a playlist
- Playing/stopping a song

My concept involves using space around the user to create a visual interface to manage songs in a playlist and play songs within playlists in a virtual space. To achieve a deep level of immersivity I chose to work towards implementing certain XR modalities and affordances. Physical modalities I aim to provide to the user include controller-based interaction, sound interaction and hand gestures. The user will be able to grab and move objects via the controller and hand interactions, whilst sound will be used to provide feedback of the current state of the system as well as appeal to emotional engagement guidelines. The following section will delve into detail on how these interactions are mapped to my tasks and concepts. Finally, I have chosen to change my application from a virtual reality environment (VR) to an augmented reality (AR) environment. My rationale for this change will be outlined in detail in the following section.

Hi-Fidelity Prototype – Design & Construction:

Transition from VR to AR:

As previously mentioned, I made the decision to change my application from a fully VR experience to an AR experience, where the user can see the world around them. My reasoning for making this change was because of my observations of individual seeming hesitant to move about the VR space. One participant also noted that they would have preferred to be stationary, whilst another noted that objects felt too large. I will admit these findings were surprising to me as I thought a VR experience would be more immersive and enjoyable.

Instead, I have decided to try and emulate a more real-world environment. The assumption that I made is that individuals will most likely want to listen to music whilst they are completing task, working at their desk for example. My goal was to build an experience that would fit in the most in this context. Therefore, I thought an AR experience would be most appropriate. I first started sketching out where I would place these objects positionally. The image below depicts this sketch. I assume the user is working at a desk at their computer and I placed the objects where I think they would be most natural to interact with.
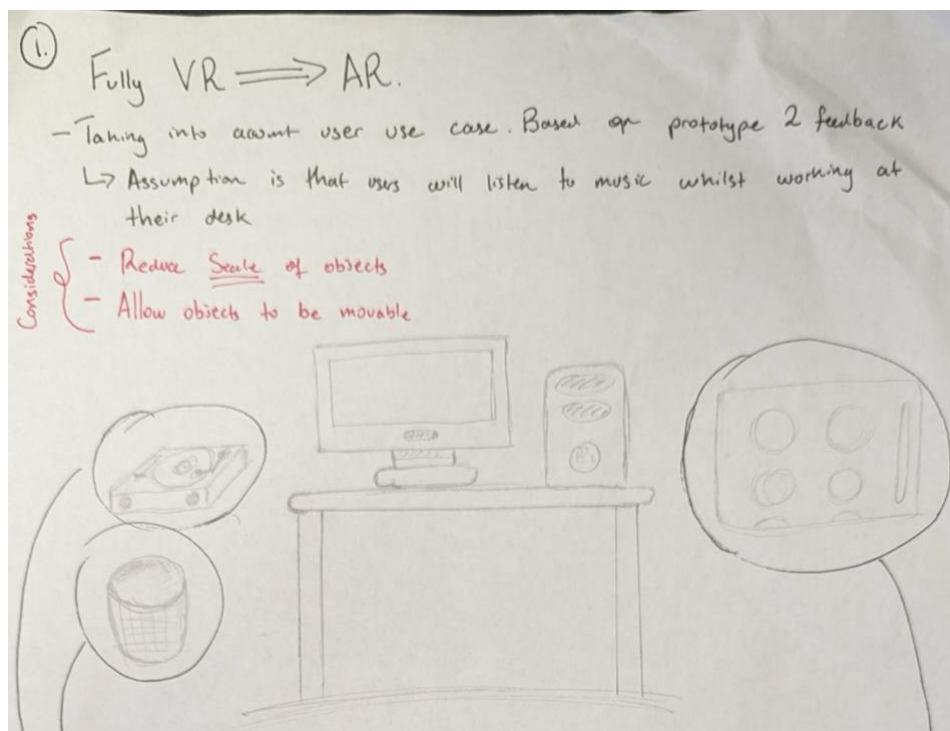

Figure 1 – Sketch of AR Spotify application

For each object I wrote about how I would design the interaction in unity and what aspects would stay the same. This writing can be found in my Miro board link at the

bottom of this document. What was important for me throughout the process was considering the context of use.

Playlist representation

One point of disconnect in my second prototype was the connection between my playlist representation and my other interactions. Therefore, it was important for my design of the playlist. Below is a sketch of how I was thinking to represent my playlist along with challenges I anticipated with the design written in red. The playlist is first represented as an album cover with an image and a menu is attached to it with each song being represented by a record.
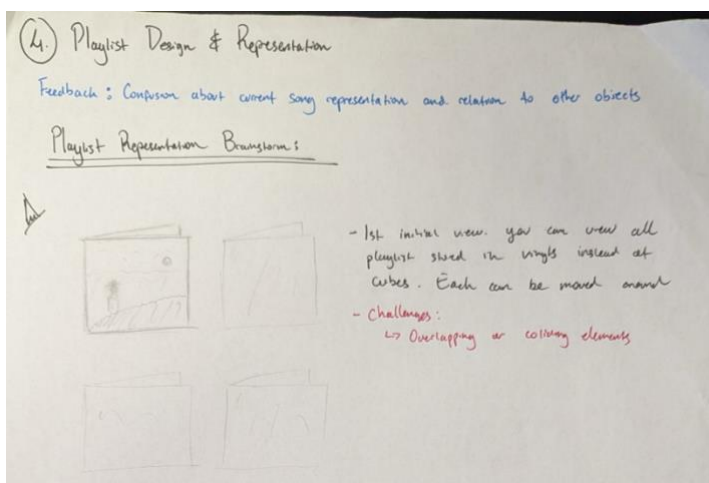

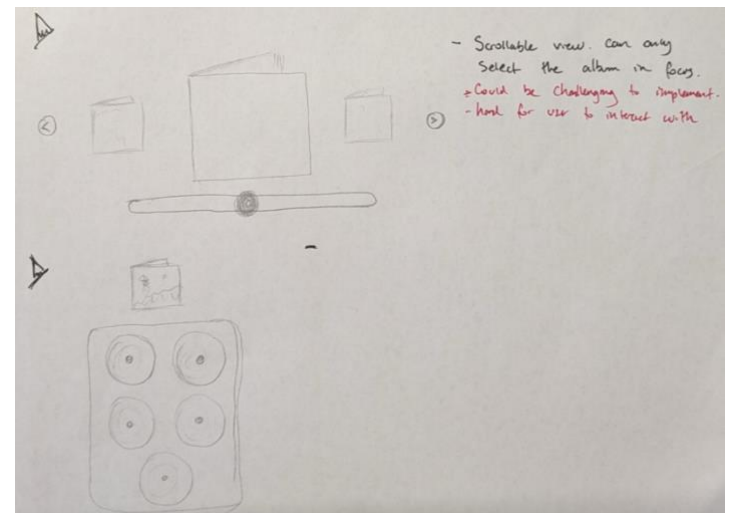Figure 2 – Playlist design and representation part 1

Figure 3 - Playlist design and representation part 2

After some work I was successfully able to replicate this design in Unity. Because of time restraints I only implemented 1 playlist. However, you can see the initial view of the playlist and the full menu view of the playlist.
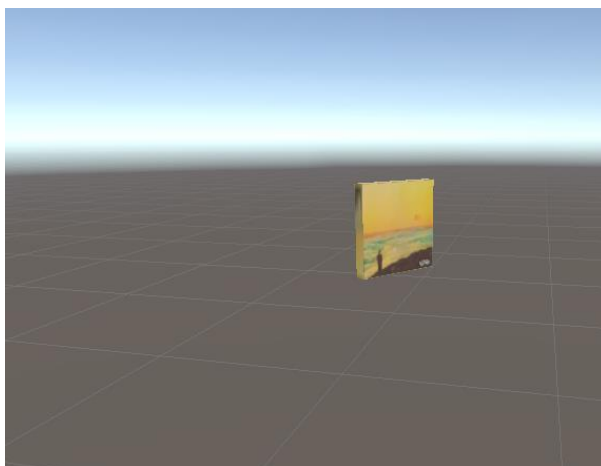

Figure 4 – Initial playlist view

Figure 5 – Full playlist view

Opening/closing a playlist

This is not a completely new interaction I decided to include, I did explore opening/closing a playlist in my first prototype. When the user first launches the application, one of the first things they see if the initial playlist view in figure 4. The playlist is positioned to the left of the users work station and they can grab and move the playlist in figure 4 as they see fit. When they poke the cube the full playlist view in figure 5 appears. When they press poke the close button in the top left of the menu the playlist reverts to figure 4 for a more compact view.

Removing a song from a playlist

This interaction has mainly stayed the same from my previous prototype as I think it worked well. I think the representation of a trash bin was appropriate, but many users said that the song disappearing was very abrupt. To mitigate this abruptness I added a time delay from when the record interacts with the trash bin collider. Additionally, once the record enters the collider area it turns red to indicate to the user that the sone will be removed. I placed the bin on the floor to the right of the user as they would expect a bin to be on the floor in real life. Figure 6 below shows the bin relative to other objects in the scene.
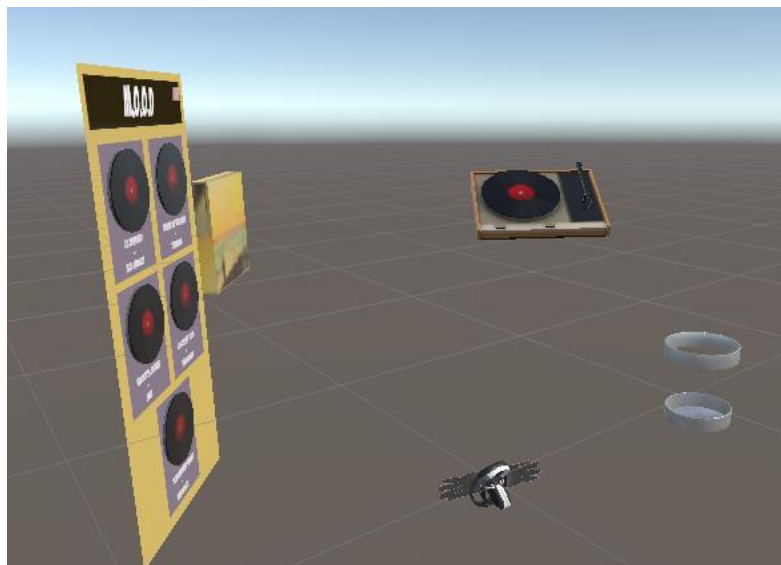

Figure 6 – Placement of objects in Unity scene

Playing/stopping a song

This interaction also remained mostly the same and little changes were made to it. Once a user drags a record towards the record player it will start playing once it interacts with the record player collider. Once they remove the song it will stop playing. The only change I made here was that when the user lets go of the record within the collider the record will spin hopefully giving more feedback to the user that the song is playing. I placed the record player to the right of the user and they are not able to move its position by grabbing like the playlist.

Figure 6 shows my completed prototype that users will interact with during my prototype. The playlist and record player are at desk height and are to the left and right of the user respectively when they start the application. And the bin is on the floor to the right of the user. Space and sizing were a huge consideration when making this prototype.

Purpose of Rapid Prototyping Testing Session 2:

The main purpose of this testing session is to test my concept at a high level and to see if the experience I have designed is intuitive, fun and immersive. Much like my second prototype I want to determine whether my application can be used with minimal instruction. One of the strengths of Spotify in my opinion is that it requires no instruction for someone to start playing around. I believe this is an indication of a good design that I want to work towards. I would also like to determine if the switch to an AR experience is enjoyable for the users. More specifically I would like to find out the following:

- Are the signifiers and interaction modalities afforded to the user intuitive and engaging (Users can use their hands to interact with the prototype now)
- Evaluate the experience of operating the application in a fully AR space
- Evaluate whether object placement is comfortable to the user

Prototype, Testing Agenda & Protocol

The testing protocol outline and script that will be used during the testing session can be found in Appendix A. My design process and general interaction flow can be viewed in my video and Miro board linked at the bottom of this report. Since one of my goals of this testing session is to observe how interaction modalities and affordances influence task completion: my initial instructions are kept broad.

The testing session consists of a brief introduction explaining what application the user will be testing, what tasks they will be asked to do and time for the user to familiarise themselves with the prototype and/or application. The user will then be asked to complete the tasks, and once they are complete a few short evaluation questions will be asked to the tester. Notes will also be taken whilst the user is completing the tasks and video will be recorded of each session to later be analysed to observe how long users took to complete tasks.

Hezekiah Owuor
s5853937

Practical 05
Shuvodeep Saha

Testing Results and Evaluation:

The following section outlines my results from my testing session. Table 1 below lists the participants and their tasks they performed. For each task I have described what the participant did as well as notes I took during testing, if any. Responses to my evaluation questions are also presented.

Participant	Task 1 – Opening/Closing Playlist	Task 2 – Play/Stopping Song	Task 3 – Removing Song from Playlist	Additional Notes:
Participant 1	Forgot they could grab/poke objects. Needed second round instructions of interactions available	Displayed some confusion when playing a song but easily stopped playing a song.	Didn't see trash bin in the beginning of task 3. Completed task easily after pointing out bin	Spacing of objects seemed to be an issue. User expressed difficulty accessing object Took a long time to complete tasks. Mainly due to object spacing and positioning
Participant 2	Poked playlist to open menu view	Completed this task easily and as intended	Dropped song above trash to remove it from playlist	Didn't notice the trash bin in the beginning of task 3
Participant 3	Grabbed playlist instead poking it to open. Poked close button to close playlist	Easily played a song. Was a bit confused on how to stop it but figure it out.	Successfully removed song from playlist as intended	Completed task easily but mentioned that positioning of objects was a bit inconvenient
Participant 4	Completed interactions as intended	Successfully played and stopped a song with intended interaction	Struggled to remove song due to physical objects being in the way	Completed the tasks with the most speed Used two hands to move songs around. Was glad to see flexibility in interaction

Evaluation Questions

How would you describe your overall experience completing these tasks?

Participant 1:

- Enjoyed the experience.

Participant 2:

- Space was an issue. Felt that the application wasn't very accessible from a seated position
- Would have liked to interact more with the record player, for example moving the needle to the player

Participant 3:

- Found the experience of completing the tasks enjoyable

Participant 4:

- Found the experience fun. Enjoyed the audio component of the application

Did you face any challenges when trying to complete any of the tasks?

Participant 1:

- Was a bit confused about how to start playing music.
- Would have liked to put the record player needle on/off the record to start/stop playing music

Participant 2:

- Reaching places was challenging

Participant 3:

- Moving song over to record player felt a bit fidgety
- The trash bin made sense but it's placement felt a bit weird

Participant 4:

- When grabbing a record from the playlist it was a bit distorted which was disorienting

Is there anything you would modify about the experience/interactions?

Participant 1:

- Would change the method of stopping the music

Participant 2:

- Restrict the rotation of the records when grabbed to two axes

Participant 3:

- N/A – After pressing further the user did not have any suggestion for modification

Participant 4:

- The orientation of the record spinning on the player was a bit odd. Suggested refining this

On a scale of 1-10 can you rate the difficulty completing the following tasks?

Participant 1:

Opening playlist: 8
Closing playlist: 8
Playing a song: 5
Stopping a song: 4
Deleting a song: 7

Participant 2:

Opening playlist: 8
Closing playlist: 7
Playing a song: 5
Stopping a song: 5
Deleting a song: 3

Participant 3:

Opening playlist: 5
Closing playlist: 7
Playing a song: 5
Stopping a song: 5
Deleting a song: 5

Participant 4:

Opening playlist: 7
Closing playlist: 7
Playing a song: 6
Stopping a song: 3
Deleting a song: 3

Evaluation Outcomes and Reflection

Overall, the testing session was semi successful, and I gained some valuable insights about the current state and future directions, I can take my prototype. In general observed that my users seemed more comfortable navigating the experience compared to my last prototype. I did not record any signs of fear in terms of scale. However, positioning remained an issue. Multiple users expressed trouble accessing some components to complete tasks. There was some initial confusion on how to complete some tasks, but it was encouraging to see that this time all users were able to complete some tasks with no assistance at all. This shows that my prototype is getting closer to achieving my goal of intuitive interaction with minimal interaction/intervention. Some users did not notice the bin or were confused with how to play a song unless given more instruction. In future it would be good to possible add labels and more written instructions in case users don't understand or are not confident in their ability to interact with the application. Essentially, I will consider ways to make visual affordances more cohesive in a way that tells a story. In future prototyping, I would like to explore playing with the scale and positioning of object more and also restricting the movement of certain objects in certain axes to reduce the "fidgetiness" off the application. My testing protocol was well designed but during the testing session I forgot to record some videos of participants testing. Because I only recorded two participants, I did not include time on task analysis in this evaluation which can be improved for next time.

Miscellaneous:

Link to video:

https://drive.google.com/file/d/1ye7wErZbYy35ZU3vZ2v2y9J5Ub156tNM/view?usp=sharing

Link to Miro Board:

https://miro.com/welcomeonboard/cVpkc1pidlhyU1BSbnpoUFFTTEgxY3BpbXBwdVNOcU9Ka1p3ZkR5T1g0NVhGMzZtZThEMGZoSnFTRkdlWVVWVXwzNDU4NzY0NTg5NTQ3NDc2NzkkxfDI=?share_link_id=13884337312

Works Cited

Best way to get variable from another script C# unity—Unity Engine. (2018, November 6). Unity Discussions. https://discussions.unity.com/t/best-way-to-get-variable-from-another-script-c-unity/720634

Record player | 3D Interior | Unity Asset Store. (n.d.). Retrieved 17 September 2024, from https://assetstore.unity.com/packages/3d/props/interior/record-player-4249

Trash Bin | 3D Furniture | Unity Asset Store. (n.d.). Retrieved 17 September 2024, from https://assetstore.unity.com/packages/3d/props/furniture/trash-bin-96670

Appendices

Appendix A – Testing Protocol Outline/Script

Introduction: Explain to the participants that they will be testing interactions for the Spotify application. They will testing 3 interactions relating to the Spotify application. The three interactions they will be tasked with performing are:

- Opening/closing a playlist
- Removing a song from a playlist
- Playing/stopping a song

Ask the participant if they are familiar with Spotify.

If the are **not** familiar; explain what Spotify is and walk the user on how to perform these functions on the mobile/web/desktop application

If they **are** familiar ask if the participant would like some time to re-familiarise themselves with the tasks they will be asked to perform in the mobile/web/desktop application

Present the prototype to the participant and explain what each of the objects represent:

- Explain that poking and grabbing are interactions that are available to the user
- Floating cube represent playlists. With each record representing a song which can be grabbed and moved around with their hands
- The trash bin and record player to your right cannot be moved around (do not explain to the user how to interact with these objects to allow them some autonomy).

Clarify to the user the context; they are sitting at a desk doing work at their laptop and want to play music from their playlist.

Once the user is ready ask them to complete the following tasks and think out loud whilst they are completing the tasks. Make sure to record video of them completing the tasks for time on task analysis:

Task #1: Open playlist

Task #2: Play a song

Task #2: Stop playing a song

Task #3: Delete a song

Task #1: Close a playlist

Conclusion and Feedback Questions:

How would you describe your overall experience completing these tasks?
Did you face any challenges when trying to complete any of the tasks?
Is there anything you would modify about the experience/interactions?
On a scale of 1-10 can you rate the difficulty completing the following tasks?

Opening playlist:
Closing playlist:
Playing a song:
Stopping a song:
Deleting a song: