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Practical 05
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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
- Unity documentation was referenced to figure out how to play a song
- Audio files used are royalty free and are not my original content

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. As outlined in my previous statement of delivery the 3 tasks I have chosen to design XR interactions for are:

- Adding a song to a playlist
- Removing a song from a playlist
- Playing 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, my application will be designed in a fully virtual reality (VR) environment as I believe this will give the user a more immersive experience.

Hi-Fidelity Prototype – Design & Construction:

As previously mentioned, my application will be designed in a full VR environment. Much like the previous prototype my first step was to conceptualise how I would

implement my concepts in Unity, and I did this through sketches and annotations. As a start I tried to conceptualise and sketch all 3 of my tasks even though I might not implement all of them in Unity. These sketches have also been included in my Miro board, (linked at the end of this document) however I will go into more detail in the following sections, whilst simultaneously referencing my relevant Unity work.

**Playlist Representation, Adding/Moving from Playlists:**

My first order of business was to conceptualise how to I would represent playlists in a VR space as this is the baseline of my design, and is what the next two tasks are dependent upon. Images below display my ideas of how to represent playlists. I decided to represent playlists in the cube and card form that I outlined in my first prototype. The floating cube will be the initial state of the system and the user can interact with the cube by grabbing it to move its position as well as tap the cube to get the full playlist.
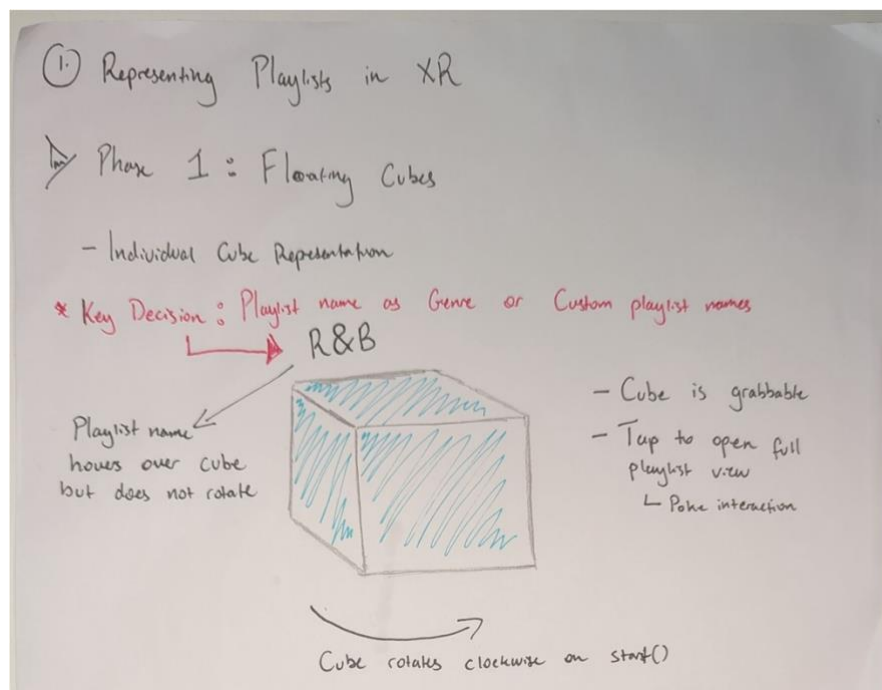
The image below shows my sketch of the full playlist view upon poking the cube. Each song is represented by a rectangular 3D object which can be grabbed and moved around as well. A song will have an image, song title, artist name and a signifier to indicate that the user can interact with the object. On the right side of the sketch I drew out some potential signifiers to indicate intractability to the user.
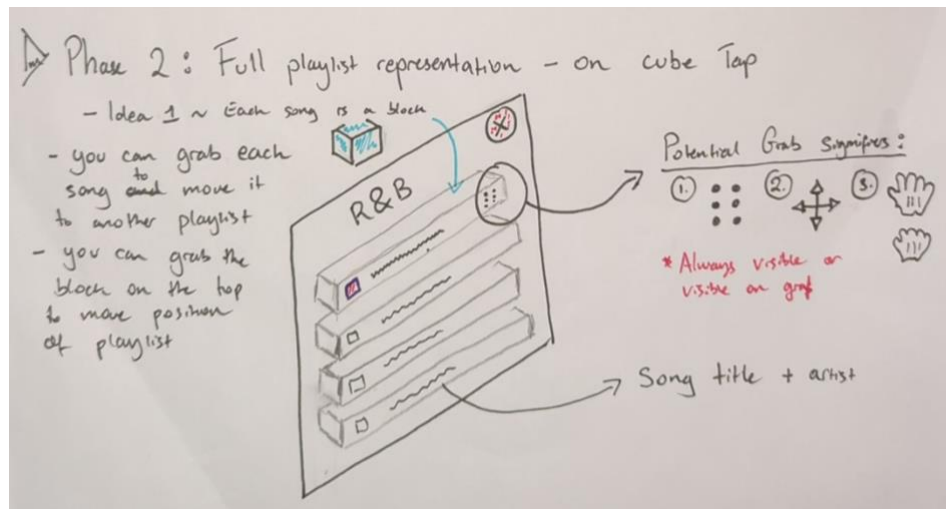
The image below shows a screenshot of my implementation of the above sketched in Unity. Due to technical issues and time constraints I excluded implementing some features I sketched out and prioritised functionality, for reasons which I will outline in the next section. Features I did not implement include poking the cube to view full playlist view, closing the playlist and song information and signifiers on each rectangle. I also chose not to implement moving a song to a playlist as I found this quite challenging to achieve programmatically. Grab interactions and collider interactions were implemented via a script.
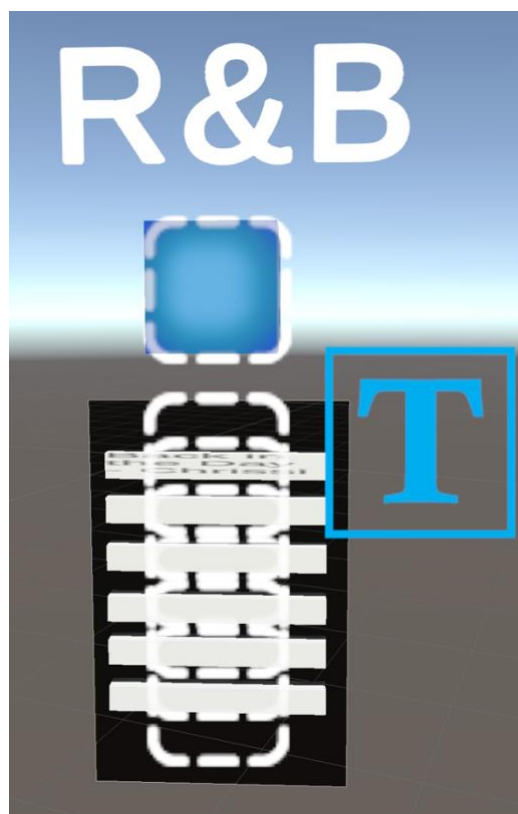
Removing Song from Playlist:

The image below shows my initial sketches for implementing removing a song from a playlist in Unity. I decided to keep my idea of representing this interaction by using a bin. From my learning in class and practical, my idea is to have an invisible collider area around the bin, that when the song collides with the area it is removed from the playlist.
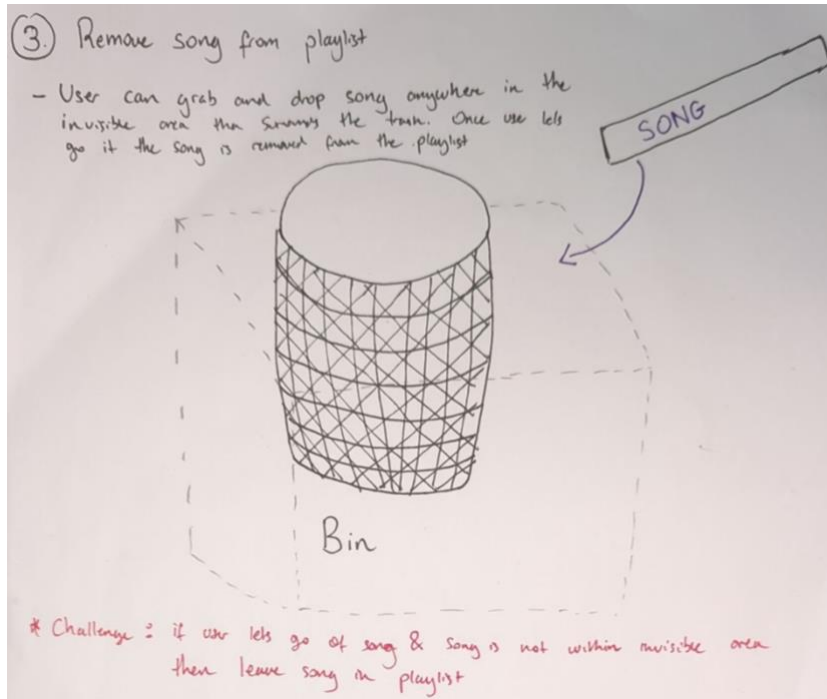

The image shows the implementation of this idea in unity. A bin asset from the unity store was used to represent the bin. The green rectangle around the bin is an empty object with a collider component attached which has a script attached to it. In terms of interaction flow, if a user wants to remove a song from the R&B playlist, they grab a song form the playlist via the controllers and move it towards the bin. Once the song collides with the bin collider object the song will be destroyed and disappear from the user's view.
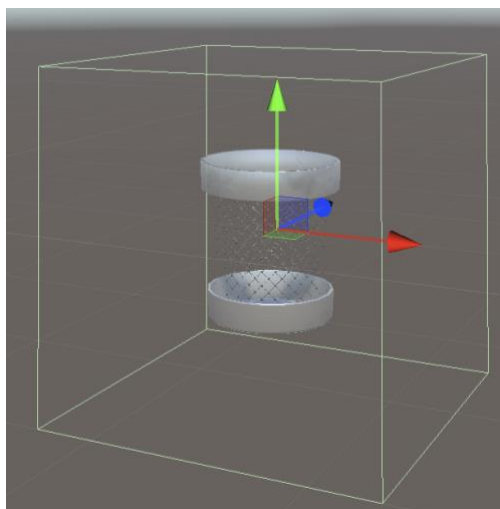
Playing a Song:

Finally, ihe image shows my sketches for the playing song task. To recap in my first prototype my intended interaction was for the user select a song and then hold the mic to their face to play song. However, based on feedback in my first prototype I have decided to consider changing the affordance of a microphone to another object that is more familiar like a speaker. Additionally, I will use the invisible collider functionality previously described to detect what song to play. It is important to note that the interaction flow has changed significantly for this task. Here a user will grab a song from the playlist via the controllers and move it towards the chosen signifier. Once the song rectangle interacts with the invisible collider the song will start playing. When the user grabs the song and moves it away and out of the collider zone the song will stop playing.
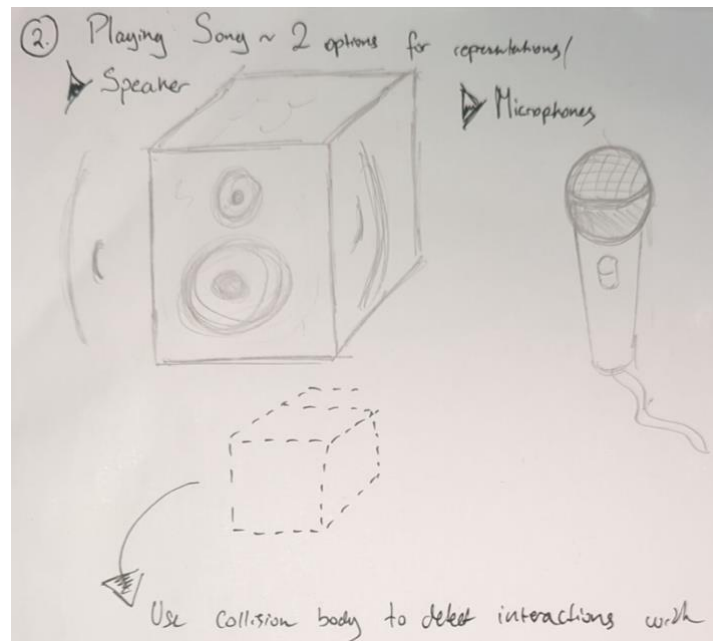
 The image below is the unity implementation of my the sketches above. I decided to use a record player as a signifier as I thought it would be more intuitive for the user to interact with. The record player was obtained from the unity asset store. The green box around the record player is an empty 3D object with a collider component attached to it. Script functionality to play the song is attached to the song object and not the record player itself.
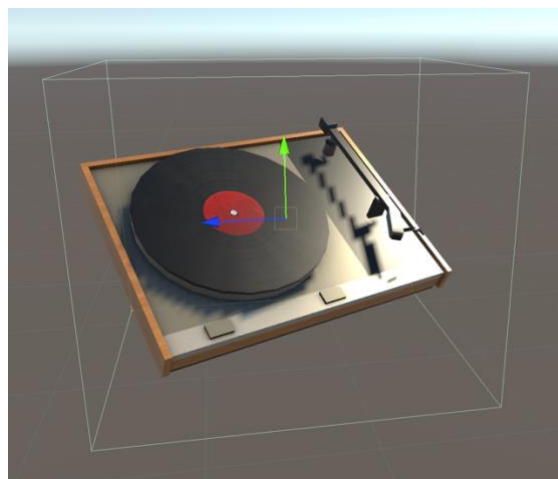
The image shows the completed prototype that users will interact with during testing sessions. The user starts in the middle with the bin to the left, the record player to the right and the playlist right in front of them. During development I found that my objects were way to far from the user and were too large, so I had to do a lot of refinement to make everything accessible. I did not consider space much during development which is important, and I will improve upon in the next prototype. Thinking about when and where a user will use my application would have informed a lot of design and development decisions and possibly saved some time tweaking.

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 first 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. Justify the design decisions I made in the previous. More specifically I would like to find out the following:

- Are the signifiers and interaction modalities afforded to the user intuitive and engaging (Controller interactions are required for this. Hand interactions have been excluded for now. Focus on functionality rather than flexibility currently)
- Evaluate the experience of operating the application in a fully VR space
- Evaluate whether object placement is comfortable to the user
- Evaluate how the inclusion of sound increases immersivity

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.

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Testing Results & 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 – Remove song from playlist	Task 2 – Play song form playlist	Additional Notes:
Participant 1	Initially did not see the bin at all Was confused at first tried to click on the blue cube Confused about grabbing technique	With some guidance was able to play a song and stop it from playing	Seemed confused at first on how to interact with the prototype at first. Really struggled to grab the white cube
Participant 2	Was confused about what white cubes represented at first Successfully removed song from playlist	Successfully played a song with intended interaction	Participant changed interaction with playlist between tasks 1 and 2 Did a little dance when music started playing
Participant 3	Successfully removed song from playlist Was confused if song actually removed from playlist initially	Successfully played a song with intended interaction	Seemed very hesitant and scared to move about the VR space. Completed task easily but mentioned that the size of objects was scary
Participant 4	Successfully removed song form playlist	Successfully played a song with intended interaction	Completed the tasks with the most speed Participant also seemed hesitant moving about the VR space

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Evaluation Questions

How would you describe your overall experience completing these tasks?

Participant 1:

- Enjoyed the new experience to play and delete a song from playlist. Described it as an interactive experience.
- Was confused on how to complete the first task in the beginning. Didn't know the connection between the white cubes and the trash before clarifying

Participant 2:

- Described the experience as fun. Enjoyed the system output.
- Found the trash can was a bit confusing. Would have liked more indication that it was there.
- Felt weird to put the song onto the record player. Maybe represent the song as a record

Participant 3:

- Liked the experience of completing the tasks.
- Found things a bit big.
- Liked the record player. Felt more intuitive than a microphone from previous prototype.
- Would have liked more feedback from removing a song. Felt abrupt

Participant 4:

- Fun and interactive.
- System was hard to understand if I hadn't guided them

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

Participant 1:

- Did not understand how to restart a song

Participant 2:

- Things felt a bit abstract. Would have like more structure and instructions

Participant 3:

- Would have preferred to be stationary, having to move between objects was overstimulating

Participant 4:

- It was challenging to understand what was initially possible to do. For example, the first thought they had was to grab the record player

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

Participant 1:

- Rubbish bin was hard to find. Could be better placed to be in the initial view. If I didn't tell them there was a rubbish bin, they would not have known it was there

Participant 2:

- Make everything more cohesive. Have visual representations of object more related. For example, records going to record player.

Participant 3:

- The layout of the experience and grouping of objects could be improved

Participant 4:

- Didn't understand the purpose of the large cubes above the playlist.
- Having things closer in proximity
- Having more song options/longer playlist

Evaluation Outcomes & Reflection

Overall, the testing session was successful, and I believe I gained valuable insights about the current state and future directions I can take my prototype. I was able to see how my design decisions and affordances I provided the participant influenced decisions. Firstly, it was encouraging to see that all enjoyed the overall experience of moving, playing and removing songs despite it being a bit confusing at times. After two prototyping sessions experimenting with giving minimal direction, I think it is clear providing instruction within the application could be helpful. This is because a common theme between participants was confusion on how to begin interacting with the prototype. In future I will consider trying to add things like popups and hints to guide the participant. Additionally, I will consider ways to make visual affordances more cohesive in a way that tells a story. For example, many participants didn't associate the song rectangles with the record player and needed some guidance. In this case I will need to reconsider my representation of the playlist and songs so that a stronger connection is formed between objects. Another large area for improvement will be use of space and immersion level. I did not consider that a VR environment could be intimidating or too immersive. It was evident by body language of participants that they felt overwhelmed throughout the experience. In future prototyping, I would like to explore reducing the scale and positioning of objects as well as possibly exploring an augmented reality (AR) setup. Overall, I am encouraged that participants enjoyed the experience of playing music, from body language I could tell including sound was something participants enjoyed. Finally, I had technical difficulties recording participant interactions so this is something I will work towards resolving in future.

Miscellaneous:

Link to video:
https://drive.google.com/file/d/1B9Ayaa5OaFWXK3h0vnJrORDcV47rYMph/view?usp=sharing

Link to Miro Board:
https://miro.com/welcomeonboard/cVpkc1pidlhyU1BSbnpoUFFTTEgxY3BpbXBwdVNOcU9Ka1p3ZkR5T1g0NVhGMzZtZThEMGZoSnFTRkdlWVVWVXwzNDU4NzY0NTg5NTQ3NDc2NzkxfDI=?share_link_id=13884337312

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Works Cited

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 2 interactions relating to the Spotify application. The three interactions they will be tasked with performing are:

- Remove a song from a playlist/liked songs
- Play 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:

- Floating cube and the card beneath you represent playlists. Each white rectangle represents at song which can be grabbed and moved around with the trigger button on the controller.
- The trash bin and record player to your left and right respectively 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 that they can move around within the space as they please

Once the user is ready ask them to complete the following tasks and think out loud whilst they are completing the tasks:

Task #1 – Remove Song from Playlist: Please remove any number of songs from the R&B playlist

Task #2 – Play a Song: Please play a song from the R&B 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?