
2024 - TEAM A

2208-901



VIRTUAL REALITY VISUALIZATION (VR)

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C. Purpose of Visualization

In today's world, more Americans face the problems of being overweight and obese as a result of the lack of physical activity and nutrition they get. This problem stems from many kids not being immersed in physical activity and participating in sedentary activities, all of which compromise their health. To combat this mentality against physical activity, it is important to teach kids the benefits of physical activity through interactive activities.

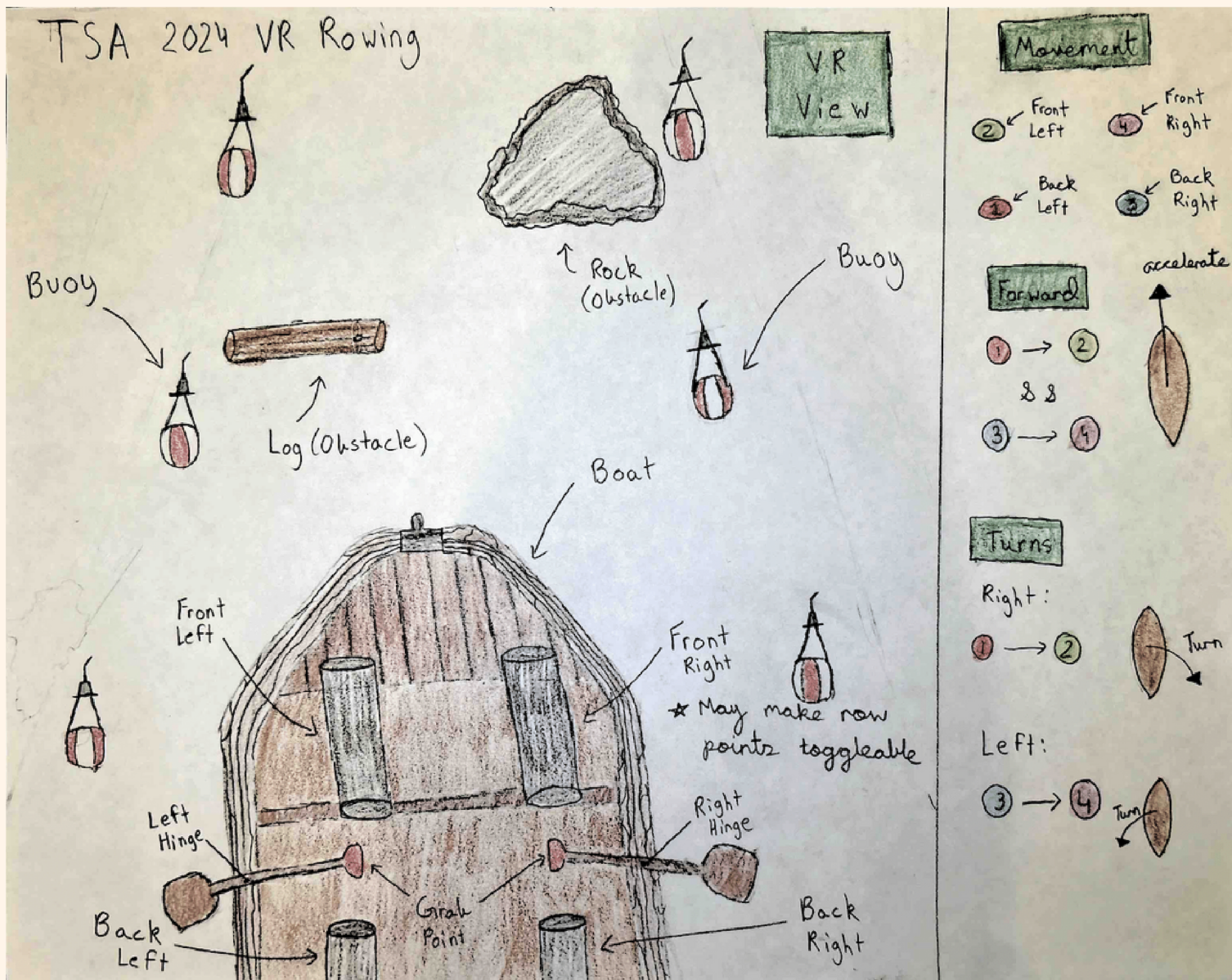
We accomplished exactly this with our visualization. We created a rowing game, Rowing Rush, where players can complete levels by rowing a boat and navigating in different courses. However, difficulty increases as the experience progresses, and the water current and obstacle layouts change to require more effective rowing from the player. Through the repeated back-and-forth motion that players perform, they are able to work out their arms while competing in challenges and fun levels. Additionally, our randomized Endless mode provides a great way to focus on endurance. This experience helps to excite physical activity by encouraging players to push themselves in order to improve their skills.

By using a VR system to create an immersive experience, we can create an enjoyable game that can captivate children and motivate them to exercise. The rowing aspect of the game takes inspiration from real-life rowing machines and the sport of rowing, both of which are proven to be excellent forms of exercise. Our focus on serene and calming environment design and decoration along with our hand-made soundtrack keeps the experience captivating and enjoyable, helping users continue exercising and improving mental well-being.

This concept of engaging users through virtual reality experiences will be increasingly important as technologies like the "metaverse" develop and as people in society need more interesting forms of change in their daily lives. By immersing a player in what would normally be an experience impossible to discover, we can create an enjoyable time while providing tangible benefits. By combining the concepts of intricate design, fun gameplay, and practical applications, we can create successful virtual reality visualizations.

D. Story Board

Main Story Board

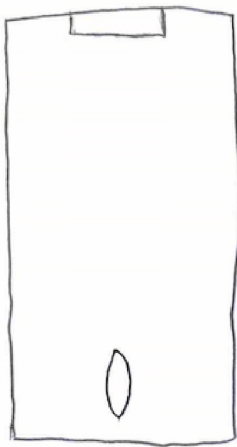


D. Story Board

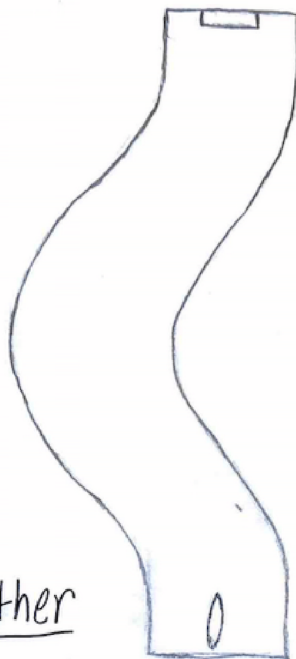
Level Design Layout

TSA VR Rowing Levels

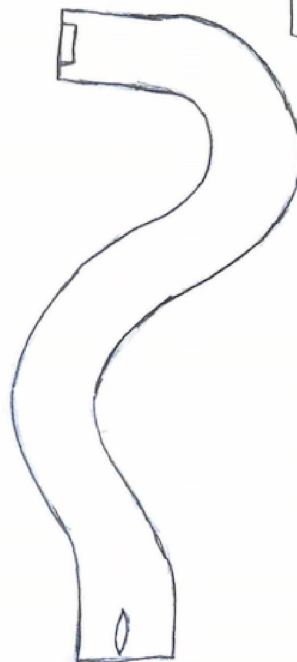
Tutorial



Level 1

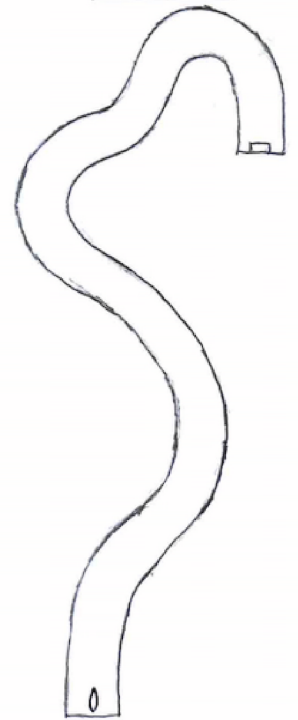


Level 2

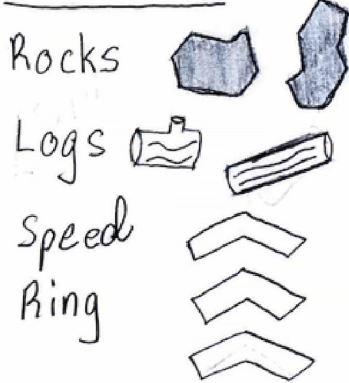


Themes
1. Islands
2. Forest
3. Mountains

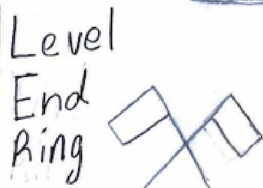
Level 3



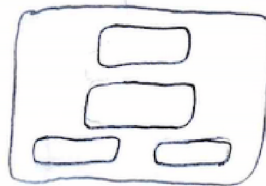
Obstacles



Other

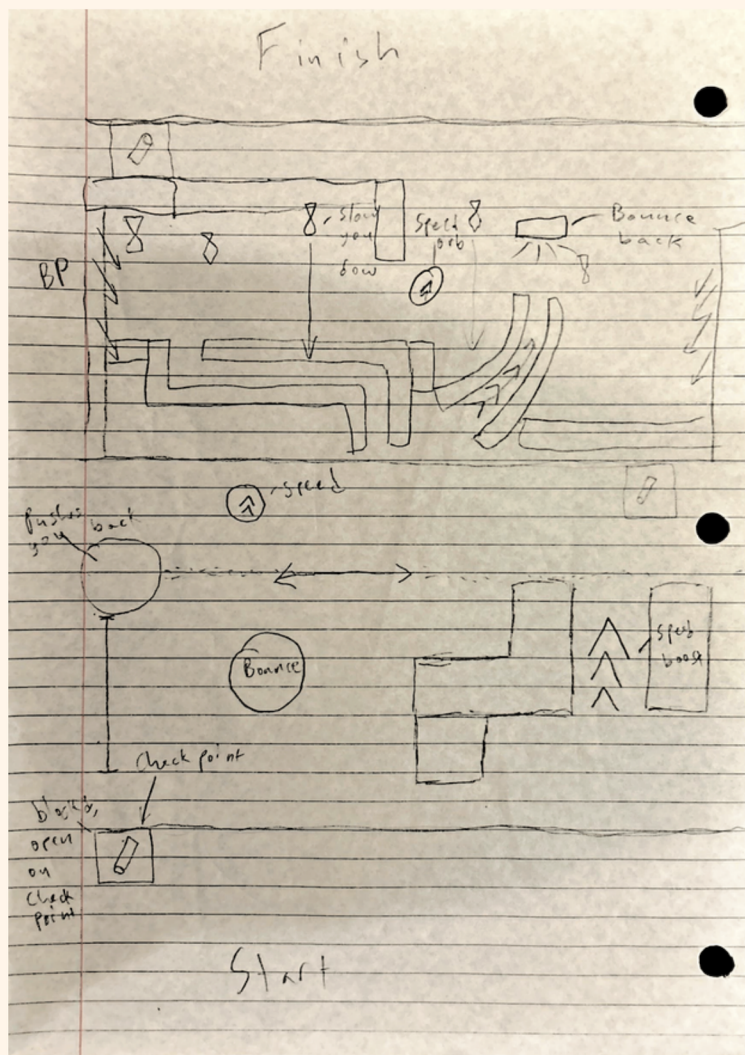
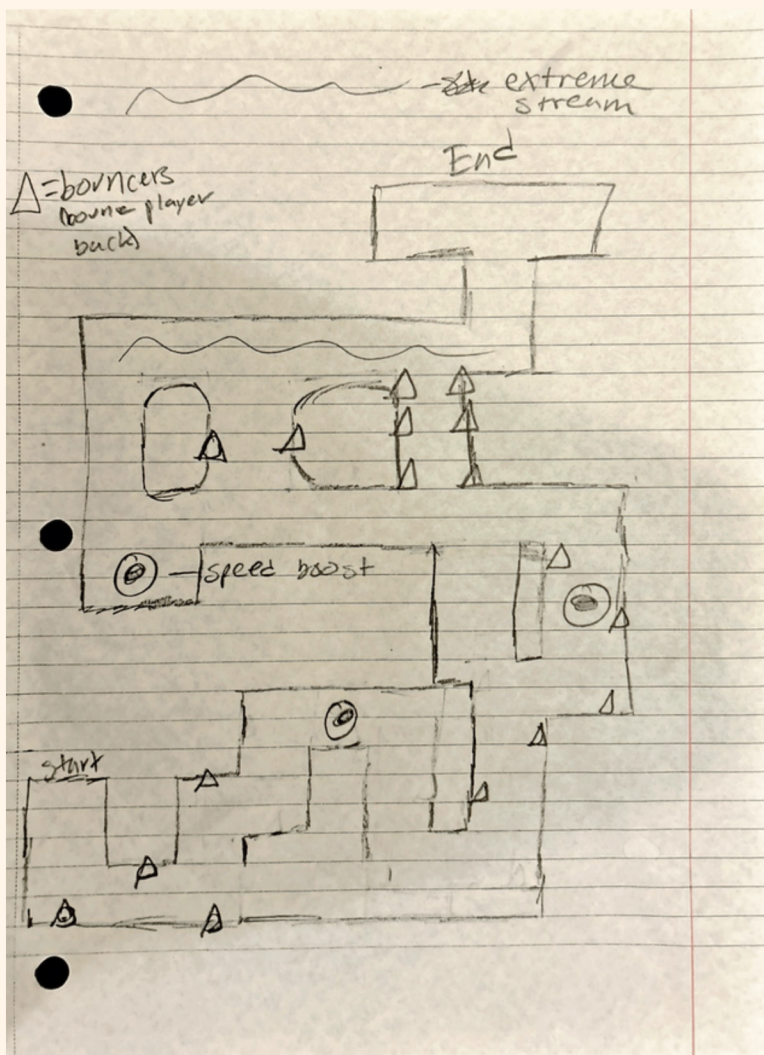


Menu

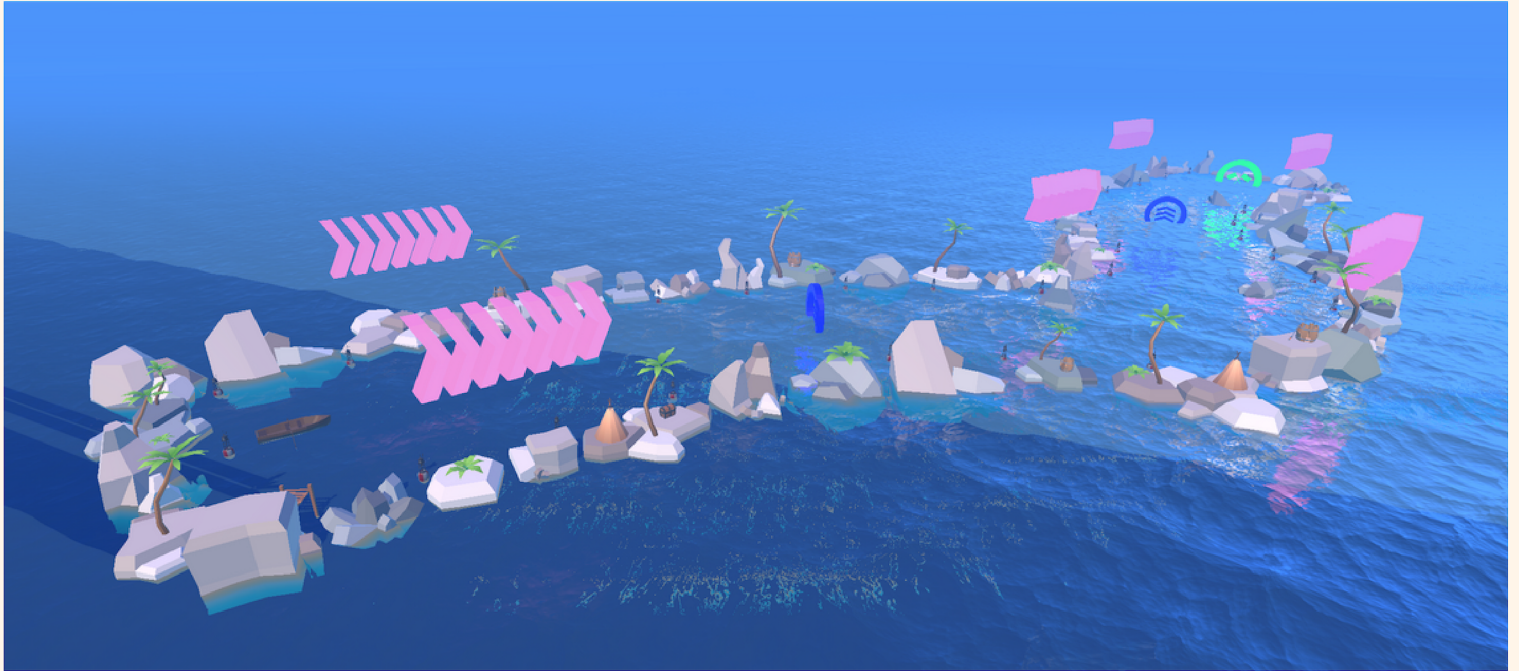


D. Story Board

Early (Unused) Rough Sketches for Level Design



E. Snapshots from Visualization



```

0 references
private void TurnRight()
{
    Quaternion newRotation = Quaternion.Euler(0, transform.eulerAngles.y + rotationAmount, 0);
    StartCoroutine(RotationLerp(newRotation, rotationTime));
}

0 references
private void TurnLeft()
{
    Quaternion newRotation = Quaternion.Euler(0, transform.eulerAngles.y - rotationAmount, 0);
    StartCoroutine(RotationLerp(newRotation, rotationTime));
}

2 references
IEnumerator RotationLerp(Quaternion newRotation, float duration)
{
    float time = 0.0f;
    Quaternion oldRotation = transform.rotation;
    while (time < duration && !(leftFinished && rightFinished))
    {
        transform.rotation = Quaternion.Lerp(oldRotation, newRotation, time / duration);
        time += Time.deltaTime;
        yield return null;
    }
    transform.rotation = newRotation;
}

```



Inspector

XR Origin (XR Rig)

Tag: Untagged | Layer: Player

Transform

Position	X: 0	Y: 0	Z: 30
Rotation	X: 0	Y: 0	Z: 0
Scale	X: 1	Y: 1	Z: 1

XR Origin (XR Rig)

- XR Origin
- Input Action Manager
- Locomotion System
- Continuous Move Provider (Action-based)
- Character Controller
- Continuous Turn Provider (Action-based)
- Snap Turn Provider (Action-based)
- Character Controller Driver
- Teleportation Provider
- Activate Teleportation Ray (Script)
- Activate Grab Ray (Script)

Detect Rowing (Script)

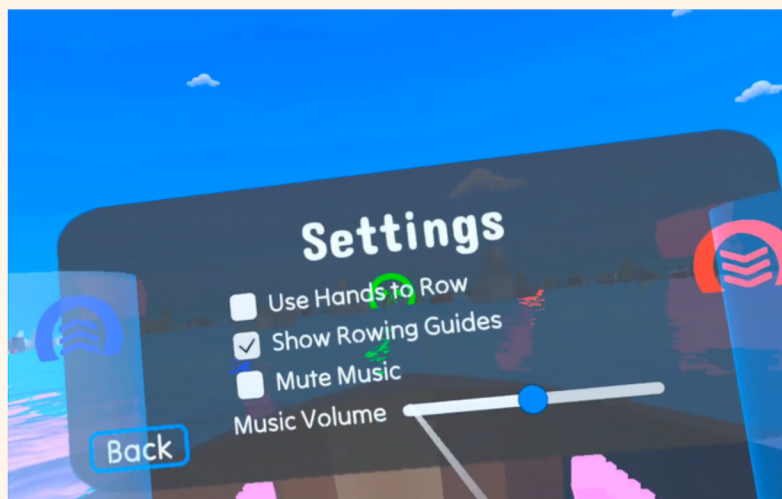
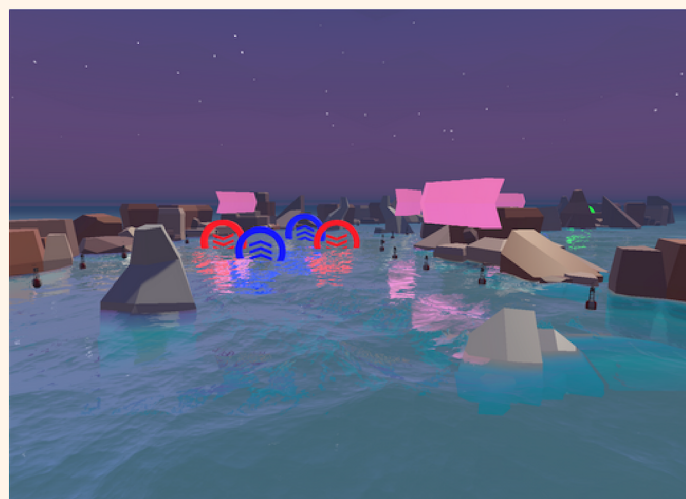
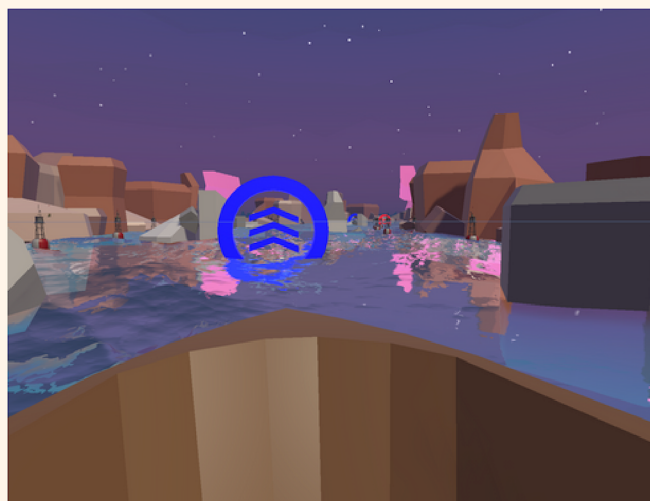
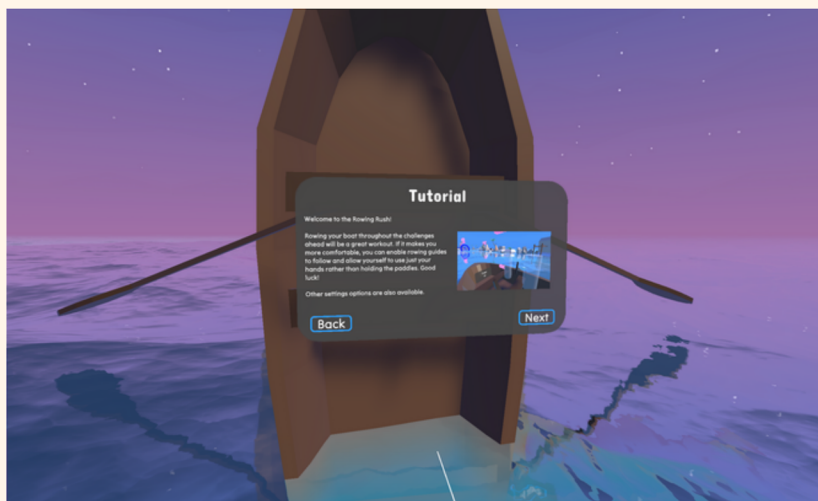
Script: DetectRowing

- Left Grab Ray: Left Grab Ray
- Right Grab Ray: Right Grab Ray
- Left Direct Grab: Left Controller (XR Direct Interactor)
- Right Direct Grab: Right Controller (XR Direct Interactor)

Rigidbody

- Mass: 1
- Drag: 0
- Angular Drag: 0.05
- Automatic Center Of Mass:
- Automatic Tensor:
- Use Gravity:
- Is Kinematic:
- Interpolate: None
- Collision Detection: Discrete

E. Snapshots from Visualization



F. List of References

Assets (some are unused in final game)

- **Awesome Free Scans - Wood Logs**
 - Freya Gameworks
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/props/exterior/awesome-free-scans-wood-logs-216756>
- **Boat Attack Water**
 - Unity Technologies
 - Unity Package
 - com.verasl.water-system
 - <https://github.com/Unity-Technologies/boat-attack-water>
- **Boats - PolyPack**
 - Alstra Infinite
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/vehicles/sea/boats-polypack-189866>
- **FREE Skybox Extended Shader**
 - BOXOPHOBIC
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/vfx/shaders/free-skybox-extended-shader-107400>
- **Low Poly Rock Pack**
 - Broken Vector
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/environments/low-poly-rock-pack-57874>
- **Low Poly Tropical Island Lite**
 - JustCreate
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/environments/low-poly-tropical-island-lite-242437>
- **Nature - Essentials**
 - Nox_Sound
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/audio/ambient/nature/nature-essentials-208227>

F. List of References

Assets (some are unused in final game)

- **Oculus Hands How to Make a VR Game 2022**
 - Valem Tutorials
 - https://youtu.be/8PCNNro7Rt0?si=NlDbG_ICCx-KgPpg
 - <https://drive.google.com/file/d/10b39lekUdpBHlcTslZ-BlnRyH5uqPUe1/view?usp=sharing>
- **Old Rowboat**
 - Gabro Media
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/vehicles/sea/old-rowboat-31917>
- **Rock Package**
 - shui861wy
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/props/exterior/rock-package-118182>
- **Simple Bouy**
 - Cross Walk Studios
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/props/exterior/simple-buoy-4734>
- **Snowy Low-Poly Trees**
 - False Wisp Studios
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/3d/vegetation/trees/snowy-low-poly-trees-76796>
- **Water Splash Pack**
 - Rocklynn Productions
 - Standard Unity Asset Store EULA Extension Asset
 - <https://assetstore.unity.com/packages/audio/sound-fx/foley/water-splash-pack-14039>

F. List of References

Music

- **Careless**
 - Original Music
 - Created for Visualization
- **Dreamin'**
 - Original Music
 - Created for Visualization
- **Ethereal**
 - Original Music
 - Created for Visualization
- **Rackin Up**
 - Original Music
 - Created for Visualization
- **Puff**
 - Original Music
 - Created for Visualization
- **LFO**
 - Original Music
 - Created for Visualization

F. List of References

Reference Videos/Documentation

- **How to make a VR game - Unity XR Toolkit 2022**
 - Valem Tutorials
 - YouTube Playlist
 - <https://www.youtube.com/playlist?list=PLpEoiloH-4eP-OKItF8XNJ8y8e1asOJud>
- **Boat Attack and Universal RP in Unity! (Overview)**
 - Unity
 - YouTube Video
 - <https://youtu.be/eYRidODuGu0?si=EGgWXsxTijK49Pdx>
- **Unity Documentation**
 - Unity
 - Online Documentation
 - <https://docs.unity.com/>
- **Blender 4.1 Manual**
 - Blender
 - Online Manual
 - <https://docs.blender.org/manual/en/latest/>

G. Software and Hardware Used

Meta Quest 2

As our platform for testing our visualization, we used the Meta Quest 2. It was very easy with this tool to connect our computer and the headset together through the air link and quest link features. Furthermore, using the controllers, we could perform tracking functions in our visualization aided by the Meta Quest 2's detection systems. Overall, with this platform, it made it easy for us to build and export our game to test in in Virtual Reality.

Unity

Unity was crucial software for building and designing our game. The structure of the game and graphical systems were set up through Unity, and the VR functionality would not be possible without Unity's OpenXR systems. Also, to develop our own game mechanics such as the custom-made rowing physics/movement system and the immersive row boat with paddles, Unity's scripting and component systems were used. Level design and decoration was very efficient using Unity's tools and asset systems. Unity was the basis of our project's creation and was fundamental to the development process.

Github

GitHub was a great tool for allowing all of our team members to collaborate and contribute toward the game. Through its build and push functions, each of our teammates could work on the game add new parts, and push the code back on GitHub for other members to add on. Furthermore, since this software was well integrated with Unity software, it made it simple to look at revisions to code as well as pull code for different sprites and objects that we coded for our visualization.

FL Studio

FL Studio allowed us to compose custom soundtracks for the game, creating a much more enjoyable and immersive environment. Using the in-depth tools, the team members with knowledge of music production created a set of music that would complement the levels and enhance the visualization. The powerful interface made the music creation process very streamlined, and allowed our team to set the mood of different levels with our music. Because of the flexibility in FL Studio, challenges like endless mode and Level 3 have faster, more intense tracks while the main menu, Level 1, and the Tutorial have slower, lighter music.

Blender

Blender provided a great interface for quick 3-D modeling that allowed us to make assets for the arrows, speed and slow rings, and level end rings. The process of creating shapes and extrusions was challenging to learn at first but worked well after enough time. The material and animation tools were also very powerful, but decided not to use them in the final product. Also, the streamlined approach of conversion from Blender projects to Unity assets was quick and easy, which made making models for our game efficient.

Adobe Illustrator

Our access to this software through our school was very helpful in designing the UI elements of our game. The pixel-precise options and flexible scaling helped create detailed menu buttons that were very reactive to the player. The process was very quick even though importing our illustrations into the game was challenging. All in all, this software was a great way to enhance the visualization experience and create a more professional feel.