

Hands on Deck: a VR sailing experience

Product Requirements Document

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Summary

We are aiming to create a shared sailing experience in VR where users can connect socially, learn real-world sailing skills, and explore a relaxing environment based off of the Puget Sound. Users will be able to interact by charting the ship's course, tying ropes for the mast, and climbing ropes and ladders to access different areas on the ship.

Project Description

The global pandemic of coronavirus has brought a great deal of hardship upon societies all over the globe. As social distancing looks to be the only way to curb the spread of the virus for the foreseeable future, people quarantined at home are looking towards technology as the primary means of safely communicating with friends, family, and peers. While video call platforms like Zoom and FaceTime are the most popular choice, we believe that virtual reality can provide an extra dimension, literally and metaphorically, in helping to bridge the current gap of social isolation. As a result, our group's project is centered around the idea of bringing people together through VR in the form of sailing.

Sailing is a cooperative activity, requiring "all hands on deck" to stay afloat and arrive at the desired destination. For this reason, we thought it would provide an appropriate setting to bring people together and promote group interaction. Additionally, sailing is a useful skill that many might not otherwise get to experience in their daily lives, so bringing it to VR can give people the opportunity to try something new, and maybe even inspire them to go out and try it in the real world (when the pandemic is over).

User Experience

Users will experience a sense of social interaction that goes beyond making a video call, a feeling of connection with others, bonding through the shared challenge of sailing. Moreover, they will learn basic sailing terminology and mechanics, all while enjoying tranquil scenery.

Hardware Platform/Device

Our first choice is to develop for the Oculus Quest, because it is more accessible than higher end VR headsets, which can be price-prohibitive. Additionally, when doing research on VR sailing titles, we found that there are only a couple for the Quest, one which is being promoted as an esport, and another which a boat manufacturer uses to simulate and teach how to operate their boats. Because of this, we felt that our project would provide a unique experience to be more friendly for all, on the Oculus Quest.

Deliverables

Minimum Viable Product

As a minimum viable product, the user will be able to grab a friend, or two, and work together to explore the world of sailing by guiding a ship through a tranquil environment inspired by the puget sound. In addition to the social aspect, we hope to include an educational experience where the user will be able to gain real-world knowledge of sailing terminology and master concepts like the points of sail in order to complete their journey.

Target Product

We will expand beyond the base experience by making all items and instruments on the ship interactive. This could include tying ropes for the mast, climbing nets and ladders to access different parts of the ship, repairing holes in the hull, and more elements once we build out the full ship. These added mechanics will allow for more ways that the users can engage with their environment and each other as well as contribute to rounding out the educational experience.

Stretch Goals

We have two primary stretch goals we would like to explore.

- First, we hope to emphasize teamwork in a challenge mode that puts the users' skills to the test in a variety of tasks and minigames based on our previously built interactions.
- For our second goal, we want to expand the number of users that can access Hands on Deck by adding support for other device platforms. We want to allow Magic Leap and mobile phone users to spectate VR teams as they voyage by giving them a literal birds-eye view, meaning they will be able to control birds that fly around the ship.

Performance Metrics

We will evaluate Hands on Deck by measuring how well it performs in the following areas:

- Realism: How well does it simulate sailing in real life? If there are concepts missing, were they left out intentionally? Is the scenery convincing on the Quest?
- User Experience: Will a user feel motion sick? If so, how do we reduce this? If not, is it too stationary that we are sacrificing realism?
- Functionality: Is there enough interactivity between users? Is there too much that it becomes distracting? And most importantly, is it fun? What aspects of the project make it fun?

Milestones

Week 1: Introductions and setting up the tools

Settle into class, get familiar with Unity, Oculus Quest, and Magic Leap

Week 2: Brainstorming ideas and coming up with our project

Ideate and select project, flesh out goals

James: Set up team website and first blog post

Patrick: Design logo for project

Abhinav and Julian: brainstorm interactive elements

Week 3: Project pitch and planning

Do research on potential interactions/networking in Unity, work on PRD

Abhinav and Patrick: research on assets and interaction physics

James and Julian: research multiplayer logistics

Week 4: Research and develop prototype

Make a prototype MVP which includes ship, water, and basic movement/interactions

James and Julian: Research multiplayer networking

Abhi: Work on water physics

Patrick: Work on ship structure/interaction

Week 5: Further build on prototype

Convincing water and final ship model with mock dock and placeholder island

James & Julian: Multiplayer

Abhinav: Continue working on water physics

Patrick: Work on wind/sail physics

Week 6: MVP

Finalize MVP / Host group planning session to refine second half/target goals

Everyone: Finish up anything left needed for MVP

Week 7: Going beyond to implement target

Work on adding interactive objects and scenery for target

Everyone: Tackle functionality for different interactive objects in parallel

Week 8: Target / Refinement / Stretch

Polish anything that still needs to be done, maybe begin working on stretch goals, starting with challenge mode.

Patrick: Look into sound effects and background music

James: AR and Mobile multiplayer support for spectating

Abhinav and Julian: Figure out how to transform interactions into minigames to maybe start developing them for challenge mode

Week 9: Refinement / Stretch

Finish stuff, implement cross-platform stretch goal if time permits

Patrick: Model birds

James: AR and Mobile multiplayer interaction; devices can control birds in game

Abhinav and Julian: Finish up as many complete challenge mode games as possible

Week 10: Final Presentation

Work of final presentation, final video, and present our finished project!

Everyone: Help make video and presentation

Materials and any external help needed

Scene Assets Needed:

- Boat
- Potential Objects:
 - Ropes
 - Crates
 - Wood objects with textures
 - Landscapes
 - Water / Wave shaders
 - Trees
 - Animals (At least birds)

Photon Networking for Unity, we will try the free version, but may potentially need features included with the one-time paid version.

Potential help with multiplayer networking: Oculus P2P or PUN, might be nice.

External help regarding sailing knowledge: we will reach out to our connections.

Budget

<https://assetstore.unity.com/packages/3d/environments/historic/colonial-ship-70472> - \$Free

<https://assetstore.unity.com/packages/3d/environments/historic/polygon-pirates-pack-92579> - ~~\$49.99~~ \$24.99

<https://assetstore.unity.com/packages/tools/network/photon-pun-2-120838> - ~~\$95~~ \$47.50

Total: ~~\$144.99~~ \$72.49

Risks and how they will be addressed

Risks for MVP from major to minor:

- Multiplayer - net code is in flux for unity developers and UNET (Unity Networking) is being deprecated
 - Possible fix: majority of developers use Photon PUN 2 pro so will likely go with that
- Physics:
 - Rope - tough to make accurate since it's very fluid in motion
 - Possible fix: don't use the actual rope on the boat and cut to a different set of objects that are more static to simulate knot tying
 - Barrel Rolling -
 - Climbing - need to make it feel like climbing a net but don't want to make it irritating or motion sickness inducing
 - Possible fix:
 - Wind/wave effect on boat - need to make the boat movement immersive but also want to avoid motion sickness
 - Possible fix: have option to disable boat rocking, give warnings for incoming wind before boat moves faster
- Motion sickness - combination of VR and being on a boat may induce nausea

- Some solutions would be basic approaches to reduce nausea such as point based teleportation, a slider to reduce boat speed, and reducing peripheral clarity (such as using mist)

Risks for stretch goal from major to minor:

- Integrating bird mechanics for Magic Leap
- Integrating spectator view for Magic Leap
 - Possible fix: Photon PUN supports VR and AR devices
- Integrating bird mechanic for mobile/tablet devices
- Integrating spectator view for mobile/tablet devices
 - Possible fix: Photon PUN supports VR and AR devices
- Scenarios for challenge mode that are engaging for all player level (novice -> semi-realistic)