

Project Proposal: *a VR Application for Rock Climbing Education*

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Introduction

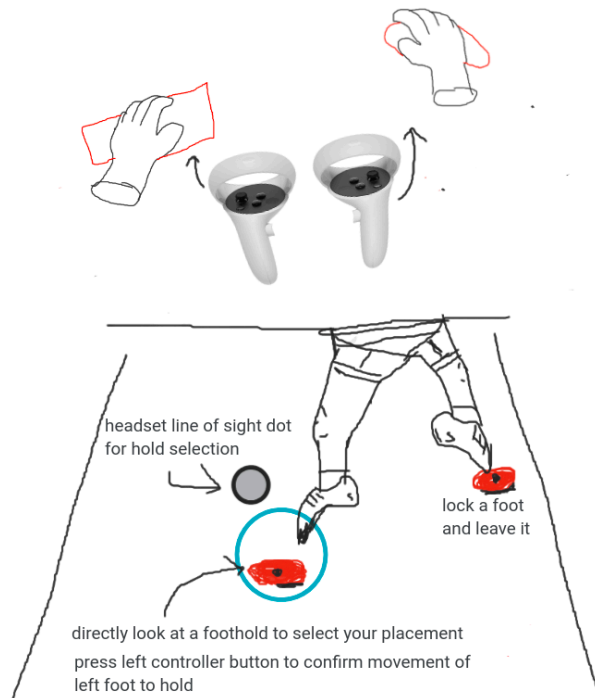
This project proposes a VR education solution for teaching aspiring rock climbers effective technique and exploring solutions to bouldering problems. With rock climbing becoming increasingly accessible, its popularity is introducing waves of new climbers to the sport. Due to its unique and individual nature compared to other sports, it can be daunting to get started as a beginner. This project aims at introducing new climbers to the different aspects of rock climbing, and inspire techniques and approaches to tackle bouldering and lead climbing problems without the need to set foot in a gym initially.

Initial Ideas

I would like to propose a VR application built with the Unity Game engine to create an immersive and educational rock climbing experience.

One challenge I needed to overcome was the inclusion of footwork. Footwork plays an extremely important role in rock climbing, and to make this application available, I would have to design a solution that excludes the use of body tracking. My initial thoughts are documented below using an informal Jamboard:

Climbing Project Mechanics



Hand Controls

Users use hands with gesture controls to use different types of grip for different problems. Grip will need to be adapted to different surfaces, types etc.

Hands and feet will have a "snapping" mechanic to holds, and each snap point will require different grips/positioning

Feet Controls

Uses eye line-of-sight dot to select footholds to move next leg too. User can control each leg move with button on L and R controller respectively

Possible dynamic menu or button system for different feet positions.

Feet positioning is extremely important.

Physics based "balancing" mechanic for users.

To summarize the mechanic:

- Hand controls will be implemented through the use of VR controllers. Different gesture controls or button combinations will allow users to explore the different grip types that one can use (Crimping, Half-Crimping, Open-Grim) and this allow users to explore appropriate types of grip for different hold types.
- Hands will use a “lock and leave it” approach, where once hands have been placed, users will be able to keep their hands snapped to a climbing hold.
- Feet Control will utilize the headset’s head tracking functionality to place a small dot at the center of the user’s viewport. Users will be able to select target holds to move their feet to, and will be able to make input via the controllers to select different feet positions
- The action of climbing will be carried out by analyzing the user’s hand, arm, leg and estimated body position to simulate their position on the virtual boulder, and will perform similar pulling motions to simulate the act of climbing. I will employ the use of a physics engine to simulate balance and stability

Suggested Design Approach

1. Firstly to inform the game, the core ideas, features and goals will need to be layed out. This will include the deliverable climbing techniques, the game's features and educational elements. A compilation of relevant sources and research will be put together to ensure intuitivity.
2. The design phase will take the research and initial goals and lay them out formally. By employing the use of wireframes, storyboards and planning, resilient evaluation of the design will be carried out to produce a work breakdown structure for the game.
3. The implementation phase will follow the structured breakdown for the game, focussing specific key features and milestones to ensure deadlines are met. Automated unit testing will be used to ensure functionality, and constant evaluation of the game state will inform the future implementation stages.
4. Evaluation and Testing: My goal for this project is for the application to be educational and intuitive for inexperienced climbers. To ensure this is carried out, I aim to survey groups of people unexposed to climbing on all aspects of the game related to the project's goals. I will also invite experienced climbers to ensure that the game’s mechanics provide a true and accurate representation of the sport.

Expected Results

This project aims to produce a functional VR application that runs on a modern VR platform and delivers an intuitive and educational experience for new climbers.

The project will provide:

- Insights and teachings on climbing styles and techniques such as bouldering and lead climbing
- Suggests approaches to solve different boulder problems, and provides a simulated environment to attempt these approaches
- Realistic simulated kinematics and physics
- Options to customize and adjust boulders or climbs.
- An evaluation on the effectiveness of the application from both experienced and new climbers.

Resources Requirement

The project requires a modern VR system (headset and 2 controllers), to be completed. Examples of these are the [Oculus Quest Systems](#) or the [HTC Vive Systems](#)