# VR Final Project Proposal

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## Introduction & Motivation

Many people do not go to gym often for various reasons. But it's too expensive to have your own fitness room built at home, and it's hard to find some exercise that is fun enough to make people exercise regularly and enjoy it. Thus, we are proposing the "Survival Game"! Image that you somehow got washed up on a very strange island... When you wake up, you found that you were been hunted by strange hunters, but you somehow can FLY! In order to survive, you will have to dodge their attack of stones, arrows and weapons. You want to survive as long as you can, find more treasure while earning as many points as possible to get on the top of leaderboard ahead of the poor souls that were on this island too.



## Technology Limitation and Solution

Currently a lot of games are developed using Unity for software, and potentially with Google cardboard for the hardware. We'll follow the same approach with Unity, and incorporate Google cardboard.

- Limitation

* Field of view is unnatural since there will be some distortion in the scene, and this will make the view unnatural to the player.
* Also there will be some latency in the pipeline, and this will seriously affect the user experience.
* Lack of haptic feedback. This can be improved to make the user experience more realistic.

- Proposed Solutions

* For us, playing the game in real-time is extremely important to the player since every split second in our game is important for dodging projectiles. Currently games all suffer from latency to some degree, whether it's because of the hardware or the software pipeline. In our case we won't try to render a very life-like scene since that would increase latency, but instead we choose to design a scene more focused on simpler parts, such as the projectiles coming towards users.
* Many games don't have haptic feedback, and this doesn't provide a realistic experience. While we might not have hardware that supports haptic feedback, we will simulate haptic feedback by having the player's view shake briefly and move backwards (simulating the head snapping backwards) when hit by an object.

## Rules of the game

Survive! And get as many points as possible before you run out of HP. We'll have a display in the top left corner of our view, showing the score and HP of the player. If HP goes below 0, the game is over and we will display the game over mode and sound in the scene, and record the score and rank among all players on the leaderboard.



+10 when successfully dodge one arrow.
+10 when successfully dodge one axe.
+50 when successfully dodge a "Fast Throw".
+50 when successfully dodge "Big Stone".
+200 when catch the treasure.
-20HP when the player got hit. (Each player has 200 HP total)
The players can continue play the game and earn score until they run out of HP.

## Technical Details

- Environment:

We will use Unity to render the virtual and the graphical environment for the project. The scene we want to build on an island where you will get attacked by primitives, hunters etc. We will use Unity to draw the scene, the Google Cardboard and the Smartphone to play the game. The environment will be a space the player can walk for a while

- 3D weapons

weapons, including arrow, axe and stones form catapult and stone age weapons will be in 3D using the skills we learn in the labs such as lens distortion, stereo rendering. We will also put the anaglyph effect in the object to make it better.

- Make it more realistic

When we got hit, we'll model the head moving backwards like how you really get hit in reality. That is to say, we will add 10 degrees to the elevation angle for a time duration, and change it back to the normal view. When the players get hit, they get hurt; thus, we will display a red flash on the screen when get hit to show "blood" to simulate this situation.



- Spatial Sound

The weapons can come with different sizes and speed. To make the game fun and let the players know their performance, we will count the point of each game, showing the points earn so far in the scene. In addition, we will add the background music to make it more realistic. In addition, when the player got hit, there will have the "being hit" sound. When the player successfully dodge the weapons from his/her left, there will have sound display from the left; similarly, right ear sound will be played as the player dodge the weapon from the right.

- Position Tracking & Flying

IMU in the smartphone will give us the position of user (user's XYZ coordinate), thus when the scene throw the weapons to the player, it can track the player as the hunters can actually see the player and aim. The player will always walk in a constant speed. While you move your head around, you can change the direction. We will set the limit minimun XYZ so the plater cannot go outside the boundary.

- Restircted Zone

Since the player will get attacked by the weapons, the places that the weapons can "pop up" are important. We don't want the player to get backstab and be attacked with the weapons too near to the player, thus, we define the following rules that limited the zone that the weapons can appear.
1. The weapons may only appear in front of the user. The user cannot be backstab.
2. The weapons may not suddenly appear in the radius of D. They need to give the user time to response.

**Milestones & Timeline**
- Week 1 (5/23-5/27):

Get familiar with Unity (C#), and set up the models for the environment.
Set up the weapons like stones and arrows, and define the boundary.

- Week 2 (5/28-6/3):

Build weapons firing scene, and implement the prototypes of weapons firing.
Write the script of the restricted zone and the weapons aiming functions and player flying.
Set up the scores in the top left corner of the view, and write its script.

- Week 3 (6/4-6/9):

Finish the whole sene and game.
Find friends to try out the game and ask for feedback.
Improve the user experience and final tune of the game, and it's Demo Day!

**Related Work**

As VR games getting popular these days, there are lots of VR games on the market now. So it' not hard to find the related works of VR games. Pen Island VR game is the closest related work, it's launched by ReaVR Games on Stream, part of it is also a dodging VR game, but it can trace hand movement thus the player can wave hands to dodge. Most VR games often include complex hardware to trace the hand movement. We want use simple headset hardware with IMU to build a fun game that let people exercise with joy. For this two-week project, we will focus more on the dodging part, training player's agility, and utilize the skills we learned through the to build a fun VR game!