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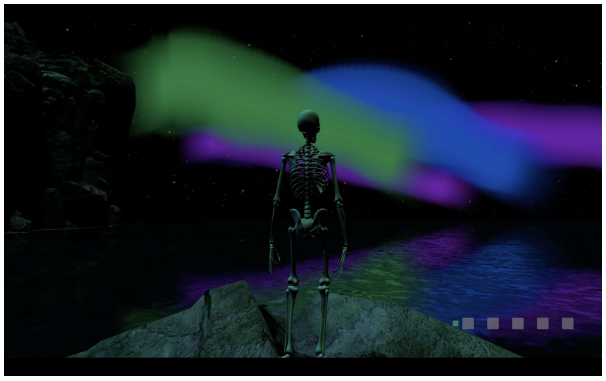
EE267 Final Project Proposal

Overview: Our final project will be creating a virtual reality stealth action video game in Unity. The game will have a time mechanic that allows the user to save specific states in time and return to them at their will. This allows the player to experiment with different routes through an environment and to easily recover from mistakes. Unfortunately, this mechanic also results in the player teleporting around the scene, which is acceptable for a third person game on a conventional screen, but may cause discomfort issues when implemented in virtual reality. We worked on third-person stealth action game in CS248, but it was only designed to be played on a conventional screen. Some of the mechanics for our VR game will be inspired by our old game, but we plan to totally rethink the stealth and movement mechanics for VR. Our main goal will be to keep the game demo as innovative as possible while keeping the experience comfortable, immersive, and smooth (performance). The biggest mechanical issue will be the low field of view of a 1st person perspective. Many stealth games are in 3rd person, but we don't think that viewpoint makes good use of the capabilities of virtual reality, so we will be making the game in 1st person. In order to get a higher field of view, we will use an Oculus Rift rather than our class headset. Since this is a stealth game, it relies heavily on the player's situational awareness: the player needs to be able to know if they are right next to an enemy, otherwise they may be caught without ever knowing why, which would result in a frustrating and not very fun experience. To combat this issue we will rely on spatial sound to ensure that the player can have precise auditory cues about the positions of enemies outside their field of view. We will also consider balancing the enemy's AI so enemy's can only catch the player if there is a line of sight from the player's eye to the enemy's eye. While this is not realistic it guarantees the player will not suffer any "unfair" losses. Another major obstacle will be performance. In our final builds of the 3rd person game we were not able to get a consistent 60fps experience on a single screen, so we will need to heavily optimize our new VR environment. We will design the environment from the ground up to minimize the number of objects on screen at any one time and possibly allow for consistent occlusion culling.

We've attached some screenshots from our 248 game for a general idea of the theme we are going for. We will be creating a new environment / scene which will be optimized for VR, but we may reuse some assets from our old game.


The player must avoid cloaked enemies to reach the end of the level.




We'll likely change the UI so it is easy to view in VR and ensure that the "traces" left for traveling through time are easily visible but not too distracting. We also plan on making time travel smooth as it can be jarring, even in third person.

Previous/Existing Work: A significant amount of work has already been done in the realm of virtual reality environments, including a large quantity of virtual reality video games. It's clear that the availability of HMDs to the public market has made VR a "consumer-level commodity" (Azmandian, Grechkin, Bolas). In a paper titled "The redirected walking toolkit: a unified development platform for exploring large virtual environments," the authors go into detail about movement in VR as well as other details such as how shape and size can cause performance issues. We will likely keep these issues in mind as we go forward with our own project as we would like to have smooth traversal in our environment while avoiding performance issues. The paper also notes that although it presents a "promising low-cost solution [...] it has not become a practical solution." For us, reorienting the player would likely make the experience clunky, so we may not use location tracking in our project.

New / Creative Aspects: We think the time travelling aspect of our game is fairly new and creative for a stealth game. We also have not seen this feature in any current VR games on the market. One interesting consequence of this feature is that it establishes a mechanic for teleporting the player through space, which is necessary in most VR games due to the limited playable area when using positional tracking. While we most likely will not have time to implement positional tracking into our game, we think this could be a natural extension of the demo we will implement which could eventually help to make a full game.

Another unique feature we plan to implement relies on the head tracking features of VR headsets. Since we want to create an immersive stealth experience, we plan to tie together the movement of the player with the sound they make. Turning around in a large circle will cause the player to make noise in game which the enemies detect, so when the player is hiding they will be incentivized to remain totally still, as might be the case in real life. We also may experiment with the AI being more sensitive to fast movements from the player to encourage players to be deliberate and thoughtful with their movements.

Timeline/Milestones: Our first goal will be to get a virtual reality HMD working in Unity so we can use it with our existing project (2 hours). From there, we'll have to get head tracking working so camera movement is tied to the player looking around (3 hours). After this, we'll implement player movement around a simple scene (4 hours). Then we will add enemies to the game with AI that is sensitive to the player's action as described in the previous section (8 hours). Then we will work on implementing a good sound system which allows players to have a

sense of how loud they are and where exactly enemies are (8 hours). Finally we will spend the remainder of our time implementing a basic environment to make the game demo convincing.

Citation

Azmandian, M., Grechkin, T., Bolas, M., & Suma, E. (2016, March). The redirected walking toolkit: a unified development platform for exploring large virtual environments. In *Everyday Virtual Reality (WEVR), 2016 IEEE 2nd Workshop on* (pp. 9-14). IEEE.