Computer Science and Engineering
University of Nevada, Reno
CT Games
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Abstract

This project aims to showcase all of VR-step's capabilities using Unity to create a Virtual Reality 3D Pacman game with a twist. The game involves a lot of movement, so VR-step is essential in creating a truly immersive experience. Rather than use an external camera or joystick, the game's movement will rely on real-time pedometry.

The game will end when Pacman has either collected all the balls (including those that allow him to eat ghosts) and has returned to the center of the maze or Pacman has lost all lives. There will be interactive map features where using certain items, like springs, will fling players to different parts of the map or even place them on the walls or roof for a different perspective. Mazes will be generated randomly and players spawn in random locations. After a certain amount of time if Pacman has not found any of the ghosts, the ghosts' outlines will be shown to Pacman. However, if Pacman were to find a tracking item, the outlines of the ghosts' will always be shown for a certain duration of time. . There will be a lot of control given to the user in terms of game settings where users can specify how many ghosts they want in a maze, the area of a maze, the number of lives granted to Pacman, and if the user would like to implement a time limit for the game.

Project Description

Main Goals and Objectives

The goal of our project is to produce an enjoyable, yet elegant game and build upon a code base to make it more robust. Doing so, we hope to learn about networking, graphics, and game balance.

Our project is trying to be as immersive as possible, with the satisfaction of playing with friends. Since VR and VR-step are fairly new technologies, we want to have intense gameplay which is also easy on the motion sickness.

Main Functionality and Characteristics

This game is supposed to feel immersive and familiar while having a unique environment since it is a virtual reality game. Multiple users will play simultaneously with different roles. One player will be Pacman, whose goal is to collect all the pac-dots and get a high score. The other players will play as ghosts that try to eat Pacman. If Pacman loses all his lives, the game is over. If Pacman eats a special blue pac-dot, then he is able to eat the ghosts. If a ghost is eaten, it is able to respawn as many times as necessary until the game is over. For an added twist, we will have obstacles for the players to deal with and items for a change up of gameplay that will be generated in each maze.

Intended Audience

The target audience for this virtual reality game is people who are tech savvy. This means they are in possession of an android smartphone and are interested in games. Those who are tech savvy are in the age range of 18-30. This demographic would be more likely to try something immersive like virtual reality. The great thing about this is that it is pretty accessible since only one add on is needed. Headsets, like Google Cardboard, are not too expensive. Because the pricing model is free with ads, people in the aforementioned demographic will at least be inclined to download it.

Key Usability Goals

The game is intended to only be recreational, so the goal is for all users to have fun and feel fully immersed in the game. To achieve this goal, we will find optimal settings like the optimal length of a given game, the area of the maze, and the number of users allowed per maze given a certain area. Of course, users will also be able to customize these options to cater to their preferences. The immersive experience is taken care of by VR-step. Current smartphones will perform well since the phones won't be doing much of the processing on the backend because all that will be handled by our servers. This is also a creative way to get users moving, even if it is just walking in place.

Potential for Further Development/Product Enhancements

The team could expand the idea in the form of a third person puzzle game, where the objective is to collect keys and special items, all while dodging enemies and exploring different VR worlds. . Expansion could be in the form of Pacman-themed mini games. For example, a racing game with different colored Pacman and ghosts where a player can go online and play with other users or choose to play against the computer and choose the desired level of difficulty. The racing tracks can mirror the existing mazes in the main game, but with simplified paths so the game is fast-paced.

Challenges and Obstacles

The game is meant to put an interesting twist on an old classic, Pacman. It may be a challenge to present the game properly so that users know the new features in this setting; for example, the way to win is to collect all orbs and return to the center of the maze. Also, when consuming a special orb making the ghosts edible, their silhouettes may be seen through walls.

Nobody on Team 15 is an artist, so we may encounter challenges with the graphics of the game. Ideally, we want an aesthetically pleasing game where everything is easily recognizable. The first thing users will notice about a game is the way it looks, so we want to maintain the user's attention.

None of the team members are experienced in using Unity, so there is a learning curve. Everyone must learn to efficiently take advantage of everything Unity has to offer to create the best user experience.

Technology Description

The intended VR technology we are going to be using are Android smartphones, Google Cardboard, and VR-Step. We will be using Unity to develop the game, building upon the framework of VR-step. Hosting will be done through a cloud platform to handle the processing, database storage, and networking.

Team Overview

Helen Medrano

Helen has been software engineer intern at Originate since May 2016 so she has plenty of industry experience and is familiar with engineering methods to efficiently complete a project with a team. This means choosing an appropriate workflow (agile, waterfall, etc), implementing version control, and maintaining great team communication through Slack, for example. She is interested in physics and hopes to create smooth transitions with Unity's physics engine. She will also work on auto generating interesting mazes given user constraints if applicable.

Mitchell Reyes

Mitchell has been a Quality Assurance Intern at Hamilton Company since July 2016, so he pays attention to detail and is able to meet deadlines. Mitchell has a passion for playing video games which will drive his desire to create the best game possible. He is interested in graphic design and is self-taught in Cinema 4D, CS Photoshop, and Adobe Illustrator which will benefit the team by giving the game an aesthetic appeal.

Erika Manning

Erika had a unique opportunity to head a core programming class at the university in summer 2016. She is has experience designing elementary software for learning purposes and is experienced meeting weekly deadlines for larges volumes of material development. She will use her experience to help keep the team organized and create realistic deadlines and goals for completing project tasks. Erika is an avid gamer, and will use her passion and knowledge of games to create and an enjoyable user experience.

Austin Turner

Austin has been working in a startup and built a web application from the ground up. He has built backend databases, front end UI's and have even worked with deploying solutions to cloud based servers on Amazon. Austin has also been looking into cyber security and networking and would love to pursue a career in that direction. As the team hopes to have the game run on machines better than what is available, Austin will take charge in deploying and managing our cloud based solution to host the applicationAustin will help in creating an intuitive and easy to use interface for players to swiftly get into the game.

Advisory Overview

Dr. Folmer is experienced with VR and can offer advice on how to handle certain situations such as: placing objects, controlling player movement, and implementing efficient physics. He is also the creator of VR-Step so he can help with any difficulties using the plugin.

Professor Sengupta is experienced with networking so he will provide advice on handling data from multiple end clients.

Professional Growth

This project provides the opportunity to work on an individualistic idea in a virtually risk free environment. Since the team is comprised of full time students, there is less strain on professional life. The team will have a first hand experience in collaborating to create a project with potential market value. Team members will also engage in communication strategies and practice version control. These are valuable skills to have in the industry. This project will add diversity to the team's portfolio as school work focuses more on teaching fundamentals, while developing this game will build on those fundamentals. There are a lot of industry jobs that involve C# or Unity, so these are valuable technologies to learn.

Market Potential

Market Analysis

There is high enthusiasm for VR games among consumers. However, until recently consumers were often hindered by the price of headsets like Oculus and Playstation's VR headset. Now there are many cheaper headset options for phone applications that are available to them such as google cardboard, a DIY headset that will cost the consumer about $15 [Google Store, website]. This, coupled with the improvement of phone capabilities makes the perfect dynamic for getting people into a new kind of game. It's cost-effectiveness and ease of access will be the key factors in introducing more and more people to the market. VR is a proven concept as seen with OculusVR. In 2014, OculusVR sold 60,000 kits priced at $300 before running out [Wired, website].

Competitive Analysis

There are many big names in the VR market who have made considerable investments in high tech equipment and game development. In many markets, large companies are taking advantage of the Uber model by enabling entrepreneurs to create their own products and then taking a small cut from their profit. Therefore, our competition is not a group of tech giants, but the independent VR game developers for phones. New Android supported games are released all the time. Our challenge will be to stand out from the flood of new games that will only increase in the future.

Competitive Advantage

3D pacman has a lot of potential and is sure to be a hit among consumers. Whenever a new technology is introduced to the gaming industry, it opens the door for innovation and implementing games that were not possible to create before. It also paves the way for fresh takes on loved classics. 3D pacman will be no different. Currently the VR game market is still light comparable to other game technologies, and missing many of the classics. According to *Big Fish Games*, 155 million Americans identify as gamers, and the average gamer is 35 years old, and standard gaming when he was 13 [Big Fish Games, website]. This means that games like Pacman are a part of their childhood. It also means we can expect to see a lot of interest in this game among the average consumers.

Time Worked on Project Concept

Some sections were a collaboration between team members. For example, the project description section features contributions all four team members.

Austin Turner contributed to the following sections: Abstract, Project Description, Budget and Budget Justification. For the project description, Austin focused on describing the following: main functionality and characteristics, and advisory overview.

Helen Medrano contributed to the following sections: Abstract, Project Description, and adding slides about the gameplay, technology, and the development environment to the team presentation powerpoint. For the project description, Helen focused on describing the following: Intended Audience, Key Usability Goals, and Challenges and Obstacles.

Mitch Reyes contributed to the following sections in the Project Description portion: Main Goals and Objectives, and Technology Description.

Erika Manning contributed to the following sections: Professional Growth, Project Description, and Market Potential. For the project description, Erika focused on describing the following: Main Functionality and Characteristics. She also worked on the Potential

All team members contributed to the Team Overview section of the Project Description in describing experience and individual strengths.

Budget and Budget Justification

For this project, we need only a few items for development testing. The First being VR Headsets for Android phones. These usually run for $15.99 + tax and come in a variety of models[“Google Cardboard”, website]. These are needed so that we can actually use our app and see how it works in the environment. Thanks to Dr. Folmer, we already have enough for us to use and test with. Coupled with the headsets, we need android phones that can run our app for us. These can be bought with no data plan for a reasonable cost. We already have 2 android phones, which have been provided by Dr. Folmer for testing purposes. Dr. Folmer has also given us codes needed for VR step so that we can integrate the plugin into the game. Lastly, we are going to need cloud hosting to store our app on and to allow for multiplayer networking. I found that Google Cloud services has the functionality that we need and the documentation is pretty good so development will be easy. Google Cloud is free under a certain usage [“Google Cloud Pricing”, website], but there is a research grant that can give us free credits if we need them [“Google Cloud Edu.”, website].

Works Cited

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