EmbarkVR: Outdoor Virtual Reality Experience
CS Senior Capstone
Software Requirements Specification

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Abstract

Many outdoor activities these days initially require a large mental and economic investment to get started. This makes people less likely to try new outdoor activities. The goal of the project is to develop an interactive product demonstration with virtual reality to combat this issue. This project has the potential to inspire people to get outdoors and try new things by first getting them comfortable in new environments or performing new movements. It strives to make outdoor activities accessible to everyone no matter their experience level. This project will not only inspire but also improve the retail experience by making it more immersive, interactive, and informative while being entertaining. The main tool being used is Unity Gaming Engine in tandem with an HTC Vive Virtual Reality System. The objective of this project is to create a functional VR outdoor experience ready to be piloted in a Columbia retail store by May of 2017.

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1 INTRODUCTION

1.1 Purpose

The main goal of the project is to make customers feel more inclined to purchase Columbia gear through the use of an immersive, outdoor Virtual Reality experience. This document exists both for development of the project and to provide a detailed description of the technical requirements for the clients.

1.2 Scope

We want to create an outdoor virtual reality experience for customers at a Columbia retail store. The application will consist mainly of visual, audio, and tactile experiences to create an outdoor world in which the user can navigate. The main activity available will involve fishing in one of the rivers within the environment.

1.3 Definitions

Virtual Reality (VR)	Artificial environment that is created with software
HTC Vive	A virtual reality headset produced by HTC
Unity Game Engine	The Unity Game Engine, developed by Unity Technologies is used in this project to develop the virtual reality simulation.
Avatar	An icon or figure representing a particular person.
Wands	Controllers that are used with the HTC headset.
Base Stations	These allow the Vive to track the movement and location of the wands and headset.

1.4 References

[1] S. Michalak and E. Lind, "Virtual reality heuristics, results from user testing for prioritization and development," Sep 2016.

[2] ——, "Virtual reality heuristics, results from user testing round 2," Oct 2016.

[3] H. Corporation, "Vive ready computers," 2016.

[4] C. Hall, "Sony to devs: If you drop below 60 fps in vr we will not certify your game," 2016. [Online]. Available: http://www.polygon.com

1.5 Overview

The next chapter of the document will give an overview of the basic functionality of the Virtual Reality application. It contains informal requirements to provide background for section three, Specific Requirements. Section three will provide more detailed requirements and is intended for a more technical audience such as developers.

2 OVERALL DESCRIPTION

2.1 Product Perspective

This VR product may be new to Columbia Sportswear but will still have ties to existing products. Users will be given the opportunity to wear Columbia gear while participating to learn how the clothes feel while executing certain movements.

The product will rely heavily on Virtual Reality Hardware. Specifically, the HTC Vive System. This system consists of the the headset, two wands, and two base stations. Additionaly a Virtual Reality compatible computer is needed to actually run the software. In terms of software the product will rely on the Unity Game Engine. Unity will do the heavy lifting when it comes to rendering the virtual environmnt and making it look as realistic as possible.

2.2 Product Functions

The VR setup will allow the user to simulate outdoor experiences. Specifically, the user will be able to virtually experience outdoor activities the clothes are intended to be used for. We will be using Unity to design VR object and fishing interactions. The final product will allow the user to experience an outdoor fishing retreat to test whether the gear they are wearing is comfortable. Our application will also take away the vanity of the products they are wearing and instead allow customers to test the more important aspects of the clothing such as functionality and breathability.

2.3 User Characteristics

The general type of user of this project will be a customer at a Columbia Sportswear retail store. Under this umbrella lies a few different types of customers. First there are customers who are inexperienced in the outdoor activity they are buying gear for. This target audience will benefit most from the VR expreience as it will allow them to experience the activity without a lot of economic or time commitment. Secondly, there are customers who are experienced in the activity they are buying gear for. This audience will benefit from the VR experience because it will allow them to test movements using new gear.

2.4 Constraints

A virtual reality headset like the HTC Vive has some inherent restrictions. The first one is space. The HTC Vive tracks how much space you have set the system up in and creates virtual barriers. This limitation can be alleviated by using the controllers to move the users within VR environment. Besides physical space, space in the virtual display is also a concern. Information needs to be supplied to the user without obstructing the VR experience. A second limitation are the graphics within the VR environemnt are not entirely realistic. According to studies done by Intel and Thug Design [1][2], the

categories most important to the feeling of immersion are realistic interactions, responsiveness, graphic clarity, and smooth transitions in that order. Because we are trying to promote Columbia Sportswear Gear in a realistic environment it needs to be as authentic as possible.

2.5 Assumptions and Dependencies

An important assumption made in this requirements document is that the virtual reality experience will be run on a computer system that can run the HTC Vive software. The following are the minimum specifications to run Vive, as found on the HTC Vive website [3]:

- Processor: Intel Core i5-4590 or AMD FX 8350, or better
- Graphics: NVIDIA GeForce GTX 1060 or AMD Radeon RX480, or better
- Memory: 4GB RAM or better
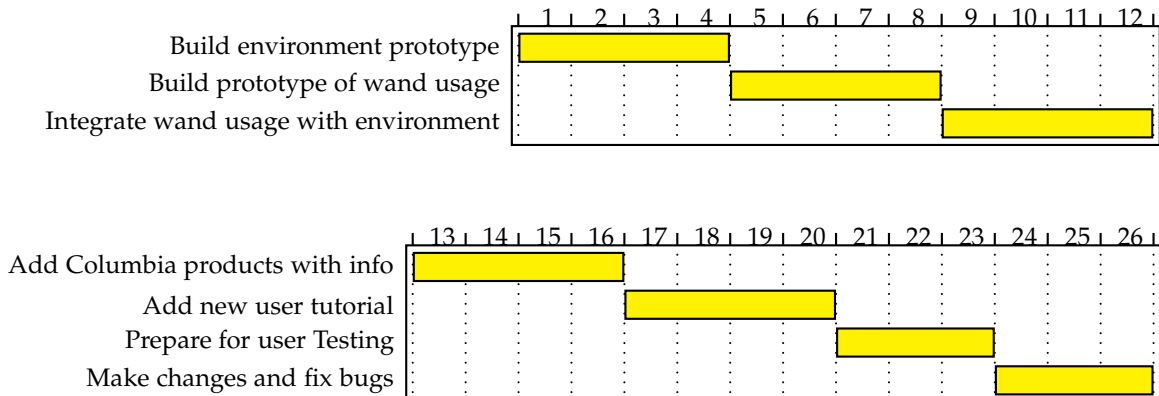- Operating system: Windows 7 SP1 or better

Design decisions and optimizations will be made so that a computer with the above specifications can run the experience with little noticable lag, but if the machine drops below the minimum capabilites, the requirements regarding responsiveness will have to change.

Also, the requirements often depend on the availability of a set of Columbia and Unity 3D assets. If either of those sources of assets is not available, the requirements about being able to see Columbia Sportswear gear in a realistic environment will have to change.

2.6 Apportioning of Requirements

One part of the project that will likely be delayed until later versions is the social aspect. Ideally the user would be able to share their VR experience on social media sites like Facebook or Youtube. This could be in the form or 360 degree images or videos. At the moment this requirement is not a high priority.

Gant Chart (measured in weeks)

	1	2	3	4	5	6	7	8	9	10	11	12
Build environment prototype	███	███	███	███								
Build prototype of wand usage					███	███	███	███				
Integrate wand usage with environment									███	███	███	███

	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Add Columbia products with info	███	███	███	███										
Add new user tutorial					███	███	███	███						
Prepare for user Testing									███	███				
Make changes and fix bugs												███	███	███

3 SPECIFIC REQUIREMENTS

3.1 External Interfaces

- 360 degree view of outdoor scenario within VR experience using HTC Vive headset. This will contain optional user guidance (visual).
    - Input: Movement of headset
    - Output: Visual data
- Immersive noises from outdoor VR experience. This includes audio from the optional user guidance.
    - Output: Audio through speakers and/or headphones.
- Ability for other users not using headset to see user's current view.
    - Output: Visual data on external monitor.
- Controller available to be held by user to interact within VR experience.
    - Input: HTC Wand movement

3.2 Functions

- Ability for users to interact with fishing equipment.
- Ability to see Columbia fishing apparel in use.

3.3 Performance Requirements

- Must maintain at least 60fps throughout experience.[4]

3.4 Software System Attributes

Our unity environment should be portable and work on all HTC Vive systems. Correctness can be evaluated by how authentic the real-world experience we're trying to replicate is. We should be able to adjust the scenes easily and accommodate for any changes that the client wants.

3.4.1 Reliability

The system will be considered reliable if it can provide the virtual reality experience consistently without failure. Failure can be defined as any technical issue that breaks immersion. This could include noticeable lag between the user and avatar's actions, distortion of the environment, or a software defect that causes the system to crash.

3.4.2 Availability

The system should be available to customers whenever the virtual reality station in the store is set up. There should be no downtime when the customer puts on the headset and the customer should almost immediately be placed in the immersive environment.

Many of the attributes of our system (such as availability and reliability) will be handled through the Unity game engine.

3.4.3 Security

The environment will be designed to not require a system with internet access, and will not need any user information. The expected implementation will be on a closed system in a Columbia store, where physical and remote access will be controlled by Columbia employees.

3.4.4 Maintainability

As time goes on it should be easy to adapt the product to easily include Columbia Sportswear products and virtual reality environments to accompany them. Changes to the environment through the addition of assets (Columbia gear) should not be difficult and an updated scene should be accomplished with a small patch.

3.4.5 Portability

The environment should work on all HTC Vive systems with the minimum requirements to be Vive Ready [3].

4   SIGNATURES

Document: Software Requirements Specification (EmbarkVR)

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Intel Sponsor   Date

_____   _____

Columbia Sponsor   Date

_____   _____

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Student Team Members   Date