Software Requirements Specification

for

Teals Conference Man in the Mountain

Version 1.1

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Revision History

Name	Date	Reason For Changes	Version
v1.0	1-27-18	Initial Creation	1.0.0
v1.1	4-01-18	Concept Change. No longer producing an overlay of a webcam feed where colors are detected. Program will now recreate the entire webcam feed as virtual terrain.	1.1.0

1.   Introduction

1.1   Purpose

This document provides a description of the Man in the Mountain project version 1.1 intended for presentation at the 2018 Puget Sound TEALS Computer Science Fair.

Man in the Mountain will create Terrain representation of processed images taken from the Scanning Area.

1.2   Document Conventions

None at this current time.

1.3   Intended Audience and Reading Suggestions

This document is intended for the client, software developers, and advanced practitioners. The developers should read every section to ensure that there is an understanding of the project. The main sections for the client and faculty advisor to review are sections 1.4 Project Scope, 2.2 Product Functions, and 4 System Features. Appendix A provides glossary to the terms used in this document.

1.4   Product Scope

Version 1.1 of the product shall
1) Program will continuously process images from a webcam feed and detect faces
2) Allow users to watch in as near as real-time as possible the generation of 3D basic terrain using Unity based upon the live webcam feed.

1.5   References

1) OpenCV Library
    a) https://opencv.org
2) Unity
    a) https://unity3d.com
3) OpenCV Face Tracker Example
    a)
    https://github.com/MasteringOpenCV/code/tree/master/Chapter6_NonRigidFaceTracking
4) OpenCV Asset for Unity
    a) https://assetstore.unity.com/packages/tools/integration/opencv-for-unity-21088
5) Getting Started With Unity 5
    a) Lavieri, E. D. (2015). Getting started with Unity 5: leverage the power of Unity 5 to create amazing 3D games. Packt Publishing Ltd.
6) Lightness

a) *Lightness. (2018, January 19). Retrieved January 29, 2018, from* [*https://en.wikipedia.org/wiki/Lightness*](https://en.wikipedia.org/wiki/Lightness)

7) *Sabastian Lague: Procedural Landmass Generation* [*https://www.youtube.com/watch?v=wbpMiKiSKm8&list=PLFt_AvWsXl0eBW2EiBtl_sxmDtSgZBxB3*](https://www.youtube.com/watch?v=wbpMiKiSKm8&list=PLFt_AvWsXl0eBW2EiBtl_sxmDtSgZBxB3)

2.   Overall Description

2.1   Product Perspective

Man in the Mountain is a self-contained product created for the Microsoft TEALS conference of 2018 at Puget Sound and any future TEALS conferences so long as Eastern wants to use it. It is being developed for the Eastern Washington University booth at the conference and is meant to serve as a demonstration of the ability for the attendees to, through Computer Science, work with and create engaging and interesting technologies. The goal is to elicit a positive emotional response within the attendees and by doing so, encourage their interest in pursuing a career in the field of Computer Science.

Man in the Mountain was chosen in consideration of the stated goals of this product and of how best to achieve them given the target audience. Image Processing and 3D rendering not only represent widely recognized technologies but additionally presents a greater opportunity in terms of interaction and engagement with the target audience.

2.2   Product Functions

Man in the Mountain shall have User(s) who are able to stand in front of a webcam within the Scanning Area which will then be processed by a computer running the associated software to produce a virtual terrain based upon the received data. A screen will then display the Terrain to the Viewer(s).

2.3   User Classes and Characteristics

The users of Man in the Mountain will be high school students attending the TEALS conference. They will typically be between 14-18 years old. The students will be from diverse backgrounds and ethnicities from across America who have taken and/or are enrolled in a TEALS class. Given their experience in TEALS, the students will have some knowledge, experience and/or interest in Computer Science. As such, the goal of this product is to encourage the students to pursue a degree in Computer Science by impressing them with an engaging demonstration of image Processing and 3D rendering and showing them what they could create by the end of their senior year at Eastern Washington University.

User:
> The User can generate and change Terrain that will be displayed on a screen.

Viewer:

A Viewer is anyone that needs/wants to view the Terrain being generated by the User.

2.4   Operating Environment

2.4.1 Software Environment 1.0
Man in the Mountain will run in a Windows operating system using Windows 10. Man in the Mountain will use the developers' algorithm for image processing to detect and process the Scanned Area. Man in the Mountain will use Unity to generate Terrain that will be displayed on a screen.

2.4.2 Hardware Environment
The associated hardware will include a display, a visual scanning device capable of recording in HD and a computer capable of processing the Scanned Area as close to runtime as possible while generating and displaying Terrain.

2.5   Design and Implementation Constraints

None at this current time

2.6   User Documentation

There shall be a user interface and a user manual containing the basic use information allowing users to quickly understand the overall design and controls of the product.

2.7   Assumptions and Dependencies

It is assumed that we shall have access to a computer that is capable of running the Man in the Mountain software at a level such that the user experience is not negatively impacted.

It is assumed that we shall have access to enough space at the conference booth to set up computer, scanning device, and Scanned Area.

It is assumed that we shall have access to all necessary electrical equipment to run the physical computer and associated devices.

It is assumed that we shall have access to a webcam and a tripod/holder stand to set it in front of the Scanned Area.

It is assumed that we shall have access to a screen to display the Terrain to Viewer(s).

3.   External Interface Requirements

3.1   User Interfaces

Man in the Mountain shall display a view of generated Terrain of the Scanned Area.

User interface shall display an option menu to control webcam, camera, texture, map, and noise.

3.2   Hardware Interfaces

The scanning device shall be connected to the main computer running Man in the Mountain via its associated cables.

There will be a Scanned Area that User(s) will stand in front of, which will then be scanned to have Terrain be generated.

3.3   Software Interfaces

Scanning device feed shall interface with image processing algorithm to scan the drawing from the Scanned Area. Developers' algorithm for image processing will then interface with Unity Rendering Engine, to generate the Terrain in Unity.

3.4   Communications Interfaces

None at this current time.

4.   System Features

4.1   Scanning Area

4.1.1   Description and Priority

Users will be provided a Scanned Area in which they can stand in front of. This area will be detected by a webcam and then using image processing algorithm, translate the images into some form of usable data for rendering in the Unity engine.

4.1.2   Stimulus/Response Sequences

Users stand in front of scanning device.

The scanning device shall actively collect the visual data of this area.

Image processing algorithm shall be used to collect relevant information within the visual data, specifically, different colors.

The relevant information shall then be translated into a format usable by the Unity engine and passed to it.

4.1.3   Functional Requirements

REQ-1: Users shall have a means to stand in Scanned Area.
REQ-2: There shall be a physical scanning device constantly viewing the Scanned Area.
REQ-3: The different colors within the Scanned Area shall be scanned and differentiated based upon their RGB values and position within this area.
REQ-4: This data shall then be passed to the rendering engine.

4.2   3D Terrain Generation

4.2.1   Description and Priority

Man in the Mountain shall use the Unity engine to process the gathered positional and "color" data and then via software implementation, generate a Terrain object that is then rendered and displayed upon a view screen in as near real-time as possible.

4.2.2   Stimulus/Response Sequences

"Color data" is passed into the rendering engine.

The associated RGB values will be used to determine Terrain type within the environment.

The given color value will be used to determine "height" with darker values corresponding to higher terrain and lighter values "lower" to the ground.

Man in the Mountain will respond as quickly as possible to detected changes and alter the Terrain accordingly.

4.2.3   Functional Requirements

REQ-1: The data passed to the rendering engine shall be in a usable format and shall, at a minimum, include RGB values and associated color Lightness.
REQ-2: RGB values shall determine Terrain type and Lightness shall determine height.
REQ-3: The Terrain shall respond to changes in the scanned color data in as near to real-time as possible.
REQ-4: Water Terrain height shall be based upon surrounding Terrain and not color value.
REQ-5: Terrain shall smoothly transition to surrounding Terrain. E.g. grassland Terrain shall transition to sand in an aesthetically appealing way.

4.3 Face Recognition and Tracking

4.3.1   Description and Priority

4.3.2   Stimulus/Response Sequences

4.3.3   Functional Requirements

REQ-1:

5.   Other Nonfunctional Requirements

5.1   Performance Requirements

Man in the Mountain must be able to process input from the Scanning Area, generate graphical Terrain based off that input, and display that Terrain in as near real time as possible. This is to ensure that the User(s) are given an engaging experience via a

responsive and interactive augmented reality demonstration. Man in the Mountain v1.1 will not need to run on lower end computers since it is being made as a one time demonstration for the TEALS conference. Thus, it will only needs to be optimized for the one computer used for the demonstration.

5.2   Safety Requirements

None at this current time.

5.3   Security Requirements

Physical computer equipment is not handled without consent of the operating team.

All physical equipment is not taken without consent of the operating team.

5.4   Software Quality Attributes

Enjoyment of experience is a priority for this product. The overall objective is to elicit positive emotional responses within the users and other viewers with the hopes of encouraging their future engagement within the field of Computer Science. As such, priority shall be given to ensuring that the user experience is always a positive one, this includes ease of use and an easy learning curve such that users can quickly engage with and enjoy the product.

Secondary consideration shall be given to development concerns such as maintainability/ modularity since the product is intended for a single-use demonstration at the TEALS conference. When in development, good design practices shall at least be attempted first to create a well-made and sustainable product.

Appendix A: Glossary

User   a person actively marking the Drawing Area with different colored markers

Scanning Area   the physical space that the webcam will be scanning

Viewer   a person who is able to see the terrain being generated by the User

Terrain   the 3D virtual terrain of ground and water

Lightness   the representation of variation in the perception of a color.

Appendix B: Analysis Models

Appendix C: To Be Determined List

1. The needed specs of the computer to be used for the demonstration.