Mental Disorder Assisted VR Navigation

Project Description and Clarification

WSU College of Education

CougDirect

Alexander King, Martin Bui, Yurun Han

9/21/2022

I. Introduction

VR devices like PSVR, Gear VR and Google Cardboard glasses are increasingly being adopted by mainstream users. The great potential of VR is that it allows us to experience virtual environments that we cannot experience in real life. One of the groups that benefit the most is the disabled. People can experience new places, games, navigate, or participate in rehabilitation training in this way through the VR environment. VR technology is able to create more meaningful and immersiveness than any technology ever made. The main goal of our project is to develop a VR-enabled mobile application that can effectively guide students with mental disabilities to plan their journeys and understand the effects of everything around them to make safety tips. The main use for navigation and out-of-home planning on campus.

Designing techniques to meet the needs of people with disabilities, however, is not without its challenges. Those with physical or mental disabilities did not receive more attention. Although VR has the potential to solve problems. So the app that we are going to develop will optimize these issues and there will be a map to show what is needed. And to meet the support of Android and ios platforms, more in-depth research and optimization of the needs of special users. Not only that, but I'll also consider whether psychotherapy could potentially help those with physical or mental disabilities to reduce pain and stress.

II. Background and Related Work

Last year, a student got lost on campus at night. Her phone was dead and she had no clue where to go. Our solution is to provide a phone application that will provide campus navigation for the student before they arrive on campus and for when they arrive. Our mobile phone application will provide key information for the user such as where the sign of the building is located, a brief description of the entrance, open and close hours, and etc. There are already applications similar to this such as Google Maps, Apple Maps, Waze, etc. However, the key difference that our application will have that none of the listed applications earlier don’t have are Point of View (POV) videos of the locations. The three of us don’t have that much experience working with Virtual Reality however, we are thrilled to research and learn more about this field of work.

III. Project Overview

Our project is to develop a mobile application with VR capabilities to help students with mental disabilities find their way around the WSU campus. The application will have multiple functions that can help students navigate the school efficiently and safely. The goal is to have students plan their trip before making the walk, or bus ride, and then they have the ability to watch a video and use the VR capabilities to understand their surroundings before they experience it in real life. For example, if a student needs to

walk from their classroom in Cleveland Hall to get lunch at Southside Dining Hall, they will be able to put this in the app using buttons in a list. Then they will be able to see which doors they need to use to exit their current location, which paths to take, and where to enter their destination. Each destination will have a VR tour using 360 video, much like taking a tour of a home or apartment virtually. Then many of the paths in the university will have first-person video footage of the safest and most efficient walking paths from many buildings to another. We plan on getting footage for a handful of popular WSU buildings, as well as a few dormitories and apartments. The list of WSU locations to film is as follows: Cleveland Hall, Spark, CUB, CUE, Chinook, Rec Center, Cougar Health Services, Southside Dining Hall, Chinook Apartment Complex, McEachern Residence Hall, Stephenson Residence Complex.

The applications will be compatible for both Apple and Android devices, and the 360 tours will be available to use on Oculus Rift as well. The mobile applications will have links to the videos and tours embedded in the application. The user should be able to see their current location based on their input as well; if the user says they are currently in Cleveland Hall, the map will indicate they are in Cleveland Hall on a minimap on the screen. The user should also be able to see how long it can take to walk from one location to another. This data will be recorded by averaging our times that we take walking from one location to the next. The walking videos will be recorded in two dimensions, while the tours will be recorded in three dimensions. We believe it is less disorienting for the user to follow along with a first person point of view while walking. However, on the location tours, it allows the user to make their way around the building themselves, allowing for self-exploration which can help them get a better feel for the building itself. The walking videos will start inside one location, and end inside their destination building. These videos will also have voice overs that include captions with various reminders and tips.

Another feature of this application is that the users will be able to select from a list of items, and these items will be the items the user currently has with them at the moment. The user then will receive notifications or reminders to grab all of the items they have with them before they leave their current location. The user can opt in or out of this feature, as it may be tedious for those who rarely forget anything. An example of the feature would look like this: The user is currently at the Chinook, and they select the items they currently have on them at the moment. In this instance they are carrying their backpack, keys, and wallet. Once the user plans their trip to their next location, McEachern Hall, they will receive a notification reminding them to grab all of their selected items. This is different than the reminders and tips placed in each video we create. Those are more general reminders such as “don’t forget to lock your door” when leaving their apartment. These notifications are user-specific and are helpful to those who often leave their belongings behind.

Our client also specified a feature they want and that is map capabilities. The application will have a map of WSU, with all of the hotspots highlighted on the map. The user should be able to zoom in and out, as well as see their current location on the map. We also want to be able to show the user's route they have created for themselves and the average time it takes to walk that route.

IV. Client and Stakeholder Identification and Preferences

Our main clients consist of the WSU ROAR Program, industry sponsor, Katie Abrams, and our mentor, professor Ananth Jillepalli. Our Stakeholders would be anyone who decides to download and use our application while they're on WSU campus. However, our main target is for those with a mental disability.

V. Glossary

WSU: Abbreviation for Washington State University.
VR: Virtual reality (VR) is a simulated experience that can be similar to or completely different from the real world. Or refers to virtual reality devices such as: virtual reality helmets, Google glasses, virtual reality sensors, etc.
PSVR: PlayStation VR is a virtual reality headset released by Sony Interactive Entertainment in Japan.
Gear VR: Samsung Gear VR is a virtual reality headset released by the South Korean company Samsung**.**
POV: Point of View
Android: Android is a mobile operating system based on a modified version of the Linux kernel and other open source software, designed primarily for use in touchscreen mobile devices such as smartphones and tablets.
IOS: iOS is a mobile operating system created and developed by Apple Inc. exclusively for its hardware. The operating system powers many of the company's mobile devices, including iPhones, iPads and Macpros, etc.
Waze: Waze, a subsidiary of Google, provides satellite navigation software on GPS-enabled smartphones and other computers.
Oculus Rift: Oculus Rift is a line of virtual reality headsets developed and manufactured by Oculus VR, a division of Meta Platforms. A virtual reality device.

VI. References

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Requirements and Specifications section

WSU College of Education

CougDirect

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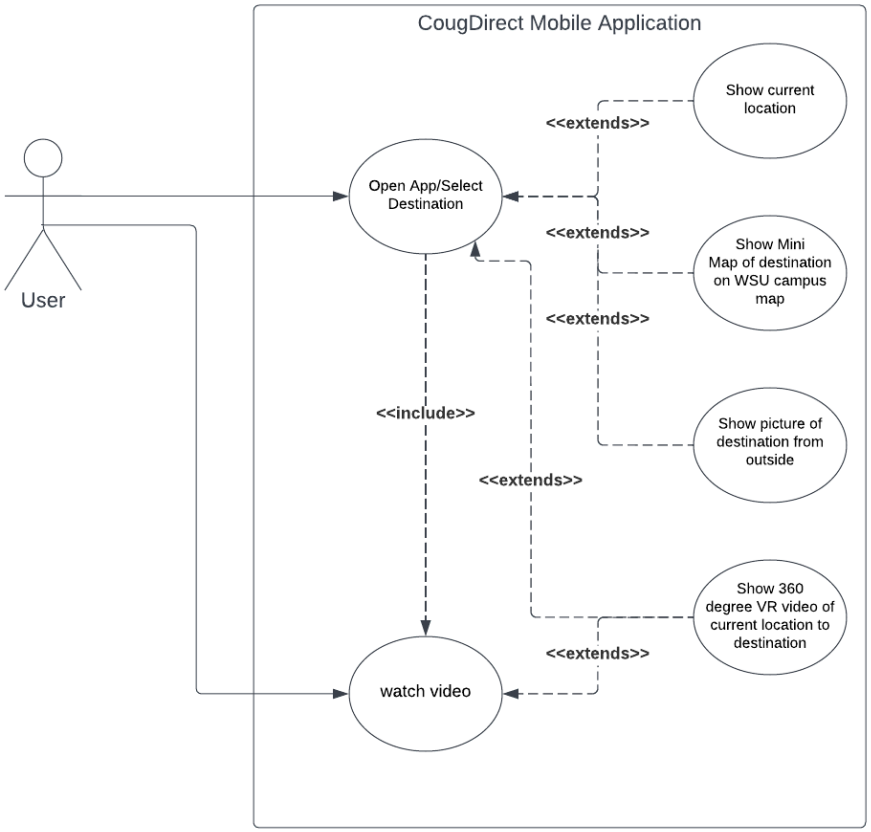
I. Introduction

Last year, a student born with mental disabilities got lost on campus overnight and she had no clue what to do. Our project is to develop a phone application with integrated virtual reality (VR) capabilities to help guide them from their current location to a building located on campus. An example would be Clevand Hall to the Compton Union Building (CUB). Our application would have a few features such as showing the user where the destination is located on the WSU campus map, a 360 degree video showing them step by step how to get to that location, and an outside POV shot of the destination they wish to go to. We believe VR for navigation will allow those with and without mental disabilities an easier time understanding what to do to get to their destination.

II. System Requirements Specification

II.1. Uses Cases



II.2. Functional Requirements

There are many requirements for functionality that both us as a group, as well as the client, have in mind. The following list breaks each of these down.

II.2.1 Built-In Videos/VR Capable Photos

The client wants an application that has videos built-in to the application that each show the user how to get from one location to another. These will become available to the user once they determine which locations they want to go to from a predetermined drop down list. Additionally, the app will contain a 360-degree tour of the locations, and this can also be viewed using a VR headset.

II.2.2 Non-GPS capable map

The client made us aware that not all of the users have access to a GPS, or cellular data for that matter. This means that we need to design an application that the user can still check their relative location on a map without using a GPS system. We determined that the user can find their location from the dropdown list, and select a button signalizing they are at that current location. Additionally, once the user creates a route to their next location, both the map as well as a header on the screen will tell them the location they were just at as well as the one they are headed to.

II.2.3 Descriptions of location/Misc. Features

There are a few miscellaneous features that both the client and we discussed. One of these is that each location will have a brief description attached to it. Another will be the amount of time it takes to walk from each location to the next, and if the user decides to make multiple stops along the way at other locations, the application will tell them their total route time as well. The client stressed to us to keep the application as simple as possible, meaning we should have no more than 3 to 4 buttons available on the screen at once, instead have a secondary screen for each location to display these miscellaneous features.

II.3 Non-Functional Requirements

The client laid out a few other requirements for us. The main one is concision with the app. She would like us to have as few additional features as possible. The application must be smooth, neat, and very understated; or else it may be overwhelming for the user. Since our users primarily will be those with mental disabilities, it is imperative we do not make the use of the app stressful in any way. The client recommends a soft color scheme, as well as little to no animations. Another requirement is that the application must be usable for both iOS and Android based devices. The 360-Tours also must be available to view and use on Oculus Rift headsets via Youtube.

III.System Evolution

Software evolution was a major factor when creating the design for this project. The first area our team needed to adapt was running on both iOS and Android. How to develop an application that adapts to both Android and iOS platforms is one of our most important problems. Usually, there are two hybrid APP development modes: "Native + H5" and "Native + applet". In contrast, the development model of "Native + applet" is better. With cross-platform capabilities, a set of code can run on both iOS and Android platforms. Can obtain more system permissions and

complete richer product design. At present, the feasible aspects we have considered are these but may be updated with more suitable versions and technologies as more information is available. If for some special reason then we will have to consider other ways. In addition, another aspect that our team needs to consider in this project is to make the system more flexible and realize the function of GPS, which requires more technical support. Lastly, our team must also be mindful of some of the customer's possible requirements and changes or additions to the project so that the application can be more easily changed to fit the new environment later on.

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Solution Approach sectionents

WSU College of Education

CougDirect

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10/03/2022

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I. Introduction

This document is the detailed information about the CugDirect team project. The project to be implemented is to develop a mobile phone application with integrated virtual reality (VR) capabilities to help guide users from their current location to buildings on campus. The app will have a map showing the destination and current location as well as a 360-degree video showing them step by step how to get there. Use these to experience and analyze the current environment. The main goal of the project is to effectively guide users to plan their journey and understand the impact of everything around them to make safety tips, mainly for campus navigation and outdoor planning. Among the important information is three-dimensional sensory and environmental information and analysis. Unlike general navigation, it allows users to analyze the environment of the destination through perception, rather than imagination. This document will provide detailed information on system overview, architecture design and system evolution.

II. System Overview

About the system overview, we must first understand that this project is based on the support of Android and ios platforms. And follow-up in order to meet the special needs of more in-depth development and optimization. A suitable framework and language need to be picked. So when creating a design for this project, we will consider learning swift. The first area the team needed to adapt was running on iOS and Android. Swift's switch syntax is very similar to Java and C++. Extensions in Swift are powerful and can also extend the classes of the system. We have proposed two hybrid APP development models before: "Native+H5" and "Native+Mini Program". The cost of learning React Native ideas and syntax will be relatively high and requires a certain understanding. It is also to avoid functional differences between Android and iOS products. May be updated to more appropriate versions and technologies as more information becomes available. For example some possible requirements of the client and changes or additions to the project.

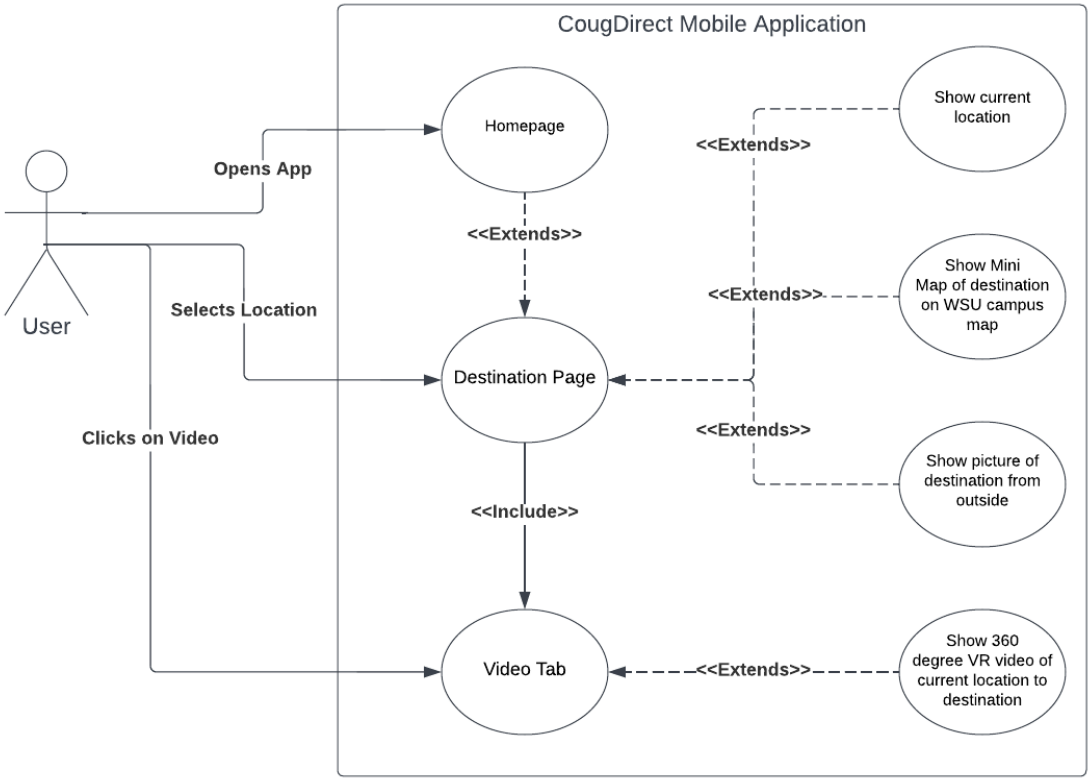
The panoramic navigation done by the project adds the functions of scene jump, route guidance and positioning and wayfinding on the basis of panoramic images or videos, thus giving the panorama the role of navigation. It puts the user in a scene that is no different from the real environment, and also solves the problem of unclear orientation recognition. Arrow guidance is more intuitive and effective, and at the same time, the confusion during wayfinding is greatly reduced. There are complex environments distributed on the campus, and ordinary navigation software cannot cope with it at all, and GPS cannot locate the details of the user's location. With the help of Panorama, users can learn more about small functional facilities. Meet the navigation needs within a few hundred meters.

These functional solutions will try to improve and better design the user interface and functional settings through team discussion and thinking. Such as the stability of GPS functions, the integrity of interface information and the availability of mini-maps. To make it have a variety of information without appearing complex, it is necessary to consider the design of the interface.

And the most important panoramic video must ensure that users can open more quickly and smoothly.

III. Architecture Design

III.1. Overview



Story: Casey is a first year student at Washington State University who was born with a mental learning disability. She is currently sitting in the lounge watching TV at the Compton Union Building (CUB). Casey almost forgot she has to be at the WSU ROAR meeting room at 1:15pm and the current time is 1:00pm. Casey has about 15 minutes until she has to be in the meeting room. She opens CougDirect and is greeted with the homepage. Within the homepage, she sees a button with the words “Select your destination”. Casey presses the button and is shown a dropdown menu with a variety of locations. She selects Cleveland Hall and is taken to a different page within the app. Casey is taken to a page dedicated to her destination. Here she is greeted with a text stating her current location, a picture of the campus map which includes where her current location is compared to her destination’s location and a picture of her destination. Casey clicks on the video and she is taken to a video tab. Here she is shown a 360 degree video, instructing her how to get to her destination. The video also includes a narration on how to exactly get from her current location to her desired location. Following the video, Casey makes it to the meeting room at 1:15pm exactly.

III.2. Subsystem Decomposition

III.2.1. Implement Home Page

The homepage only includes a couple features. The user will be greeted and will have the option to select a desired location. This page will feature a drop down menu with a variety of different locations within the Washington State University campus. Once a desired location is selected, this page will take the user to another page dedicated to the destination. Thus, the Homepage must be able to extend to the Destination Page.

Priority: Level 0: Essential and required functionality

III.2.2. Implement Current Location Tracker

This feature will allow the application to know the exact location of where the user is at the moment. With this information, the application will be able to provide the correct video to show the user. The mini map feature will also require this location tracker to be working correctly and fully functioning.

Priority: Level 0: Essential and required functionality

III.2.3. Implement Mini Map

This feature will be located within the Destination Page. The mini map will allow the user to see where they are currently compared to their destination on the Washington State University campus map. The mini map feature will require the application to have access to the user's current location, thus the Current Location Tracker must be functioning correctly.

Priority: Level 1: Desirable Functionality

III.2.4. Implement a way to include a picture of destination

This feature will be located within the Destination Page. This feature is pretty simple. We want to include a picture of the destination so the user can identify if they have reached their desired location or not. To implement this feature, we just print out a picture of the destination to the user's screen.

Priority: Level 1: Desirable Functionality

III.2.5. Implement Destination Page

The Destination Page will include a fair amount of features. First, stated previously, this page should include a mini map presenting the user where their current location and destination are located in correlation with each other on the Washington State University campus map. Second, an image of the destination will also be presented to the user to assist them in identifying that the destination is true. Lastly, this page will include and allow the user to watch a 360 degree VR video in fullscreen about how to get to their desired destination from their current location.

This page will need access to a few things to be functioning fully. The page must be able to have access to the user's current location, the mini map feature, a picture of desired location, and the 360 degree VR video of directions from current location to desired location. This video can also be enlarged so the user can watch the video in fullscreen.

Priority: Level 0: Essential and required functionality

III.2.6. Implement the video tab/fullscreen feature

This feature is pretty simple. We want the user to have the ability to watch the 360 degree VR video in fullscreen mode. To implement this feature, we can manipulate how the video file is being played and projected so that it covers the entire screen of the user's mobile device.This feature will only need access to the media file and the destination page, thus it must have access to both features.

Priority Level: 1: Desirable Functionality

IV. Data Design

Our project will not be collecting data on the user and their habits for their privacy.

V. User Interface Design

Since our project is a mobile app, it will have a graphical user interface. It will have many different pages and functionalities.
The application will have a welcome/home page; this page contains a few buttons all with different functions. These buttons are as follows: Select a destination (from drop down menu), assign current location, view map. There will also be a tab that the user can toggle to view other various options, such as view specific locations, or watch videos on their own without creating a path.
Once the select a destination button is selected, the user will then choose from a predetermined list of locations where they would like to go. The user will be able to string destinations together as well to create a path. The user will be able to determine the order of the locations in which order they select the item from the drop down menu. This will be indicated by a number indicating the order next to each item. For example, if the user selects both the item "CUB", as well as the item "Chinook Apartments", a 1 will appear next to "CUB" and a 2 will appear next to

“Chinook Apartments”. A text box on the app will indicate how long it takes to walk from each location to the next, and this will be updated depending on which locations the user chooses. Each page that is not the homepage will have an icon that can direct them back to the home page. The user can also decide to look at specific locations, and on these pages they will see a photo of the building, as well as a preview and link to a 360 tour video of the inside of the building. The user will also be able to view a walking path video to this building.
Once the user selects the view map, if they have selected their current location from a drop down list, they can see where they are in relation to the rest of campus. Otherwise it will be a normal interactive map of WSU.

One major thing the client has stressed to us is to keep the UI as simple, and subtle as possible. The user should not be overwhelmed with a large number of buttons or functions, and they should not be offput by bright and flashy designs. The user should only be noticing the main functionalities of the UI and nothing more. The UI will have a modest color scheme and soft edges for all of the buttons.

VI. Glossary

GPS: The Global Positioning System, formerly known as Navstar GPS, is a satellite-based radio navigation system used to determine the location of something on Earth.
Oculus Rift: Oculus Rift is a line of virtual reality headsets developed and manufactured by Oculus VR, a division of Meta Platforms. A virtual reality device.
VR: Virtual reality (VR) is a simulated experience that can be similar to or completely different from the real world. Or refers to virtual reality devices such as: virtual reality helmets, Google glasses, virtual reality sensors, etc.
Android: Android is a mobile operating system based on a modified version of the Linux kernel and other open source software, designed primarily for use in touchscreen mobile devices such as smartphones and tablets.
IOS: iOS is a mobile operating system created and developed by Apple Inc. exclusively for its hardware. The operating system powers many of the company's mobile devices, including iPhones, iPads and Macpros, etc.
"Native + H5": Provide interactive functionality for applications. one of the modes
"Native + applet": Provide interactive functionality for applications. one of the modes
360-Tours: A virtual tour is a simulation of an existing location, usually consisting of a series of videos or still images. It can also use other multimedia elements such as sound effects, music, narration and text. It is different from using live TV to influence remote travel.
Cellular Data: Mobile data (also known as "wireless" or "cellular" data) is how you connect to a network when you're not using WiFi

VII. References

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