The University of Hong Kong

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VR Application for Building Memory Palace

Final Year Project Detailed Plan

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Abstract

Memory Palace, also commonly known as the method of loci, is a memory system based on mentally visualizing the things to remember so as to utilize spatial memory to strengthen memory. It has been adopted by many world memory champions who are able to memorize extremely huge amount of information in a short period of time with its help. It can be used to memorize all sorts of information from knowledge like vocabulary and history to things in daily lives such as shopping lists and phone numbers.

Memory Palace has been proven to be an effective way for having quicker and stronger memory. However, its usage relies purely on imagination. People can only use imagination to create a virtual scene, which can be challenging and time consuming. The lack of way to actualize the virtual scene results in a lot of difficulties in using this technique.

Meanwhile, virtual reality (VR) technology has emerged as one of the hottest technology in recent years. VR allow users to immerse themselves into a virtual world as if it is reality. VR has the potential to solve a lot of the problems of using Memory Palace since the realization of a virtual things is exactly what it needs.

The intention of this project is to develop a VR application to let users build their own memory palace. This project plan will give a detailed introduction to Memory Palace and discuss how VR can solve its problems, as well as the detail of building the application.

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1. Background

Memory Palace

Memory Palace, also known as the method of loci, journey method or mind palace, is a prevalence memory system. When using the system, people will visualize things they want to memorize, and mentally place the imagined objects into a place mentally. It is found that human are much better in memorizing spatial and graphical information than texts or concepts because our spatial memory is very powerful but it is not utilized in remembering texts. This is the reason we are able to remember what happened on our way to school easily but hard to memorize words on textbook. Memory Palace aims to enhance our memory by the utilization of spatial memory.

Memory Palace has been proven to be an effective memory enhancement technique. A lot of people have found it useful in helping their study and work. Mnemonists utilized it to memorize unbelievably large amount of information.

Here is the detail of how the system is used:

1. Create a list for the things you want to memorize, e.g. a phone number, a list of names, etc.

2. Choose a place you know well (e.g. your home), or a route that you are familiar with (e.g. the route from your home to school)

3. Pick locations in the place or on the route, each location for one items on your list

4. Find a symbol for each of the item on the list. The symbol is something that can lead you back to the thing you want to memorize.
Here is an example for memorizing the phone number of our department:
2 - a tool like a hammer
8 – octopus card
5 – fire
9 – line
2 – tool
1 - won, represented by a trophy
8 - octopus card
0 - egg

5. Use imagination to visualize the symbols on the locations that you have selected. For example, a hammer (2 - tool) on the bed, an octopus card on the desk (8 - octopus), etc.

When you want to recall the things that you have memorized, you just go through your memory palace again, and recall the items one by one.

Although Memory Palace has proven to be an effective way of memory, a lot of people have found some difficulties in using the techniques, which has affected its effectiveness:

1. Pure imagination is not enough for visualization
The effectiveness of Memory Palace hugely depends on our imagination. We have to visualize the virtual scene as real as possible so as to deceive our brain that they are real. This can be quite difficult, especially for people who have poor imaginary ability.

2. The memory palace is difficult to record
Although our spatial memory is powerful, we can still forget the memory palace we have created. It would be better to record it down for future revisions. We can either use drawings or texts to record it. However not everybody is able to draw and the visualization would be lost if we use texts.

3 Running out of place to build memory palace
After using the system for a period of time, a lot of people have used up all of the places that they are familiar with. They will have to reuse some places which can confuse our old memory. Some people have to go out and find a new place for building memory palace, which is inconvenient and time-consuming.

Virtual Reality

Virtual Reality (VR) is the technology to allow users to immerse themselves into a 3D digital world. Users would explore the digital world from a first person perspective just like how they look at things in reality. The digital world is delivered through a headset. Common headset device includes Oculus Rift, Microsoft Hololens and Google Cardboard. Users may even be able to have interaction with things inside the digital world with the help of the controller of headsets or hand motion tracking device like Leap Motion and uSens Fingo.

Motivation

It is noticed that VR technology has the potential to solve the above mentioned problems people faced when using Memory Palace techniques. VR provides a realization of a virtual scene, which is exactly what the system needs.

Here is how VR can solve the above mentioned problems:

1. Pure imagination is not enough for visualization
Everything can be visualized in the digital world. With the help of VR, we no longer need to rely on imagination to visualize a virtual scene. VR allows us to actually see the things and even interact with it. This can greatly strengthen our memory.

2. The memory palace is difficult to record
The virtual scene is actualized inside VR. The virtual scenes created can be stored, retrieved and modified easily.

3 Running out of place to build memory palace
VR can provide a lot of virtual places to be used for building memory palace. Those virtual places can be those exist in real world or those purely created. It avoids the troubles to travel around physically to find new places.

2. Objectives

The objective of this project is to build a VR application for building memory palace. The intention of the application is to provide an easy way to build and view the virtual scene created for using Memory Palace system. Moreover, the application can provide a way to allow users to actually see the memory palace that have built so as to strengthen users' memory and increase the effectiveness of the Memory Palace system.

When using the application, users can pick a virtual place or a route. Then users can manipulate the virtual place by placing the objects they want to visualize. The application will provide a large number of objects for users to choose. The user will be able to interact with the objects by grabbing the object and place it onto the virtual location. After the creation, user can save the created memory palace. They can view or change them later easily.

3. Related Works

There is a project called Macunx VR which is labelled as 'a platform for building memory palaces in 3D and Virtual Reality'. The platform is still under development so the exact feature is unknown yet. It can be anticipated that it would provide similar functionality as my application.

4. Prerequisites

Hardware

1. Mobile phone with Android 4.4 or above

2. Google Cardboard, a VR headset used together with an Android phone

3. uSens Fingo, a hand motion tracking device

Software

1. Unity 3D, a 3D game engine for application development

2. Fingo Service, a system to be installed on Android phone in order to use Fingo

Figure 1 – Google Cardboard with Android phone

Figure 2 – uSens Fingo

5. Methodology

Development

The following technology will be used in the development of the VR application:

1. Unity 3D
Unity 3D will be used as the development platform. It is a 3D game engine which is popularly used for developing games and VR applications. It supports both JavaScript and C#. JavaScript will be used since I am familiar with JavaScript but have never used C# before. Learning time can be saved.

2. Google VR SDK
Google VR SDK provides a set of API that implements features like head motion tracking which are necessary for developing VR application for Google Cardboard.

3. Fingo SDK
It is a set of API provided by uSens which implements the features needed for using Fingo in my application.

4. WRLD SDK
It provides a set the location-based environments for VR application. The memory palace will be built with the places provided by WRLD.

User Interface

A suitable UI will be purchased on Unity Asset Store.

Data Storage

The created memory palace will be stored in JSON format. The application will send the JSON data to a server with the service provided by Socket.io API. Socket.io is a JavaScript library which enables real-time bidirectional communication between server and client. The server will be built by Node.js and will be connected to a

database. MongoDB will be used as the database. It is a NoSQL database which is suitable for storing JSON data.

Testing

Unity Test Tools will be used to write test cases for the application. It is a test framework for application developed on Unity. It is free to download it on Unity Asset Store.

Figure 3 – Unity 3D

Figure 4 – Google VR SDK

6. Schedule

Item	Time
Project Plan and website	Sep 2017
Study of Unity and other APIs	Oct 2017
Implementation of main feature	Nov & Dec 2017
First Presentation	8-12 Jan 2018
Delivery of Detailed Interim Report	21 Jan 2018
Integration of User Interface	Feb 2018
Implementation of server & database connection	Feb 2018
Completion of Beta version	Mar 2018
Application Testing	Mar 2018
Delivery of tested implementation & Final Report	15 Apr 2018
Final Presentation	16-20 Apr 2018
Project Exhibition	2 May 2018