Zroad – *AUGMENTED REALITY NAVIGATION*

CITYU CS FYP PROJECT PLAN

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1. INTRODUCTION

1.1. BACKGROUND

In this IT century, most people get at least one mobile phone, information flow media is changed from physical material to digital tool. It brings a lot of benefit. Time cost is reduced and more information can be displayed with one click.

Traditionally, people navigate themselves with a paper map but now, as the popularity of mobile device, people will use applications like Google Maps, transportation application to find their destination.

Google collects geographical data over the world and provides a web mapping service, Google Maps. Google Maps for Android guides users to their destination with GPS navigation, public transit, biking or walking directions based on the geographic information. (Inc., 2013)

1.2. LIMITATIONS

There are still limitations which make the instructions from Google Maps less effective.

- Inconvenience

  When users get the path on 2D map, they need to integrate the path on the screen to the surrounding in the reality. If the users do not familiar with what the map represent in the reality, they may go to Google Street View and get more visual information about where they are. It is inconvenient to work on the integration and finding directions.

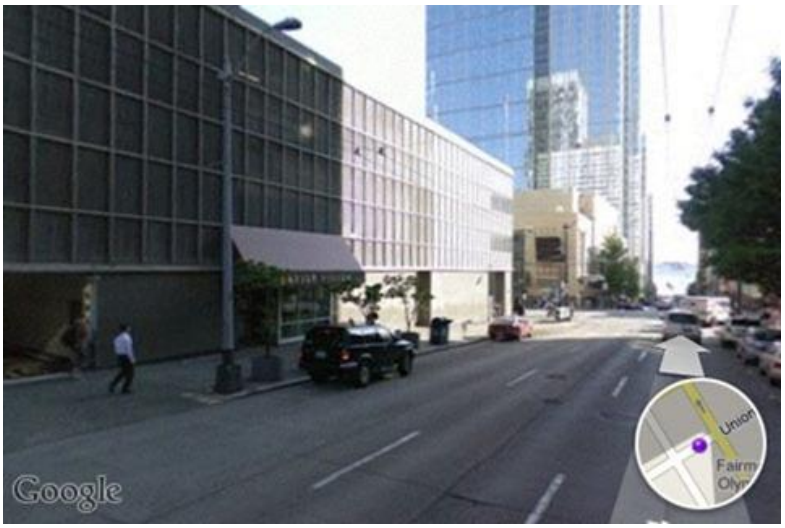

Figure1.2. Google Street View

- Accuracy of user interpretation with path instructions

  With input of destination and current location, Google Maps generates a representation of suggested path displayed on 2D map. The visual aids are not sufficient for users to apply the path into the reality. How the path mapped to the reality is depended on the users. This costs inconsistent performance to the navigation.

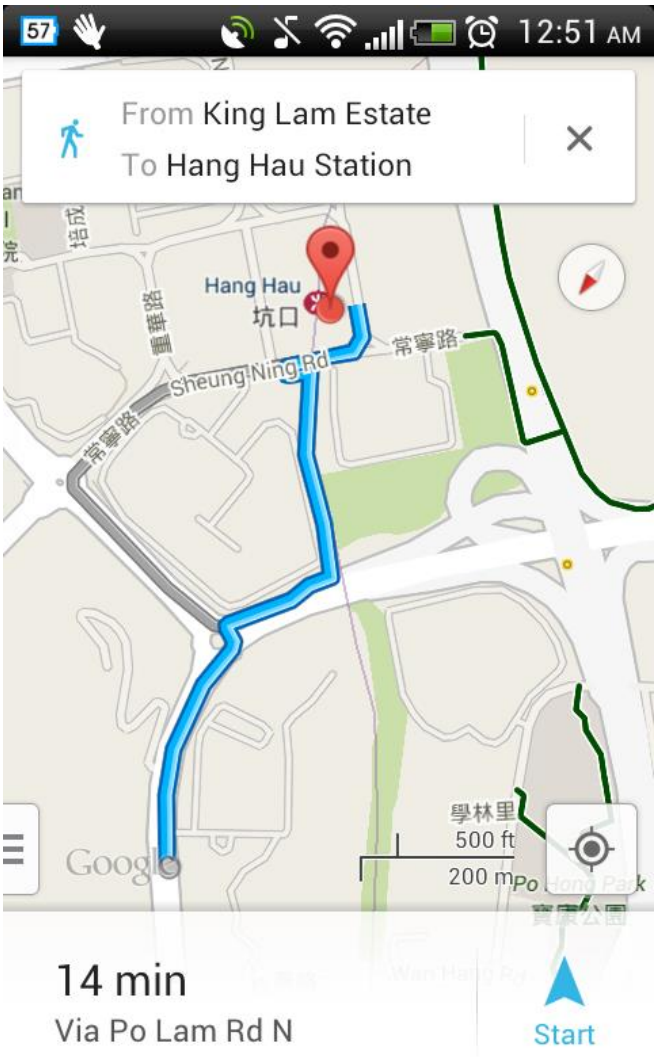

Figure1.1. Path generated from Google Maps for Android

- Recognition

  There may not be significant recognition for the surrounded building when users observe the environment in the reality. Users require time to locate themselves by investigating the surrounding environment.

1.3. PROJECT AIMS

To address the above problems, we propose an augmented reality navigation system, Zroad, to enhance the ability of Google Maps navigation. Zroad connects the geographic information from Google Maps with augmented reality with the help of GPS and the camera of mobile device. By recognizing the environment of surrounding, Zroad will do the integration between the suggested path and the reality for users. Through overlaying visual aids in the viewfinder, Zroad will guide users to their destination. All the users need to do is to follow the instructions from the visual aids. This will enhance the accuracy and effectiveness.

Moreover, the buildings which are within the specific distance from the users will be spot with its information (name, location). This will allow the users to get more understand on where they currently are.

1.4. PROJECT OBJECTIVES

Using an enhanced map on hand is the best choice for people who get loss easily. The more details can people get the information, the easier people to arrive the destination. The ability of the application response the actual location and the surrounding environment can help the user to get the direction efficiently.

Zroad is a mobile application that provides augmented reality based on the instructions to get to the destination efficiently. Zroad, with the pronunciation 'See road', directs user to their destination with the camera and GPS in their mobile device. Even non-map readers now lose in the complicated road like 'Z' shape, they can still easily get their way with instructions from Zroad. After

inputting the destination, all they need to do is to simply raise their mobile device with the camera, focus to the surroundings where they currently are. Zroad will give them directions with some visual aids. Users will not need to worry about the map and just follow the instruction from the given visual aids.

To increase the efficiency of map navigation, AR-based map navigation brings more benefit to user.

- Recognize the surrounding building
- Navigate the direction of movement by overlaying visual aids in the camera viewfinder of mobile devices

1.5. ASSUMPTIONS

- The setting in the mobile devices allows Zroad to grasp their geographical location.
- Accuracy of GPS location is depended on the mobile devices.
- Required architecture on the mobile devices of users was the following:
  - Android 2.2 or above
  - Supporting OpenGL ES 2.0
  - Internet connection (Network/Wi-Fi)
  - GPS Access
  - Camera function and Camera Access
  - Phone Storage (To Be Confirm)

1.6. SCOPE

- Scoped within Mong Kok.
- Scoped for outdoor navigation only.
- Scoped for English only.
- Scoped users are in ground level.
- Data based on Google Walking directions which are in beta and its suggested route may be missing sidewalks or pedestrian paths.

2. SYSTEM DESIGN

2.1. FUNCTIONALITIES

2.1.1. RECOGNIZE THE SURROUNDING BUILDINGS

After Zroad gets the current location with GPS and activates the cameras of the mobile devices, users need to raise their devices and capture the surrounding. The buildings in viewfinder will be spot and the information of the buildings will be displayed.

Figure2.1.1. Prototype of Zroad with camera viewfinder of mobile device

2.1.2. GET THE PATH INFORMATION TO THE DESTINATION

After getting the input of the destination and the information of current location, Zroad pass the data to Google Maps service. By searching in the data collection from Google Maps, the location of the destination is found and Google Maps will generate suggested path and return the path information to Zroad.

2.1.3. DISPLAY THE VISUAL AIDS TO GUIDE USERS WITH THE PATH

Zroad will process the path information received from Google Maps with the mobile viewfinder. Then Zroad will overlay the viewfinder with visual aids according the path information and gives instructions to users to turn, go straight or back.

Figure2.1.2. Prototype of Zroad with camera viewfinder of mobile device

2.2. MAJOR TECHNICAL COMPONENTS

2.2.1. ENVIRONMENT

Hardwares	
Personal Computer	Samsung series 5 ULTRA
Testing Device	Samsung Note 2

Softwares	
FYP Server OS[1]	Window 7 Ultimate
IDE[2]	Eclipse Kepler Release

2.2.2. TECHNOLOGIES

2.2.2.1. GOOGLE MAPS API

As a web mapping service, Google Maps offers API which provides location searching, route planning for traveling by car or with public transports. There is also route for walking (Google Walking) and cycling in beta version.

2.2.2.2. ANDROID SDK

Android, an operation system which is popular in smartphones (Google) and tablets, provides SDK for developer to build Android applications and launch them to a platform, Google Play where allows users with Android devices to download variety application. There is also the Android Open Source Project which provides source code for developer to learn about Android (Google).

[1] Final Year Project Server Operation System
[2] Integrated development environment

2.2.2.3. WIKITUDE SDK

Wikitude SDK provides the library which unifies Augmented Reality technologies and helps in overlaying text, images, graphics or 3D objects in the viewfinder. (Wikitude, 2012)

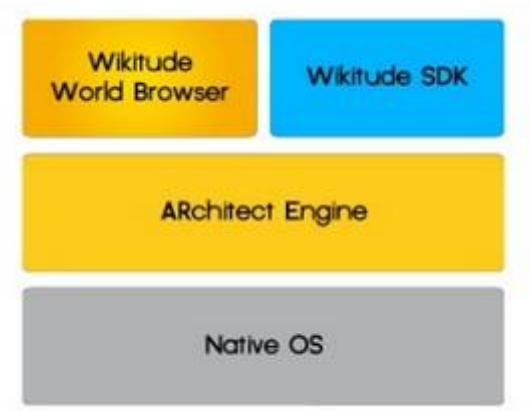

Figure2.2. Relation between OS and Wikitude

2.3. PROJECT STRUNCTURE

2.3.1. ARCHITECTURE AND DESIGN

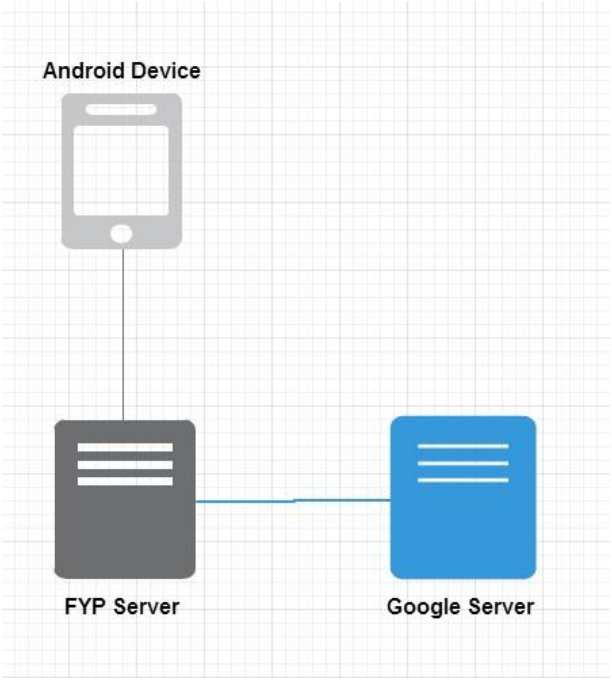

Figure2.3. FYP Server, android phone & Google Maps Server

2.3.2. USER TYPES

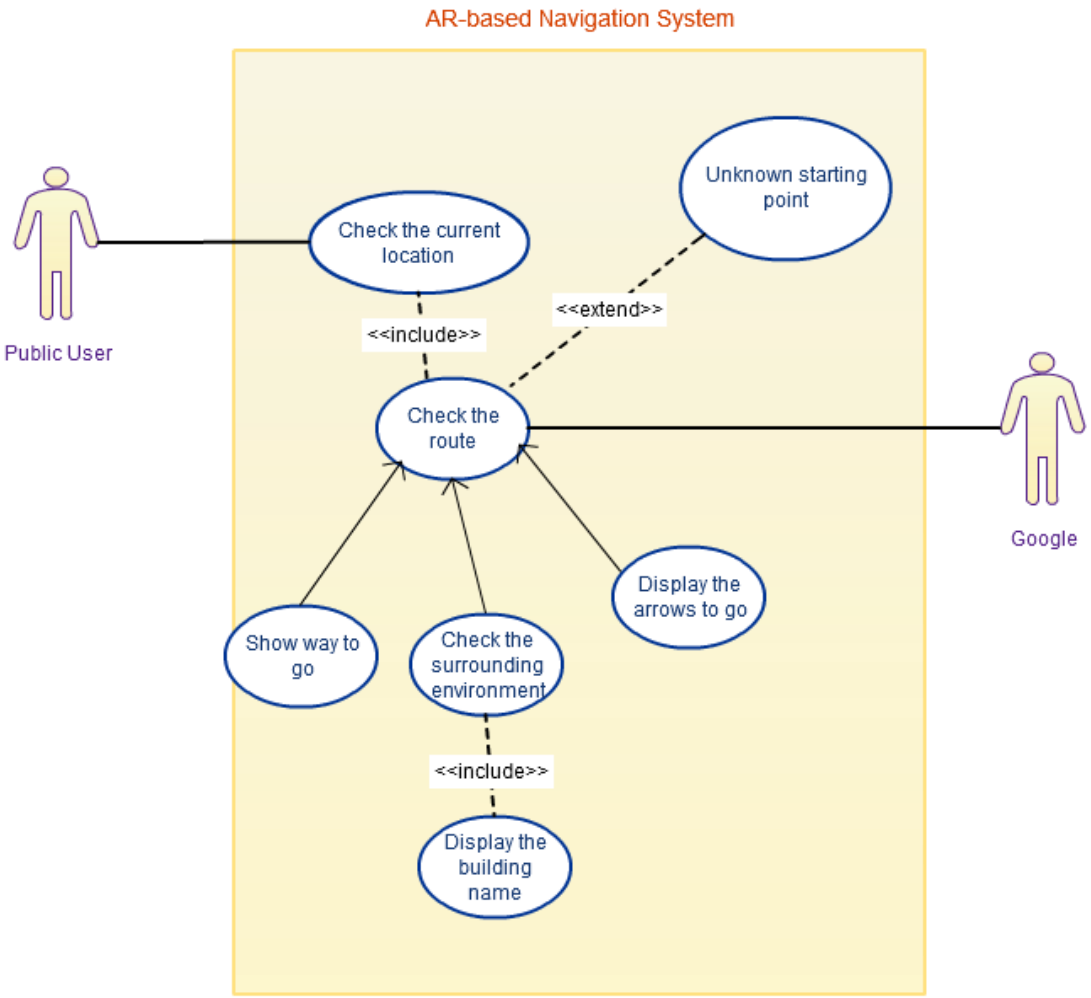

Figure2.4. Use Case Diagram of Zroad

3. PROJECT SCHEDULE

Period	Task(s)
Sep	- Initialize the Project Plan - Study on Wikitude
Mid-Sep	- Finalize the Project Plan - Set Up Server
Oct	- Research on UI Design, Google Maps, GPS - Study on the existing navigation system
Mid-Oct	- Finalize the Program Structure - Initialize the development of Zroad
Nov	- Finalize the First Interim Report
Late-Nov	- UI Design - Unit Test the existing method
Dec	- Integration Test
Jan	- System Test
Feb	- Test Zroad in the reality - Finalize the Second Interim Report
Mar	- Enhance Zroad - Finalize Zroad
April	- Finalize the Final Report

4. CONCLUSION

To conclude, Google Maps has been widely used on no matter mobile devices or websites. It is undoubtedly in contributing to publics. Zroad, with the advantages of Google Maps, enhances the existing navigation system and benefits for people who would like to have instructions to their destination, especially for those who are not familiar with map reading.

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