CHAPTER 3

RESEARCH METHODOLOGY

This research involves in searching tourist attractions and culinary places in Phnom Penh, Cambodia through the mobile application of location based AR technology. To successfully achieve its target, certain research materials or tools as well as necessary required data, concise and clear phase of research activities and research schedule must be thoroughly prepared.

To acquire a better insight of the works which need to be performed in the research, it is very crucial to organize a research framework. To overcome the successful implementation of this research, some components of research activities need to be thoroughly prepared such as (i) the required data, (ii) tools or supportive equipment (hardware and software), (iii) research phase and flowchart, and (iv) research schedule. The detail of these components is described below.

3.1. Data Used in the Research

The raw data which used in this research is coordinate data (longitude and latitude). These data are retrieved from Google Map. The pictures of tourist attractions and culinary places are downloaded from official website of Ministry of Tourism (MoT). The location descriptions are retrieved from various references such as from its official website and other media online.

3.2. Tools Used in the Research

This section outline the hardware requirement and the developing software requirement used in this research.

3.2.1. Hardware Requirement

The selected hardware requirement used in this research will be drawn as the following:

a. Computer specification with processor Intel Core i5 2GHz, memory (RAM) 4.00GB, Display Intel HD Graphic 4000/NVIDIA GeForce GT 740M, Hard Disk Drive 1TB.

b. The operating system of mobile android platform used for testing is Galaxy Note 2 GT-N7100 with android version 4.4.2 (KitKat), processor Quad-core 1.6 GHz Cortex-A9 and GPU Mali-400MP4, memory 2GB, display 5.50 Inch, rear camera 8 megapixel, advanced built-in sensors namely 3G/4G, GPS, Compass, Accelerometer and so on.

c. USB cable is a required element to test the application during the coding implementation. The USB cable is connected between mobile device and computer.

3.2.2. Software Requirement

Some supportive tools or softwares required in this research for developing the proposed application are listed as the following:

1. The Operating System used in this research is Windows 10 Pro.

2. Android Studio 2.1 for developing the proposed application.

3. PHP and MySQL used as tool for developing database and web service.

4. Wikitude SDK used as library to implement the location based AR.

5. Android SDK used as Android development tool.

6. Google Map API used as a service to provide the map.

3.3. Research Phases

The research phases are very significant to be prepared in advance to acquire the successful and smooth running research work. There are six stages of the research described below such as (i) Data Collection, (ii) System Requirement Analysis, (iii) System Design, (iv) System Development, (v) System Evaluation and (vi) Research Report. These steps are explained with the details below and clearly shown with the flowchart of research methodology (Figure 3.1).

3.3.1. Literature Study

In this phase, many relevant literatures have been studied or reviewed which support or are related to the research topic such as location based AR technology. The literatures hereby can be a book, journal, scholarly paper, etc. Through the literature study, the researcher is able to provide detailed explanation of relevant theories and also helps to identify or select the tool that will be utilized to develop the proposed application.

3.3.2. Data Collection (Tourist attractions and Culinary places)

The main fact used in this research is coordinate data. This data is retrieved from each location of chosen tourist attractions and culinary places. The coordinate of each location is obtained from Google Map. The

pictures and description of the chosen places are retrieved from official website of MOT and other online sources.

3.3.3. System Requirement Analysis

In this phase, after gathering the data completely and accurately, the requirement analysis process is implemented by using the obtained data from the previous stage. The system requirement hereby is functional and non-functional. After that, the next step is to analyse the system architecture of the developed software.

3.3.4. System Design

According to the result of the analysis, this phase is implemented by designing a system such as software modelling. This stage will provide the outcome of system architecture, database, and application user interface (prototype).

3.3.5. System Development

At this point, the software development or coding process is achieved. The developing software will be performed with the Android Studio 2.1.2 as IDE (Integrated Development Environment) application which execute the Android Emulator on desktop computer. The implemented steps in this research will be drawn as the following:

1. Design the user interface which is suitable with the prototype

2. Prepare the database that suits the system requirement

3. Design web service for parsing the data from web server

4. Create a layer as AR information service on Wikitude SDK

5. Connect web service with AR information service

6. Generate the android package installer (apk file) for mobile device

3.3.6. System Evaluation

In this phase, system evaluation or testing is implemented after completing the software development successfully. The system evaluation is divided into two stages:

1. The evaluation of software functionalities is done by mobile application developer.

2. The software evaluation is directly conducted by users regarding all the functions to assess the usability of the system and gather feedback for further improvement. It is done by interviewing and providing the questionnaire to respondents for testing the proposed software. Thirty respondents will be chosen to test the software and then fill the questionnaire. Respondents must be users of Android mobile platform. Respondents' age requires at least 18 years old. The respondents will be chosen from various group of people such as local people and international tourists who are visiting Phnom Penh city in Cambodia.

3.3.7. Research Report

Research report is the last stage of research phases and it includes thesis writing with conclusions and recommendations for further research work. This phase also requires to make a journal for publication.

3.4. Research Flowchart

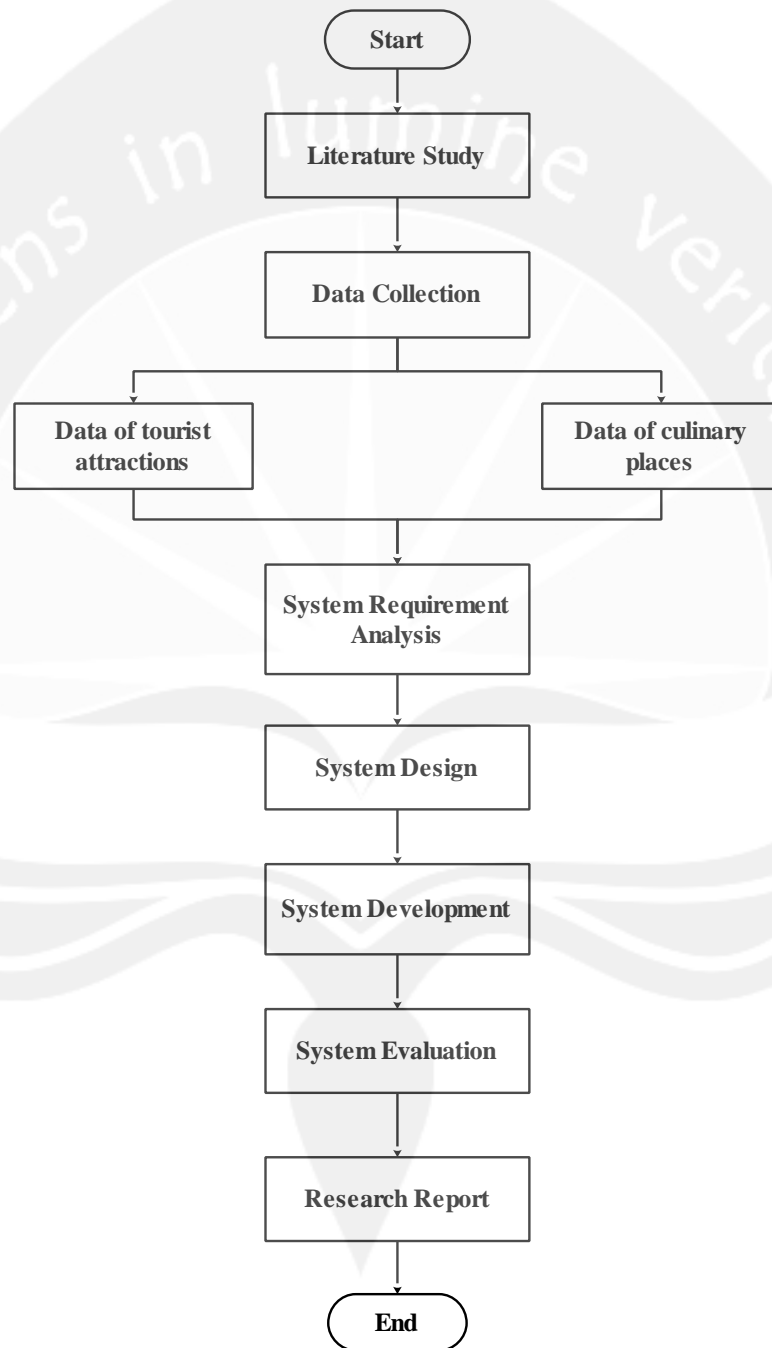According to the research phases which explained above, hence the thesis flowchart is shown as follows:

Figure 3.1. Flowchart of Research Methodology

3.5.   System Flowchart

Figure 3.2 presents the flowchart of the Camtour AR system. When the user start searching the location, the camera view will be displayed on the mobile screen. At that time, it will check the condition if GPS service enables or not as well as if internet connection is active or not. If both conditions are met, all determined two-dimensional POI objects or markers will be loaded on the screen. In contrast, if one of the conditions are not met, the augmented reality camera view will appear without any POI objects. The user can choose one of POIs which overlaid on the mobile screen to view the detailed POI information. After displaying POI information, user can press back button which will re-display augmented reality camera view. If the user press the back button again, it will come out of this screen and go to main screen.
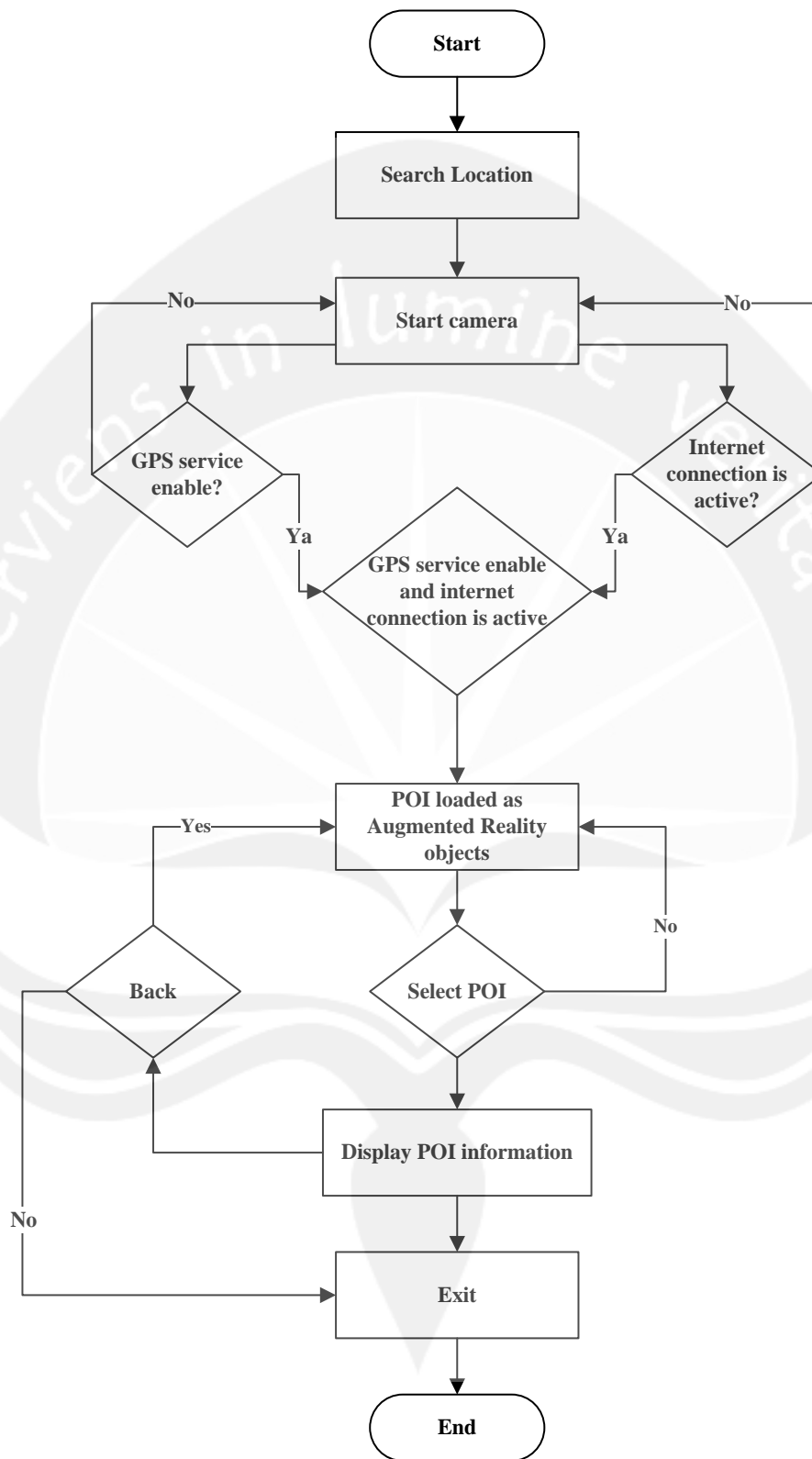
Figure 3.2. System Flowchart

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