

## Chapter 20

# UMS Location-Based Augmented Reality Tour Mobile Application

Siti Aisyah Mohd Yassin<sup>1</sup>, Siti Hasnah Tanalol<sup>1\*</sup>, Norhayati Daut<sup>1</sup>, Asni Tahir<sup>1</sup>, Aslina Baharum<sup>1</sup>, Datu Razali Datu Eranza<sup>2</sup>

<sup>1</sup>UXRL, Faculty of Computing and Informatics, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, MALAYSIA

<sup>2</sup>Faculty of Business, Economics and Accountancy, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, MALAYSIA

*hasnah@ums.edu.my\**

### ABSTRACT

Following the fast forward development of advanced technology and the expansion of smart gadgets, we cannot deny that technology plays a significant impact on the way we live and communicate. Moving on to the tourism field, it's already become a necessity for people to use technology alongside their journey. However, current tourism application still has limited attractive and informative content about the location of attraction places, especially in Universiti Malaysia Sabah area. This could lead tourists to experience difficulties in finding their directions, useful information and the facilities around the campus while using the application as sometimes they would prefer to do touring on their own. The research element that has been using for this mobile application was the content-based filtering for a recommendation that stores content information about each place to be recommended based on their preferences. The methodology used in this project is the Agile Methodology that includes planning, analysis, design, implementation, testing and maintenance. This mobile application is able to provide recommendation based on their preferences of the attraction places around Universiti Malaysia Sabah campus, including useful information in the attractive view to attract users. The improvement of technology in a mobile device allowed the recommendation and augmented reality technique to be implemented in this mobile application project. This project changes the way in presenting some information to user from a normal text and image display on the screen to a real-time Augmented Reality with the Location-based technique. It also provides recommendation for the user based on their chosen preferences and somehow the research element still being implemented into the mobile application. The results of this project used to evaluate the user acceptance using usability testing on ten participants.

**Key Words:** Augmented Reality, Recommendation, Location-Based AR, Eco-Campus Tourism

## 1. INTRODUCTION

Tourism is an individual action of travelling and visiting places. It has created and promoted various styles or kinds of travelling and travellers. In August 1972, an Act of Parliament created Malaysian's Tourist Development Corporation (TDC) as an agency under the former Ministry of Trade and Industry. With the creation of the Ministry of Culture, Arts and Tourism on May 20, 1987, TDC was transferred to this new ministry and became the Malaysia Tourism Promotion Board (MTPB) through the 1992 Malaysia Tourism Board Act. As well established as Tourism Malaysia, their full focus is on promoting Malaysia internationally and especially domestically (About Tourism Malaysia, 2012). In 2019, our Former Prime Minister Tun Dr Mahathir Mohamad unveiled the Visit Malaysia 2020 last year at Sepang. He said that the Visit Malaysia campaign is an opportunity to make the country a destination of choice for tourists and make Malaysia one of the highest numbers of tourists who came for travel (Mazwin Nik Anis and Joseph Kaos Jr, 2019). Malaysia attracts nearly 25 million visitors every year and for a good reason; the vibrant, multi-cultural and multi-religious nation is a multifaceted gem that lures as much with quiet graces and natural attractions. Tourism in the university also continues to grow including Universiti Malaysia Sabah that has its own platform that handles the tourism around the campus which is Eco Campus Visitor Information Centre (EVIC) under the Eco Campus Management Center.

The Eco-campus Management Center was founded in February 2013 by Universiti Malaysia Sabah (UMS) as a forum for the university to provide a structure to be adopted, applied, monitored, assessed and reviewed based on the critical elements of the Eco Campus Transformation Plan. The launch of UMS Eco Campus Tourism Information Centre on 3 August 2016 will provide visitors and tourists with information about the campus's attractions and tourism packages (Ecocampus Management Centre, 2015). There are five Eco Campus Tourism Packages available that are focusing on Nature Tourism and Green Tourism concepts. Nature Tourism is described as 'responsible travel to natural areas or related sites to see, admire, enjoy and learn about the environment. Flora and fauna as well as culture in the areas without causing dangerous disruptions and destruction, for the protection of the environment and the well-being of the local population'. Green Tourism is characterized as 'responsible travel to natural areas or related sites with minimal climatic impacts through efficient and sustainable use of energy and water, minimized waste production, recycling and promotion of environmentally friendly goods for natural resource conservation, reduced operational costs and increased tourist satisfaction'. In 2016, Eco Campus Visitor Information Centre (EVIC) was established to promote UMS as an eco-tourism university in Malaysia and help to introduce UMS for the first-time tourist as the EVIC located at the main gate of UMS. Besides offering five tourism packages, the EVIC also serves as a central ticketing centre and facilitates the purchase of tickets to all of the attractions in UMS. Bicycles and the buggy car are available for visitors that use electricity and help reduce the carbon footprint possible for travellers to enjoy a panoramic view of the campus. As the technology expands day by day, the tourism field including tourism in Universiti Malaysia Sabah has been improved by implementing it into the smartphone. Basically, the smartphone is one of the advanced technologies that play a significant impact on the way we live and communicate. People use the application in the smartphone because apparently, mobile apps can act as a replacement to other devices to become one device that can fit their needs. These include the availability of today's smartphone, which is a camera, calculator, notebook, reminder, music and for browsing the internet. Smartphones can help us find local and destination information in terms of knowledge, enabling us to check the weather, monitor our location via GPS and find the restaurants. Users can even use services such as Google Maps to get directions

to where we are going. Using a smartphone is also one of the advantages when a user can experience a more attractive way while travelling which is Augmented Reality technique and improve the tourism field in the smartphone by adding the Recommender system for more user experience.

The main goal of this project is to develop a mobile application which can offer recommendations and information about some exciting places around the campus for the tourists from other countries or even locals for more straightforward navigation. This application provides a better travel guide platform that can improve the user experience while travelling to University Malaysia Sabah. Most of the time, the tourists are often lost in the sight of directions and tend to wander around the campus to find a specific location of attractions around the university. In the worst-case scenario, when they are first-time visitors, and they do not know where they should go first based on their preferences even after asking for directions because they would sometimes forget about the locations. Hence, the project is developed to help the user increase their user experiences while travelling. This project has proposed an Android-based Augmented Reality application to provide the user with a helpful tour guide around the campus alongside the addition of recommendation elements that were included in the apps. By adding a recommendation based on the user needs feature it will help them to make a decision in a short time and plan their tour better in terms of time-saving and less energy required. This service also will show the directory of the place to help guide the tourists where are the nearest facilities such as toilets and cafes or restaurants from their current location.

## 2. LITERATURE REVIEW

Universiti Malaysia Sabah (UMS) is one of the tourist's attractions places with beautiful scenery campus, and it is expecting that the number of tourists will keep increasing every year. Based on the interview made with the supervisor of Eco-campus Visitors Information Centre (EVIC), the main attraction in the university is Clock Tower, Chancellery Building, Outdoor Development Centre (ODEC), Medical Gallery, UMS Mosque, Chancellor Hall, Aquarium, UMS Library and the ITCB Greenhouse. All the attractions are scattered all around the campus that might be difficult for the tourist to reach quickly and no recommendation for the nearest convenient places. When it comes to camera worthy pictures for tourists to take, they mostly face some difficulties with finding the attraction due to mysterious ways yet confusing for the first-timer tourists. Worst case scenario might occur if they come to the campus without a tour guide and face difficulties in allocating the attraction places they want to go first and also estimate the distance from one place to another. For now, they have provided an application and website for HQ, which is UMS Investment Holdings that when users click the site they have several divisions and one of the divisions is Eco-campus Tourism that links to EVIC website. But the website is still under maintenance until they launch it, so they have to share the website with UMS Investment Holding at this moment. For the application, the user is required to scan their barcode to download the app that can help them get directions, view attraction places, information about the places and how long it will take to reach those places.

According to the Supervisor of Eco-Campus Visitors Information Centre (EVIC) Mr. Rashid Thomas, the number of tourists and visitors each day reached the average total amount of thousand visitors, and they received the same complaint and feedbacks which is language difficulties and minor feedback for loss of directions since most of the tourist will get the tour guide to guide them around the campus. At this moment they overcome the language difficulties problem by training their staff to be able to communicate in various languages to help the user with their tour around the campus because the tour guides that

Eco-campus provided is limited as the human resources for the centre is not enough (refer appendix for full interview session). Following the current application that Eco-campus has provided, it has limited attractive content in the system so the user can only use the app to view the information and attraction places. To ensure the satisfaction and memorable experience, adding some of the information elements and tour recommendations in the application might attract the tourist in using it as useful tools to go around campus.

The problem statements had been summarized and listed as the following:-

- i. Lack of information about the exact location of attraction places by user's preferences causing tourists to experience difficulties in finding their directions and facilities around the campus;
- j. Lack of information about recommended and nearest location that should be visiting first that can cause time-wasting;
- k. Limited attractive and informative content in available resources to attract the user.

### 3. METHODOLOGY

Agile methodology is selected as the process model for the development of this project. This methodology is selected because it aims to offer an alternative to conventional project management approaches, such as waterfall methodology, for mobile application development. The agile method involves less preparation, and it divides the job into small increments and is designed for short-term projects with an effort of following the software development life cycle (Sharma et al., 2012). This promotes adaptive preparation, evolutionary growth, early implementation and continuing change. This iterative and scalable approach can be used in a complex project where there is constant change in customer requirements. Figure 1 shows the methodology that has been used in this project that is suitable for the development of this mobile application. This methodology consists of several steps, as shows in Figure 1.



Figure 1: Agile Methodology for UMS Tour Recommendation Mobile Application

#### 4. IMPLEMENTATION

For the implementation phase, the system design prototype will be converted and implemented to develop a mobile application using suitable and proper tools. From the prototyping process, it transforms into the real system. This project has been reaching this stage, where all the modules that have been identified were implemented in this phase.

At the finishing stage of the development, the system will be tested where the application is either working as desired and successfully built by meeting all the requirements and achieving the main objectives of this project. In this type of methodology, a system will be developed by version, meaning the policy will be updated according to requirements gathered from the beginning and the steps will go through analysis and design once again until the desired system is developed according to the objectives. This is to avoid any errors and bugs.

#### 5. RESULTS AND DISCUSSION

Usability testing is a way to see how a system or mobile application is used by testing it with the real target user. Usually, the user was asked to complete some tasks on the mobile application that will be provided. This usability testing has been done on this project by distributed questionnaires using Google form to the target user. There are 10 respondents that were selected randomly. Testing has been done by providing the user with a full video demo of UMS Tour Recommendation mobile application. The testing video has included the testing of Augmented Reality in the range available using my current location. The video also included the feature of Recommender system using content-based filtering where the user can choose their preferences based on the choice given. This is to test the user acceptance about the Augmented Reality and Recommendation feature on this mobile application. The testing on the mobile application has been done by asking the user to use and explore all the features of the mobile application (apk file provided with the video demo). After the user completes the task, a set of questionnaires using google form was distributed to evaluate the user acceptance to the mobile application.

##### 5.1 Usability of the Mobile Application

To evaluate the usability of the mobile application, there are several questions distributed to the user testing. Users evaluate the mobile application based on the linear scale 1 to 5 which represents 'Strongly Disagree' and 'Strongly Agree' as stated in the questionnaires that have been prepared. Questionnaire for Usability Testing attached on Appendix C.

## 5.2 Summary of Usability Testing

Table 1: Results from user feedback after using the UMS Tour Recommendation Mobile Application

Item	SD	D	N	A	SA	Mean
The information in Augmented Reality feature in this mobile application is attractive to view	0	0	0	0	10	5.00
The recommendation feature helps to find the preferences places easier	0	0	0	1	9	4.90
All features in this mobile application are useful and suitable for the use of a travel guide	0	0	0	0	10	5.00
The interface of this mobile application is user friendly	0	0	0	0	10	5.00
Overall, I am satisfied with how easy it is to use this mobile application	0	0	0	0	10	5.00
Total overall mean						4.98

SD: Strongly Disagree, D: Disagree, N: Natural, A: Agree, SA: Strongly Agree

Overall, there are total 10 respondents, most of them are students from Universiti Malaysia Sabah including the international student and 4 of the respondents are the visitors that experience travelling around the campus. The number of male's respondent is 4 and female's respondent is 6. The testers are mostly from UMS student age from range 20 to 40. There are 20% and 10% respondents from age 15-20 and Above 40 because this range of age was collected from the visitors. No respondent from the age below 15.

The overall mean of result is 4.98, it can be concluded that the number of respondents satisfied with the UMS Tour Recommendation mobile application is higher than the number of respondents that are not satisfied with this mobile application. From all the results of the evaluation above, there is a small number of respondents who did not strongly agree with the statement but still agree with it. This is because one of the respondents above 40 answered it as he just clicked the function button but then after being explained about the recommendation features and seeing it again he strongly agrees with the statement as he just answered it with agreement. The number of respondents that are satisfied with the mobile application is higher and to be concluded all of them are satisfied with the mobile application. This is because most of the respondents are students from Universiti Malaysia Sabah and they have Information and Communication Technology (ICT) knowledge. Therefore, it is easy for them to use the mobile application.

## 6. CONCLUSION

In conclusion, the result shows that most of the respondents are satisfied with the UMS Location-Based Augmented Reality Tour Mobile Application. This mobile application is still in the progress of the development process and will achieve the entire objective that has been stated. The project will undergo each stage of the software development life cycle. At the beginning of the project, three problem statements had been listed. The problem statements are identified based on some problems faced by the tourists in

Universiti Malaysia Sabah. From the defined problem statement, the objectives to achieve in project development are listed. There are three objectives to fulfil which are to design and develop an Android-based tour guide application that allow users to view attraction places in UMS, to implement a location-based Augmented Reality using Geolocation technique in mobile application and lastly to evaluate the usability of the developed mobile application to the user by distributing questionnaires to tourists around the campus. To make sure the mobile application that will be built up to date and follow the current user requirement, reviews on the similar mobile application available in the market have been made. The analysis that has been done based on some function that will be implemented on the proposed mobile app. The proper methodology will affect the development process of the mobile application. Agile methodology has been chosen for the development of the UMS Tour Recommendation mobile application because it is a suitable methodology for small mobile application development.

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