UMP VIRTUAL DIRECTORY IN
AUGMENTED REALITY

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ABSTRACT

UMP virtual directory in augmented reality (AR) project is developed to provide a platform for students to easily get to know the university campus building information and avoid students from searching through internet or directly asking. The purpose of this project is to develop an interesting AR system. The objectives of this system are to enhance the information provided by the university and help students to find out the function of each UMP campus building. A survey questionnaire was carried out among UMP students and the finding is that most of the students does not actually care or use about UMP map board. By compared to this conventional way, the new system will be more convenient and attractive to be use. A student does not need to always refer to UMP map board when they are lost direction or does not know what the building for. This AR virtual directory offers interaction with the marker which enables students experiences a new way to understand the campus buildings. It will assist students to find the right information of the campus building.

Keywords: Virtual directory, augmented reality

ABSTRAK

UMP direktori maya dalam augmented realiti (AR) projek dibangunkan untuk menyediakan platform kepada pelajar bagi mudah mengetahui maklumat universiti kampus bangunan dan mengelakkan pelajar daripada mencari melalui internet atau meminta secara langsung. Tujuan projek ini adalah untuk membangunkan satu aplikasi AR yang menarik. Objektif projek ini adalah untuk meningkatkan maklumat yang diberikan oleh universiti dan membantu pelajar untuk mengetahui fungsi setiap bangunan kampus UMP. Satu soal selidik telah dijalankan dalam kalangan pelajar UMP dan penemuan ini adalah bahawa kebanyakan pelajar sebenarnya tidak peduli atau menggunakan UMP peta papan. Berbanding dengan cara konvensional ini, sistem baru ini akan menjadi lebih mudah dan menarik untuk digunakan. Pelajar tidak perlu sentiasa merujuk kepada UMP peta papan apabila mereke sesat jalan atau tidak mengetahui fungsi bangunan itu. Direktori maya AR ini akan menawarkan interaksi dengan penanda yang membolehkan pelajar mengalami cara baru untuk memahami fungsi bangunan kampus. Ia akan membantu pelajar untuk mencari maklumat yang tepat.

Kata kunci: Direktori maya, augmented realiti

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LIST OF ABBREVIATIONS

UMP: University Malaysia Pahang

AR: Augmented Reality

GPS: Global Positioning System

PC: Personal Computer

3D: Three Dimensional

PART 1

INTRODUCTION

1.1 Introduction

Public universities in Malaysia often cover huge area. The buildings are everywhere in the campus. Some building student well known about it function and the purpose but some they do not. This issue same goes to University Malaysia Pahang (UMP). Especially when there are still a lot of buildings is expanding. At this rate, there will be more and more building in the campus. Meanwhile at the same time, there will be increasing students also.

This was a good sign for the students since students can further study and get use of all the facilities. However because of the lack of information, sometime, students will ignored this facilities provided by all those building. Although info centre is provided and person in charge can help them but they will act not care and not ask until they have been graduated. Reasons may because of shy to ask and lazy. At the end, not much student will be benefited. At the same time this will became a bad sign. Thus, this project is proposed to overcome this issue.

This project is most likely about a guide for student to get know the function and the structure of the university buildings. With using augmented reality method, students can retrieve multimedia information about the building. Students can view the important information of the building by using their computer and the webcam. They will get to know where this place is and what the exact function of the building is. Thus they do

not need to ask the person in charge. All students need to do is just run the software application in their computer with build in webcam and start scan through the building image marker where image marker need to be printed out. The information show up will be like the purpose of the building, the facilities provided by the building and the structure of the building. This will be an easy and simple way for students to retrieve the structure and information of the building. Meanwhile with the 3D structure, the information show up will be more interesting and fun for students to view. At the same time, students will get to know what the building is for and they will have the chance to use the facilities provided.

1.1.1 Problem Statement

In Malaysia, there are overall twenty public universities in the country (Ministry of Higher Education). Students who graduated from SPM, Matrics or STPM will have the chance to enter their favorite university and thus continue their further study. As a student in university, all students well known that all these public universities is huge in area, not alike Malaysia secondary school. University Malaysia Pahang (UMP) is one of the examples.

In the orientation week, students who enter this university may lose their direction even with their parents. Inside the university, there are a lot of buildings like cafe, hostel, office, lab, class room, sport centre and many more. With the new environment and lack of time to adapt these environments, many students complained they have lost in university. This indicates that the lack of information provided by the university. Meanwhile, some student also complained about there are too much of office building, and they do not know the exact function of the building. This shown that the university needs to improve their information delivery method. Thus, this phenomenon has made a lot of student confuse about their university and they miss out the chance to use the facilities that provided by these building. This will be a lost for students and a waste from university.

Thus to ensure and avoid this lost and waste, this project research will carry out. This project can provide useful and helpful information for student to understand the structure of the building and the function of the building by using their computer. Upon completion of this project, students will free from these problem.

1.1.2 Objective

The objectives of the project are to:

    i.   Apply augmented reality method to build up a virtual directory for UMP campus.

    ii.   Enhance the information provided by the university.

    iii.   Let students understand well about the university building structure and its functions.

1.1.3 Scope

The scopes of the project are to:

    i.   Provide a platform for student, lecturer, parent and visitor to understand the function and structure of university building.

    ii.   Cover all the important hot spot of university building and provide virtual information for user.

    iii.   Present the useful information to user with interaction method.

1.2 Previous Work

Augmented Reality (AR) is a term describing a view of a physical real-world environment whose elements are augmented by virtual computer-generated imagery (Azuma, 1997). It is related to a more general concept called mediated reality, in which

a view of reality is modified by a computer. As a result, the technology functions by enhancing one's current perception of reality. By contrast, virtual reality replaces the real world with a simulated one. Augmentation is conventionally in real-time and in semantic context with environmental elements, such as sports scores on TV during a match. With the help of advanced AR technology (e.g. adding computer vision and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulable. Artificial information about the environment and its objects can be overlaid on the real world (Daemon, 2012).

There are two types of AR technology where there are marker-based and real-time (markerless). Marker-based system needs user to captures an image of the environment, detects the marker and deduces the location and orientation of the camera, and then augments a virtual object on top of the image and displays it on the screen (Siltanen, 2012). However in real-time (markerless) systems, any part of the real environment or real image may be used as a target that can be tracked in order to place virtual objects (Jose, 2012).

Ferrari, Tuytelaars and Van Gool, 2001, presented an approach, which is based on markerless AR. They presented a new real-time affine region tracker. Instead of tracking fiducial points, they track planar local image patches, and bring into complete correspondence, so a virtual texture can directly be added to them. This is a great AR system.
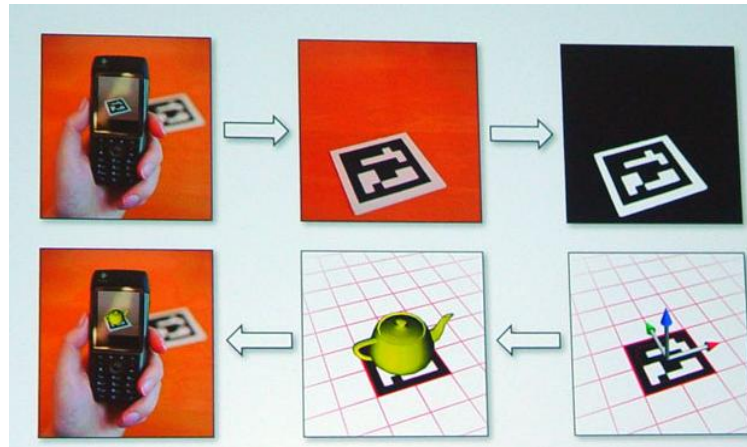
Figure 1.1: Marker-based AR system
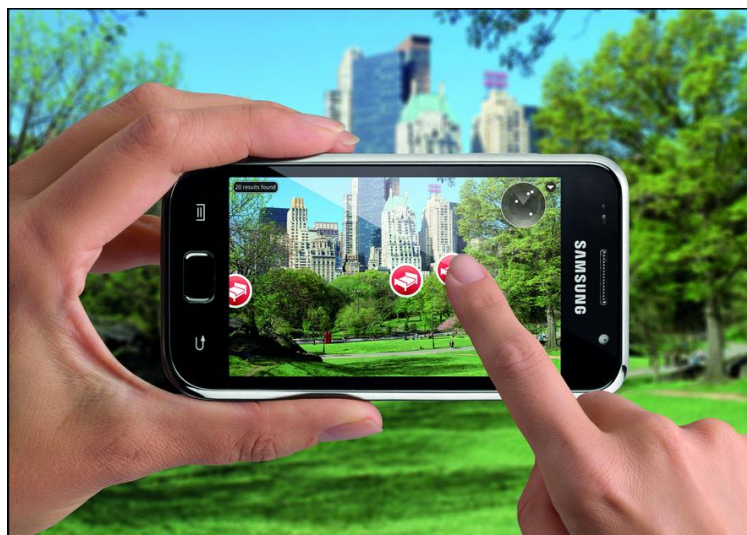
Figure 1.2: Real-time AR system

1.3 Current System and Limitation

For UMP virtual directory in augmented reality, there is no exact computer based system has been develop yet. However, the related system or current system to guide students to find the location and understand the building will be the map board. Map board is the plan of the environment where it always consists of the pictures of the buildings and show up the name of the buildings. It places in specific locations where

students can view and check on their current location. Meanwhile students also can check on where they want to travel by seeing the map board. In short, map board is to provide information on the specific environment and the location of the buildings. With this map board, students will guide easily to get the location to travel and a promise for students not to be lost in UMP campus. There are few map board provided in UMP surrounding, thus students can always check on it when he or she is lost. Figure 1.3 shows the UMP main map board.

Figure 1.3: UMP map board

However, these map board have a lots of limitation. For example, if a student lost in environment where there is no map board. Thus, these map board will unable to help the student since the student unable to find the map board to view. Besides, map board does not promising an information view on that building like the purpose of the building, the operation hours and the description of the building. Meanwhile, sometime the map board is confusing for certain student. This is because they do not understand on how to retrieve the information from it. The reason maybe the pictures is too small or there is lots of name of the building be combined together. And last of course this map board is too bored to be view by most of the students. The design is almost the same and

there is no interesting point for students to play around. Thus, all these limitations have made lots of students ignore the actual function of the map board.

Augment is one of the current existing systems for marker-based AR. Augment is an apps for smartphone that lets user to visualize the 3D models in real environment. Augment is the best way to try furniture at home, to test paintings on the walls, and to discover buildings, tech products or even characters in stunning 3D. User will first need to download the marker from the website and print it out. Thus with user smartphone or tablet scan through, the 3D structure of the object will appear in the screen. But there are some limitations over this system. One of the limitation is the 3D object is too large to display in smartphone. This is due to the small screen of the smartphone thus affected the display object. The size of the 3D object is not so match when using smartphone to display however it is match on tablet. Thus, the proposed project for UMP virtual directory is a computer based to let the students have a bigger screen to view the 3D object.

Figure 1.4: Augment 3D object with marker

Mobile augmented reality system for personal museum tour guide applications where presented by Jing, Junwei and Yongtian, 2011, outlined about the real-time AR system. In the system, they developed a prototype of a mobile interactive museum guide system, which consists of an ultra mobile PC equipped with a webcam. This system will automatically find and retrieve to the visitors in an intuitive way. Thus this system

replaced the booklet or text label that placed close to the exhibit object. Visitors only need to take a picture of an object of interest from any position, image processing technology recognizes the input picture and provides augmented multi-model. This will attract visitors to appreciate art more deeply. However one of the serious problems is the slow processing speed of the device. It needs to take a long time to recognize the object and process the data very slow. Besides, un-portability of the device also is a problem since the device needs visitors to carry it from one position to another.

Layar is one of the real time AR applications in mobile. There are many sub-AR systems in Layar. One of them was "The Ocean is in Your Hand". This system was developed by a Malaysian call Norman Chee. He developed this system as his final year project in his digital media course. The purpose of his project is to promote awareness about marine life and to promote marine protected areas. User will get to know more about endangered species of marine life through this application. The limitation is it contents is only available in Multimedia University, Malaysia. The similar app for the Layar will be the Wikitude.

There are a lot of current system that nowadays using a printed book. For example, the Ikea 2013 catalogue. User can play around the augmented reality technology with their smartphone and the catalogue. At the same time, user also can view the catalogue page by page. The only interesting is the added function of augmented reality. With downloaded Ikea app, user can scan through the image of the furniture and get the 3D model of the furniture. User will have a deep knowledge on how to decorate their furniture. Besides, there are some video on it when scan through the image. The video will provide even more information of the furniture. This feature will make user feel more comfortable when their want to chose the furniture. On the other hand, every system has its own limitation. The limitation of this system is slow response time. User has to wait long when scanning the image. Besides, sometime the app does not recognise the image in the catalogue.

This existing system is quite similar with UMP virtual directory in augmented reality. The common point is there is a printed book with marker. User can scan the marker and get the virtual information. But the main focus for developed UMP virtual directory is computer based. The different here is Ikea uses mobile based where a smartphone is needed.

Figure 1.5: Ikea 3D object

For computer based, augmented reality is mostly used by marketers to promote new products by online. Most techniques use markers that the users present in front of their webcam either on special software or simply on the advertising company's website (Carmigniani et al., 2011). For example, MINI, the famous car company, ran an augmented reality advertisement in several German automotive magazines. The reader simply had to go to the MINI's website, show the ad in front of their webcam, and a 3D MINI car appeared on their screen. This is the same application to UMP virtual directory which uses computer for user to interact the virtual 3D object. User can rotate the marker to have a 360 degree view of the model.

Figure 1.6: MINI 3D car

1.4 Method of Approach

We will use BuildAR and Maya software to develop this system. Hardware we will use is the computer and the build in webcam.

1.5 Scope and Limitation

The scope of the project is to:

i.   Provide a platform for student, lecturer, parent and visitor to understand the function of university building.

ii.   Cover all the important hotspot of university building and provide user virtual information on their computer.

iii. Present the useful information to user with the augmented reality technology and immerse them into an interesting view.

1.6 Outline of Material Presented in Rest of Report

This technical report consists of 3 parts. The first part which explained about the introduction, problem statements, objectives and scopes of the entire project. Meanwhile, review on previous work and current system and limitation are also cover in this part. This subsection briefly compared the existing system and proposed system. Besides, this part also contains the method of approach and scope and limitation.

In part two, the main focus is explained about the methodology used to develop the system. This part explained the used of Software Development Life Cycle (SDLC). Last but not least, this part also discussed the user requirements, flow chart, storyboard and the method use for the whole development process.

The last part is the conclusion of the technical report. This part concluded and summarizes the key important point for the entire project.

PART 2

REPORT BODY

2.1 Methodology

This part will discuss about the methodology that used to develop the system. In order to develop this system for the title UMP Virtual Directory in Augmented Reality, ADDIE model is used as a methodology. This methodology is used as a guide to control the development process. There are five phases in this method which included:

i)   Analysis phase
ii)   Designing phase
iii)   Development phase
iv)   Implementation phase
v)   Evaluation phase

Each phases will be discuss in the next section for details. It is important to define all the phases because when the phases is proper arrange, there will be no unnecessary work to carry out. This will help to develop the system in the project scope.

The reason for choosing ADDIE model as a methodology is because this methodology is simple and easy to understand for the development whole process. Besides, this model also use due to the project is a multimedia course. Because of multimedia course project, ADDIE is the most suitable in multimedia development. Due to time constrain for this project, ADDIE is also a beneficial way to be chosen. This is because ADDIE defines all the phases in proper arrange. Phase by phase follow will decrease the chance of making mistake and allow knowing what to do after one

phase is finish. With the schedule that a deadlines has been set, the work progress is more efficiency deliver on time. Besides by using ADDIE, all the project requirements are stable and the system progress can be measure from time to time.

2.2 Planning

Before go deep into the ADDIE methodology, a planning is needed to carry out. The planning is to discuss about the plan of the project before undergoes other process. To avoid unnecessary work, planning a project is important. It discusses the flow of the whole project process. The plans created will help to manage the time, quality, change, and risk. It will help all the flows of the works in proper arrange.

Flowchart was one of the important tasks that needed to be carried out during the planning. Flowchart provides the visual information on how the process of the system is going on. In this system, there are 2 types of flowchart, which included development process flowchart and system flowchart. Both flowcharts will explain the difference flow of the system from the beginning until the end. Figure 2.1 show the flowchart of the development process and Figure 2.2 show the flowchart of the system.
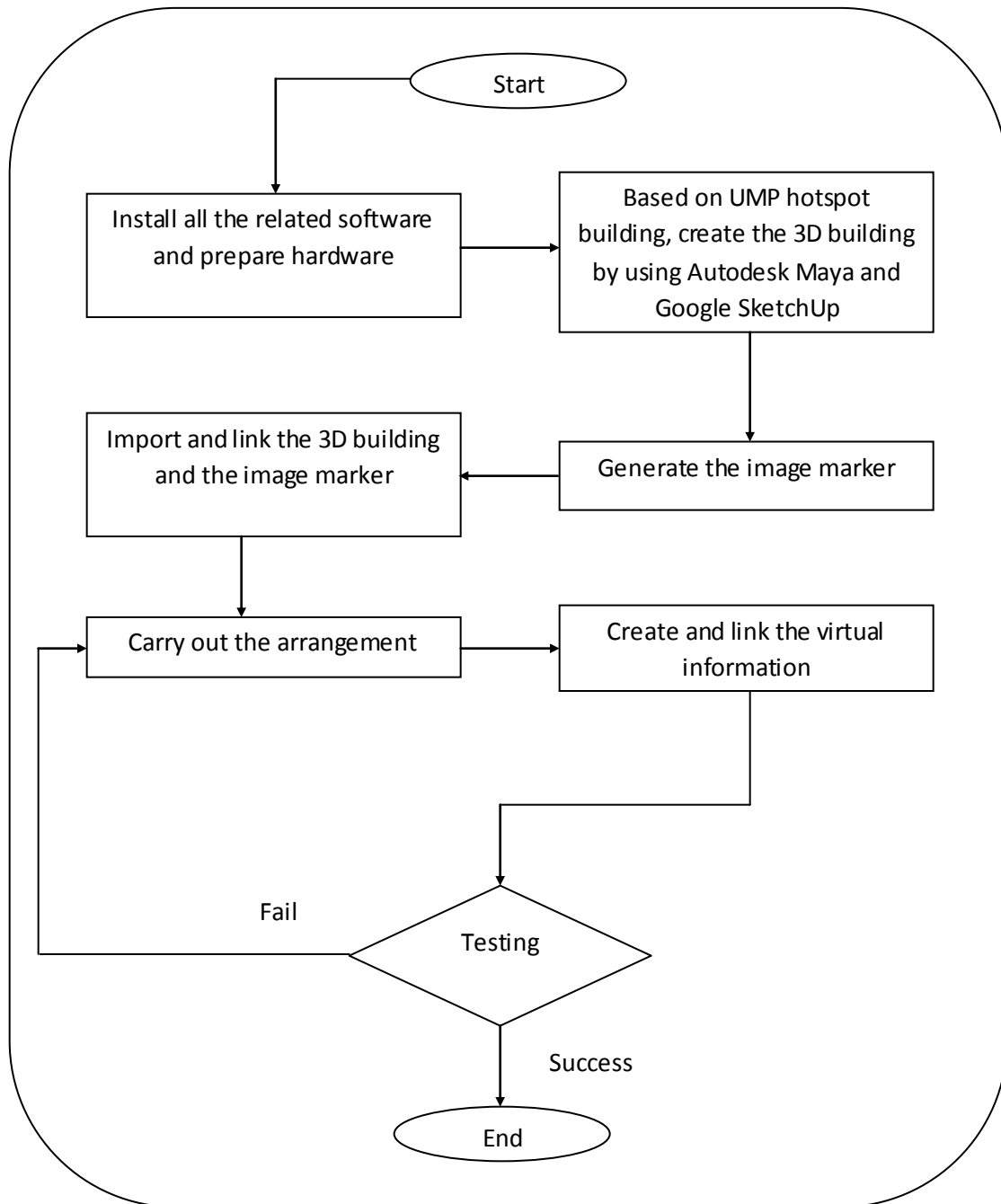
Figure 2.1: Development process flowchart