Indonesian Journal of Electrical Engineering and Computer Science
Vol. 13, No. 3, March 2019, pp. 1237~1242
ISSN: 2502-4752, DOI: 10.11591/ijeecs.v13.i3.pp1237-1242

Augmented reality application for location finder guidance

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Article Info

Article history:

Received Sep 15, 2018
Revised Nov 30, 2018
Accepted Dec 15, 2018

Keywords:

Augmented reality
Global positioning system

ABSTRACT

Finding directions to a specific location can be troublesome especially when we are not familiar with a new area. Conventionally, we may want to ask people around or possibly we use Global Positioning System (GPS) navigator. However, using GPS navigator may not be the best solution if the address is not entered accurately. Therefore, this paper presents an augmented reality (AR) application for location finder guidance. Instead, a user is only required to scan the address indicated on a surface such as card or flyer using smart phone camera.The proposed application has utilized various components of AR technology including multiple image target, virtual button and markerless features. The development of the AR application follows phases of activities in Multimedia Mobile Content Development (MMCD) model. The proposed application is found to be very interactive and convenient in finding directions to specific location.

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1. INTRODUCTION

Augmented reality (AR) is a new technology that enables mixing of real environment and virtual objects created in a 3D environment with interactive functions [1]-[3]. In AR application, some of the elements in real-world environment are augmented by computer-generated sensory input such as sound, video, graphics or Global Positioning System (GPS) data [2]. Different from virtual reality application which demonstrates totally artificial environment, AR application is closer to real-world environment [4]. AR technology has been applied in various applications including education, e-commerce, business, automobile, and tourism [5]-[10]. The existing AR applications are known for their benefits of more interactive delivery, closer proximity to real-world environment and attractive information display.

Our interest in this study, is to explore the potential of AR technology in finding specific destination, given an address on an invitation card, business card, and flyers. One of the many problems while travelling to unfamiliar addresses, is one may find difficulties to find directions to the specific destination. Possible solutions may include asking people around to query for directions or using GPS navigator. However, both solutions are prone to some limitations. The information given by humans may not be sufficient, while typing the address or coordinate manually on the GPS navigator may be inaccurate [11],[12]. The capability of AR technology in utilizing features such as markerless GPS coordinates utilities, multiple image target, virtual buttons, 2D and 3D modelling [13], [14] shall be explored to solve the limitations in finding the desired destination or location.

This paper presents an augmented reality application for location finder guidance. In this study, we will present main activities in the phases of the ARGUIDE development in Section 2. Next, Section 3 will explain implementation and testing of the proposed ARGUIDE. Finally, Section 4 presents some conclusions of the ARGUIDE development work.

2. RESEARCH METHOD

The ARGUIDE is proposed with the aim to find location of the address indicated in business card, invitation card, or flyers. A user has to scan specific image target, that is the address to view the 3D object, virtual button and information. Then the user can touch the virtual button, and eventually the application will send GPS coordinate that connect to Google Map, Waze or other maps application. Interestingly, users can also view information about the location presented in image and textual form. To encourage usability, the ARGUIDE is proposed to operate on android platform for potential users.

The ARGUIDE was developed according to the phases in Multimedia Mobile Content Development (MMCD) [15]. Figure 1 shows five main phases of MMCD: application idea creation, structure analysis, process design, main function development, and testing.

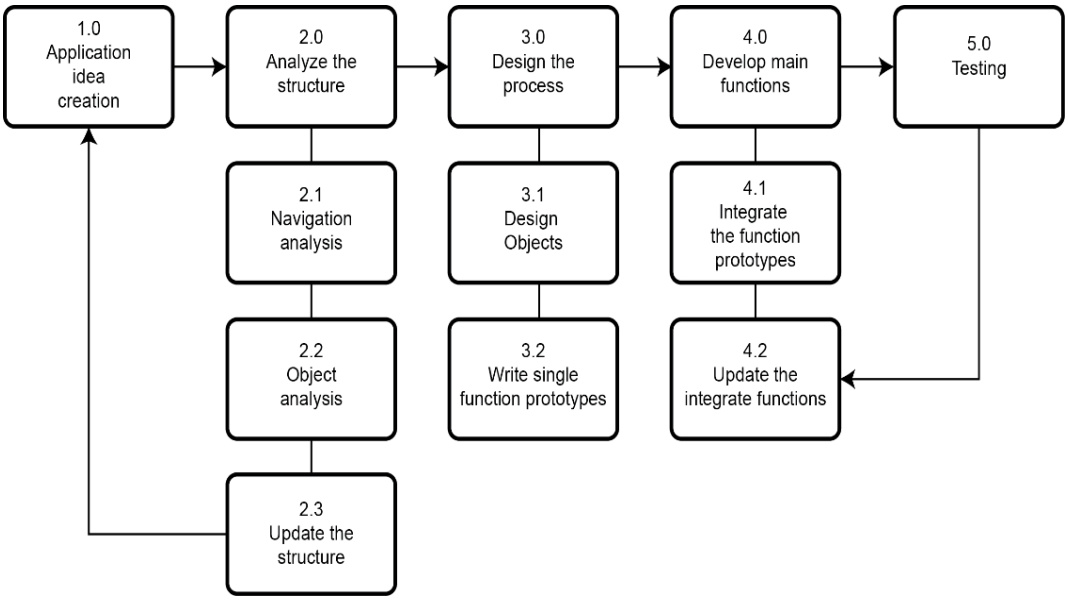

Figure 1. Phases of Multimedia Mobile Content Development (MMCD)

At the beginning of the development phase, the idea creation was focused on defining the design concept for business commercialization and tourism. The design concept of business commercialization and tourism was chosen as the design concept because the case studies to evaluate the proposed ARGUIDE involved two destinations: EZCetak and Tanjung Piai Johore National Park. The EZCetak is an event management company, while Tanjung Piai National Park is a recreational destination in Johore. For the EZCetak, the address is given on a business card. On the other hand, the address of the Tanjung Piai Johore National Park, the address is given on a flyer.

In the structure analysis phase, the objects and navigation structure for the ARGUIDE were then identified. The presentation of the application is narrated in story boards to confirm the flow of the application and target coordinates of destination. Then, in the process design phase, most activities focus on producing the ARGUIDE interface, virtual buttons, and background. The 3D model for selected objects were created, target images were designed, and a prototype was developed. A number of softwares were utilized in this phase, including 3D Unity, Blender, and Vuforia. An example of a 3D model with virtual objects and buttons in the ARGUIDE is shown in Figure 2. Next, in the main function development phase, a number of integration activities were carried out to ensure all of the application components, such as menu, submenu, modules, virtual buttons, and objects were functioning in a 3D setting. Finally, in the testing phase, a number of questionnaires were released to potential users of the ARGUIDE for preliminary feedback.

Figure 2. A 3D model with virtual button and objects in the ARGUIDE

3. IMPLEMENTATION AND TESTING

The interface for ARGUIDE was designed according to the business commercialization and tourism industry concept. In the case of Tanjung Piai Johore National Park, the entrance interface design is illustrated in Figure 3. The entrance interface design contains welcome message, coordinates information, and background of images of the destination. A user can scan specific image target to view the 3D object, virtual button and information. This application provides information displayed in textual and image forms. The direction to a specific location will be displayed when a user touches the virtual button. The input is sent, and the application will send GPS coordinate that connected to maps application. Eventually a navigated direction to the specific location or destination will be displayed. To encourage interactivity, the interface of ARGUIDE is also equipped with main menu, settings, help, about and AR scene.

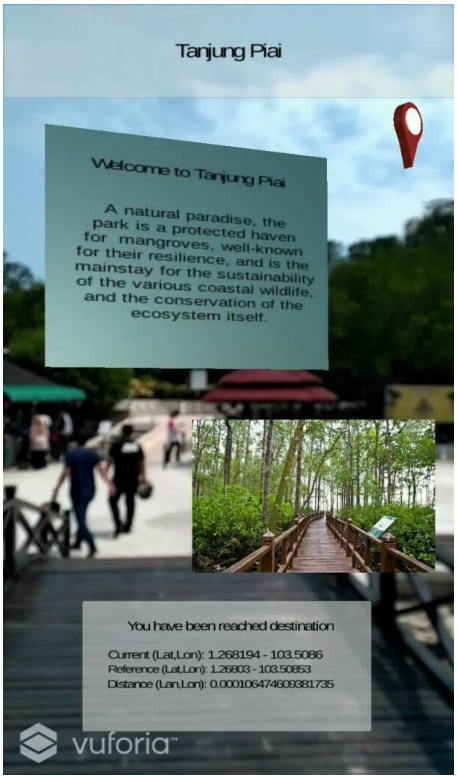

Figure 3. Interface design for the entrance to Tanjung Piai Johore National Park

Main activities of the ARGUIDE implementation include environment preparation and coding of interaction modules. Unity 3D is used to create the environment of AR. The Unity 3D is helpful to facilitate interaction with the Vuforia database for the image target. The image target was designed using Adobe Illustrator CS6. Then, the image target can be uploaded to Vuforia website to make it as a database for the ARGUIDE. Figure 4 shows Vuforia website with a list of the databases that have been created. Figure 5 shows the image target interface with the features of the points in the image.

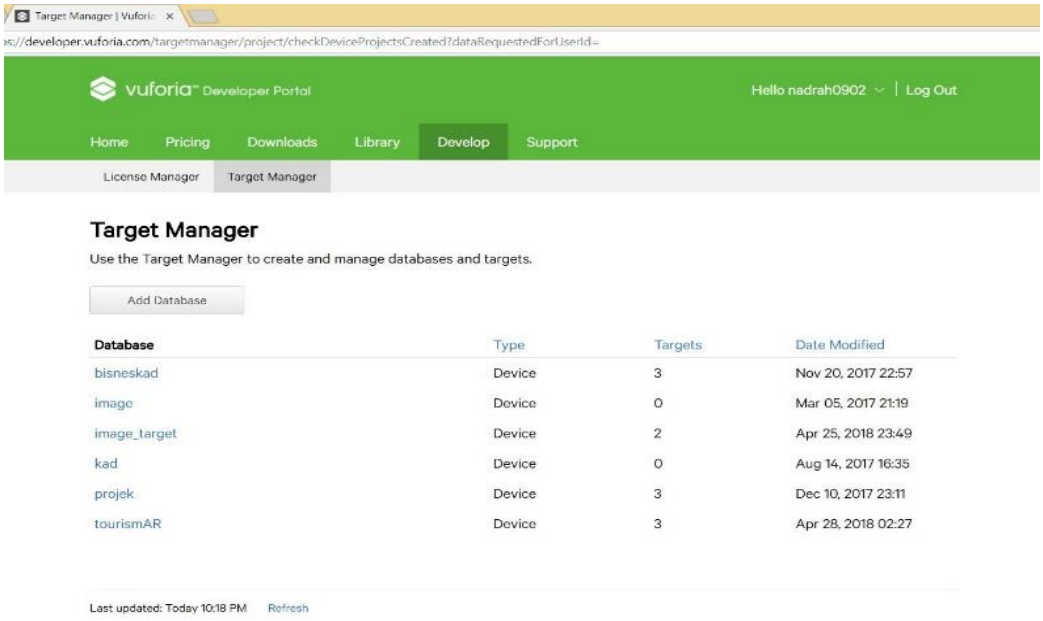

Figure 4. Vuforia website

Figure 5. Image target

Figure 6 shows code segment for the image target. The code includes the target name, the information and some 3D objects and other objects too.

```
if (name == "endau")
{
    PanelDescription.gameObject.SetActive(true);
    TextTargetName.GetComponent<Text> ().text = name;
    TextDescription.gameObject.SetActive(true);
    TextDescription.GetComponent<Text> ().text = "Endau-Rompin is the second largest forest park or forest reserve in the
     peninsula of malaysia after the national park." +" Rich in flora and fauna and millions years of rock  life. Endau-Rompin
    National Park is a protected tropical rainforest in the southernmost" +" prolongation of the Tenasserim Hills, Malaysia";
    LocTitle.text = "Endau Rompin - Peta / Selai";
    playSound("sounds/soundEndau");
}
else if (name == "ledang")
{
    PanelDescription.gameObject.SetActive(true);
    TextDescription.gameObject.SetActive(true);
    TextDescription.GetComponent<Text> ().text = "Gunung Ledang is a mysterious mountain and one of the destinations for
    those who like to climb" +" and located in Tangkak District, Johor, Malaysia. Cool off in the rushing waters of Puteri Falls." +
    " Discover a world alive with the wonders of nature at her finest.\n ";
    LocTitle.text = "Gunung Ledang";
    playSound("sounds/soundLedang");
}
```

Figure 6. Code segment for image target

Preliminary testing with potential users have been carried out with staff of EZCetak and visitors of Tanjung Piai Johore National Park. More than 90% of the respondents agree that the ARGUIDE contains very clear instructions, friendly interface and easy to use to find directions. Indeed, majority of the respondents agree that the augmented reality based application will present a value added service for tourism industry. In addition, the EZCetak staff note the potential of the ARGUIDE in improving their value added service to customers in producing AR based business cards and invitation cards for its event management business.

4. CONCLUSION

This paper has presented an AR application for location finder guidance, called ARGUIDE. The ARGUIDE includes multiple interactive components that help potential users to find and navigate direction to desired destination. The ARGUIDE application has been evaluated with potential users in both organizations: EZCetak and Johor National Park. The preliminary testing shows that such AR based applications have the potential to provide alternative approach in finding specific locations using address images. In fact, such AR based application has been proven to improve business services in event management and tourism industries.

ACKNOWLEDGEMENT

This study is supported by a research grant under Ministry of Higher Education, Malaysia, Fundamental Research Grant Scheme Vot 1609 and partly sponsored by Gates IT Solution Sdn. Bhd.

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