

Towards the development of RSU augmented campus: An augmented reality campus guide for Romblon State University

Ricky Michael Oliva^{1*}, Labicane Malapote Gianinna Elaine¹

¹Romblon State University, Philippines

*Corresponding author: kielmoralesoliva@rsu.edu.ph

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ABSTRACT

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In this era of emerging technologies, the application of the new trends has been accepted and applied in the fields of medication, education, sports, and infrastructure. Along with current innovations comes the birth of Augmented Reality (AR), a new technology that imposes 3D images and visuals into the real world. This study aims to automate and augment the process of locating campus buildings and offices by providing information as well navigation by scanning the infrastructures' image trackers using the process of augmentation. The application will elevate the on-campus experience of the students and visitors by providing an entertaining and efficient way of navigating through augmentation. To assess the user acceptability of the application, survey questionnaires were distributed through Google forms. As for the respondents, 450 students and 50 faculty personnel were considered as the sample size. Results reveal that users believe that the application will be able to provide helpful information on the location of buildings and offices for visitors. Moreover, results showed that the application received a high acceptability rating and, in fact, is needed by the users.

1. Introduction

The rising prevalence of Augmented simulation takes an increasingly important role in tourism, medical, and education. Augmented reality is one of the newest technologies that currently changes the daily human living. It amplifies the usage of wearable technologies, computers, and mobile phones and provides a more engaging and realistic experience by superimposing visuals, sound, and haptic elements into the real-world environment (Craig, 2013). This technology can be a key factor that would change GPS assisting applications or area locators into a more detailed and entertaining way.

In the mapping and tourism sectors, usage of the Global Positioning System is the manual way of locating heritage or key areas, providing coordinates of locations and routes; however, remote areas such as provinces and rural districts experience difficulties in using GPS-based applications due to the unavailability of signal towers in such areas.

Augmented Reality-based applications use an Image Processing algorithm by means of image targets that provide information to the user solving the strains of GPS-based guiding applications.

1.1. Augmented Reality on Mobile Phones (Mobile AR)

In the Philippines, almost 71 million people accessed the Internet using their mobile phones in 2019. Roughly 83.2% of the population can communicate, search, play and maximize the features of the Internet using mobile phones.

Due to being inexpensive, mobile devices can be acquired by the general population. Purchasing these phones is also a good deal because of their features, importantly the access to the Internet.

The idea of the portability of these gadgets gives justice to the functions of augmented reality, which imposes visuals by detecting image targets from any visible objects requiring the device to be portable and mobile to make it easier to detect targets (Craig, 2013).

1.2. Image Targets (Mobile AR)

Through 3D simulation and augmentation, it is possible to create an application that visualizes building areas information using image targets. Augmented reality uses an algorithm that requires image targets to undergo image processing by means of scanning to process the 2D, 3D visuals, sound, and haptic elements to be imposed in the device. Targets are placed in accessible key points areas of the heritage/campus rooms to provide information on the area where the image target is located.

Markers: Usually wide image targets that are commonly used in wide areas. These image targets are best to provide information about a building or a huge room.

Multi targets: It is used to detect multiple objects. Most are used in a crowded area where multiple targets are placed. It is best used in detecting rooms close to each other.

Text recognition: These can be used to decipher blurry texts in areas such as names. Augmented reality on tourism or GPS location finding received high acceptance and positive feedback from users due to the portability of using image targets as well as the integration of engagement and entertainment.

2. Literature review and research gap

Augmented reality is an emerging technology that can be applied in the fields of medical, education, tourism, and everyday life with its captivating features (Chan, Wan, & Ko, 2019).

2.1. Integration of technology in tourism

Many tourism businesses have viewed new technology to stay competitive and improve their marketing campaigns in numerous ways. AR has become a term in modern information technology, gaining traction in the media as well as through a range of applications. This trend is fueled by smartphone apps as well as the wearable computing buzz sparked by Google's Glass project, which is set to arrive in 2014. Even though research on augmented reality has been undertaken in a variety of industries, including the tourism industry, the bulk of studies focuses on technical elements of AR, while some are targeted at specific applications (Jung & Han, 2014).

Tourism is one of the most important factors in today's cities' economic and social development. It is critical that both domestic and international travelers are informed about the most important tourist locations and destinations, as well as how to get there. If travelers can get up-to-date and instantaneous information, their satisfaction will skyrocket. The application of augmented reality technology for everyday innovation is becoming more widespread. This idea is also being used in the travel business (Bhatt, Panchal, Patel, & Rote, 2020).

Furthermore, according to Van Krevelen and Poelman (2010), technology plays an important role in recruiting tourists and increasing rivalry among locations and enterprises in the tourism industry. Information technology advancements enable destinations and other enterprises in the tourism chain to provide new management, marketing, and advertising opportunities, as well as a competitive advantage.

2.2. Advancement of augmented reality in GPS-based application

For on-site tour guides, augmented reality, which superimposes virtual information on the real world, has provided an entertaining and educational experience. By overlaying virtual content on heritage locations, augmented reality GPS guides, unlike traditional tour guides, allow users to enjoy interesting and realistic experiences. Many recent studies and research projects, such as Seo, Kim, and Park (2010), have used AR-based tour guides to promote cultural tourism.

Being one of the rapidly growing technology, AR in tourism will create competition in marketing and convenience. It is seen that AR applications are used in this field increasingly, providing convenience in terms of marketing, businesses, and destinations. Tourists benefit from augmented reality applications because they make them feel safer while making their journeys easier. All organizations who wish to take advantage of market growth in the next years and gain a competitive advantage by tourists are expected to adopt augmented reality applications extensively (Özkul & Kumlu, 2019).

From a practical standpoint, advancements in wearable computing and augmented reality, as well as their potential consequences on tourist experiences, have been stressed (Tussyadiah, Jung, & Dieck, 2017). However, there is a gap in the literature regarding how the complexities of human-computer interactions via augmented reality applications are critically situated within the discourse of tourism experience, as well as how to better understand the implications of these interactions for tourism management. By examining the usage of wearable augmented technology in situated tourism encounters, they hope to conceive and assess technology mediation. It is aimed at travelers' perceptions of the altered representations of sites as well as their overall experiences while wearing wearable augmented reality technology. A deeper knowledge of how wearable technology manifests itself will aid in the management of tourism sites that employ advanced technological systems.

2.3. Research gap and opportunity

The challenge of integrating image processing for instances where an area lacks sufficient lighting is an endless limitation for AR applications. Several studies have been done and implemented during the day, but none of them has found a solution to the nighttime limits. The illumination is a common barrier for AR applications; however, the campus guide offers a solution for this by employing the GPS tracker. According to Te-Lien Chou's research, it's also critical to be explicit with the orientation and directions so that users don't have trouble navigating the app. To make the tourism AR app more interesting, it's also vital to include social features.

3. Research methodology

This descriptive study employed a survey form in collecting data. All the questions in the survey questionnaires were designed in English and have been distributed through online mediums such as Google Forms through personal messages on Facebook. The questionnaire is designed to emphasize user feedback and receive detailed information from the survey.

The survey materials have been disseminated to Romblon State University faculties and students. The form used to conduct the survey consists of demographics and users' willingness and acceptability to use the proposed application, which can be found here:

<https://forms.gle/q4DGuwYaPC9sF6us5>.

A sample size of 700 was used with the following parameters: response distribution = 50%, population = 17,498, confidence level = 95% and margin of error = 3.63%. 750 survey questionnaires were distributed to obtain the minimum viable sample size. In total, 711 responses were gathered and used for the study.

The respondent's profile includes 18 - 30 years old (98%), male (57%), student (98%), with most of them having mobile phones (99%) and have used augmented reality applications (45%). Frequency, mean, and percentage were utilized to describe the data.

4. Results and discussion

Table 1

University office's traditional identification

Rank	Most Visited (n, %)	Reasons for difficulty locating offices (n, %)	Client ways of identifying offices (n, %)
1	Registrar (308, 44%)	Unaware of building locations (282, 39%)	Asking University guards (329, 47%)
2	Cashier (231, 33%)	Aware of area but cannot identify specific rooms (226, 32%)	Asking co-students and teachers (315, 45%)
3	Library (105, 15%)	University's massive land(112, 16%)	By referring to University maps(56, 6%)
4	Faculty Rooms (49, 7%)	Lack of orientation of office info (70, 10%)	By asking staff (7, 1%)
5	Administration Offices (7, 1%)	Not having difficulties (10, 1%)	Not having difficulties (10, 1%)

Source: Results from Google Form Report

Results reveal that the majority of 44% of the respondents experience the most difficulty in locating the Registrar's office, followed by the Cashier's Office 33% and the library 15%. In terms of the reasons for the difficulty in locating these buildings, the majority of 39% of the respondents state that it is simply because they are unaware of the buildings' whereabouts inside the University. In response to this, the majority of 47% of the respondents seek the assistance of university guards.

Table 2

Students' experience with AR controls

Remark	Students with mobile phone (n, %)	Students who havetried AR (n, %)	Students who tried First- person controller-base app (n, %)
Yes	692, 98.9%	328, 46.7%	223, 31.9%
No	8, 1.1%	372, 53.3%	473, 68.1%

Source: Results from Google Form Report

The table above shows the students’ experience with augmented reality controls. The majority of 98.9% of the respondents stated that they own mobile phones. Meanwhile, 46.7% stated that they had tried augmented reality before, and 31.9% stated that they had already tried first-person controller-based applications.

Table 3

Student acceptability

Remark	Believes that an AR-based guide will help (n, %)	Willing to install the application (n, %)
Yes	670, 95.71%	679, 97%
No	30, 4.29%	19, 3%

Source: Results from Google Form Report

Table 3 shows the student acceptability of the Augmented Reality Campus Guide. Results show that 670 or 95.71% of the respondents consider an AR-based guide, while 679 or 97% stated that they are willing to install the application on their phones.

Table 4

Acceptability rating

Remark	SA	A	N	D	SD
<i>Approval</i>	370, 52.9%	204, 29.14%	97, 13.86%	12, 1.7%	14, 2%

Legend: SA= Strongly Approve; A= Approve; N= Neutral; D= Disapprove and SD= Strongly Disapprove
 Source: Results from Google Form Report

Table 4 shows the overall acceptability rating of the Augmented Reality Campus Guide. The results reveal that the majority of 52.9% of the respondents fully approve of the application.

According to the results of the data gathering instrument and interpretation, the students are in great favor of the development of the application. Some of the users are yet to use augmented reality applications making the technology a breakthrough for their experience. The majority of the students have mobile phones and will be able to accommodate the system.

5. Future research

The development of the application will be based on the current faculty, building, and office count. Romblon State University is a developing and emerging Institute in terms of curriculum and campus structure, and there are buildings still under development. The application covers the current counts and will soon be outdated. Patches are encouraged to update the application complementing the status of the Institute.

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