









The Significance of Augmented Reality Based Magazine Book for Historical Places of Bangladesh: Case Study

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Abstract. Augmented Reality (AR) is the integration of real-world objects with the use of information in the form of text, graphics, audio, and other virtual enhancements. In mobile augmented reality, a client can see virtual particles superimposed on live video of this display reality utilizing visual following or plan rendering. Any country's economy is heavily reliant on its tourism sector. In our country, there are several tourism sectors, but they are not well-organized and attractive. Augmented reality is still a relatively new technology in Bangladesh. We've seen this technology applied successfully in a number of articles. To implement the tourism sector, we have proposed the development of augmented reality-based magazine books in our research. We used Vuforia, SDK for this and developed the graphics part ourselves. Then we have selected our magazine book places and designed the app accordingly using Unity3D. Finally, we have evaluated how effective this system could be, where we send the application and a google form to more than 50 people to use the app fill up the form and most of them were satisfied with the effectiveness of our magazine book in the tourism sector.

Keywords: Augmented reality · Mobile augmented reality · Tourism sector in Bangladesh

1 Introduction

Augmented reality can be characterized as a framework that fulfills three fundamentals highlights: a combination of genuine and virtual universes, real time interaction, and exact 3D enrollment of virtual and genuine objects. On mobile devices like Smart phones, tablets, the augmented reality works like a magic window. The main breakthroughs of mobile augmented reality between 1968 and 2014. Mobile augmented reality has generally produced on final decade as well as explains what mobile augmented reality is [4]. The first real operational augmented reality system is Virtual Fixtures that was created by Louis Rosenberg in 1992.

The existing tourist magazine books are not interactive for tourist. Because all the tourist magazine books which provide by tourist guide is hard copy based that can feel bored and not so attractive with them. The significance of an historical place can't explain properly with plain text or book pictures. In hard copies of a magazine, there are lack of details with the normal pictures. This generation are not interested in reading books. For this they search in internet to see some details and videos to get a good overview of the tourist spot more efficiently. Absence of interaction with the plain text book doesn't attract the tourist to hold their interest.

Our objective is to develop a mobile Augmented Reality (AR) system using this Framework to enhance the tourist interest in Bangladesh famous places. In our system we will use images, videos which will increase the interest of tourists towards famous places of Bangladesh which is not available in any other mobile system.

The system we are proposing, has some potential significance as a helping media for the tourist. The system is integrated with 2D/3D images, animations, and video which will help tourist to visualize the famous places. As the image and animations are responsive, tourist can directly interact with the system by tilting the device. Mobile augmented reality is a colossal field and it is turning out to be more mainstream step by step. Our primary objective is to expand the enthusiasm of the individuals in far off nations towards the magnificence of Bangladesh. With the integration of vuforia and Unity engines, users can use their Android phone cameras to capture real-time video and render virtual objects in an enhanced environment [19].

2 Background

2.1 Augmented Reality

Augmented Reality is an innovation that mainly give the experience of real-world environment. Augmented Reality is mainly a modification of Virtual Reality [12]. The AR is much utilized and don't require costly hardware stuffs. AR can be easily implemented in smartphones, laptop or computers. AR, with its layering of information over 3D space, does modern recognition with the world and prescribed that AR ought to be grasped inside some a long time to provide another way to educate, learn, explore, or invent. Now-a-days augmented reality used in various fields as for gamming, military training, education sector, medical sector [5]. As indicated by many research Augmented Reality Technologies gives special benefits in the education sector [8]. AR encourages students to study as it gives real visualization about real objects [9]. It inspires students to research in-depth to gain more skills [13].

2.2 Mobile Augmented Reality

In this era, smartphones can do lots of heavy tasks like sending or receiving mails, can record high quality audio or videos, captures high quality images and also can

handle high quality games [11]. Now some high configuration 2D and 3D games can be played on smartphones. These new features of smartphones are rapidly growing and many features are connected with AR interface on phones. The Mobile Augmented Reality-based mobile apps and mobile advertising market is now more than 732 million dollar [10]. Utilizing a handle AR interface on a cell phone, a client can see virtual particles superimposed on live video of this display reality utilizing visual following or rendering. Convenient AR advancement can offer a curiously substitution for the ordinary sound tape visit control.

2.3 Tourism Sector in Bangladesh

Bangladesh is full of natural beauty. Bangladesh’s tourist places incorporate historical monuments, resorts, picnic spots, beaches, wildlife of various species, forests and tribal people. In 2014 125,000 tourists visited Bangladesh. This number is awfully low comparative to total population. Starting at 22 May, 2019 the all-out nearby populace numbering 166,594,000 occupants. This gives a proportion of 1 traveler for each 1,333-local people. In 2019, contribution of travel and tourism to GDP (% of GDP) for Bangladesh was 4.4%. Though the contribution of Bangladesh in traveling and tourism to GDP (% of GDP) varied significantly in recent years.

2.4 Vuforia Augmented Reality Library

Vuforia is an SDK for creating AR apps for Android, IOS, and UWP (Universal Windows Platform). It uses computer vision technology to recognize and track planar images and 3D objects in real time. In 2015 the SDK was bought by PTC Inc. One of the main features of Vuforia is image recognition in real-time image Target. The Vuforia SDK supports a variation of 2D and 3D target categories including ‘markerless’ Image Targets, 3D Model Target, and a type of addressable Fiducial Marker, known as a VuMark.

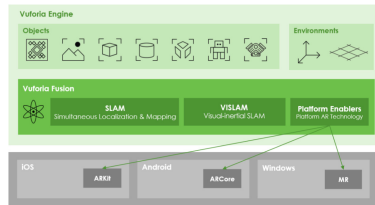


Fig. 1. Vuforia engine (vuforia fusion)

2.5 Unity (Game Engine)

Unity is a cross-platform game engine created by Unity Technologies. The Unity game engine was launched in 2005, pointing to “democratize” diversion improvement by making it available to more developers [6]. Unity was initially released

for Mac OS X, later adding support for Microsoft Windows and Web browsers [7]. 3D computer graphics use a third dimensional representation of geometric data that is stored in the computer for the purposes of performing calculations and rendering 2D images. Through The 3D model is to be used for two critical subsystems of the system architecture, i.e. positioning and visualization of virtual objects [14].

3 Methodology

3.1 The Flowchart of the System

Description of the Flow chart:

First start the application. Then we take AR Book as input, what we developed for our application. We capture the image by the application. If the application detects the target image then it will go to the next step. Otherwise, it goes to the previous step and tries to capture the image and match it with the targeted image. If the system able to come to this step, the system will show 2D/3D images or videos in the phone screen. After that, the user can finish/stop the application.

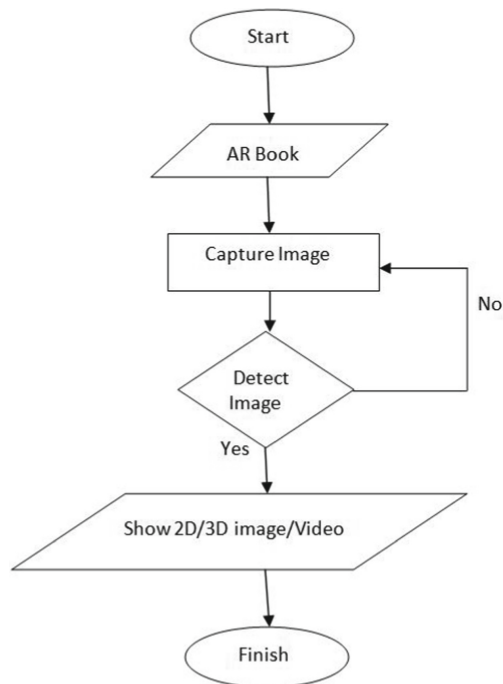


Fig. 2. Flowchart of the system

3.2 Development Methodology

System Development Life Cycle (SDLC) is software that is systematic approach to design and development that assures high quality and surpassed client's expectations, reaches perfection. It is easier to control the risks as high-risk tasks are completed first [15].

SDLC consists of a foolproof plan that explains specific software, planning, building and maintenance procedures. SDLC basically divided into five to seven phases, based on the project's scope project managers can combine, split, or omit steps. For this application, five steps will be followed.

Planning and Making Prototype: In this phase, the terms of the project are evaluated which includes determining the labor cost and material costs, making a schedule with target goals, and creating the project's groups. The project scope and purpose of the application is defined in planning phase.

Requirement Collecting and Analysis: This research depends on android smartphones, the Android platform was considered for this project. Android SDK is free and it was downloaded from Google Developer Server. Vuforia library was used for this research.

Development and Implementation: The main objective for mobile augmented reality, was getting a moving picture. A smartphone camera is used to catch the constant picture. Android SDK has necessary camera API. To develop the project, unity id used.

Software Testing: This phase of the SDLC helps to identify all the bugs and errors in the software. Testing starts once the coding is complete and the modules are released for testing.

Deployment: The deployment phase consists of some parts which include deployment preparation and procedures, product deployment, transferring ownership of the product, and closing the deployment.

4 Design of Magazine Book

Plan a magazine is the principal assignment to build up an application. For this, utilizing some acclaimed places image of Bangladesh with the portrayal we have made the magazine book. By checking those images tourist can visualize the 3D/2D picture or video. Such as: Shaheed Minar National Parliament House, shat Gombuj Moshjid, Ahsan Manzil, National Martyrs' Memorial. We develop 3D image for magazine book first page, Shaheed Minar and National Martyrs' Memorial. We develop 2D image for National Parliament House and Ahsan Manzil. We also create video for Shat Gombuj Moshjid and last page of the magazine book. Here are some samples of the magazine book.



Fig. 3. Cover page of the magazine book



Fig. 4. Second page of the magazine book, Shaheed Minar



Fig. 5. Last page of the magazine book

4.1 Implementation of the System

For executing the framework, right off the bat we catch video and after that we track the framework. We changed some code in the framework in C# language. At the point when it finds the suitable picture then it shows the ideal video or 3D/2D model/picture into the versatile screen. For a portion of the spots,

it will show video and for other people, it will show 3D models. To play video we have called “VideoPlayer.Play()” into the capacity “OnTrackingFound()”. At the point when the objective image (marker) is lost the video shape will likewise vanish. To do this specific occupation we have called “VideoPlayer.Pause()” into the capacity “OnTrackingLost()”.

4.2 Capturing Video

In this exploration, an android cell phone’s inherent Android camera API is utilized for catching the video. The ongoing picture was caught by a Smartphone camera for AR tasks. We have utilized the default content given by solidarity for opening the camera and video catch alternative. At the point when the objective picture (marker) was lost the 3D model will likewise vanish.

4.3 Tracking

For tracking we use vuforia. When the system find a image it will check the image with the vuforia, is it on the vuforia database or not. If the system find the image then it show 2D/3D image or video for the specific image.

4.4 Rendering

There are two 3D Models we have utilized in our framework. 3D Models are worked with the assistance of Prisma3D and coordinated into the framework utilizing Unity. We gather video and image from web and composed into the structure using Unity.

Picture of our system:



Fig. 6. 3D model of Shaheed Minar

Picture of our system:

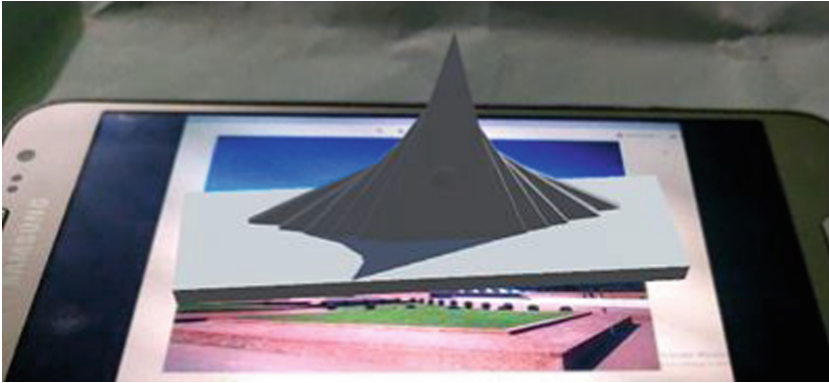


Fig. 7. 3D model of National Martyrs' Memorial



Fig. 8. Sample pictures of 2D model



Fig. 9. Sample pictures of video model



Fig. 10. Sample pictures of video model

4.5 Evaluation

We evaluate the system by 50 peoples and collect their response.. Those are referenced beneath:

Table 1. Familiarity of AR.

No	Statements	Feedback			
1	How familiar are you with Augmented Reality (AR)?	Very 30% (15)	Have idea but Never used 46% (23)	A bit 22% (11)	Not at all 2% (1)

Table 2. Facing problem while using our system.

No	Statements	Feedback		
2	Have you faced any kind of problem regarding 3D/2D Model Rotation and video playing while using the Application?	Yes 20% (10)	No 62% (31)	Slightly 18% (9)

Table 3. Recommendation of system.

No	Statements	Feedback			
3	Will you recommend this application to the tourists?	Strongly recommended 34% (15)	Recommended 60% (30)	Neutral recommended 4% (2)	Not recommended 2% (1)

Table 4. Impacts of the system.

No	Statements	Feedback			
4	Do you think this application will have a great impact to the Bangladesh tourism sector?	Strongly agree	Agree	Moderately agree	Disagree
		59.2% (29)	38.8% (19)	2% (1)	0% (0)

5 Conclusion

5.1 Limitation of the Study

While doing the testing, some drawbacks of the application were identified. Those are Uncertainty. When it's time to recognize the pictures, our application only identifies the pictures that have database entry. Consequently, different markers that might be available containing a relative picture don't get recognized. Moreover, in inadequate lighting markers might not get recognized well. As physical alliance is not a part of this application, users will not be able to control the 3D models or videos through their finger touch.

5.2 Future Work

We have not been able to include all the historical places of Bangladesh in our research. The following works can be done in future research such as: Other interesting places in Bangladesh. More 3D effective and more interesting videos can be added to make the application more interesting. It could also be implemented for IOS. This application can be published publicly through play store by dealing with any organization.

5.3 Summary

The purpose of this research is to develop an application using Mobile Augmented Reality for Smartphones that will encourage and enlighten tourists around the world about the Bangladeshi cultural heritage. In the literature reviews we discussed about Augmented Reality, Handheld Augmented Reality, rendering, interaction, and Augmented Reality Applications. The research methodology chapter splits into two segments, development and evaluation. For developing the application, we have used the Software Development Life Cycle (SDLC). From the evaluation report, we acknowledged that the application meets its expectations, and user's feedback was satisfactory. To sum up, the mobile AR system was implemented successfully and could be upgraded with new features and should keep on maintenance.

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