

Library Digital Guide using Augmented Reality

T. Ramesh ¹, Harikrishnan S^{#2}, Ravikumar R^{#3}, Udhaya Kumar P^{#4}

^{#1,2,3,4} Department of Computer Science and Engineering, R.M.K. Engineering College,
Kavaraipettai, India.

^{#1} trh.cse@rmkec.ac.in, ^{#2} hari16131.cs@rmkec.ac.in ,

^{#3} ravi16310.cs@rmkec.ac.in, ^{#4} udha16330.cs@rmkec.ac.in

Abstract. *Augmented Reality is a technology which works with recognition algorithms based on computer vision. Day by day, new editions of books make huge volumes to the library as it makes it difficult for students as well as librarian guides to pick a correct book. By using the Augmented Reality (AR) application, our challenging task is, one able to search books in the library using a mobile camera with help of Unity3D and Vuforia. Details of the books like category, title and authors appear to the user through a mobile viewing device. Once we start the application the camera will fetch the image frame and identify the image (Marker can be of QR code). With the help of markers, 3D virtual objects appear in the corresponding location in the real world. So, the objective is to design a flexible model of 3D objects for the library as there is no need for a Library Guide, instead it acts as an AR Guide. The proposed Library Digital Guide using Augmented Reality has been tested at our college Library.*
Keywords: *Augmented Reality; Marker; Mobile device; 3D objects.*

1. Introduction

1.1 Explanation of AR

AR is originated from the word “Augment” which means enhancing or adding digital elements. AR is the combination of merging both real world and virtual world. It helps to give the content and brings out strong understanding, a good learning knowledge to people. The main purpose of AR is used to guide the people. We can use markers to generate 3D objects using mobile camera and hence it is processed with image recognition system. AR is used in many fields such as Education, Entertainment, Games, Medical, Robotics, and also in many architectural industries and can easily improve the growth of business by its visual projection. It is a simple process, both for the designer and the client, by providing a natural experience. Augmented Reality (AR) is a better depiction of the actual physical world with the help of visual sound elements or other sensory stimuli.

1.2 Example of AR

In particular, it is an increasing phenomenon among companies engaged in mobile computing applications. In the midst of the increase of data collection and analysis, one of the primary goals of augmented reality is to highlight unique features of the physical environment, improve understanding of these features and provide intelligent and open knowledge that can be applied to the real world. Such large data can help guide decision-making by businesses and, among others, gain insight into customer buying patterns. Increased reality continues to evolve and become more mainstream through a large application reality, as the marketers in design and technology firms have had to battle the misconception that AR is nothing but a marketing tool. Even so, as part of their procurement process, there is evidence that clients are beginning to derive concrete benefits from this resource and demand it. In the retail industry, some early adopters have developed innovations aimed at enhancing the shopping experience. Shops allow

customers to imagine how different items will appear in different environments by integrating Augmented Reality into catalogue applications. Shoppers point the camera to the right room for furniture, and the product shows up in the foreground.

1.3 *Benefits of AR*

In other areas, the advantages of virtual reality could extend to the health sector, where a much larger role could be played. One way would be via applications that enable users to see extremely detailed, 3-Dimensional images of various body systems when they hover over a target image on their mobile device. Augmented Reality (AR), for instance, may be an effective learning instrument for medical professionals during their teaching. For instance, tablets showing a small portion of the user's smart eyewear environment, if it progresses enough to become popular, would provide a more complete connection between real and virtual realms if it progresses to attain mainstream.

2. **Literature review**

2.1. *Existing Systems*

The existing scheme, such as the intelligent supermarket scheme with indoor navigation using beacon technology, makes things simpler for clients to shop through augmented reality. It provides In-house shopping experience to customers to purchase the product at their homes. The goal of the previous framework is to develop a high functioning mobile app with framework of position estimation and navigation system. This is the base thinking idea that enables to develop our Augmented Reality Smart Library successfully. Student can able to search and pick up the correct books effectively in library. They are provided with 3D augmented objects to view the superimposed augmented reality scene. Using the markers, one can able to visualize the content effectively.

2.1.1 *Issues in Existing Systems*

1. No practical exposure of knowledge.
2. Deceptive action without entering the actual shopping mall to do shopping.
3. In order to understand and provide deceptive purpose of personalizing service and product details, the methods used in this strategy are complicated.

2.2 *Proposed System*

The main concept of Library Digital Guide using Augmented Reality is to search and find the books in library effectively using vision based recognition system. Vuforia software development toolkit is used to register with markers and each marker is recognized as a unique license key. It allows the Unity 3D game engine to produce augmented objects. The details include book category, title, and author. This is also applied in smart education for effective learning as it brings visualization knowledge and thinking to students. By using this AR application, it enables the students to visualize the content in 3D augmented objects without library guide.

2.2.1 *Advantages*

1. Practical exposure of knowledge is gained.
2. No need of library Guide, instead it uses AR Guide.
3. We can implement this concept in smart education and also in medical field.

3. Methodology

3.1 Preliminary Definitions

3.1.1 Unity3D

It is a powerful game engine used for rendering two-dimensional or three-dimensional visualizations and also provide simulations for computers, smart phones. C-Sharp (or C#) is the language that the engine uses for scripting API.

3.1.2 Vuforia

It is a AR software development tool that is used in mobile devices used to develop AR apps. Vuforia is the only code-free authoring environment that allows content creators to:

1. Reduce development costs—create content quickly without programming.
2. Speed up content creation—use existing 3d cad software and animated motion sequences streamline.

4. Algorithm Used

Computer vision-based recognition systems

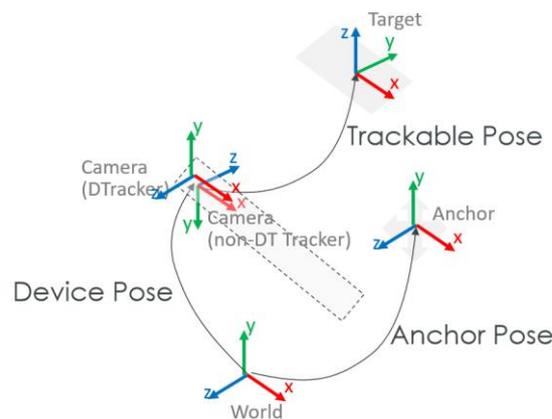


Figure 1. Orientation Diagram

Figure 1 depicts the Orientation diagram of our. It has Trackable pose, Device Pose, Anchor Pose.

4.1 Procedure Steps

1. Using the camera, take the real scene of library and search for markers.
2. Analyze the orientation and position of the marker 3D and is nothing more than finding a rigid matrix of transformation of the body used to determine the position of the marker with respect to camera phone.
3. Using recognition system based on computer vision to recognize patterns.

- Using Vuforia, real scene of library is converted into augmented reality scene (Real scene superimposed with digital information).
- Render 3D augmented objects through Unity 3D and display the information.

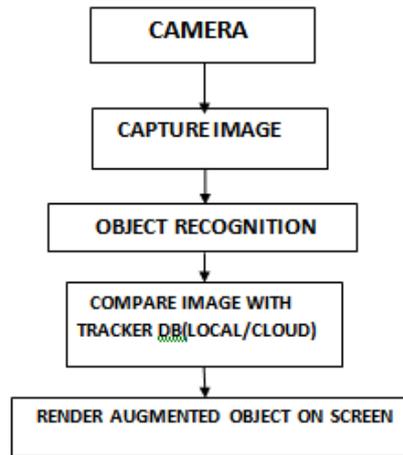


Figure 2. System Prototype

Figure 2 depicts the System Prototype of our Library Digital Guide using Augmented Reality.

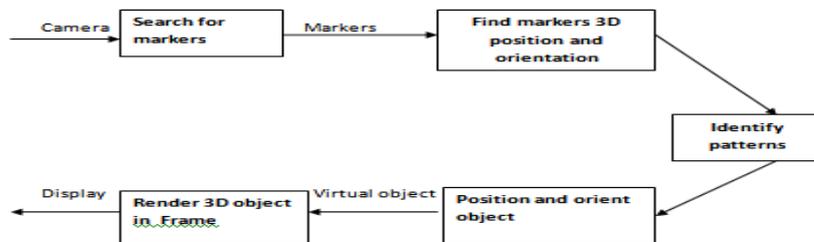


Figure 3. Methodology

Figure 3 depicts the methodology diagram of our Library Digital Guide using Augmented Reality. While starting the application the camera will open to search for the markers, once markers detected it will Calculate the position and angle of the 3D object , after identifying the patterns the position and angle will be fixed, then the virtual object will be displayed on the screen inside the fixed frame.

4.2 Image target

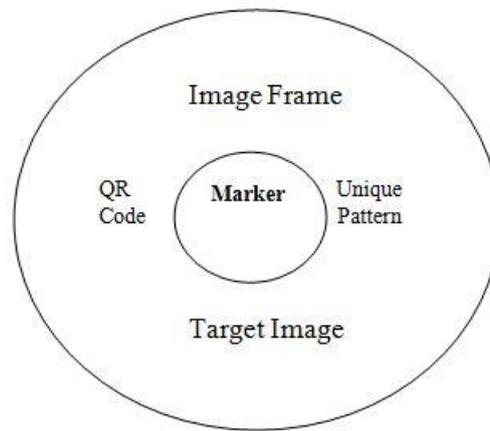


Figure 4. Image target

Figure 4. depicts the Image Target of our Library Digital Guide using Augmented Reality. Different image target can be used produce augmented object in the real scene. Based on the clarity or content of the image target many data point of the image can be obtained from the target through which better augmented image can be formed in the real world. Better the content of the image more the data of the image. There can be different type of image target like unique pattern, QR code, unique image frame or intended image target of the specific augmented object.

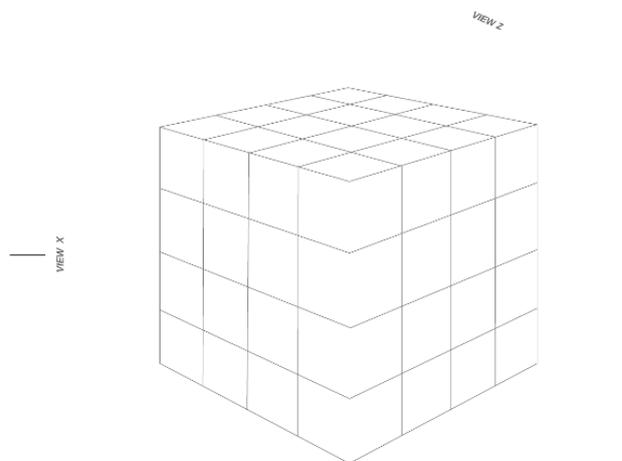


Figure 5. Augmented Object

Figure 5 depicts the Augmented Object of our Library Digital Guide using Augmented Reality. The augmented object perspective change based on the data point collected on the image target. Due to that the augmented object viewing angle changes based on the different viewing of the target image under observation.

5. Results and Discussions

5.1 Real Scene of Library Book

Consider the two books shown in Figure 6 which are acting as the real scene before transforming into a 3D augmented object.



Figure 6. Real scene of Library book

5.2 Augmented Scene of Library Book

The two books shown in Figure 7 are acting as augmented scenes which are nothing but after transforming into a 3D augmented object. The Details of the books like category, title and authors appear to the user through a mobile viewing device.



Figure 7. Augmented scene of Library book

6. Conclusion and Future Enhancement

6.1 Conclusion

In this proposed system, we instigated the problem of librarian guide to search for books in the library. Firstly, using a mobile camera take the real scene of the library and search for markers. Secondly, Analyze the orientation and position of the marker 3D and is nothing more than finding a rigid matrix of transformation of the body used to determine the position of the marker with respect to camera phone. Thirdly, Using recognition system based on computer vision to recognize patterns and using Vuforia, the real scene of the library is converted into an augmented reality scene (Real scene superimposed with digital information). Finally, we render 3D augmented objects through Unity 3D and display the information through mobile camera itself.

6.2 Future Enhancement

The concept of Library Digital Guide using Augmented Reality has to be implemented in schools and colleges as it will motivate every student to take the correct books and study effectively with the help of AR Guide instead of Library Guide .It can also be implemented in smart education, construction and medical fields for great learning experience. It can make close relationship with artificial intelligence.

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T.Ramesh completed his M.E under the stream of Computer Science and Engineering at Sathyabama University, India and doing his PHD under the stream of Energy Efficient Scheduling in Cloud Computing at Sathyabama Institute of Engineering and Technology, Chennai, India .He is currently working as Assistant Professor at R.M.K. Engineering College, Kavaraipettai, India.



Harikrishnan S is a final year student pursuing Bachelor of Engineering at R.M.K. Engineering College, Kavaraipettai, India under the stream of computer science department. His area of interest includes web development and Machine Learning. He has participated in various coding competitions and good problem solver.



Ravikumar R is a final year student pursuing Bachelor of Engineering at R.M.K. Engineering College, Kavaraipettai, India under the stream of computer science department. His area of interest includes Cyber Security and Ethical Hacking. He is an optimistic person with immense knowledge in python.



Udhaya Kumar P is a final year student pursuing Bachelor of Engineering at R.M.K. Engineering College, Kavaraipettai, India under the stream of computer science department. His area of interest includes web development and Deep Learning. He has a good problem solving ability and also participated in many coding competitions.