

Application of Augmented Reality for Enhancement of Teaching Learning Process

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Abstract: — Students occasionally find it challenging to learn from books because they can only grasp things in 2D. It takes a lot of effort and time to envision each component and comprehend how it works while learning. Modern technologies benefit students by minimizing the amount of time they need to learn. In this research, we use the idea of augmented reality to create a straightforward mobile instructional application. Augmented reality for mobile devices is a relatively young but expanding area of mobile applications. It makes it possible to combine the physical experience of the actual world with information-based virtual reality. This article examines how this link is created as well as the useful and entertaining uses of this technology. The proposed system will give a 3D representation of an image.

Keywords: Augmented Reality, 2D to 3D Conversion, Unity 3D, 3D models, Vuforia.

I. INTRODUCTION

Augmented reality is referred to as AR. [1] These days, augmented reality (AR) is regarded as one of the most significant technology trends. The era of augmented reality (AR) adds layers of digital information to our actual world. To replace actual virtual ones, AR no longer creates false worlds. With augmented reality (AR), the immediate environment is enhanced with noises, motion pictures, and graphics. Users who see objects in augmented reality (AR) can notice features and the scale of an object that they cannot see from a plain photograph.

Exploration is the key component of AR, which ultimately helps pupils learn and comprehend. Studies are being impacted by the COVID-19 pandemic because online programmers have replaced traditional classroom instruction. However, this program will prove useful for both students and teachers. For instance, a biology instructor can swiftly go over all the key aspects relating to a certain body area, and students will pick it up quickly thanks to the 3D model that is readily available to them (through the app). We used the cross-platform gaming engine unity to create this application. The photograph will be scanned by this application, which will then superimpose a 3D image to aid in immediate visualization and a better understanding of how it appears in the actual world. The purpose of this project is to maximize the benefits of augmented reality applications in education.

II. LITERATURE REVIEW

There has been a lot of augmented reality technology research going on lately, both domestically and internationally. A growing number of pertinent workshops are available. Researcher communication is fully supported by scholarly publications and international conferences. Its research spans a range of topics, including interactive performance evaluation and hardware tracking technology. [2] The first year of AR was 2015, and since then it has experienced an unstoppable boom fueled by money and technology. Even though augmented reality technology has advanced significantly over the past 20 years, there are still numerous technical issues. Microsoft, Google, and other foreign firms make AR hardware. Vuforia, Wikitude, and other companies make AR software. In recent years, numerous articles and study findings have been published by increasingly renowned universities, research institutions, and organizations from around the world which demonstrates the use of augmented reality as a tool for human-computer interaction.

III. AUGMENTED REALITY

The term Augmented Reality (AR) describes the combination of the physical world and the virtual (computer-generated) world. The actual image is photographed and then "augmented" with additional layers of digital data [2]. Before designing the system, a lot of distinct components must be considered. It takes some expertise and experience to build modules and interfaces, create the architecture, and choose the right components [3]. Comparable to using systems theory in product development is the design process. The parts that describe the process are listed below.

A. Image Capture

Real-world photos are captured via a camera and displayed. The device camera takes pictures of the 2D images from the book that will be made into 3D. It's important to capture images properly.

B. Image Processing

A fundamental shift in how people engage with data will be facilitated by augmented reality (AR), a major generation [2]. For diverse input sources, augmented reality uses a variety of image processing techniques. Various outputs can be produced based on the input sources.

C. Marker Recognition

A Marker is an image (it might be anything) that can be uniquely identified and cannot be confused with other images, as it is the point of entry for virtual materials into the physical world. The application is designed to find the marker in any scene and provide information about its position and orientation.

D. Markerless Recognition

Markerless Augmented Reality (AR) refers to a type of software that may overlay virtual 3D content onto a scene and keep it fixed in the designated area without prior knowledge of the user's surroundings. The primary method for photograph recognition in Augmented Reality (AR) systems is markerless [4]. This photo processing is different from the opposite reputation

in that it employs a marker created from the photographs that are taken using the camera rather than a predefined marker. Two steps make up this process:

1. Preprocessing:

It is the initial stage of the scanned image's processing. The environment is recreated in three dimensions using pictures obtained from various angles.

2. Real-time Processing:

The feature point is retrieved from the live stream using SURF after the files that are kept in the database are imported first [2]. Then, using the orientation and purpose of the actual-international coordinate obtained from the acquired image, the 3D components are rendered.

IV. AR ARCHITECTURE

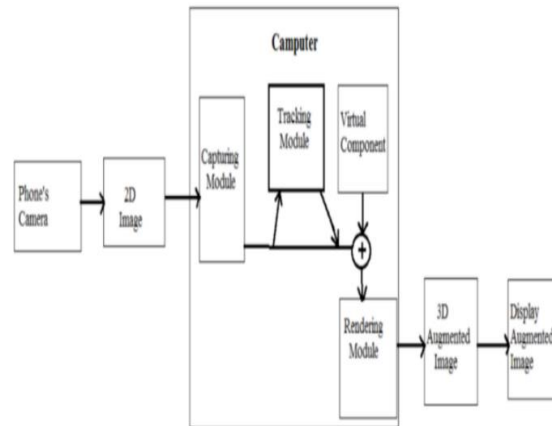


Fig.1. AR System Architecture

The illustration depicts a straightforward augmented reality setup. It is made up of various modules, including those for capture, tracking, virtual components, and rendering. Between the display device and the camera is the application. The image is first captured by the capture module, after which the tracking module tracks the object while maintaining the original background. The virtual overlay's position and orientation are determined by the tracking module. [1] The rendered larger image is then combined with the original background and the virtual object using the estimated position by the rendering engine. The tracking component of the augmented reality system is crucial. For calculating the position in real-time. Utilizing a marker to mark the location is the simplest method [4].

V. WORKING PRINCIPLE

INPUT: 2D graphics taken from a textbook as input.

OUTPUT: 3D model of the input image is the output.

PROBLEM DESCRIPTION: Identification of the 2D image and presentation of its 3D model for enhanced viewing.

Step I: Start.

Step II: Scan the 2D image from a textbook or which is displayed on a screen.

Step III: The application will check whether the image is present in Vuforia Database or not.

Step IV: If the image is not present, then nothing will be displayed.

Step V: If present, then the user will get to see a 3D model of the given image.

Step VI: End.

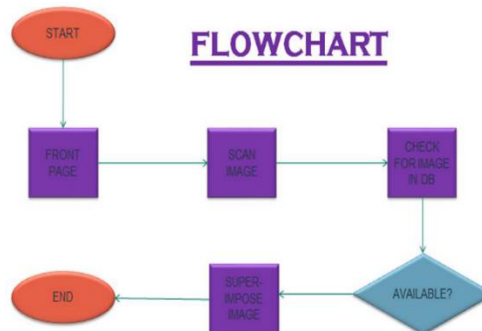


Fig.2. Work Flow Diagram

A. Augmented Model

The models are then added on top of the markers once the system has completed all of the recognition steps. You can find it under the Assets folder called "Model." The model is made a child of Image Target for it to appear over Image Target. Simply dragging and dropping the model prefab into the Hierarchy panel will accomplish this [3]. When the Image Target is spotted by a mobile device's camera, all of the target's offspring show up at once. This module will operate in the background; thus, the user won't be able to see the work being done.

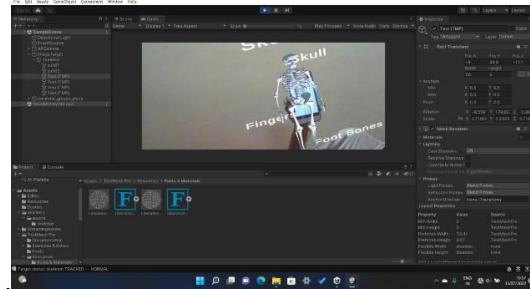


Figure 3 – Display of 3D Model

B. Running the Application

When the application is deployed, the installation package becomes accessible. The camera module will launch after the package has been installed. To render the relevant graphics, all the user needs to do is move the camera over the specified text or image. The 3D model will be displayed simply [3]. The app will determine in this module whether or not the scanned image already exists in the database. There won't be any changes to the UI Module if the image isn't in the database. The 3D picture will be superimposed over the scanned image if the image is found in the database.



Fig.4. 3D Model of given 2D image

VI. PROPOSED METHODOLOGIES

Here is a list of the equipment and procedures needed to use augmented reality to transform 2D photographs into 3D images.

A. Vuforia

Qualcomm Connected Experiences produced Vuforia. It is a platform for software that makes the best and most inventive encounters with augmented reality [2]. Superior image recognition software from Vuforia is supported by several platforms including Android, iOS, Unity, and web-based browsers.

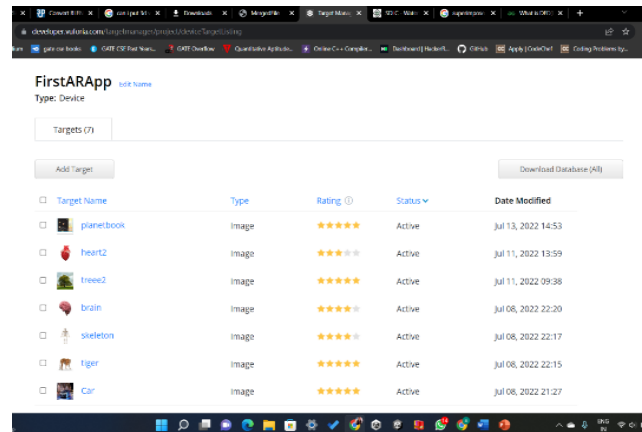


Fig.5. Vuforia Database

B. Unity 3D

A cross-platform IDE for game development is Unity3D. It can create sophisticated apps as well [4]. It has extensive 3D design tools and supports Vuforia, making the implementation of augmented reality apps considerably simpler and quicker. It is written in C#.

C. Setting up Vuforia

The implementation is carried out in Vuforia and Unity. The Developer Portal for Vuforia is set up so that you must first register an account before you can begin working. A developer page can be accessed after signing in [5]. When utilizing Vuforia to construct an application in Unity, a license key serves as the ID. This license key is generated using a "License Manager" on the developer website. The next step in adding an Image Target in Unity is to use the "Target Manager." By including the Image Target database and filling up the information, this is accomplished. The brand-new database is updated with the photographs. Finally, Unity imports this target picture database from the download.

D. Integrating with Unity

The cross-platform application engine Unity, created by Unity Technologies, offers a foundation for creating 2D and 3D games or app sceneries. An Augmented Reality camera prefab from Vuforia is called "AR Camera." The "Prefabs" folder contains an Image Target that is added to the scene. Fig. The Image Target shown in Figure 6 was added to Unity and was obtained by importing the Vuforia dataset.



Fig.6. Unity Platform

E. Result

The system is set up so that when a user moves their camera over a website, an augmented display, such as a 3D model, a video, or a description of the page, appears. It is a method that eliminates the need for searching or typing to obtain information. By enabling youngsters to acquire new ideas using graphical representations, the application lends a helping hand to young learners. A student can use the program whenever it's convenient for them because it can be installed on any smartphone. Additionally, this program doesn't require any additional maintenance, making it a cost-effective choice. The interactive features of this program, such as the 3D model view, enable the user to comprehend the idea from all sides.

VII. CONCLUSION AND FUTURE SCOPE

Researchers have been paying close attention to augmented reality technology recently. This project will benefit educators everywhere and demonstrate its effectiveness in the field of education. The goal of contemporary society is an intelligent world. In this process, education's job is to educate students about the difficulties of a changing world and to help them become fully contributing members of society. The present work's study focuses on effective and cutting-edge technology and tools that have the potential to revolutionize education [4]. They enable the development of learning environments that are in tune with the requirements and traits of contemporary society and digital learners. The work's specific goal is to demonstrate the wonders of augmented reality in turning education into smart education. The use of augmented reality in teaching could fundamentally alter how kids learn. Students will receive immersive content via this technology to aid in idea understanding [5]. Students can more readily learn complicated information and have a deeper understanding of topics when presented with engaging 3D representations. This application will be highly beneficial for kids because education has changed from traditional classroom instruction to virtual instruction. IMAR's 3D depiction of items will aid in helping them understand various concepts better.

- We intend to add more labels to various areas in the future to make it easier for users to correctly identify each segment.
- To make it more user-friendly, we also intend to add a panel.

VIII. REFERENCES

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