AR ANDROID APP FOR EDUCATION

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***ABSTRACT*:** In today's education, visualization is essential, but many students lack it. As a result, augmented reality (AR) is utilized to enhance visualization. The students are able to interact with the augmented reality, making learning more exciting for them. Executing this outcomes in extreme change in present day school system. We're turning to cutting-edge technology like augmented reality to transform classroom learning. In this paper, we propose a new Unity project. The vuforia unity interfacing package must be imported into the Unity setup. When we import this, we get assets from Vuforia to Unity that contain the augmented reality (AR) components that are used to create augmented reality (AR) applications. Compared to previous computer-based applications like 2-D, this one is better because all teaching topics can be observed in 3D graphical image and video format. This is the AR enhancement application.

Keywords—education learning, augmented reality(AR),3D vuforia

INTRODUCTION **(Heading 1)**

The idea of combining real-world and computer-generated data (virtual reality) is called augmented reality (AR). In augmented reality, computer graphics objects are incorporated into real-world footage in real time. As a result, the technology works by making people's current sense of reality better. A camera takes pictures of the markers that are pasted on real-world objects and processes them in a computer using image processing routines. A product code scans each edge for the marker and whenever found, computes the place of the camera comparative with the markers. A 3D virtual object is superimposed on the actual video marker once the position is determined. Consequently, the user sees the virtual 3-D object superimposed on the real world when viewing the real-world video. As a result, we can say that augmented reality brings virtual content into the real world. We chose to use augmented reality because of this advantage of augmented reality in order to assist the user in comprehending the complex ideas contained in the static form of geometry, where teaching and learning methods are still limited to 2D visualization. A student's comprehension of 3D Geometry can be enhanced through the use of augmented reality. Since it works straightforwardly in 3D, it will empower a client to grasp the 3D Math ideas quicker and better. Math teachers and students preparing for competitive and school exams are among the beneficiaries.

II. REVIEW OF LITERATURE

A. Existing Systems

We'll talk about a variety of systems and methods for learning three-dimensional geometry in this section. 1) The Old-Fashioned Method: Using PowerPoint presentations as a teaching tool is a common approach to learning geometry. Using a projector, a teacher will show the shape and the operations performed on it on the screen, and the students will learn from the teacher's explanations. The educator can either make recordings of the tasks to be performed on the item or can play out the activities before the understudies. The following are some other systems that are in place:

2) An Augmented Geometry Learning Tool for Elementary Students: This device upholds the

making of expanded reality based applications by recognizing and enrolling the virtual items progressively [2]. One can utilize this instrument to help the rudimentary kids to gauge points utilizing a protractor. There are four colored cards, namely, lime, blue, red, and green These colored cards serve as pens. The pivot point is the red card, the target point is the green and blue cards, and the size of the angle is shown on the lime card. Because it will become the center of the coordinate system, the pivot point should not move. Students can now show the blue or green marker to the web cam once the red marker card has been identified by the camera. The intersect line will appear from the positive x coordinate if it is a blue marker. The intersect line will emerge from the negative x coordinate if it is a green marker. After displaying the intersect line, students can now measure the angle between them using a protractor. A lime marker is shown to verify their answer's accuracy. The function that displays the angle measurement on the screen is triggered by this.

3) An augmented reality and pattern recognition-based interactive e-learning system: This is an intelligent e-learning framework, which utilizations design acknowledgment and increased reality [3]. The system provides students with realistic audio-visual content while they are learning. The system has a number of parts, including an audio-visual augmented reality engine, color and polka-dot pattern recognition, and image recognition. The current textbook page on a PC is captured by the system using a web camera. The system then identifies the page's images and adds audio and video to the monitor. The system makes use of color-band or polka-dot markers for interactive learning. This marker should be applied to the tip of a finger that will serve as the mouse cursor to point to the correct location in the textbook image. When the marker is placed on one of the textbook's predefined image objects, appropriate interactive audio-visual content is added to it. The elementary school educational courses that use this e-learning system have achieved satisfactory results.

4) MARIE, the Multimedia Augmented Reality Interface for E-Learning: Magic Book, a powerful augmented reality interface [4], is closely related to MARIE. A computer, a small camera, and a light Head Mounted Display (HMD) are used to build the system. The system effectively calculates the actual camera position and orientation in relation to predefined marked cards by utilizing computer vision techniques and a portion of the AR-Toolkit's functionality. The user receives a see-through, custom-built HMD. In accordance with the learning context, the user places a set of markers that have been predetermined on the table and looks at the markers through the head-mounted display (HMD). This allows multimedia information to seamlessly blend with the actual environment in real time. A marker was made for each unit, and the student is presented with the appropriate units of the teaching material. This assists in clients with choosing right markers related with the educating material. The teacher now has the responsibility of choosing the best learning approach for the students. That is, the order in which students should use the markers in an augmented reality environment to see the learning material.

B. Issues in Existing Systems

Some the issues in the existing systems discussed above are –

• In the traditional approach, teachers displayed shapes and performed a variety of operations on them using Power Point presentations. Because of this, understudies don't get to comprehend the shapes the manner in which they need to. Their comprehension is limited to what the instructor will show on the projector screen and is one-dimensional. The students are not given any hands-on experience with operations.

• In order to assist students in imagining the structure in a three-dimensional space, teachers may use actual examples of cubes, spheres, and other similar shapes in their instruction. However, the teacher finds it inconvenient to carry the specimens around. In a class of about 60 students, it's hard for the teacher to give each student individual attention. As a result, it is extremely uncommon for a student to receive an individual specimen for analysis, and it is not possible for every student to obtain an individual specimen. As a result, you won't be able to do things like cut through the shape, change the dimensions, etc.

• The Multimedia Augmented Reality System for E-Learning works by superimposing a virtual 3D image on a marker that has been scanned from a page. This system is no longer useful because it relies too much on markers. The new system that will be developed will look for and comprehend the shapes drawn on the page in order to superimpose a virtual image of the drawn object. The fineness in the edges of the marker relies on the force of the marker light, while perhaps not

appropriately lit the limit cycle gives rough edges and makes it challenging to recognize the shapes. During occlusion, or when an external object covers the marker, the system fails. OpenGL software takes longer to create this system because the objects need to be coded. Blender, on the other hand, allows for faster rendering.

It was decided to develop an e-learning system that effectively teaches three-dimensional geometry using augmented reality after looking at the various issues in the existing systems.

Objectives:

AR educational content was made possible by the development of related technologies and augmented reality (AR). Applications that are already usable in educational settings are the result of advancements in real-time tracking, graphics rendering, hardware computing power, and augmented reality authoring tools. This paper aims to measure the impact of augmented reality educational content as a first objective to demonstrate its usefulness. Although there are a lot of educational augmented reality prototypes in the current literature, only a few were developed by interdisciplinary teams and used learning theory as their foundation. Regardless of whether the present status of-the-workmanship execution of AR instructive substance is powerful, it must be imitated to different settings on the off chance that a rule exists for applying AR for training. By first summarizing the most up-to-date implementation and evaluation of AR prototypes, we aim to provide a guideline for effective augmented reality content as our second objective. Then, we list the benefits of augmented reality for education and talk about learning theories that will apply to future AR educational content.

III. OUR APPROACH

Our educational system's main idea is to combine educational content with technology. With additional visual content that is played on the personal computer or any other specific terminal, this helps students study concisely. Our objective is to develop a mentoring system for self-study that gives students interactive access to visual content learning. The related content on the display is played or augmented when the images and objects on the text pages are recognized.

Our e-learning system's architecture is depicted in Figure 1. It consists of an augmented reality engine and image recognition, such as virtual button recognition. The e-learning system first identifies the images on the page, which serve as markers, and then augments the corresponding visual contents on the monitor based on the marker's position and orientation when the camera captures the current page (real-world live video). The Vuforia SDK is used to register the markers, which gives each marker a unique license key. The Unity Game Engine is able to process specific augmented outputs because each marker is uniquely recognized. Simply put, the markers' positions and orientations are identified by processing the live video stream for each frame. When every video outline has been handled, the first picture and the virtual item is joined and delivered utilizing the expanded reality motor into the necessary increased view.

Our e-learning system's virtual buttons allow users to interact with it interactively for better comprehension. The virtual buttons package found in the Prefabs folder->Assets file is used to execute the virtual buttons. To indicate the choice made by the user, the user's fingers behave in the same way as a mouse cursor. In doing as such, the awareness of the virtual button must be expanded which prompts the result turning out to be more receptive to shadows. The predefined menu function for that button is activated when the user hovers their finger over it. The capabilities comprises of increasing, downsize, turn left, pivot right, climb, drop down, move left and move right.

In the second application module, the object's properties can be displayed at any time. The student must hold the object in their hand to activate this module. The camera shows the characteristics of the specific object after recognizing the hand's shadow. The application's pop-up video playback is the subject of the third module. The Text Recognition technology is utilized in this section of the application. Here, a particular word has already been entered into the game engine, and a particular video has been assigned to it. The word is matched to the assigned video and added to the video when the camera detects that it is available in a particular font style. Students who are struggling to grasp fundamental geometric concepts will benefit from the audio-visual assistance provided in this module. Videos contribute to the creation of a more immersive environment. A self-evaluation quiz constitutes our system's final module. The test contains different trouble levels and each level has a progression of inquiries that the client can answer in light of the virtual buttons accessible. The subsequent question is displayed and the corresponding answer is recorded when the virtual button is hovered over. The system displays the user's performance statistics after the quiz is over so that the user can keep track of and advance in geometry.

Our approach to an augmented reality self-learning application is designed in this way to assist students in understanding complex geometric concepts, provide them with tools for self-learning, and identify their

strengths and weaknesses., the corresponding answer is recorded and the next question is displayed. Once the quiz is over, the system displays the statistics of the user's performance, so as to monitor and improve his/her progress in geometry.

In this way, our approach to augmented reality selflearning application is devised to help students in learning complicated geometric concepts and provide them as an aid for self-learning capability and in turn recognize their strengths and weaknesses.

V. WALKTHROUGH TUTOR

Our Augmented Reality system for learning threedimensional geometry is built using C-sharp language and can be run on Mac OS or Windows 10 OS with Intel processor. One has to keep in mind certain important points while working with our 3D Geometry Augmented Reality tool.

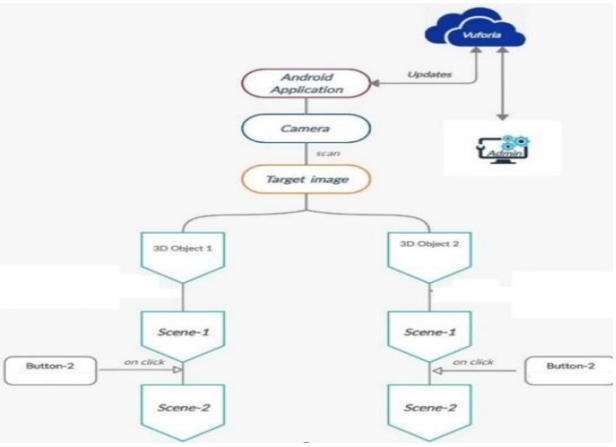
1) For a computer system to run this application, Unity 3D software should be installed on the system.

2) The marker must be kept straight in front of the camera. It helps in clearly detecting the marker and recording its position and orientation.

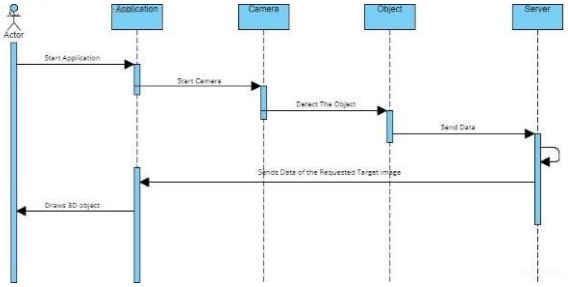
3) The camera in question should be highly sensitive to recognize the inputs or the shadows that fall on the virtual buttons.

Project Design:

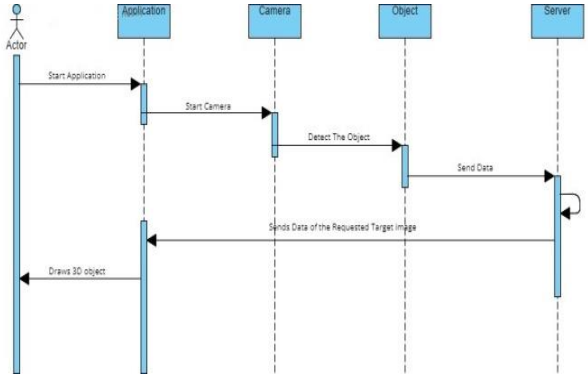
A. Architecture Diagram



B. Use Case Diagram

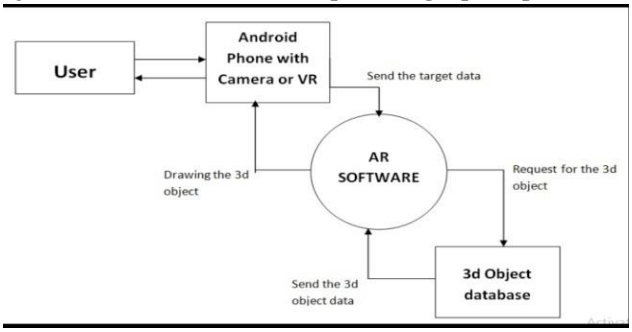


C . Sequence Diagram



IMPLEMENTATION

An image is scanned using android phone with camera by the user as shown in the Fig. It is then loaded into the AR software such as Unity 3D, Android AR core. Next, a request is made to 3D object database such as spatial, graph options and



geometrical objects as shown in the Fig. The 3d object data is then sent to AR software. The AR

software draws the 3d object and then superimposes in the real world.

Results and Discussion:

Augmented reality (AR) technology allows users to interact with virtual objects in the real world by overlaying digital information on top of their physical surroundings. AR applications can be developed using a variety of tools and platforms, including Unity and Vuforia.

Engagement: A highly interactive and engaging way for users to experience a story is through an augmented reality story application. It can provide them with a sense of immersion that traditional storytelling methods cannot, as well as a chance to feel more connected to the story's characters and events.

Education: An AR story application can be a successful method for showing clients a specific theme or topic. An AR story app could, for example, be used to teach science or history concepts in a more interactive and engaging way.

Entertainment: Users can have an enjoyable and entertaining time with an AR story application. It can provide users with a one-of-a-kind and memorable experience as well as a fun way to pass the time.

Accessibility: Stories and information can be made more accessible to users through an AR story application. For instance, an AR story application could be utilized to make a book or gallery display more intelligent and connecting with for clients.

CONCLUSION:

Unity and Vuforia to develop an AR story application for primary education can be a powerful and effective way to engage and educate young students. The interactive and immersive nature of AR technology can make learning more engaging and enjoyable for students, and can provide a unique and memorable learning experience.

The following are some potential advantages of using an augmented reality story application in primary education:

Fun: Students' motivation and engagement can be boosted by using an AR story application as a fun and enjoyable method of education.

In general, using an AR story application in primary education can be a useful tool for teachers who want to make learning more fun for their students.

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