

# Augmented Reality App for Engineering Education

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**Abstract**— Technology in education can influence students to find out actively and may motivate them, resulting in an efficient process of learning. Since its introduction, AR has shown to have good potential in making the learning process more effective, active, and meaningful. The aim is to explore the field of augmented reality with a central focus on the education of engineers. AR system generates in real-time, a composite view which is a combination of the real scene viewed by a user and a virtual scene generated by the computer that augments with some additional information. Allowing users to control and manipulate objects that are not real but in an augmented environment. AR are often particularly helpful in learning about the structures of complex models. Therefore, AR app-based learning using easily accessible smart phones in the digital world is a better choice of smart and effective learning. Looking at the current pandemic scenario, it will have more significance with the online mode of study.

**Index Terms:** Technology, Augmented Reality, Education.

## 1. INTRODUCTION

Technology has become embedded in education and results indicate a positive impact on learning and teaching styles. Lessons that are supported by technology cause more innovative sorts of teaching and learning. Because use of this technology involves real-world problems, information sources, communication with professionals, and simulations of concepts. In addition, learning using technology is believed to complement with a traditional form of teaching and learning. Augmented reality (AR) may be a new technology that has emerged with potential for application in education. While tons of research has been conducted on AR, few studies are conducted within the education field. The number of studies on AR is growing thanks to the effectiveness of this

technology in recent years. AR has been used in different fields of education. AR supports seamless interaction between real and virtual environments, allows a tangible interface metaphor to be used for object manipulation.

## A. PURPOSE

This project is used to develop a new educational tool that combines a mobile application for engineering students with an augmented reality technique. The technology helps to interleave concepts of theoretical and practical learning. Augmentation can serve to aid and enhance an individual's knowledge and understanding of concepts. AR is bringing a revolution to the entire education system and the way we teach and learn. AR mobile application developed to be implemented by engineering instructors to improve the quality of teaching. App displays models required to be taught in engineering courses in 3D interface and allows to interact with them through touch using a smartphone.

## B. OBJECTIVES

Our objective presents an Augmented Reality mobile application developed to be implemented by us to improve the quality of teaching in engineering education. The app displays the models required to be taught in engineering courses during a 3D interface and allows students to interact with them (control display, rotate, scale, etc.) through touch using a smartphone.

## 2. LITERATURE REVIEW

“AR app for Kid's Education”, by Surabhi Nanda, was published in 2017.

The paper explores the field of augmented reality with the central focus on education for kids.

Augmented Reality bridges the gap between theoretical and practical knowledge. Generally, an AR system generates, in real-time, a composite view which is a combination of the real scene viewed by the user and a virtual scene generated by the computer that augments it with additional information. It allows the users to control and manipulate the objects that are not real, in an augmented environment.

“AR for Diversity Education”, by Dr. Sanish Rai, published in 2020.

The purpose of this research paper is to develop a mobile application using innovative Augmented Reality (AR) technology for interactive study content targeted toward middle school and high school grades. By using the developed AR application, students will be able to learn about diverse science topics more efficiently and visually. The AR mobile application allows the user to project a 3D (3-Dimensional) AR model of science topics on a real-world surface (such as a table or a piece of paper). The users will be able to interact with the model as if it existed outside of the mobile application using touch interfaces.

“Android mobile augmented reality application based on different learning theories for primary school children”, by BehrangParhizkar, published in 2012.

Due to advancements in mobile technology and the presence of strong mobile platforms, it is now possible to use the revolutionizing augmented reality technology in mobiles. This research work is based on the understanding of different types of learning theories, the concept of mobile learning, and mobile augmented reality and discusses how applications using these advanced technologies can shape today's education systems.

There is a wide range of available technologies that can be used for the visualization of abstract concepts. Examples of visualization technologies that have been examined in previous research include animation, virtual environments, and simulation. Students can improve their mastery of abstract concepts through the use of virtual environments that have been designed for learning.

### 3. DATA FLOW DIAGRAM

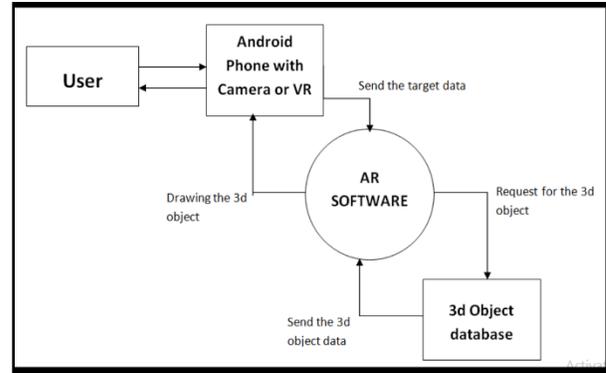


Fig. 1 Data Flow Diagram

### 4. METHODOLOGY

It's not easy for students to imagine a 3D object such as mechanical motors, computers, electronic circuits when it comes to pictorial presentation of those objects, using this application students can get a 3d augmented model in front of them from all the 3 dimensions to clear their concepts and images easily. This application allows to presentation 3d models so according to engineering aspects, it's great to have such an application that will show their Mechanical parts and other such engineering component using AR. This application, that enriches education is always in demand, now more than ever. A big disadvantage of using the normal Instructor-led classroom is its inability to deal with individual learner needs, resulting in a scarcity of attention and interest among students. This is where this application comes with AR technology which provides visuals to learners that can enrich the learning experience and assist the educators in creating content that links visuals to reality. For educators, an application like this offers a method of delivering content that makes learning interesting and easier to understand.

#### A. Stages of App development



Fig. 2 Image Target

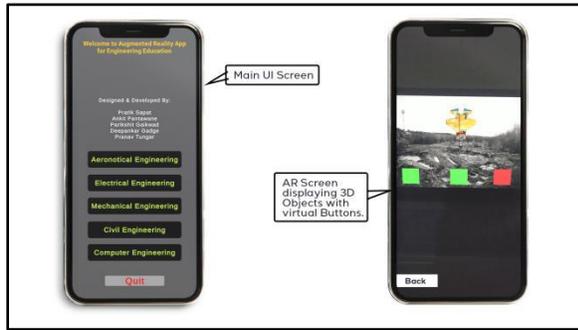


Fig. 3 Home Screen & 1<sup>st</sup> Dept. 3D Object

Fig.2 This is the target image for our application. The user must scan the target image by any smart device, using an application created by unity and the result will be the 3D model for the Departments.

Fig.3 The front page contains a button for Different DEPARTMENTS. This button will directly connect with the first department to its object.

Fig.3 It consists of three virtual buttons and a one-touch button at the bottom. The back button connects to the home screen, the first virtual button connects to the first object with its description, the same with the second virtual button, and the third virtual button hides the first two buttons.

Fig.3 Then comes the second department. It also consists of three virtual buttons and a one-touch button at the bottom. The back button connects to the home screen, the first virtual button connects to the first object with its description, the same with the second virtual button, and the third virtual button hides the first two buttons.

Fig.3 Then comes the last department. It also consists of three virtual buttons and a one-touch button at the bottom. The first virtual button connects to the first object with its description, same with the second virtual button, and the third virtual button hides the first two buttons, the back button connects to the home screen & quit button quits the application.

## 5. ALGORITHM USED

A. Canny Edge Image Detection in augmented reality  
The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images. It was developed by John F. Canny in 1986. Canny also produced a computational theory of edge detection explaining why the technique works.

So, how exactly can Canny Edge detection detect a picture as a marker for augmented reality? Well, in the first step like said above, the camera will blur the images to help for finding the edge, but if it is using an operator the images are then divided into some kind of small block that will be categorized into appropriate classes, and relationships. Canny Edge detection is a technique of image processing used to identify points in a digital image with discontinuities, simply to say, sharp changes in the image brightness. These points where the image brightness varies sharply are called the edges (or boundaries) of the image.

## 6. TECHNOLOGY USED

A. Graphical User Interface:

In this AR-based project, the GUI component contains a Menu Screen where different GUI Buttons are present to enter a particular section of the application.

B. C#

C# is a powerful and flexible programming language. Like all programming languages, it can be used to create a variety of applications. Your potential with C# is limited only by your imagination. C# was created as an object-oriented programming (OOP) language.

C. AR module:

This module includes Vuforia and Camera to give the user the experience of Augmented Reality which is the main feature of this application.

## 7. CONCLUSION

Using AR systems learners interact with 3D information, objects, and events in a natural way. The research conducted in several fields in education shows that AR technology has the potential to be further developed in education. This is because the advantages and beneficial uses of AR features can engage students in learning processes and help improve their visualization skills. The features can also help teachers to explain well and make the students easily understand what they are being taught.

The use of AR technology has also received positive feedback from participants and students who have

shown interest to use AR in their learning processes. These good responses are important because they indicate the willingness of scholars to actively engage in their studies through AR tools. When the potential of AR technologies is more fully explored, the beneficial functions of AR can begin to be used widely altogether fields of education and therefore the efficiency of the teaching and learning process will be improved.

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