

## REVOLUTIONIZING EDUCATION WITH AR

Ronak Keshubhai Jethava\*<sup>1</sup>, Harmish Motibhai Gothi\*<sup>2</sup>, Jay Shaileshbhai Panchal\*<sup>3</sup>

Dr. Jitendra Saturwar\*<sup>4</sup>

\*<sup>1,2,3</sup>Computer Engineering, Universal College Of Engineering, Mumbai, India.

\*<sup>4</sup>Head of the Computer Engineering Department, Universal College of Engineering, Mumbai, India.

### ABSTRACT

The technological tendencies of the past 15 years have made a big impact on society. Technology in education can influence students to learn actively and motivate them, leading to an effective learning process. research has identified that generation will create a passive mastering technique if the era used does not sell essential questioning, which means-making, or metacognition. The Augmented Reality (AR)-based learning environment provides educators with novel ways to present learning materials and gives learners the opportunity to spontaneously interact with the material. Augmented truth (AR) has been proven to have a precise capacity in making the studying technique extra lively, powerful, and significant. this is because its superior era allows customers to engage with digital and actual-time programs and brings herbal experiences to the person. similarly, the merging of AR with education has currently attracted studies interest due to its capacity to permit students to be immersed in real experiences. Augmented Reality superimposes virtual objects over real-world environments. Educators recognize that mastering deepens, not just through studying and listening but also via developing and interacting. This proposed venture of our objectives to beautify the present-day instructional device using Augmented fact. We are developing an application that will show animations, videos, and 3-D models of educational material. This project can enhance learning, creativity, and retention among students. Our application will also foster intellectual curiosity among students making them smarter. We aim to change the conventional way of education and open a new opportunity for a smart classroom.

**Keywords:** Augmented Reality, Virtual Reality, Three-Dimensional, Education, Learning.

### I. INTRODUCTION

One of the modern-day and, at the identical time, most thrilling technological developments in education is using augmented reality (AR) to empower getting to know. Augmented fact lets users interact with pc-simulated environments, real or imagined. using AR helps deal with a number of the fundamental problems in modern-day training. these include the shift from reality retention strategies of coaching towards more interactive ones and the look for new methods to engage students. AR era has much to offer in terms of getting students interested in mastering material. The virtual world of countless opportunities allows the creation of educational and education content that results in a more understanding of superior principles. similarly, AR useful resource gaining knowledge of by using permitting energetic participation all through the classes in addition to assisting to personalize education and enhance the learner's creativity. computer systems and the net permit teachers and college students to paintings, observe, and benefit from records in ways that had been once unthinkable.

Augmented fact (AR) has been slowly but virtually following its predecessor virtual fact is converting the education quarter — digitizing study room mastering, and making training more numerous and interactive. The cellular augmented fact can upload price to inexperienced persons of every age, starting from nursery kids to number one college scholars, all the manner to college and university college students. And maximum these days, AR has been brought in to help people in numerous fields with on-the-task training and recruited inside area of interest sectors to assist human beings to realize complicated subjects and study interactively. One of the pleasant use instances that I've visible for nursery-age kids comes from Disney. Quoting Disney research, coloring books supply kids with one in every of their earliest possibilities for innovative expression, but "given the proliferation and recognition of virtual devices, real-international activities like coloring can seem unexciting, and kids grow to be less engaged in them. Augmented reality holds the particular capability to effect this case with the aid of presenting a bridge between real-world sports and digital enhancements."

Going onto number one, secondary school, and university studies, AR can add actual cost to science-based getting to know. no longer each person can buy a skeleton to find out about the human frame or explore specific elements of its construct-in extra depth. but, all of us with get admission to to an AR-enabled book or application should retrieve such statistics within the three-D layout and satisfy their choice for visible mastering. It isn't just anatomy even though; think about visualization of ways protons, atoms, neutrons, and electrons paintings in chemistry and what the packages will be for biology. some other educational use case for augmented reality that can run from nursery to grownup courses is card games. The augmented truth function has been carried out as an assistant for hassle-solving, while traditional assessments might also reveal the result, AR capability suggests how the outcome was completed.

## II. EXISTING SYSTEM

### A. Existing System

Collaborative reading allows the user to participate in the learning environment. However, due to the improvement of the learning environment, the conventional manner of gaining knowledge did no longer fulfill the scholars, and the mastering process became uninteresting. This is due to the fact the interaction between studying and scholarly tools is restrained to pieces including text. It seems difficult for students to visualize and will easily fail to focus, and all of these things are expensive too. So, the proposed system is used to enrich the learning environment and to allow the students to participate completely in the learning process and it is cost-effective and easy to use too.

### B. Project Scope

Using AR technology, we will build an application that will augment the model when a target image gets detected by the camera and will also react on the touch or other medium of interaction. More focus should be on minimizing the gaps which came across in the research surveys. The system should also be affordable and user-friendly. We will use this high-end technology to make learning interesting, interactive, and dynamic so that we can enhance our learning experience. Recent research has shown that almost fifty three% of youngsters very own cell phones by means of the age of seven, the percentage will increase unexpectedly with age, and phone ownership is almost popular as soon as kids reach secondary school. that is both the group of human beings in the cutting-edge education machine and also gift and destiny employees and customers of the business community. So, in place of getting rid of gadgets from the study room, we have to search for approaches to combine them.

## III. PROPOSED SYSTEM

This chapter includes a brief description of the proposed system and explores the different modules involved along with the various models through which this system is understood and represented.

### a. Analysis/Framework/Algorithm

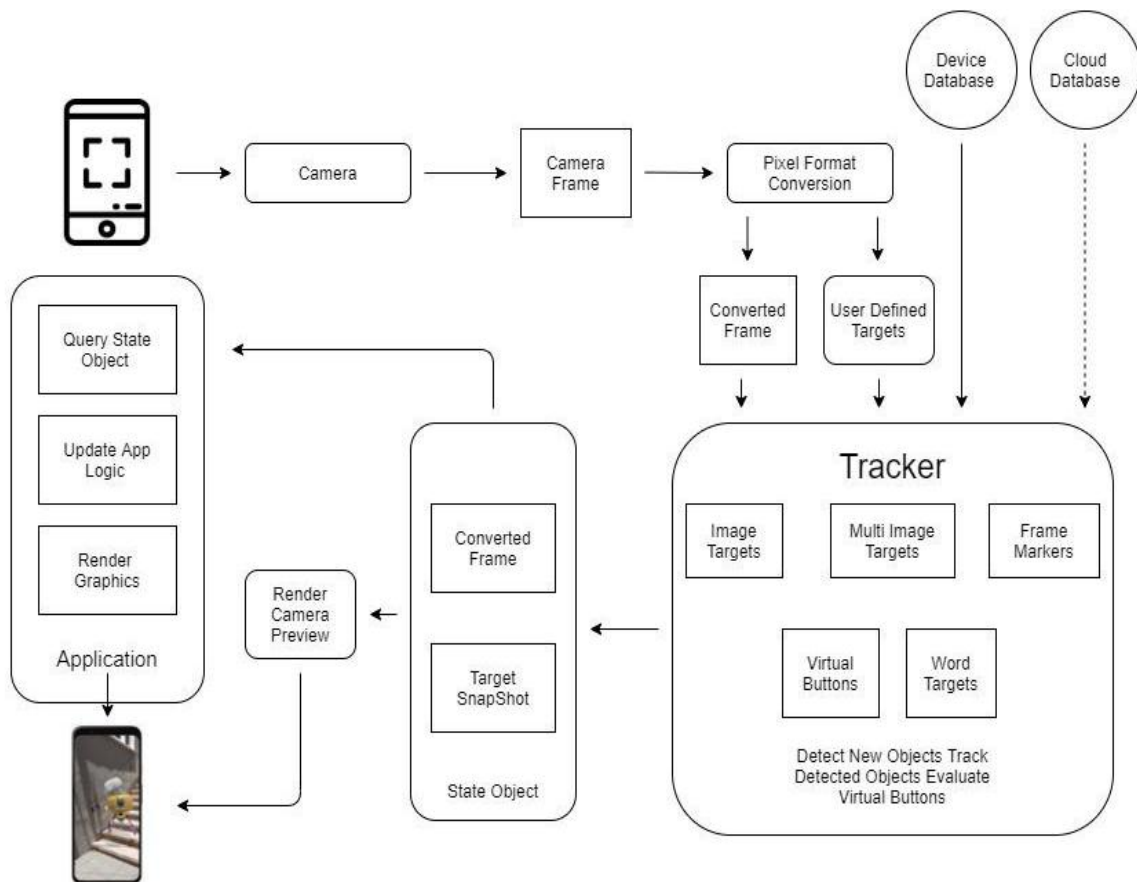
This will help in improving the traditional teaching and learning methods. The conventional systems used today are very high-end and not related much to the subject user is learning. This software often comes with a price tag and expensive inputs which make it not so affordable for every user of the platform. Additionally, this software isn't specifically designed for a secondary/higher secondary student, whereas else for imparting basic knowledge, these systems are often more complex, which is not required at that stage. Also, the main goal of the proposed system is to enhance e-learning without any additional cost. The system is an application that uses augmented reality to display 3D anatomical structure whenever the target image is kept in front of the camera this target image is stored in a database generated by Vuforia, which is an integrated module of Unity 3D and used for storing target images that can be scanned in realtime in an application whenever pointed by the smart device. A virtual structure will be displayed over the target image in real-time. These structures are the object files created via Autodesk Maya and both the image target and the structure is linked with each other via Unity 3D, which further helps us with the App development. The system also incorporates a video AR section where on detection of the target image a video will be played the target image itself.

- Target Image - Target images are the images which on which the application will give the output after successfully scanning and matching the copy of the same which is stored in the backend i.e. Vuforia database. Vuforia can track and recognize image target features based on contrast. By improving the visibility of these

features through adjustments to the target’s design, it’s rendering, and also the way it’s printed, we can improve the performance of a target. One can also improve detection and tracking performance by designing your app’s user experience to obtain the best image of the target and by controlling the focus manually of the device camera.

- 3D Objects - 3D objects or structures are created using Autodesk Maya, a tool that is used for building 3D assets, animation, etc. irrespective of geometry. Autodesk Maya stitches two or more images to give users a curved structure, further helping in creating anatomical structures. Since anatomical structures are not made on a coordinate system, a tool like Autodesk Maya and an adobe blender help us in achieving these results.
- Camera Module - Unity 3D allows us to use an in-build AR camera module and gives the feasibility to alter its functionality as per our needs. Since Vuforia maps the points based on the contrast of the images, even a phone as small as a VGA camera can detect the image target and track the points. Keeping the camera module with no user interface gives the application “point and play” functionality. It also keeps the application simple and concise w.r.t size.
- Unity - Unity is the software that we will be using to integrate the 3D models to the traced 2D model. It will also help us in adding functionalities to the displayed model and will also be linked to Vuforia Engine and the Software application.
- Vuforia Engine - Vuforia Engine will be a one-stop-shop for all the 3D models and will be a database for those 3D models.

**b. System Architecture**



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Fig 1: Proposed System Architecture

It's an application that uses AR to display 3D structure whenever the target image is kept in front of the camera; this target image is stored in a database generated by Vuforia, which is an integrated module of Unity 3D and used for storing target images that can be scanned in real-time in an application whenever pointed by

the smart device. A virtual structure will be displayed over the target image in real-time. These structures are the object files created via Autodesk Maya, and both the image target and the structure are linked with each other via Unity 3D, which further helps us in app development following steps are involved in the development of the application..

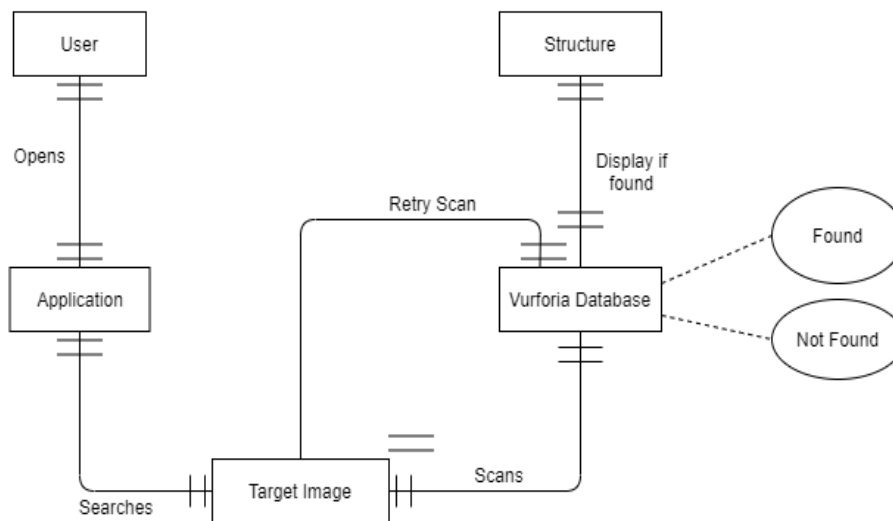
- Upload an image to Vuforia- Uploading the target image on Vuforia Target Manager.
- Vuforia develops an image with feature points that can be loaded in Unity.
- Image in Unity as our marker that will load the database into your main folder.
- AR content on top of this marker- Export 3D object files into Unity.

Load the application to your phone and enjoy learning.

**c. Data Model and Description**

Data Model describes the relationship and association among data which includes Entity-Relationship Model.

Entity-Relationship Model - Below diagram shows the Entity Relationship Diagram of the proposed system. An Entity Relationship diagram is a data modeling technique that graphically illustrates an information system’s entities and the relationships between those entities. Here, the entities are User, Application, Target image, Vuforia Database, Structure.

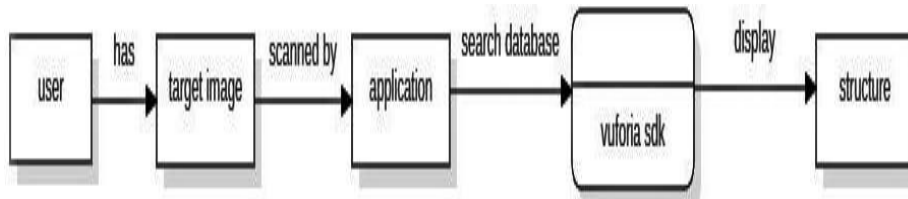


**Fig 2:** Entity-relationship diagram

Fundamental Model - Fundamental model of the project gives an overall idea about the project. How the entities are related to each other, what are the attributes of the entities, how the data flow between the entities is shown by the fundamental model.

Data Flow Model - A facts go with the flow diagram (DFD) maps out the float of facts for any system or machine. It makes use of described symbols like rectangles, circles, and arrows, plus quick text labels, to expose facts inputs, outputs, storage points, and the routes between every destination. information flowcharts can variety from simple, even hand-drawn technique overviews to in-intensity, multi-degree DFDs that dig steadily deeper into how the records is dealt with. They can be used to research an current machine or version a brand new one. Like all the first-rate diagrams and charts, a DFD can often visually “say” things that would be hard to provide an explanation for in words, and that they paintings for both technical and non-technical audiences, from developer to CEO.

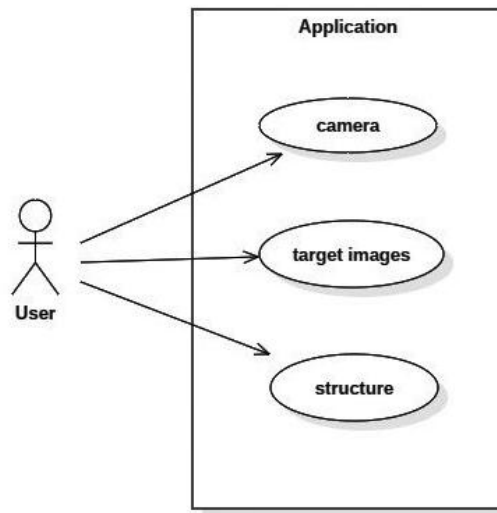
DFD Level 0 - A level zero statistics waft diagram (DFD), also known as a context diagram, shows a facts system as a whole and emphasizes the way it interacts with outside entities. This DFD level 0 example shows how such a system might function within a typical application. Here,the server host containing the ML model will notify the host with classification and will give the idea about the server client’s authenticity.



**Fig 3:** DFD Level 0

UML (Unified Modelling Language) Diagram - The Unified Modelling Language is a widespread-purpose, developmental, modeling language inside the area of software engineering this is intended to provide a general manner to visualize the layout of a system. We have prepared and designed the UML diagrams of the Use Case.

Use Case Diagram - Use Case Diagram of the proposed system. It shows the user’s interaction with the systems. The purpose of a use case diagram in Unified Modeling Language (UML) is to demonstrate the different ways that a user might interact with a system. In this use case diagram, there is one actor involved, the actor is the user. It depicts the interactions between the various processes and the actor in this system.



**Fig 4:** Use Case Diagram

#### IV. EXPERIMENTAL RESULTS

This chapter includes the snapshots of the actual outputs that were seen by the user and this chapter also contains the results of the proposed system.

Result in Table - The results of the proposed system to the existing system using some crucial factors are examined.

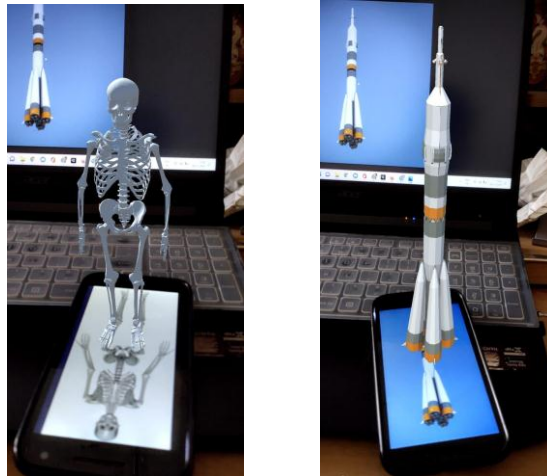
**TABLE 1:** COMPARISON BETWEEN EXISTING AND PROPOSED SYSTEM

PARAMETERS	EXISTING SYSTEM	PROPOSED SYSTEM
Cost of implementation	High	No cost
Ease of use	Difficult to use	Easy to use
Pace of output generation	Takes more time	Takes less time
Quality of output	Dependent on human skills	Dependent on human skills
Inputs	Costly inputs	No additional inputs (school textbooks can be used)



<b>Hardware</b>	Might Require structure sensor	No additional hardware required
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Snapshots of Project - The accuracy levels achieved by the proposed systems are regal, but to generate the desired result takes a large amount of time and human effort. The current system depicts the fully working model created to show the implementation.



**Fig 5:** Project Demo

## V. CONCLUSION

This assessment of studies conducted in numerous fields in training indicates that AR technology has the ability to enhance education. that is due to the fact the advantages and useful use of AR features are capable of have interaction college students in gaining knowledge of procedures and help enhance their visual competencies. capabilities can also assist teachers to express themselves actually and to make it less complicated for college students to apprehend what is being taught. the usage of AR generation additionally received tremendous comments from individuals and students who expressed interest in using AR of their mastering procedures. these nice responses are crucial because they exhibit students' willingness to take part absolutely in their research with AR tools. AR generation is quite new in training, so there are nevertheless a few boundaries. however, research evaluations show that many of the boundaries are associated with technical troubles. Such obstacles can be overcome over time as AR integration research in education are repeated and advanced. as soon as the technological skills of AR are completely explored, the useful capabilities of AR can start to be broadly used throughout all disciplines and the effectiveness of the teaching and gaining knowledge of process can be greater.

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## VI. REFERENCES

- [1] Nor Farhah Saidin, Noor Dayana Abd Halim & Noraffandy Yahaya conducted their research on the applications and advantages of augmented reality in education where they discovered that because of this interactive form of learning, students are generating more interest in their respective field of

- studies. They concluded that AR/VR has the potential that can be adapted in education but along with this there were some limitations.
- [2] Maria Meletiou-Mavrotheris, Ana Rita Carrilho, Constadina Charalambous, Katerina Mavrou and Christiana Christou they also researched on AR/VR in education and they said that it is a Living Book Approach. This approach of study drives students crazy and along with this it generates digital literacy.
- [3] Su Cai, Changhao Liu, Tao Wang, Enrui Liu and Jyh-Chong Liang are the professors in the field of AR/VR who conducted their research. Their research states that the AR-based learning environment is an emerging concept, many of which have never been centered within the old educational principles and psychological theories they also added that AR can be used in physics and other subjects as well for conducting various different experiments or reactions and it can create dynamic impact on students.
- [4] Marina Paolant conducted research on how teachers can be assisted by AR / VR, in such a way that students can reinforce learning outcomes, that was acquired during the classroom talk. They conducted the survey on both normal and AR approach but there were some limitations.
- [5] Kamran Khowaja and Dena Al-Thani conducted a systematic review of the basic lessons relevant to the use of the supplement fact (AR) to improve the various skills of children and adolescents diagnosed with autism spectrum disorder(ASD) from 2005 to 2018. After review they conclude the study with some work ideas to do.
- [6] Nor Farhah Saidin, Noor Dayana Abd Halim & Noraffandy Yahaya," Research on Augmented Reality in Education". In- Augmented Reality,(2018), CCSE.
- [7] Maria Meletiou-Mavrotheris, Ana Rita Carrilho, Constadina Charalambous, Katerina Mavrou & Christiana Christou," Augmented Reading: The Living Book Approach". In Augmented Reality, MDPI.
- [8] Su Cai, Changhao Liu, Tao Wang, Enrui Liu & Jyh-Chong Liang, "Effects of learning physics using Augmented Reality on students' self-efficacy and conceptions of learning". In Augmented Reality, (2021), BJET.
- [9] Marina Paolant," An Educational Platform to Improve Students' Learning Through Virtual Reality". In- Augmented Reality, (2021), IEEE.
- [10] Kamran Khowaja and Dena Al-Thani," Augmented Reality for Learning of Children and Adolescents With Autism Spectrum Disorder (ASD)". In- Augmented Reality, (2021), IEEE.