

Augmented reality for students and learning enthusiasts

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Abstract — Augmented reality (AR) is an evolving technology that has the potential to revolutionize how we learn and understand complicated concepts. AR combines real-world objects with virtual information to create a hybrid world in which technology meets reality. This allows pupils to study complicated concepts in a more pleasant and simple manner. Our application facilitates the understanding of complicated schematics by using 3D models and accompanying video explanations. The software also has interactive features that allow learners to effortlessly connect with the application. This makes learning more fun and engaging, while also helping pupils to better understanding the concepts that they are studying.

Keywords—augmented reality, education, camera, videos, 3D models.

I. INTRODUCTION

Augmented Reality (AR) is an enhanced version of the real physical world that has been achieved through the use of digital visual, sound, or other sensory stimuli, which has been delivered via technology. Augmented reality uses computer generated images to augment what a person sees in their physical environment. This technology is mainly used for entertainment purposes and gaming, but there are also some examples of augmented reality in education. In AR, the part of the surrounding environment is 'real' and just adding layers of virtual objects to the real environment. The primary augmented reality devices are to display through mobile, VR and AR head sets.

II. AR APPLICATIONS IN EDUCATION

Augmented Reality is the next revolution in the world of education. It has been introduced for students and learners as a way to get a better understanding of concepts that are difficult to understand through traditional methods. Some benefits of augmented reality in education are as follows:

- Learning resources are available at all times and from any location. Books, object models, posters, and textual guides might all be replaced with augmented reality. It offers mobile and low-cost learning resources. Education becomes more portable and accessible as a result.
- There is no requirement for specialised equipment. As many of all teenagers have own smartphone. The majority of the target population can use AR technology right away.
- AR learning that is interactive and user friendly can have a big beneficial influence on learners. It maintains students' interest throughout the course and makes learning enjoyable and simple.

- AR gamification attempts to enhance the overall learning process of youngsters with intellectual disability. It provides a game-based learning system with three levels (training, iterative design and class evaluation).

III. PROBLEM IDENTIFICATION

A student's life includes studying, yet not everyone finds studying enjoyable. The students feel uncomfortable because of lengthy sentences and boring material. To tackle this issue, we suggest switching from the traditional approach of learning to a new one that makes use of augmented reality (AR) as a learning tool. To assist pupils acquire new ideas, some literary works that have been included in augmented reality technology. The real and digital environments can be combined to make studying more enjoyable for pupils. According to the ScienceDirect, the study in order to assess the efficacy and outcomes of utilizing AR in teaching. We can infer from their paper that employing AR as a learning tool aids [13].

This is primarily accomplished by seeing abstract ideas as 3D objects. As a result, AR can be utilised to help students to understand the fundamentals of abstract ideas. Students also find AR to be intriguing, which inspired them to study more. Due to the more engaging experience, the pupils may readily recall and remember information. Because students can view the replicas of real objects while learning and practising, AR is generally a more effective learning medium.

IV. PROPOSED WORK

In this paper, we have completed the work related to the NCERT physics 12th standard book.

The AR software starts with the camera, which recognises the image in the book by pointing the smartphone camera in its direction, followed by the presentation of a 3D model and viewing choices for the 3D model and video. AR app's 3D model-zoom and rotate-features, as well as video-play, pause, and reset-features, would assist in providing interactive learning to users.

The application is being created in two stages.

- The AR system and assets (3D models and videos) were produced in the first stage.
- The assets were deployed in the second stage.

Software such as blender, vectary, unity and android were used for the creation of application.

A. System Requirement

1) DEVELOPER

Software's Required (With Versions duly mentioned)

- Google AR core API
- Android min SDK version
- Android 7.0 and unity 2021.3.4f1[2]
- Vuforia 10.7

Hardware's Required

- Nvidia Geforce RTX 2070 Super
- CPU with minimum clock speed of 3.5 Ghz
- SSD with 256GB storage
- 8GB Ram

2) *END USER*

Software's Required (With Versions duly mentioned)

- Android 7.0
- IOS 9

Hardware's Required

- Any modern smartphone with camera

B. Activity Diagram

An activity diagram is a flowchart that illustrates, how one activity leads to another. The activity diagram is shown in figure 1 along with the circumstances and order in which the activities take place.

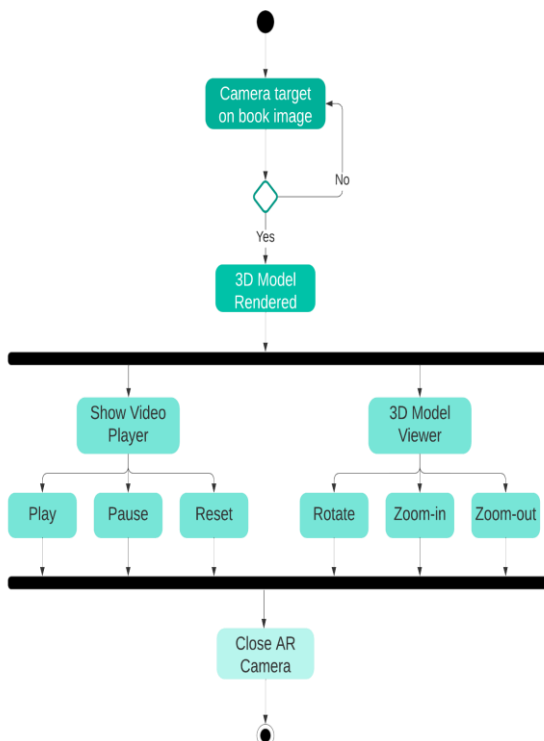


Figure 1[3]

The process of targeting a picture and creating a 3D model in response to it occurs first. Following that, another activity sequence with the options to “Show Video Player”

and “3D Model Viewer” became accessible. The activity diagram is then completed with the choice to close AR Camera.

C. Class Diagram

Following are the types of the objects residing in the application along with corresponding relationships between them:

- 1) *ButtonController*
- 2) *FlyThroughCam*
- 3) *ImageTargetHandler*
- 4) *NotDestroyGameObject*
- 5) *ThreeD_View*
- 6) *Unity3DViewerScene*
- 7) *MouseOrbit*
- 8) *Zoom*

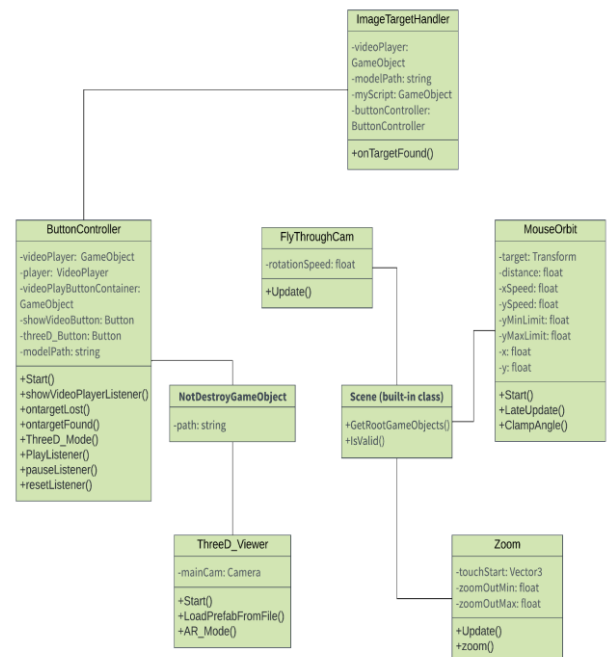


Figure 2[1][3]

V. SNAPSHOTS

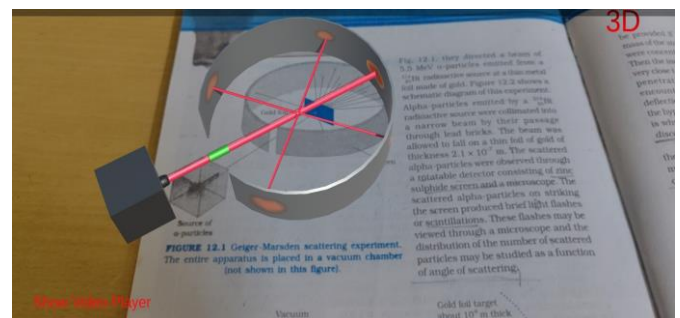


Figure 3

In figure 3 a three dimensional representation of Rutherford model is displayed over its 2D image along with following two options:

1. Show Video Player – Upon click, the associated video will be displayed
2. 3D – The model will be displayed individually together with rotate, zoom-in, zoom-out, and back to augmented reality mode via changing the scene.



Figure 4

In figure 4 video corresponding to the Rutherford model is shown along with the following options:

1. Show Video Player – Demonstrates the video associated with the model
2. Play – The video will begin to play
3. Pause – Pauses the video that is currently being played
4. Reset – The video will restart

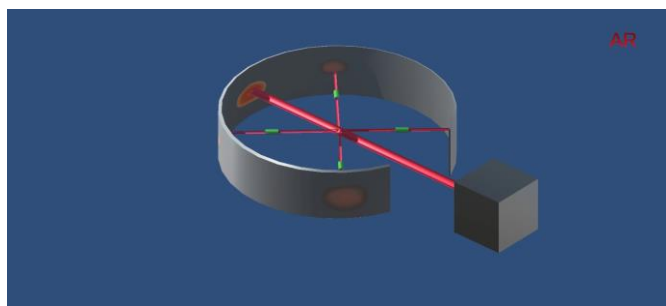


Figure 5 [11]

In figure 5 a three dimensional representation of the Rutherford model is provided along with

1. Rotate
2. Zoom-in
3. Zoom-out
4. Back to AR mode options

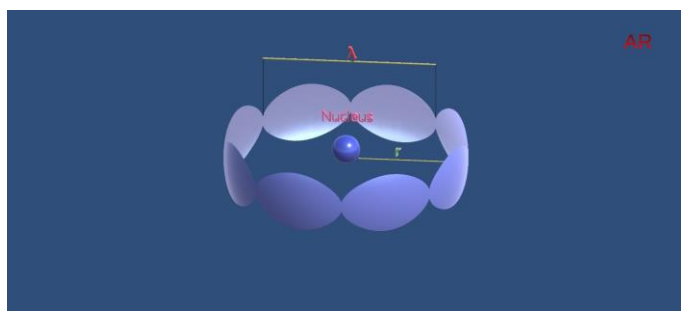


Figure 6[4]

In figure 6 a three dimensional model representing a standing wave on a circular orbit where four de Broglie wavelengths fit into the circumference of the orbit is provided along with

1. Rotate
2. Zoom-in
3. Zoom-out

4. Back to AR mode

VI. CONCLUSION

AR allows teachers to assist students in grasping complex topics. Teachers may enrich classroom experiences, teach new skills, encourage student minds, and get students enthused about pursuing new academic interests by utilizing the engagement and experimentation that AR technology provides.

Because AR allows lecturers to display three dimensional representation of images and incorporate interacting components which makes textbook materials more interesting, any institute will be remarkable and more engaging.

Through the use of the application developed, students will get a better interacting way of learning and memorizing information.

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