



DEVELOPING LEARNING TOOL FOR ELECTRICAL AND ELECTRONIC COMPONENT USING AUGMENTED REALITY

B. Magesh¹, J. Bilson², Chundru Naveen Kumar³, Mrs. L. Jenitha Mary⁴

B.E, Department of Computer Science and Engineering, DMI College Of Engineering, Chennai, India¹

B.E, Department of Computer Science and Engineering, DMI College Of Engineering, Chennai, India²

B.E, Department of Computer Science and Engineering, DMI College Of Engineering, Chennai, India³

Assistant Professor, Department of Computer Science and Engineering, DMI College Of Engineering, Chennai, India⁴

Abstract: In the era most of the engineering students are known the theoretical concepts of electrical and electronic components used in the laboratory but they couldn't experience or imagine the how each of the component is functioning and the electron current flows in the circuit. In this project, an application is developed to learn and experience the components and overcome the problem which was faced by the student community via augmented reality. Augmented reality provides new development ideas for the visualization of data information, and at the same time provides new development space for the convergence of digital visualization technology and multiple industry. Augmented reality makes the virtual object into the real scene. So the students can able to understand the concept practically through by visualizing the objects. Here we are trying to develop a learning tool for laboratory that uses electrical and electronics components using augmented reality. In this work, initially we are designing the electrical and electronic component through unity and to show the simulation of electrons in the electrical and electronic component through animation. This makes the student to understand the concept theoretically as well as practically. In this project implementing the super imposition augmented reality that makes the virtual object is placed on top the real object in real scene. unity which acts as an toolkit for making the 3D objects and makes the animation on the object. which makes everyone can able to understand the concept practically through virtualizing the virtual electrically and electronic components.

I. INTRODUCTION

A. Augmented Reality

Augmented reality (AR) is a technology that allows computer-generated information, such as images, sounds, and other digital data, to be overlaid on top of a real-world environment in real-time. This creates an interactive and immersive experience for the user, where virtual objects appear to be part of the physical world. AR is typically achieved through the use of a camera or other sensors, which capture the real-world environment, and a software program that processes the data and adds the virtual content to the user's view. This can be accomplished through a variety of devices, such as smartphones, tablets, wearable technology, and head-mounted displays. AR has many potential applications in fields such as gaming, education, healthcare, marketing, and tourism. It has already been used to create interactive games, educational tools, and virtual product demonstrations. AR can also be used to provide real-time information to users, such as directions, product information, and safety alerts. Overall, AR has the potential to revolutionize the way we interact with technology and the world around us, and it will likely continue to play an increasingly important role in our daily lives in the years to come.

B. Superimposed Augmented Reality

Superimposed augmented reality is a type of augmented reality where virtual objects or digital information is overlaid onto a real-world environment in a way that they appear to be a natural part of that environment. This means that the virtual objects are superimposed on top of the real-world objects, appearing as if they are part of the scene. Superimposed augmented reality is typically achieved using a camera or other sensors to capture the real-world environment, and a software program that processes the data and overlays the virtual content onto the user's view. This technology has been used in a variety of applications, such as gaming, education, advertising, and product visualization. One example of



superimposed augmented reality is the use of virtual furniture placement. Users can visualize how a piece of furniture would look in their home by using their smartphone or tablet camera to capture a photo of their room, and then superimpose a virtual model of the furniture onto the image. This allows users to see how the furniture would look in their space before making a purchase. Another example is in the field of education, where superimposed augmented reality can be used to enhance learning by providing interactive and immersive experiences. For example, students can explore historical sites or scientific phenomena by superimposing virtual models onto a real-world environment. Overall, superimposed augmented reality has the potential to provide engaging and innovative experiences that merge the physical and digital worlds, and it will likely continue to be an important technology in various industries in the future.

C. Unity

Unity is a popular cross-platform game engine used to create 2D and 3D video games, as well as other interactive experiences such as virtual reality (VR), augmented reality (AR), and architectural visualizations. The engine is designed to be user-friendly and flexible, making it accessible to both experienced developers and newcomers to the industry. One of the strengths of Unity is its ability to support multiple platforms, including mobile devices, desktop computers, consoles, and even web browsers. This allows developers to create a game once and then export it to multiple platforms, reducing development time and costs. Unity also offers a wide range of tools and features to help developers create high-quality games, including a powerful scripting language (C#), a visual editor, physics simulation, animation tools, and a robust asset pipeline. Additionally, Unity has a large and active community of developers who share knowledge, tutorials, and resources, making it easier for new developers to get started. Unity has been used to create a wide range of successful games, including popular titles such as Pokémon Go, Hearthstone, and Cuphead. In addition to games, Unity has also been used to create non-gaming applications, such as architectural visualizations, medical simulations, and training software. Overall, Unity is a powerful and flexible game engine that offers developers the tools and resources needed to create engaging and immersive experiences for a wide range of platforms and industries.

D. Android Studio

Android Studio is an Integrated Development Environment (IDE) used to develop Android applications. It is the official development tool for Android, created by Google, and is available for free to download and use. Android Studio provides developers with a wide range of features and tools to create, test, and debug their applications. Android Studio is built on top of IntelliJ IDEA, a popular Java IDE, and offers several additional features specifically for Android development.

Some of these features include a layout editor, code completion, an APK analyser, and a built-in emulator for testing applications. Android Studio also provides access to the Android SDK (Software Development Kit), which includes a variety of libraries and tools required for building Android applications. Additionally, Android Studio supports multiple programming languages, including Java, Kotlin, and C++. Overall, Android Studio is an essential tool for any Android developer looking to create high-quality and efficient applications for Android devices.

II. LITERATURE SURVEY

A. Author: Hao Wang et al.

Year: 2022

Description: Used a novel image processing pipeline that is designed to accurately identify the planar structure of a breadboard, even in the presence of occluding circuit components.

Domain: Augmented Reality

B. Author: Nisal Thiwanka et al

Year: 2021

Description: Used image recognition technology to identify circuit symbols and their connectivity can help students understand the function of each component and its role in the circuit.

Domain: Augmented Reality

C. Author: Joel Weijia Lai et al

Year: 2020

Description: There are ethical considerations such as privacy, security, and accessibility that need to be addressed when using AR in education.

Domain: Augmented Reality



D.Author: Norizah binti Md. Ishak et al

Year: 2021

Description: AR technology can improve student retention by making learning more memorable and allowing students to visualize and interact with concepts in a way that is more likely to stick in their memory.

Domain: Augmented Reality

E.Author: Guoshun Nan1 et al

Year: 2020

Description: AR can be accessed from anywhere with an internet connection, allowing for flexible and remote learning. Implementing AR technology can be expensive, making it difficult for some institutions to adopt it as a teaching tool.

Domain: Augmented Reality

F.Author: Salaheddin Odeh et al

Year: 2021

Description: Used image recognition technology to identify circuit symbols and their connectivity can help students understand the function of each component and its role in the circuit.

Domain: Augmented Reality

III. PROPOSED SYSTEM

An application is developed to learn and experience the components and overcome the problem which was faced by the student community via augmented reality. Augmented reality makes the virtual object into the real scene. So the students can able to understand the concept practically through by visualizing the objects. Here we are trying to develop a learning tool for electronics and communication laboratory using augmented reality.

A.Architecture Diagram:

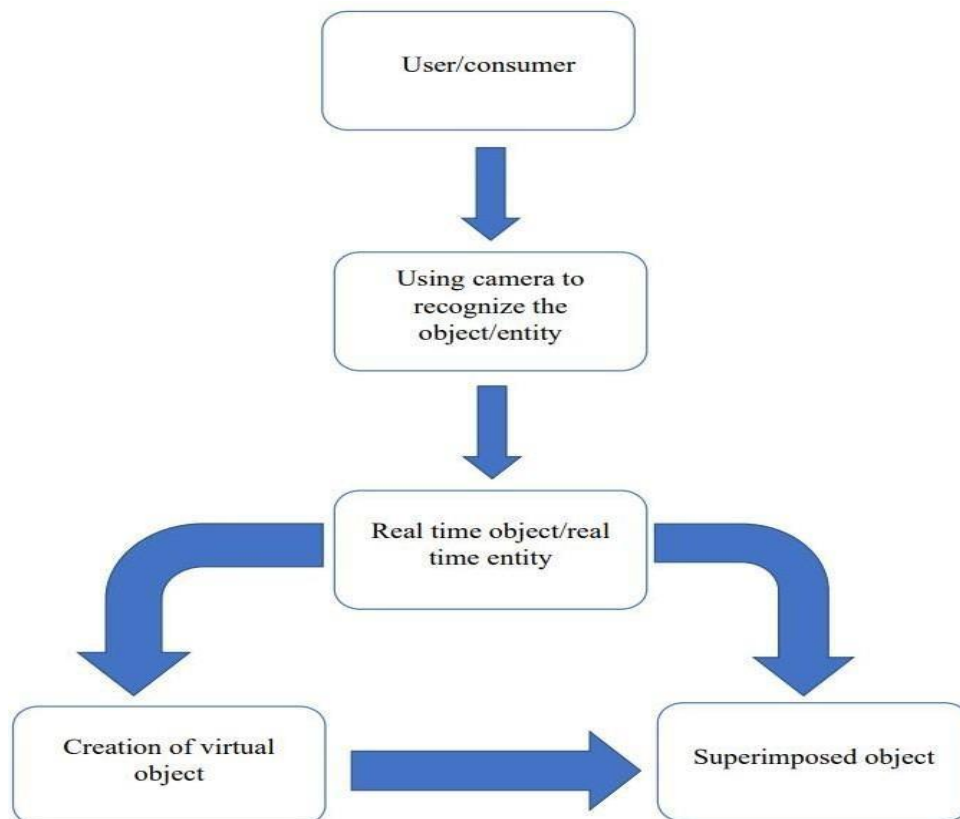


Fig.1. Architecture Diagram



2. Use Case Diagram:

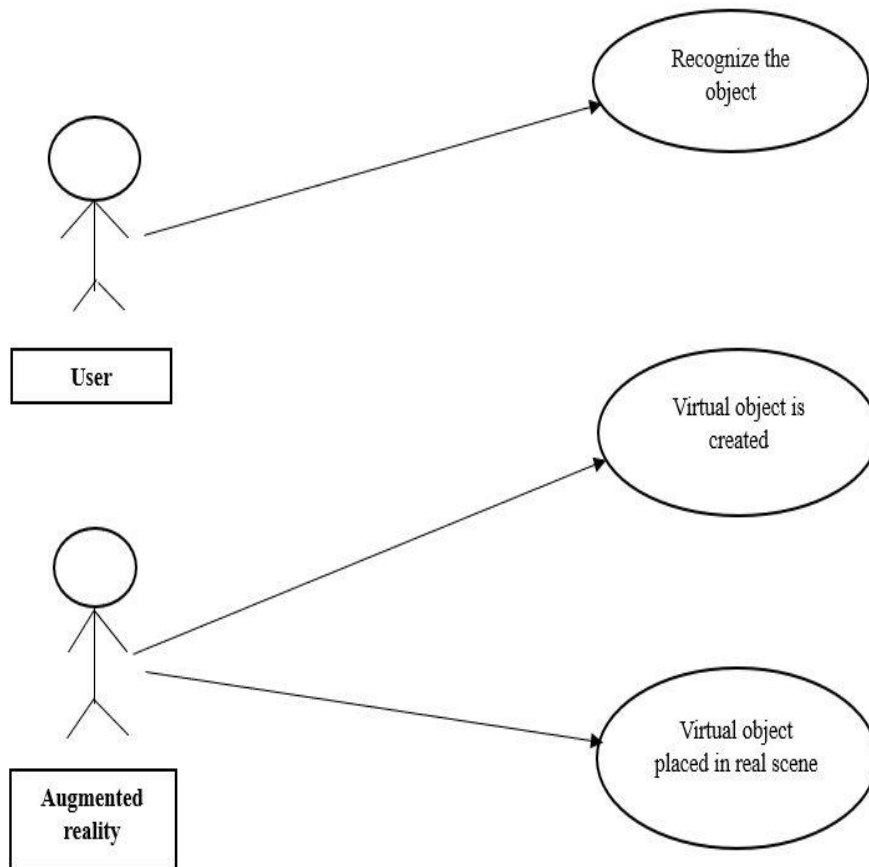


Fig.2. Use Case Diagram

IV. MODULE DESCRIPTION

A. Designing circuit and making Animation in the circuit:

In this module, we are identified the electrical and electronic components. And we are designed the circuit with the identified electrical and electronic components. And making animation for the sphere which is present inside the circuit. For the simulation of the sphere all over the circuit similar to the electrons which flows in the circuit. The simultaneously movement of the sphere is achieved by animation controller, its maintains the transition of the workflow of the sphere.

B. Create a Mobile Application using Android studio:

In this module, we are going to create the four interfaces with the android studio frame work. The each interface which is connected with one another, which means the each interface is redirected with another interface. at the final interface we created camera to recognize the real time object.

C. Integrate the mobile Application with the designed circuit:

In this module, we are going to integrate the designed circuit with the mobile application which is developed by the android studio. After recognition of the image the animated virtual circuit gets flows.



V. PROJECT OUTCOMES

A. Output for module 1:

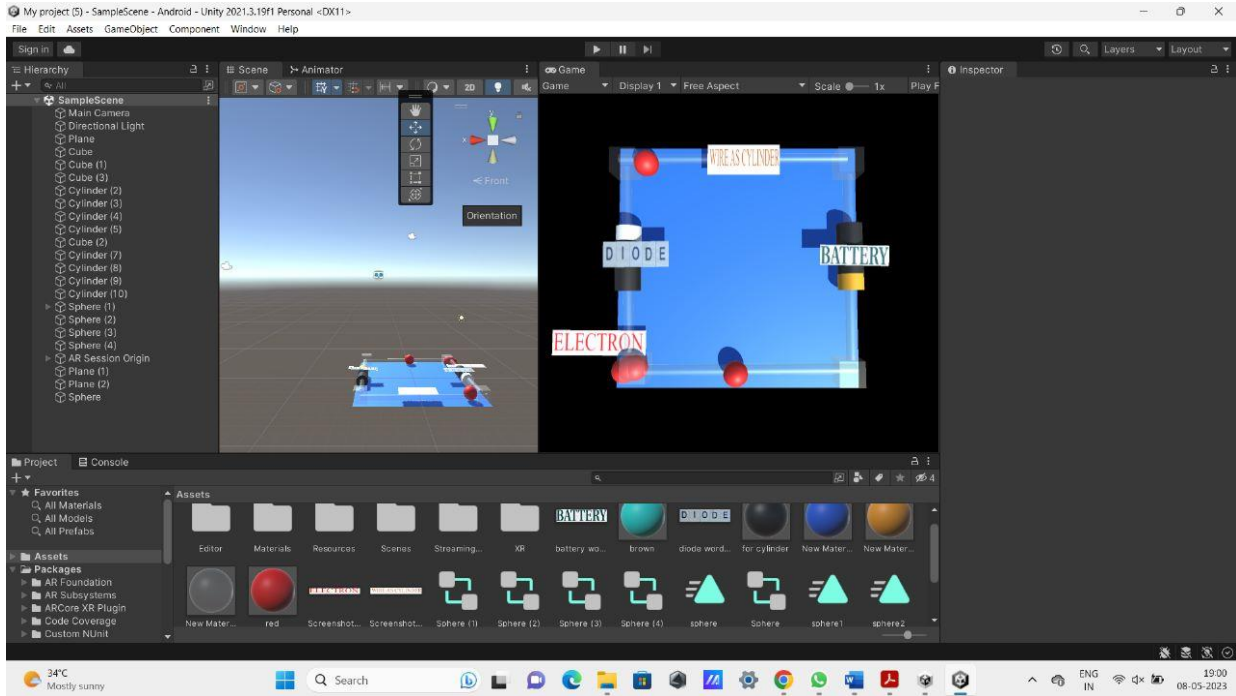


Fig.3. Result for module1

B. Results for Module 2:

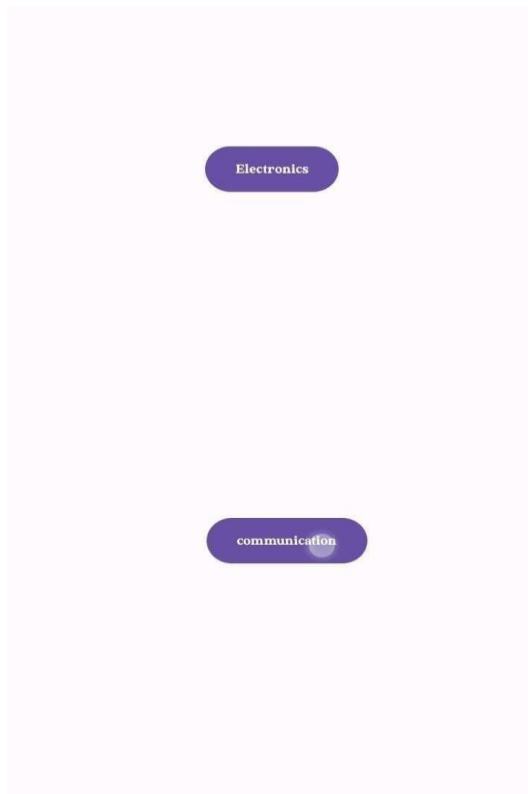


Fig.4. Result of interface 1

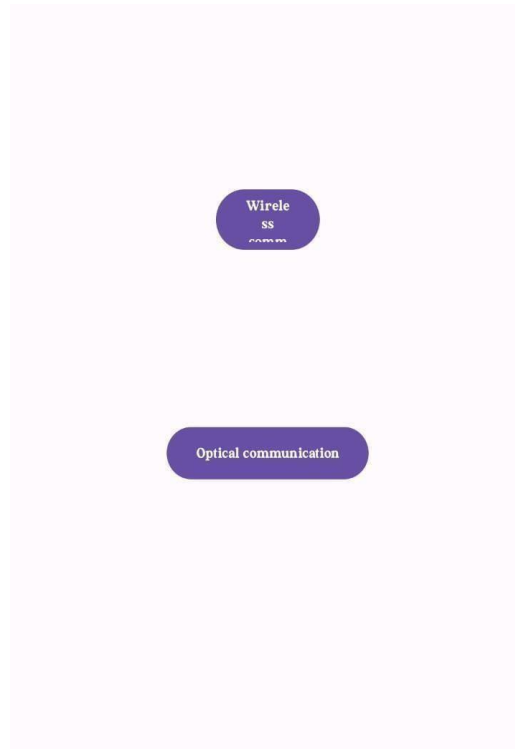


Fig.5. Result for interface 2

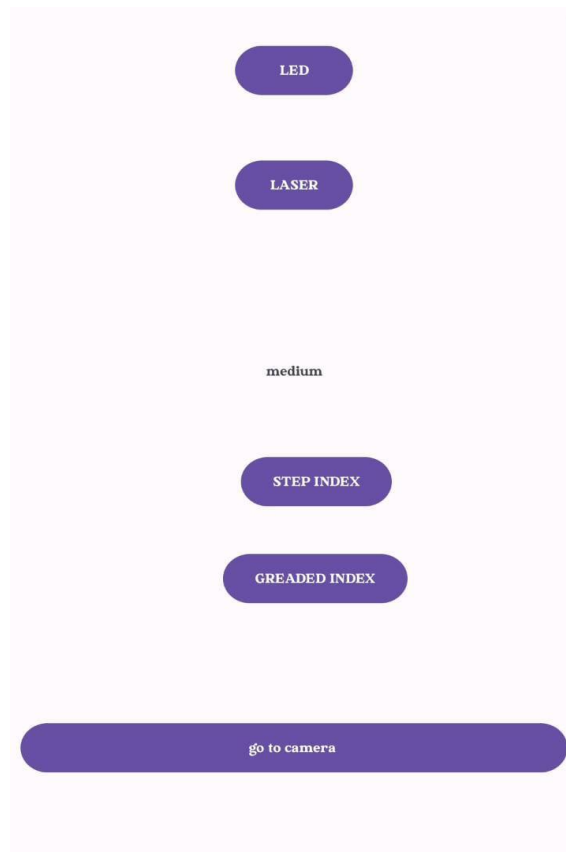


Fig.6. Result for interface 3



C.Results for Module 3:



Fig.7. Result for opening unity APK

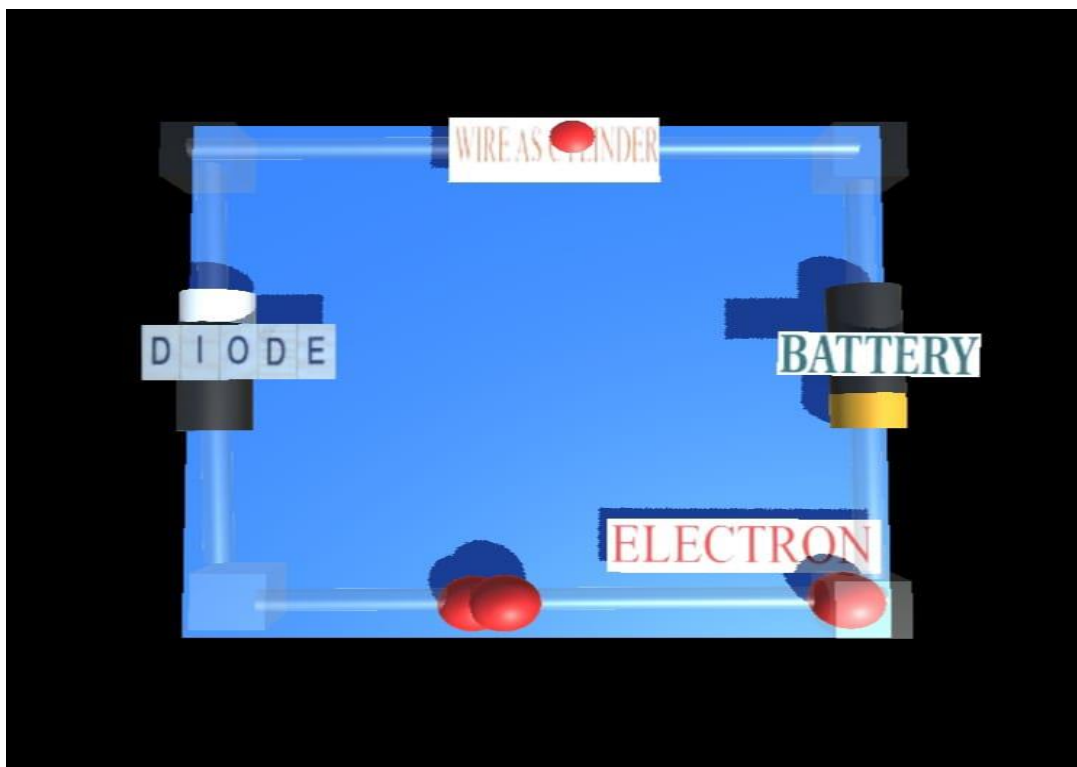


Fig.8. Result for electron flow

VI. RESULT AND DISCUSSION

As we are identified the electrical and electronic components and we designed the virtual circuit and make the animation in the circuit using the animation time line and then animation controller. After animating all the thing next we move on to the module 2 for developing application using Android studio we created totally four interfaces that the each interface are linked with each other. Which means the interface that are redirect to one-to-one. After creation of the interface at finally we integrate the module1 and module2 with the unity packages for the final flows of electrons in the circuit



V. CONCLUSION

A. Conclusion:

In this project we developing the learning tool for electrical and electronic components using augmented reality its only for ECE and EEE students. Augmented reality makes the virtual object into the real scene. So the students can able to understand the concept practically through by virtualizing the objects. In this work, initially we are designing the electrical and electronic component through unity and to show the simulation of electrons in the electrical and electronic components through animation and animation controller. This makes the students to understand the concept theoretically as well as practically. In this project implementing the super imposition augmented reality that makes the virtual objects is placed on top the real object in real scene.

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