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**Augmented Reality based interior designing application**

**A PROJECT REPORT**

***Submitted by***

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***in partial fulfilment for the award of the degree***

***of***

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**in**

COMPUTER SCIENCE AND ENGINEERING

**XXXXX COLLEGE OF ENGINEERING AND TECHNOLOGY**

**“TOWN” – “PINCODE”**

**ANNA UNIVERSITY : CHENNAI 600025**

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The successful completion of this Project work was made possible with the help and guidance received by us from various quarters. We would like to avail this opportunity to express our sincere thanks and gratitude to all of them.

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Last but not least we also extent thanks to all our staff members and lab technicians for their kind co-operation.

**ANNA UNIVERSITY : CHENNAI 600025**

**BONAFIDE CERTIFICATE**

Certified that this project report “**An Augmented Reality Application for Personalized Shopping”** is the bonafide work of **XXXX,XXXX,XXXX** who carried out the project work under my supervision.

SIGNATURE SIGNATURE

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The project report submitted for the viva voice held on ..............................

**INTERNAL EXAMINER EXTERNAL EXAMINER**

**ABSTRACT**

This project aims to address the increasing demand for home automation systems that are intuitive, flexible, and accessible. The rapid development of smart home technology has led to an increased demand for intuitive and immersive control systems. The proposed system combines augmented reality (AR) and internet of things (IoT) technologies to develop a novel approach to home automation. By using virtual buttons that are activated through AR technology, users can interact with their home appliances in a more intuitive and immersive way. The IoT component allows the system to connect with various smart home devices, enabling users to control and monitor their appliances remotely. Moreover, the implementation of extended reality (XR) management provides an additional layer of flexibility and convenience, allowing users to manage their appliances from anywhere, anytime. The proposed system offers numerous benefits, including increased efficiency, improved energy management, and enhanced user experience. It has the potential to revolutionize the way people interact with their home appliances and transform the home automation industry. The system is also highly scalable and can be customized to meet the needs of individual households.

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**LIST OF ABBREVIATION**

|  |  |
| --- | --- |
| AR | Augumented Reality |
| VR | Virtual Reality |
| XR | Extented Reality |
| IOT | Internet of Things |
| AI | Artificial Intelligence |
| API | Application Interface Programming |
| ESP |  |
|  |  |

**CHAPTER 1**

**INTRODUCTION**

In recent years, there has been a significant rise in the adoption of smart home technology, with homeowners looking for ways to improve the comfort, convenience, and security of their homes. To meet this demand, there has been a surge in the development of smart home devices, which can be controlled through mobile apps or voice assistants. However, the use of these control systems can often be cumbersome and unintuitive, requiring users to navigate through complex menus or memorize specific voice commands. To address these challenges, this project proposes a system that combines augmented reality (AR), internet of things (IoT), and extended reality (XR) management to control home appliances. The system utilizes AR technology to create virtual buttons, which allow users to control their home appliances in an intuitive and immersive manner .By leveraging IoT, the system connects to various smart home devices and enables remote control of appliances through the virtual buttons. Additionally, the XR management system provides users with a flexible and convenient way to monitor and control their appliances remotely, regardless of their physical location .The proposed system has the potential to revolutionize the way people interact with their home appliances, making home automation more intuitive, immersive, and accessible than ever before. The project aims to design and develop a functional prototype of the system, which can be customized to meet the needs of individual households.

**1.1 SCOPE OF THE PROJECT**

The proposed system's scope includes the following areas:

The system aims to provide a more intuitive and immersive control system for home appliances, making it easier for users to interact with their smart home devices. This will lead to an improved user experience and greater user satisfaction. By enabling remote control of appliances through the virtual buttons, the proposed system will improve energy efficiency and reduce overall energy consumption in households. The system can be integrated with security devices, such as cameras and alarms, to improve home security and provide peace of mind to homeowners. The system is highly scalable and can be customized to meet the needs of individual households, making it suitable for a wide range of homes and lifestyles. Overall, the Unlocking the magic of virtual buttons and extended reality for appliance control by augmented reality and internet of things project has the potential to transform the way people interact with their smart home devices. The system's scope is vast, with potential applications in homes, offices, and public spaces, making it an exciting and innovative project.

**1.2 OBJECTIVES OF THE PROJECT**

The Unlocking the Magic of Virtual Buttons and Extended Reality for Appliance Control by Augmented Reality and Internet of Things project has the following objectives:

The project aims to design and develop a functional prototype of the system, which combines AR, IoT, and XR technology to control home appliances. The system aims to provide an intuitive and immersive control system for home appliances, making it easier for users to interact with their smart home devices. The proposed system will enable remote control of appliances through the virtual buttons, improving energy efficiency and reducing overall energy consumption in households. The XR management system will provide users with a flexible and convenient way to monitor and control their appliances remotely, regardless of their physical location. Overall, the objectives of the Unlocking the Magic of Virtual Buttons and Extended Reality for Appliance Control by Augmented Reality and Internet of Things project are to create a functional and intuitive system that enhances the user experience, provides energy efficiency, improves home security, and can be customized to meet the needs of individual households.

**CHAPTER 2**

**LITERATURE SURVEY**

**1. TITLE: Augmented Reality for Smart Home Control Using Internet of Things"**

**Authors: Priyanka Khedkar, Sanket Shaha, and Arvind Shaligram**

**YEAR: 2016**

Abstract: This project explores the integration of augmented reality (AR) and the Internet of Things (IoT) for smart home control. By utilizing AR interfaces, users can visualize and interact with virtual representations of their IoT-connected devices, enhancing the user experience and simplifying device management. The project focuses on device integration, data synchronization, 3D modeling, and AR interface development to create a seamless and intuitive control system. The integration of AR and IoT technologies has the potential to revolutionize smart home control by providing a user-friendly and immersive experience.

**2. Title: "**Smart Home Automation Using IoT and Augmented Reality**"**

**Authors:** C. Rajalakshmi, S. Padmapriya

**Year:** 2017

**Abstract:**This project aims to leverage the Internet of Things (IoT) and augmented reality (AR) technologies for smart home automation. By integrating IoT-enabled devices and AR interfaces, the project seeks to create an innovative and intuitive control system for managing various aspects of a smart home. The project focuses on device integration, data synchronization, and the development of AR interfaces to provide users with an immersive and interactive experience. The goal is to simplify and enhance smart home automation by combining the power of IoT and AR, enabling users to control their home devices with ease and efficiency.

**3.Title: "**Augmented Reality and Internet of Things Integration for Smart Home Control"

**Authors**: I-Shiang Yu, Tsung-Han Lee, Chao-Kai Wen, Kuo-Wei Hsu

**Year: 2016**

**Abstract:** This project explores the integration of augmented reality (AR) and the Internet of Things (IoT) for smart home control. By combining AR interfaces and IoT technologies, the project aims to provide users with an intuitive and immersive experience in managing their smart home devices. The focus is on device integration, data synchronization, and the development of AR interfaces to create a seamless and user-friendly control system. The integration of AR and IoT has the potential to revolutionize smart home control, simplifying device management and enhancing the overall user experience.

**4. Title: "**Augmented Reality User Interface for Controlling Smart Home Appliances"

**Authors**: Varun Jain, Hareesh Ravi, Kshitij Salgunan, Ashok Jagadeesan, G.R. Sinha

**Year: 2016**

**Abstract:** This project explores the development of an augmented reality (AR) user interface for controlling smart home appliances. By leveraging AR technology, users can interact with virtual representations of their smart home devices, offering an intuitive and immersive control experience. The project focuses on designing and implementing an AR interface that allows users to visualize and manipulate appliances in real-time. The goal is to enhance the usability and convenience of controlling smart home appliances, ultimately improving the overall user experience in managing their smart homes.

**CHAPTER 3**

**EXISTING SYSTEM**

Some of the existing systems include:

Philips Hue is an IoT-enabled lighting system that can be controlled using a mobile app. The system allows users to set up schedules, control brightness, and change colors using their smart phones. Amazon Echo is an IoT-enabled smart speaker that uses voice recognition technology to control smart home devices. The system can be integrated with various smart home ecosystems, making it a convenient and versatile home automation system. Samsung Smart Things is an IoT-enabled home automation system that allows users to control their smart home devices through a mobile app. The system can be customized to meet the needs of individual households and can be integrated with various smart home ecosystems. Overall, these existing systems provide a range of features and functionalities that enable homeowners to automate their homes and improve their quality of life. However, the proposed Unlocking the Magic of Virtual Buttons and Extended Reality for Appliance Control by Augmented Reality and Internet of Things project aims to create a more intuitive and immersive control system that combines AR, IoT, and XR technology, providing users with a unique and innovative home automation experience.

**3.1 WHAT IS AR ?**

AR stands for Augmented Reality. It is a technology that blends the real-world environment with computer-generated images or content, creating an interactive and immersive experience. AR technology enhances the user's perception of reality by overlaying digital information onto the real world, typically through a smart phone or tablet device, or specialized AR glasses. AR technology is used in various applications, such as gaming, education, marketing, and industrial training, and is rapidly advancing with the growth of AI and computer vision technologies.

**3.2 WHAT IS XR MANAGEMENT?**

XR Management refers to the management of extended reality technologies such as augmented reality, virtual reality, and mixed reality. It involves the creation, development, deployment, and maintenance of XR experiences and applications. XR Management focuses on optimizing the user experience by considering factors such as usability, interactivity, accessibility, and user feedback. It also involves managing the technical aspects of XR, such as hardware and software requirements, as well as the integration of XR with other technologies, such as IoT and AI. The goal of XR management is to create immersive and engaging experiences for users while ensuring that the technology is functional, efficient, and scalable.

**3.3 WHAT IS BLYNK CLOUD?**

Blynk Cloud is a cloud-based platform that provides a backend service for the Blynk mobile app, an IoT platform that allows users to control their devices remotely. Blynk Cloud provides a scalable and secure infrastructure that enables users to connect their devices to the internet and control them remotely using the Blynk mobile app. The Blynk Cloud platform provides a range of features, including device management, data storage, and user authentication, allowing developers to build IoT applications quickly and easily. Blynk Cloud also supports a variety of protocols, including Wi-Fi, Ethernet, Bluetooth, and cellular, making it versatile and flexible for various IoT applications.

**3.4 COMPONENTS REQUIRED IN SOFTWARE PART**

* + - UNITY HUB
    - BLYNK APP

**3.4.1 UNITY HUB**

Unity Hub is a desktop application developed by Unity Technologies that simplifies the installation, management, and organization of Unity Editor and projects. It provides a centralized interface for managing multiple versions of Unity and allows developers to quickly switch between different versions of Unity for different projects. Unity Hub also allows users to create and manage projects, download and install different Unity modules and extensions, and access the Unity Asset Store. The tool also provides a convenient way to access documentation and tutorials, making it easier for developers to learn and use Unity for their projects.

**3.4.2 BLYNK APP**

Blynk App is a mobile application developed by Blynk Inc. that allows users to control IoT devices remotely. It provides a user-friendly interface that enables users to create custom dashboards with various controls, such as buttons, sliders, and graphs, that can be used to interact with connected devices. Blynk App supports a wide range of hardware platforms and communication protocols, making it a versatile IoT platform. The app also supports various integrations, including social media, messaging platforms, and email, allowing users to receive notifications and alerts from their connected devices. Additionally, Blynk App supports the integration of third-party services and APIs, enabling developers to create custom IoT applications quickly and easily.

**3.5 COMPONENTS REQUIRED IN HARDWARE PART**

* + - * ESP 8266/NODE MCU
      * SINGLE CHANNEL RELAY MODULE

**3.5.1 ESP 8266/NODE MCU**

ESP8266 or Node MCU is a low-cost Wi-Fi enabled microcontroller that is commonly used for IoT applications. It is based on the ESP8266 microcontroller and comes with built-in Wi-Fi connectivity, making it ideal for projects that require wireless connectivity. Node MCU is compatible with the Arduino IDE and supports programming languages such as Lua and C++. It has a 32-bit RISC CPU that runs at 80 MHz, 4MB of flash memory, and various I/O interfaces such as GPIO, I2C, SPI, and UART. The Node MCU board also includes a USB-to-serial converter, making it easy to program and debug the microcontroller. Node MCU is widely used in various IoT applications such as home automation, smart lighting, and environmental monitoring, among others. Its low cost, compact size, and built-in Wi-Fi connectivity make it a popular choice for DIY and hobbyist projects.

|  |  |
| --- | --- |
| **PARAMETER** | **SPECIFICATION** |
| Memory | 32 bit |
| Processor | Ten Silica L 106 |
| Processor Clock | 80MHz-160MHz |
| RAM | 36Kb |
| Storage | 16 Mb |
| Operating Voltage | 3.0V- 3.6V |
| Operating Temperature Range | -40C 125C |

**3.5.2 SINGLE CHANNEL RELAY MODULE**

A single channel relay module is an electronic device that is used to control the flow of electricity to a circuit or device. It consists of a relay switch and a control circuit. The relay switch is an electromagnetic switch that is used to open or close a circuit. The control circuit is used to activate or deactivate the relay switch. Single channel relay modules typically have a single relay switch, which can be controlled by a digital signal from a microcontroller or other electronic device. They are commonly used in home automation and industrial control systems to control devices such as lights, fans, and motors. The module is easy to use and install, and its compact size makes it suitable for use in small spaces.

**3.5.3 BATTEN HOLDER**

A batten holder, also known as a lamp holder or socket, is a device used to hold and connect a light bulb or lamp in place. It provides a secure electrical connection between the bulb and the electrical wiring in a light fixture or lamp .The batten holder typically consists of a base that can be attached to a surface or a fixture, and a socket that holds the light bulb. The base is usually made of heat-resistant materials such as porcelain, plastic, or metal. It contains the necessary wiring connections to supply electricity to the bulb. The socket of a batten holder is designed to accommodate different types of light bulbs, such as incandescent, fluorescent, or LED bulbs. It usually has screw terminals or pins that make contact with the bulb's electrical contacts, allowing the flow of electricity .Batten holders are commonly used in various lighting fixtures, such as ceiling fixtures, wall sconces, pendant lights, and table lamps. They are available in different sizes and configurations to suit different bulb types and wattages.

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**3.5.4 JUMPER WIRE**

A jumper wire, also known as a jump wire or jumper cable, is a short length of wire used to create an electrical connection between two points or components in an electronic circuit. It is typically used to bridge a gap, bypass a component, or make temporary connections during prototyping or troubleshooting. Jumper wires are commonly used in bread boarding, where electronic components are connected on a breadboard for testing and experimentation. They are also used in circuit prototyping, repairs, and modifications. Jumper wires come in various forms, including pre-cut and pre-stripped wires with connectors on each end, as well as spools or reels of wire that can be cut to desired lengths. They are available in different gauges (thicknesses) and colors, allowing for easy identification and organization in a circuit. In electronic circuits, jumper wires are used to establish electrical connections between different points on a breadboard or circuit board. They are typically inserted into the holes or contacts of the components or the conductive tracks on the board. Jumper wires can be connected in series or parallel to create the desired circuit configuration. When using jumper wires, it is important to ensure proper insulation and secure connections to avoid short circuits or loose connections that could lead to unreliable circuit operation or potential damage. It's also crucial to consider the wire. gauge and current-carrying capacity to handle the required current in the circuit



**CHAPTER 3**

**PROPOSED WORK**

**3.1 CREATE A PROJECT PAGE IN BLYNK APP**

To create a project page in Blynk App, follow these steps:

Open the Blynk App and log in to your account. Tap on the developer mode icon in the bottom right corner of the screen to create a new project. Give your project a name and select the hardware platform you will be using. Choose the type of connection you will be using to connect your hardware to the Blynk Cloud server, such as Wi-Fi, Ethernet, or Bluetooth. Once you have selected your hardware platform and connection type, tap on the "Create" button to create your project. You will now be taken to the project dashboard, where you can start adding widgets to control and monitor your devices. To add a widget, tap on the "+" icon in the center of the screen and select the type of widget you want to add, such as a button, slider, or graph. Configure the widget settings, such as the pin number, data range, and display options.

**3.2 WRITE THE PROGRAM IN ARDUINO IDE**

Install Arduino IDE on a computer if you haven't already done so. Open the Arduino IDE and go to "File" > "Preferences". In the "Additional Boards Manager URLs" field, add the following URL: http://arduino.esp8266.com/stable/package\_esp8266com\_index.json. Click "OK" to save the changes. Go to "Tools" > "Board" > "Boards Manager" and search for "esp8266". Install the latest version of the ESP8266 board library. Connect the ESP8266 to the computer using a USB-to-serial converter.Go to "Tools" > "Board" and select the appropriate board type for the ESP8266, such as "Node MCU 1.0 (ESP-12E Module)" or "Generic ESP8266 Module". Go to "Tools" > "Port" and select the serial port that your ESP8266 is connected to. Open a new sketch in the Arduino IDE and write your code for the ESP8266. it can use the example code I provided earlier as a starting point. Verify the code by clicking the "Verify" button or going to "Sketch" > "Verify/Compile". Upload the code to the ESP8266 by clicking the "Upload" button or going to "Sketch" > "Upload". Wait for the upload process to finish. Open the serial monitor by clicking the "Serial Monitor" button or going to "Tools" > "Serial Monitor". Set the baud rate to 9600 and it should see the serial output from the ESP8266. Test the ESP8266 to make sure it is working as expected. You can modify the code and repeat the verification and upload process as necessary.

**3.3 CREATE A PROJECT PAGE IN UNITY HUB**

Here are the steps to create a new project in Unity Hub:

Open Unity Hub on the computer. Click the "New" button in the top right corner of the screen. In the "Create a new project" dialog box, select the version of Unity to use for the project. Choose a project name as “ar+iot” and location to save the project files. Select a template for the project as 3D. Choose the platforms to target for the project as mobile devices. Click the "Create" button to create the project. Unity Hub will now create a new project for you based on the options that selected. Once the project is created, it is opened in Unity Editor by clicking the "Open" button next to the project name in Unity Hub.

**3.3.1 ADD VUFORIA ENGINE TO UNITY**

Here are the steps to add the Vuforia Engine to Unity:

Download the Vuforia Engine Unity Package from the Vuforia Developer Portal. Open Unity Hub and select the project to add Vuforia to. In the Unity Editor, go to "Assets" > "Import Package" > "Custom Package". Navigate to the downloaded Vuforia Engine Unity Package file and select it. In the "Import Unity Package" dialog box, select all the files and click the "Import" button. Wait for Unity to import the Vuforia Engine files into the project. Once the import is complete, go to "Window" > "Package Manager" in the Unity Editor. In the "Package Manager" window, select the "Vuforia Augmented Reality" package and click the "Install" button. Wait for Unity to install the Vuforia Augmented Reality package. Once the installation is complete, go to "Window" > "Vuforia Configuration" to configure your Vuforia settings. right click on the window >select vuforia engine >select AR camera into the project. Now added the Vuforia Engine to the Unity project and can start creating AR experiences.

**3.3.2 ADD TARGET IMAGE TO VUFORIA**

Open the Vuforia Configuration window in Unity by going to "Window" > "Vuforia Configuration". Click the "Add License Key" button and enter your Vuforia license key. In the "Database" section, click the "Create Database" button to create a new database for your targets. Give your database a name and click "Create". Click the "Add Target" button to add a new target image to the database. Choose the type of target to create. The most common type is a "Single Image" target. Choose an image file to use as the target. The image should be a clear, high-contrast image with distinctive features that can be easily recognized by the Vuforia engine. Set the width of the target image in real-world units. This will be used to scale the virtual content to match the size of the target in the real world. Click the "Advanced" button to set additional options for the target, such as adding metadata or adjusting the detection settings. Click the "Add" button to add your target image to the database.

**3.3.4 ADD SCRIPT TO THIS AR PROJECT**

To add a script to your AR project in Unity, follow these steps:

In the Unity Editor, open the "Project" window and navigate to the "Assets" folder. Right-click in the "Assets" folder and select "Create" > "C# Script". Give your script a name and double-click it to open it in the Visual Studio editor. Write the script code in the editor, using the Vuforia and Unity APIs as needed to interact with the AR targets and virtual objects. Once it have written the script, save the file and return to the Unity Editor. Drag the script file from the "Assets" folder onto the object in the scene to attach it to. This could be a camera, an AR target, or any other object to control with the script. Alternatively, attach the script to an object by selecting the object in the "Hierarchy" window and clicking the "Add Component" button in the "Inspector" window. Then select your script from the list of available components. Once attached the script to an object, use the "Play" button in the Unity Editor to test the AR project and see how the script affects the behavior of the virtual objects.

**3.3.5 ADD URL TO THE BUTTONS**

In the Unity Editor, open the scene that contains the button you want to add a URL to. Select the button in the scene hierarchy, and in the Inspector window, click the "Add Component" button to add a new script component to the button. Name the script something like "Open URL" and double-click it to open it in the code editor. In the Inspector window, you can now set the url variable to the URL you want to open when the button is clicked. You can do this by selecting the button and entering the URL in the "Open URL (Script)" component that you added to the button.

**3.3.6 BUILD THE AR APPLICATION**

Open the Unity project that contains the AR application and XR management settings. Go to File > Build Settings. In the Build Settings window, select the target platform to build the application. Configure the player settings for the target platform. This includes settings such as the company name, product name, and package name. You'll also need to set the resolution and aspect ratio for the application. If the application is building for Android or iOS, need to configure the platform-specific settings. This includes settings such as the icon, splash screen, and minimum API level. Once configured the build settings, click the "Build" button to generate the application package. Be prompted to select a location to save the package. Wait for Unity to finish building the application. This can take some time, depending on the complexity of your application and the target platform. Once the build process is complete, you'll have an application package that you can install on your device or upload to an app store for distribution.By following these steps, you should be able to build the AR application with XR management in Unity for your target platform.

**CHAPTER 4**

**PROGRAMS**

**4.1 PROGRAM FOR HARDWARE PART**

/\*New Blynk app with Home Automation

Home Page

\*/

//Include the library files

#define BLYNK\_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

//Define the relay pins

#define relay D0

#define BLYNK\_TEMPLATE\_ID "TMPL3Ku3m\_Sfc"//Enter your blynk template id

#define BLYNK\_TEMPLATE\_NAME "AR IOT"//Enter your blynk template name

#define BLYNK\_AUTH\_TOKEN "wytg7NPZV7g6fy\_ZFuChVK0r5Q2f9KAL" //Enter your blynk auth token

char auth[] = BLYNK\_AUTH\_TOKEN;

char ssid[] = "Imran";//Enter your WIFI name

Char pass[] = "imran12345";//Enter your WIFI password

//Get the button value

BLYNK\_WRITE(V0) {

bool value = param.asInt();

// Check these values and turn the relay ON and OFF

if (value == 1) {

digitalWrite(D0, LOW);

} else {

digitalWrite(D0, HIGH);

}

}

void setup() {

//Set the relay pin as output pin

pinMode(D0, OUTPUT);

// Turn OFF the relay

digitalWrite(D0, HIGH);

//Initialize the Blynk library

Blynk.begin(auth, ssid, pass, "blynk.cloud", 80);

}

void loop() {

//Run the Blynk library

Blynk.run();

}

**4.2 PROGRAM FOR SOFTWARE PART**

using System.Collections;

using System.Collections.Generic;

using UnityEngine;

using UnityEngine.Networking;

public class ClickUrl : MonoBehaviour

{ public string url;

public void open()

{

StartCoroutine(GetRequest(url));

}

IEnumerator GetRequest(string url)

{

using (UnityWebRequest webRequest = UnityWebRequest.Get(url))

{

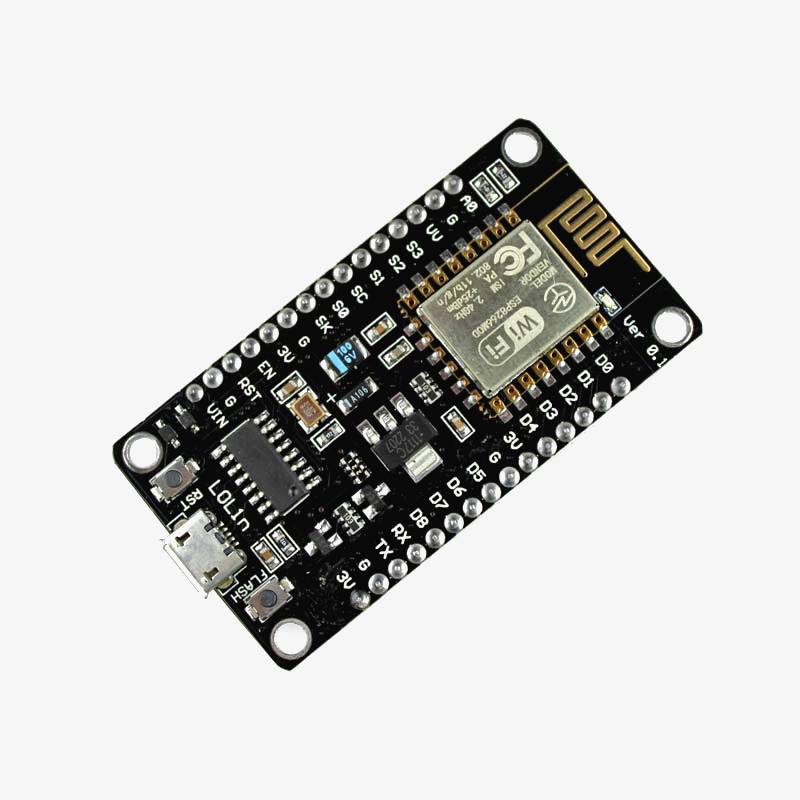
// Request and wait for the desired page.

yield return webRequest.SendWebRequest(); }}}

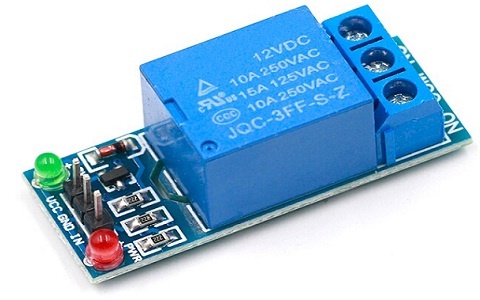
**CHAPTER 6**

**DIAGRAM**

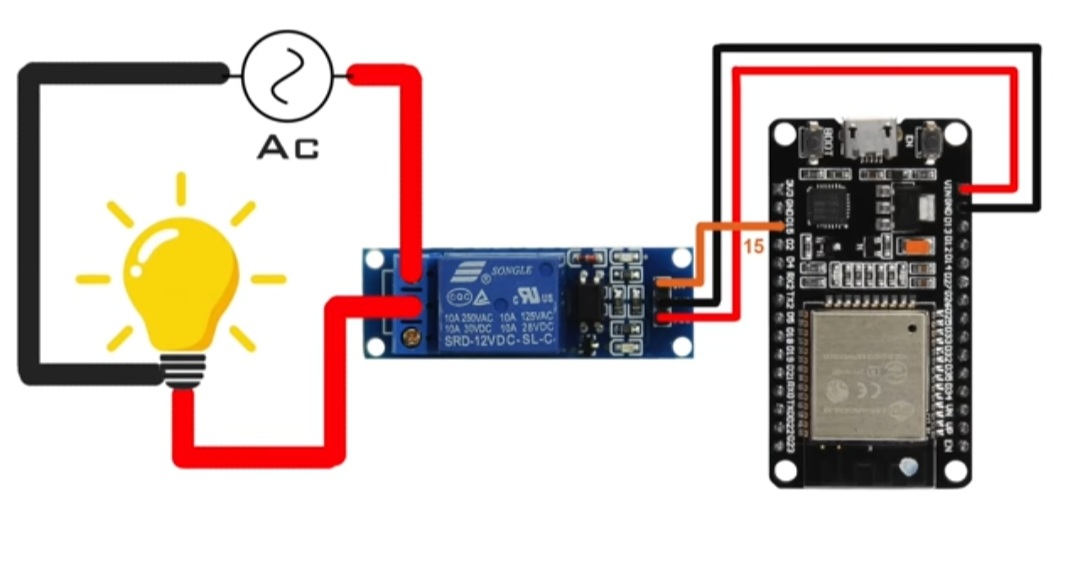
**6.1 PIN DIAGRAM OF ESP 8266**



**6.2 DIAGRAM OF RELAY MODULE**



**6.3 CIRCUIT DIAGRAM FOR THIS PROJECT**



**CHAPTER 7**

**RESULT AND DISCUSSION**

Improved User Experience: The integration of virtual buttons and extended reality for appliance control has the potential to enhance the user experience by providing more intuitive and immersive interaction methods. Users can have a more natural and engaging control interface, resulting in increased satisfaction and ease of use.

Enhanced Accessibility: By leveraging augmented reality and IoT, appliance control can be made more accessible to a wider range of users. Virtual buttons and extended reality interfaces can be designed to accommodate different physical abilities, making it easier for individuals with disabilities or limitations to operate appliances independently.

Remote Control Capabilities: If the project includes remote control functionality, one of the key results would be the ability for users to control appliances from a distance. This can enable convenience and flexibility, allowing users to manage their appliances even when they are not physically present.

Real-time Feedback and Visualization: Another potential result could be the provision of real-time feedback and visualization of appliance status and control actions through augmented reality. Users can receive visual cues and information overlaid on physical objects, helping them monitor appliances effectively and make informed decisions.

Energy Efficiency and Automation: The integration of extended reality and IoT can enable energy-efficient automation of appliances. Users may have the ability to set up schedules, trigger actions based on specific conditions, and optimize energy consumption. This result can lead to improved energy efficiency and reduced costs.

It's important to note that these results are hypothetical and based on the potential benefits and applications of virtual buttons, extended reality, augmented reality, and IoT in appliance control. To obtain actual results and detailed discussion about a specific project, it would be necessary to refer to the project's documentation, research papers, or any published findings related to the project.

**7.1 HARDWARE FIGURE WITHOUT WORKING**

**7.2 HARDWARE FIGURE WITH WORKING**

**CHAPTER 8**

**CONCLUSION**

In conclusion, virtual buttons and extended reality for appliance control by augmented reality and internet of things project is a promising technological innovation that has the potential to revolutionize the way we interact with our homes. The integration of augmented reality and IoT technologies allows for a seamless and intuitive control of various home appliances through virtual buttons that are projected onto real-world surfaces. This project offers numerous benefits, including enhanced user experience, improved accessibility, increased energy efficiency, and better home automation management. Additionally, the XR management aspect of the project ensures that users can easily customize and personalize their virtual buttons and appliance controls to suit their individual preferences. While there are some challenges associated with the project, such as ensuring the security and reliability of the IoT devices and systems, overall, the virtual buttons and extended reality for appliance control by augmented reality and internet of things project has the potential to transform the way we interact with our homes and make our daily lives more convenient and efficient.

**8.1 FUTURE SCOPE**

The future scope of virtual buttons and extended reality for appliance control by augmented reality and internet of things project is very promising. With the rapid advancement of technology and the increasing demand for smart home solutions, this project has the potential to evolve and offer even more benefits in the coming years.

Some potential areas of development and improvement include:

In addition to using virtual buttons to control home appliances, the project could also integrate with voice assistants like Alexa or Google Assistant, allowing users to control their appliances using voice commands. Using augmented reality, the project could incorporate gesture recognition, allowing users to control their appliances through hand gestures. The project could be designed to optimize energy usage in homes by tracking usage patterns and adjusting settings accordingly, resulting in lower energy bills and reduced carbon footprint. The project could integrate smart security features such as motion sensors, facial recognition, and alarms to enhance the security of homes and alert users of any suspicious activity. The project could integrate with other IoT devices, such as smart thermostats, lighting systems, and security cameras, to offer a comprehensive smart home solution .Overall, the virtual buttons and extended reality for appliance control by augmented reality and internet of things project has a lot of potential for future development and innovation, and it will be exciting to see how this technology evolves in the coming years.

**REFERENCE**

If this is a recent project, I recommend conducting a literature search on academic databases, such as IEEE Xplore, ACM Digital Library, or Google Scholar, using relevant keywords like "virtual buttons," "extended reality," "appliance control," "augmented reality," and "Internet of Things." This should help you find research papers, conference proceedings, or articles related to similar projects or topics.

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