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# Virtual Switches for Controlling Electric Appliances Using IOT and Augmented Reality

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**ABSTRACT:** This paper determines the easy and convenient access of home appliances by using Augmented reality with Internet of Things over internet. The Blynk app and Unityhub are responsible for the connection of IoT with AR. Nowadays, home Automation using IoT have become an essential component for accessing all kind of devices. This paper provides way to minimize the direct interaction with the manual switches. Moreover, most of the existing household devices are not IoT enabled and they need special mechanisms for controlling those devices. The main principle goal of this paper is to analyse the control of home equipment that use Augmented reality with Internet of Things by using a Wi-fi based microcontroller named Esp32.

**KEYWORDS:** Home automation, Augmented Reality, Blynk app, Esp32, Wi-Fi-based microcontroller, IoT, Unity hub;

## I. INTRODUCTION

Currently, human lifestyles have become easier in all means of interaction and management, which is mainly due to the rise of technologies. The usage of smartphones has made a drastic change in the field of communication, but the interactive environment is not provided yet. Augmented reality is where computer-generated motion images are meant to be present in the real world. IoT is an interactive environment where all gadgets are interconnected with each other and transfer data without the help of humans [1]. In this modern world augmented reality plays a vital role in terms of interaction [2]. The automation can be done by a Wi-Fi processor for the IoT part. The automation for Augmented reality is done by extending it with IoT [3]. Several technologies ensure the interaction of humans and the world. The Unity 3D facilitates the mobile app in 3D objects that are augmented in the real world [4]. The Blynk API is a Cloud-Platform that is used by android apps for controlling microcontrollers over the internet. It is a platform for developing a graphic interface for the project. This can control hardware components remotely and ensures safe communication. The Esp32 is the one-step device which replaces the use of Wi-Fi and Bluetooth. Herein this model an app was developed in Unity which controls home appliances remotely with augmented reality and IoT. Vuforia is a well-known taxpayer software development kit that allows the creating AR apps. It tracks 3D images by the use of computer-assisted visual recognition technology. Vuforia is the most commonly used platform for augmented reality in mobile phones, tablets. The main purpose of this engine is to recognize the target 3D image [5]. Home automation has become an important part of human activities since every inch of human comes under technology. The world gets updated every day with new technologies, so we have to get adapted to it. Automation is simply making things work on their own. Here, we achieve automation by augmented reality, which is the future where every work will be done by AR. These are pictorial representations that seem to be existing in real world. The important goal is to achieve access to household things via AR.

## II. LITERATURE SURVEY

In the paper, "IoT based smart home automation using Sensor node". The authors H. Singh, V. Pallagani, V. Khandelwal and U. Venkanna proposed the methodology as bluetooth is connected to Arduino and all the electric appliances can be controlled by Arduino where the bandwidth of Bluetooth should be minimum [6]. Outcome: The Bluetooth module used must be in the range at which the home appliances can be controlled.

In the paper, "A low-cost Automation System". The authors N. Vikram, K. S. Harish, M. S. Nihal, R. Umesh, A. Shetty, and A. Kumar Proposed the methodology as the system can be controlled directly from the Wi-Fi module which eliminates the need of using an Arduino board. The user can directly provide commands to control the appliances [7]. Outcome: Since the equipment used is low cost, there can be numerous occasions.

In the paper, "IoT-based smart security and home automation system". The authors Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose, and Lakshmi Boppana Proposed the methodology as the IoT part focuses on a wireless home security system which alerts the owner by using the Internet through a Microcontroller [8]. Outcome: This prototype can function only for a smart security system and as a smart home automation system.

In the paper, "Bluetooth Based Automation System". The authors Jolan Baccay Sy, Shaik Irfan Proposed the methodology as home appliances can be controlled to avoid the danger of electric shock and convenience for users. The Bluetooth client was tested on different android phones from different manufacturers, and its works based on its desired functions. [9] Outcome: This system is not user friendly.

In the paper, "Artificially Intelligent Home Automation System Based on Arduino". The authors Rituparna Halder, Susmit Sengupta, Sudipta Ghosh, Debasish Kundu proposed the methodology which gives basic instruction to control various home appliances and provide security using Arduino Uno and MATLAB GUI. [10] Outcome: This paper uses low-cost off-the-shelf components and is based on Visual Basic and Arduino platforms where both are FOSS (Free Open-Source Software). So, the overall implementation cost is very cheap and is affordable by a common person.

In the paper, "Voice Controlled home automation system". The authors P.J. Rani, Jason Baktha Kumar proposed the methodology as, with the help of voice commands the device connected to Arduino can be controlled by eliminating the need to control using the application interface. [11] Outcome: The developer used user-defined NLP algorithm there can be times when the assistant is not able to recognize the instructors commands properly and respond wrong.

### III. PROBLEM STATEMENT

- (1) We often forget to turn off our home appliances like fans and lights in our home and in work places due to a hectic schedule, resulting in high energy bills. For this problem we should develop a device which is user friendly.
- (2) Physically challenged people and elderly people have trouble turning ON and OFF of home appliances and they also get hurt when moving.
- (3) When turning on and off electric appliances, children may receive an electric shock.

### IV. PROPOSED SYSTEM

To develop a virtual switch for controlling electric home appliance by the use of Blynk API and Unity3D is Proposed. This paper especially ambitions to offer proof For the concept of Augmented reality with IoT.

#### 4.1 IOT IMPLEMENTATION:

The IoT element is controlling the house equipment using esp32 that is related to relay and Blynk API Through the internet.

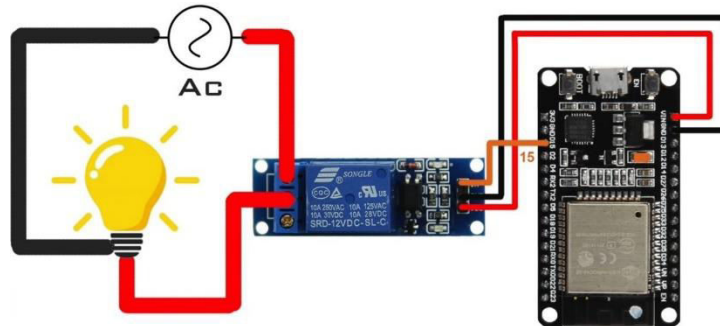


Figure 1: Connection diagram of Home Appliance with ESP32 and Relay

In the diagram above, an esp32 is connected to a relay input using one of its GPIO pins to control AC equipment. The main components required to propose the system includes Wi-Fi controller, Esp32, relay module, blynk app. To switch the circuit on and off, the relay module acts as an electro-mechanical switch. The primary use of the relay module is to address higher voltage/current than the microcontroller has to take care of the model. In the Blynk app new project is selected and the Esp32 board is connected to the bulb holder which sends a token ID to the registered email. The token is responsible for security purposes. In the Blynk android App, a new mission is created and a button widget is positioned in it. The Blynk app normally sends the API key token to the mail that is used to manipulate the appliance. IDE and the code is uploaded to the esp32 board and the home appliances are controlled. To manipulate The virtual pin of the Blynk device [12]. The\_token field is replaced by using the Blynk API key token And the pin field is changed to V1 (virtual pin). And the value might be became to 0 or 1 on and off. The Block Diagram of the IoT element is proven in fig. 2 which represents how the procedure of Conversation takes area for controlling home appliances.

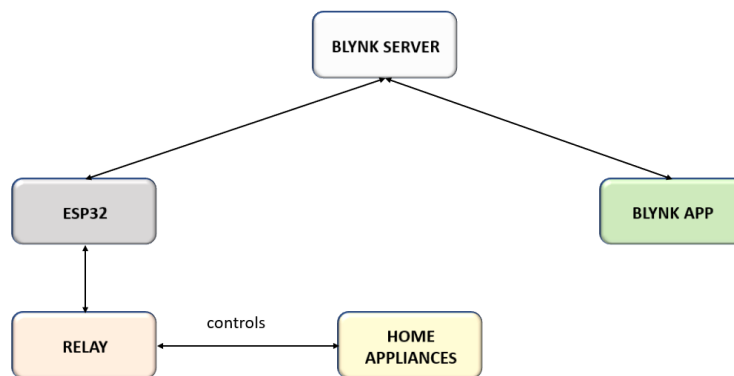


Figure 2: IoT Block Diagram for accessing Home appliances

#### 4.2 AUGMENTED REALITY IMPLEMENTATION:

The Augmented Reality part of positioning 3D objects is implemented via the Unity3D and Vuforia SDK. The augmented part can be done in unity go to add and add the latest version. Then click on android built support and then choose new project. Click on 3D create a name for the project. Add vuforia engine to the project where the target image is need to be specified. Go to web browser download Vuforia and create an account and the open the file and import all the necessary packages. Vuforia Engine system is for focusing the image target. First, the image target chosen is to be transformed to the vuforia developer location and the width of 1 is set and it is downloaded as a 3D database. This is then imported to the Unity hub for placing the image target in the 3D workspace. Vuforia engine is also used to augment the virtual buttons on the image target [13-14]. in which the image is taken into it and it updates the logic state



and renders the graphics on it and it is shown on the device. This method is involved inside the augmented reality part is proven in fig. 3; first an image target is Chosen and it is uploaded to the vuforia developer location and the database is created for that image and the License of that photograph is also created in vuforia. For the AR to work we need to set a target image to the Unity app to recognize the bulb. The target image is uploaded to the database and the database is downloaded and imported to the Unity app. Noew on the imported target image add the buttons to control the ON and OFF functions.

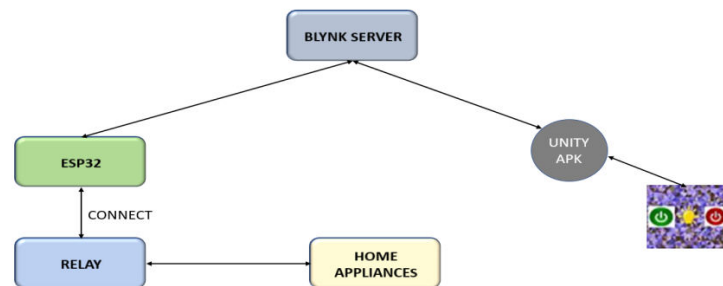


Figure 3: Proposed Block Diagram for Home appliance control

## V.RESULTS

The IoT part controls the home appliances by the Blynk server. In the Blynk app, the virtual pin is used to control the appliance through the Blynk authentication token of the project. The app is constructed by the Unity hub. The virtual buttons are shown while the app camera is positioned in front of the image target. The virtual buttons view is shown in fig. 4. The interruption between the image switches makes the Blynk API update the status of the home appliance ON or OFF. The app is likewise constructed for other home equipment. The image target shows the switch ON and OFF. The apk file evolved with the help of unity hub is saved as a Multi-Target apk report. This apk file is then installed on smart phones and when it is opened across the image target it shows virtual switches across the image target. These are used for ON (fig. 4) and OFF (fig.5) which is shown for target 1.

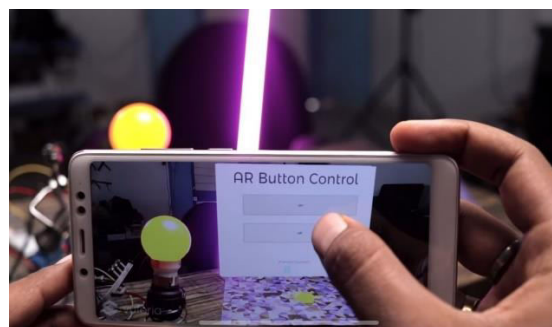


Figure 4: Target 1 Switch ON

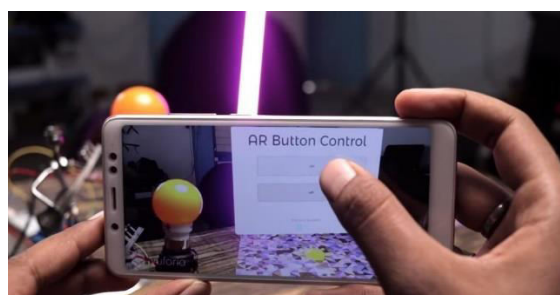


Figure 5: Target 1 Switch OFF

## VI. CONCLUSION

In this developed work, the system is designed on IoT based virtual buttons for home automation system using augmented reality technology. The conclusion part, clearly states that the system is useful to provide easy human access and integrity. By implementing this project, the unwanted wastage of electric energy consumption can be minimized, and also manual work is reduced, this system is mainly designed for the purpose to help aged and physically challenged people. Through these programs we can manage making cost effective smart homes. Here we also plan to eliminate most of the human interaction by providing an intelligent system. The system provides method to control appliances from anywhere and also ensures to save electric energy.

## VII. FUTURE SCOPE

The future scope of home automation structures consists of making smart homes greater efficient. Houses can be linked to sensors that consist of sensors, light sensors and Temperature sensors and offer computerized device-based switching. Extra power can be saved by means of keeping a sensor. The device can be included closely with home security solutions to allow greater control and protection for house owners. The next step would be to expand the program to a larger scale, consisting of offices and factories. Home automation is a global trend in interactive products. The standardization of smart houses allows the control of electric lights, the environment, electricity and safety, as well as flexibility connecting to other networks.

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