Augmented Reality Switch for Controlling Home Appliances using IOT

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ABSTRACT

Home automation is a topic which is gaining popularity in recent times. The reason for this growing need for network automation enabled by the network is reaching its peak in recent days with its simplicity and comparable accessibility. Cloud-based platforms connects to the object's surroundings for easy access on anything and everything at any time and place. Therefore, the cloud serves as the ultimate access point for IoT. Here we take the system that can control devices through a wireless based network or cloud-based approach. We are developing an Home Automation system which works on contactless controlling of appliances. Augmented Reality is a technology that executes complex tasks in an easy manner. This project will have 70% of practical and 30% of GUI interface.

Keywords : GUI, Home Automation, IoT

I. INTRODUCTION

With the daily advancement of technology our expectation of higher living standards rises sharply. From high standards of living, we mean the use of smart phones, smart watches, smart glasses, smart TVs, highly advanced laptops etc. which makes human life easier. A smart home seems "smart" because its computer systems can monitor many aspects of daily life In this age of technological advancement, automation is a matter of the hour.

A. Overview of IOT

Our project aims to make difference in people's lives. Controlling household appliances with our smart phones, smart glasses and smart watches without the use of regular switches is a home automation switch. The current emergence of a traditional medicine-oriented medicine model can be enhanced by the Internet of Things (IoT) paradigm which involves sensors (environment, clothing, and implants) spread throughout the home environment for the purpose of monitoring user health and enabling remote assistance. Automation increases our efficiency and comfort. These days most of us find ourselves clinging to our smart phones and smart devices. So, with the help of this smart device and after analyzing the market for smart devices we can do our daily activities by making our smart phones more personal.

B. Introduction to AR

The installation of an AR interface in automation is a great success as shown by the outstanding way of detecting and interacting. The client should provide a large website that contains information about objects that can be directed to the environment. So, in this report we propose a model where Augmented reality proves to be an easy-to-use home automation interface. Image processing in our model serves as the backbone of the entire system. control of machinery and equipment in a real-time environment. Our proposed model is based on Unity 3D and AR which uses the concept of image tracking and processing in the background server to control electrical and mechanical objects.

II. LITERATURE SURVEY

This is a manifestation of Augment Reality (AR) via Internet of Things (IoT). AC electrical appliances can be controlled online anywhere in the world with buttons from Augmented Reality. For this demonstration, we used a transmission module to control any AC machine. As soon as the camera detects a target image, the two 'OP' and 'FEAR' visual buttons appear in the reality of the unpopularity of taxpayers we see. The device or LED in this case can be controlled by pressing those buttons in real time in the air. Unity Editor is a popular and useful platform for creating advanced apps for both mobile devices and digital glasses. To download and set up Unity, visit https://unity.com. The Vuforia engine is easy to add to any project and you can start by providing valuable samples from the Coalition Store.

A.Vuforia Engine

Vuforia is a popular taxpayer software development kit that we see (SDK) for mobile devices that allows the creation of unpopular virtual apps. It uses computer-assisted visual recognition technology to track and track 3D images and objects in real time. This image registration capability enables engineers to place and direct visual objects, such as 3D models and other media, in relation to real-world objects when viewed with a portable device camera.

The object then tracks the location and position of the image in real time so that the viewer's view of the object is in line with the target view. The Vuforia SDK supports targeted 2D and 3D models that include 'Unmarked' Image, 3D Target Model, and the adjustable Fiducial Marker type, known as VuMark. Additional features of the SDK include 6-degree local space device creation, Local Occlusion using 'Visible Buttons', timely image target selection, and the ability to create and resize target sets systematically during operation. Vuforia Provides Application Programming Interfaces (API) in C ++, Java, Objective-C ++, and .NET languages using the Unity game engine extension. In this way, the SDK supports both native iOS, Android, and UWP upgrades while enabling the development of AR Unity applications in both forums.

The youngest generation these days, with a strong focus on character teaching, was born with ICT (Information and Communication Technology), so we recommend using the benefits of ICT such as AR. AR (Augmented Reality is a system that fills the real world with objects that appear to live together in the same space as the real world.

B. Blynk

Monitoring and control of household appliances the system is designed and operated using Blynk. Device performance is recorded and maintained by network coordinators. For this use a Wi-Fi network, which uses a modern ADSL wireless router. SSID network and Wi-Fi security parameter pre-configured. The security goal message starts the process with a visual home algorithm and when it is said to be safe it is rewritten and transferred to a real home network device. With

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the Blynk network, the Blynk controller has sent messages to the end. Security and security of all messages received by the visual home algorithm.

Reducing system costs and interfering with the installation of the Blynk communication system sequence is helpful. During this time many new breakthroughs have emerged, such as tools or systems that make daily human activity easier. To help, many organizations try to create human benefits such as systems, electrical devices or robots.

C. Unity 3D

Unity is a cross-platform game engine developed by Unity Technologies, which was first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as the Mac OS X game engine only. The engine has since been gradually expanded to support a wide variety of desktop, mobile, console and real-time platforms. It is most popular in the development of iOS and Android mobile game and has been used for games such as Pokémon Go, Monument Valley, Call of Duty: Mobile, Beat Saber and Cuphead. It is considered an easy-to-use tool for beginner developers and is popular in indie game development. The engine can be used to create three-dimensional (3D) and two-dimensional (2D) games, as well as interactive simulations and other animations. The engine has been adopted by non-video video industries, such as film, automotive, construction, engineering, construction, and the United States Armed Forces.

The Unity game engine was launched in 2005, aimed at "democratically" game development by making it accessible to more developers. The following year, Unity was ranked second in the Best Use of Mac OS X Graphics category at Apple Inc. Design Awards. Unity was first released for Mac OS X, and later added support for Microsoft Windows and Web browsers. Unity3D as a new type of professional game engine, a powerful magician function, is not limited to game

development. Although currently Unity3D use is more focused on 2D and 3D game production, however and the software is constantly evolving, the work is gradually strengthening, it's the use of other features will gradually deepen. Unity3D has been marked as new period in game development, broad prospects, its impact will be huge.
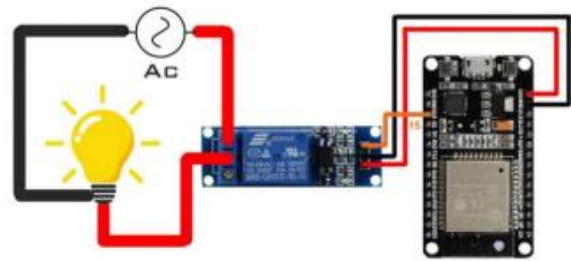
III. PROPOSED IOT MODEL ARCHITECTURE

Fig 1- Circuit Diagram IOT Model

A. Major Hardware Modules

- Node Microcontroller Unit (ESP8266)
- Channel Relay
- Jumper Wire (Male, Female)
- Connection Wires
- Any Electric Appliance
- Breadboard

B. Software Modules:

- Blynk App
- Unity 3d
- Arduino IDE
- Vuforia Engine

IV. PROPOSED TECHNIQUES

A. Image Target Detection

Targets Images show images that can be accessed by Vuforia Engine and tracked. The engine detects and traces the image by comparing the natural features

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extracted from the camera image against a well-known guided site website. Once Image Target is detected, Vuforia Engine will track the image and add your content easily using market image tracking technology

B. Implement Virtual Buttons

Visual Buttons request the interaction of your Vuforia Targets moving from screen interaction to the real world. Learn from the Visible Buttons sample on how to use and adjust Visual Buttons and immerse your end users in your AR application. Visual buttons provide a useful way to make targeted images based on images. Manage events with OnButtonPressed and OnButtonReleased when a button appears to be blocked from the camera. When creating a Visible Button, size and placement should be carefully considered in relation to user information.

There are a few features that will affect the responsiveness and usability of the visual buttons. Augmented reality (AR) is a new technology that already has the potential to be used in education. While most research has been done on AR, a few studies have been done in the field of education. Number courses in AR are growing due to the efficient use of this technology in recent years.

- Button length and width.
- The location of the target that it covers.
- The placement of a button relative to both the image border, and the other buttons to the target.
- The bottom of the button has a high brightness and detail to make the event easier.

C. Apply Multi-Image Target Detection

Multi Target is a collection of Multi-Image Targets integrated into a geometric arrangement defined as boxes. This allows for tracking and discovery on all sides and can provide multiple application situations, for example, marketing, packaging, and teaching situations. Start by creating your Multi-Targeted

Vuforia Target Manager and upload your images to the size of your Multi Targets.

D. Upload Arduino code to Wi-fi Module (ESP8266)

ESP8266 is widely available for low-cost Wi-Fi modules. In the menu select | File | Favourites | In the Arduino IDE menu select | Tools | Board: ...... | Board Manager ... | In the text box of the Board Manager dialog box type ESP, then select "esp8266 by ESP8266 Community" and click the Apply button. When the installation is complete, press the "Close" button. Connect your USB cable ESP8266 module to a computer. You can check with a blank drawing or a small drawing like Blink. In the Arduino IDE from the menu select the type of board you have. In my case this is "NodeMCU 0.9 (ESP-12 Module)" And from the Arduino IDE menu, select Serial Port to which the module is connected Click the Upload button to compile and upload the drawing.

E. Connect Blynk App to Wi-fi Module(ESP8266)

Download the Blynk app from the Google Play Store and Sign In. To Create a New Project Press + icon at the top. Gave You a Project Name. Select Device as Arduino UNO Type to connect like Wi-Fi and press Create. As soon as you create an Auth Token it will be sent to your registered email. You can also send it later to your Project Settings (Nut Icon) page -> Devices. To add a button press + and select Button. Press the newly created button to edit it. Name it and set the PIN digit to digital D13. Change mode to CHANGE.

F. Extract APK from Unity

With the installation of Android Build Support, you will be able to change the construction platform of your project to Android. To do so, go to File> Create Settings and select Android Arena. Then, click the Change Field button. Change Build Platform Unity If the Platform Change button is missing, then your build

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platform is already set to Android. Creating an APK file Once your platform has been changed to Android, the Change Field button should be replaced by the Create button. then download that apk to your phone and install it.

V. PROPOSED SYSTEM DESIGN

The following features are used in our proposed system
1. To standardize IOT and AR/MR in Our day-to-day life.
2. To operate a appliance using Virtual Reality.
3. To operate any device which is working on electricity   with the help small electronics circuit i.e. IOT
4. To secure the system by allowing only authorized users   to access the device.

VI. IMPLEMENTATION

A. User interface

The outcome of this system is to build an AR virtual button interacts with the physical world which commands to switch ON and OFF the appliances which is connected through IOT and to control the appliance using AI based gesture control. This project can be operated in three ways one purely based on IOT where Blynk app used to control the appliances and on second AR part is integrated to the IOT part of the appliances to switch ON and OFF and on third method we can control the appliance using gesture movements. The AR part of the project is made possible by the UNITY Platform and Vuforia developer portal where an app is created to recognize the image target using mobile phone camera shows the virtual buttons. These virtual buttons are intractable in physical world, we need to place the finger on the virtual buttons which commands the microcontroller to switch the appliances ON and OFF.
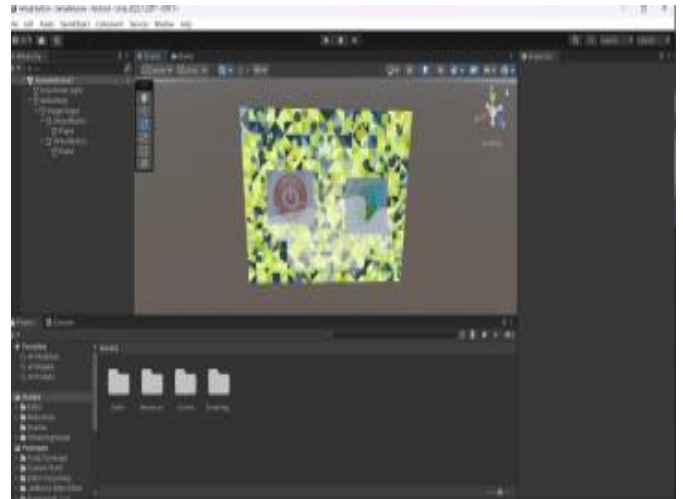

Fig 2- Unity Hub Project

We need to generate a image as an target to scan get the user interface in the real time for that we Vuforia engine software to generate ah normal image as an target image. The Model Target Generator (MTG) is a desktop application that allows you to quickly convert an existing 3D model into a Vuforia Engine dataset. This dataset can be used to create either a single view Model Target, or one that offers automatic recognition and supports multiple models and views. MTG enables you to confirm whether the features of your model will be useable, to setup the initial snapping position, and then export the final dataset. There is also the option to train your dataset through our deep learning framework for automatic recognition. The Model Target Generator supports popular formats including .obj, .fbx, .pvz, .stl, .igs, .dae, .stp, and .vrml
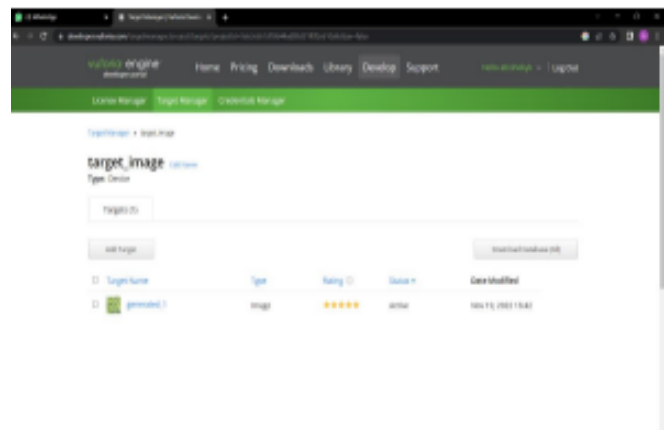

Fig 3 – Generating Target Image in Vuforia Engine

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After adding the Vuforia licence in the unity, we can access the generated target image in unity in game object option.
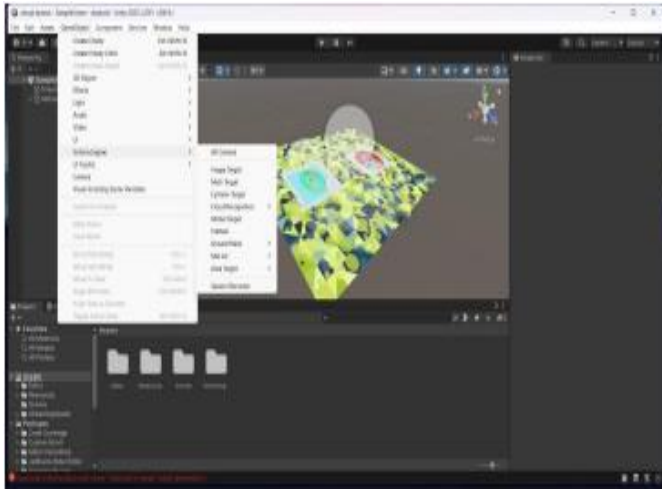

Fig 4–Target Image Generated by Vuforia Engine in unity

Fig 5 – Testing the Target Image

VII. RESULT

A. Output

In this proposed system, we are controlling the appliances using AR & AI with a help of IOT. For the first step the system must connect to an AC power supply of 230V to turn on the Controller board, the Router must have the same SSID Generate and password as we instructed in the code, once the board is turned on it automatically connect with the router. When the connection is established, it will start sending appliance state requests of that particular

device Id to the server, User touches the virtual button the server responds to the request by fetching the switch state from the Vuforia database.

Fig 6- Testing of Mobile App

As soon as the data is fetched from the Vuforia database, the server sends the data back to ESP32 in the JSON format. When the data is received by the ESP32, it 22 parses the required information from the response and then triggers the relay according to the data received.

This system can also be controlled by using the hand gestures, when user shows hand gesture in front of the camera the processing unit (Visual studio code) will start to recognize the figures and as per the fingers instruction processing unit will command the Arduino to do the process.

The Blynk service is also provided additional to control the appliance. In case of any machine error Manual switches can also been used. The AR application

recognizes the hand gesture by recognizing the meshes of your hand which is provided by Vuforia and unity engine which is flawless and the result is precise and the application works perfectly.

B. ADVANTAGES AND DISADVANTAGES

A. Advantages

1. Easy access-
At the moment, you can easily find the information you need in real time, from (almost) anywhere you are. Only smart device and internet connection are required.

2. Energy Saving-
Home automation systems have definitely proven themselves in the energy-saving arena. Automatic thermostats allow you to pre-set the temperature based on the time of day and day of the week. Real energy savings ultimately depends on the type of device you choose and its default power. But on average, manufacturers estimate that systems can help consumers save anywhere from 10 to 15 percent on heating and cooling costs.

3.Easy –
Luxury is another major selling point for home automation devices, which eliminate almost minor annoyances such as turning off the lights before going to bed or adjusting the thermostat when you wake up in the morning. Many systems come with remote dashboard power, so forgetting to turn off that coffee pot before you leave no longer requires a trip back home. Just drag the dashboard onto a smart device or computer, and turn off the coffee pot in a few seconds.

4.Security-
Remote monitoring can make your mind more comfortable while you are away. With remote dashboards, lights and lights can be turned on and off, and automated blinds can be turned on and off. These skills - combined with automated security systems - can help you reduce the risk of interference: you will be notified immediately if something goes wrong.

B. Disadvantages

1. Internet Dependence: The basic requirement for a smart home system is the Internet. Without a good and strong internet connection, you will not be able to control this. If there is no internet connection for some reason, there is no other way to access and manage your system.

2. If the device is controlled by Wi-Fi, you need to make sure you are using a private Wi-Fi network channel that can be accessed externally.

3. We have lost control of our lives — our lives will be fully controlled and dependent on technology.

4. Excessive use of the internet and technology makes people unwise because they rely on smart devices instead of doing manual labor, which makes them lazy

VIII. FUTURE WORK

We are going to work on the hardware part of the project. The relay module and the ESP32 will be used to build the circuit along with the target image. Also, the virtual buttons will be added to the target image as a switch to control home appliances. A C# code will be written on the code editor to connect Vuforia, unity and IOT device.

That code will be debugged in the unity software using Vuforia engine. To build a fully functioning app to virtually operating the home appliances. That app will be created on the unity software by debugging a different program under the module section of it. Theoretically, that code will produce a mobile

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application that will contain an Augmented reality detecting camera be generated.

IX. FUTURE SCOPE

The future scope of home automation systems includes making smart homes more efficient. Homes can be connected to sensors that include sensors, light sensors and temperature sensors and provide automated device-based switching. Additional energy can be saved by ensuring that the house stays afloat before turning on appliances and checking light and turning off lights when needed.

The system can be integrated closely with home security solutions to allow greater control and security for homeowners. The next step would be to extend the program to a larger scale, such as offices and factories.

Home Automation provides a global standard for interactive products. Standardization enables smart homes to control electrical, lighting, environment, energy and safety management and flexibility connect to other networks.

X. CONCLUSION

As AR (Augmented Reality) and AI (Artificial intelligence) is one of the driving forces of technology in future and will be applied every part of the technology that we use now, IOT is going to be the base of all technology because of the seamlessly connectivity between the appliances.

Bringing the best out of both the technology into one project is a technological innovation. This project helps us to control the appliance in an easy way that it helps the physically challenged and elderly person.

Not only helps the elderly and physically challenged, it can replace the normal switches helps to reduces the physical contact so that the spread of the disease can be reduced and decrease the chances of having a pandemic which are easily spread through the physical touch.

This project improves the quality of life. It improves the efficiencies of IOT Technology due to interaction to the physical world through the virtual buttons. Switching is way faster than the normal mechanism of switch we use daily.

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