AUGMENTED REALITY BASED REAL TIME AUTOMATION FOR IOT DEVICES

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Abstract: In the recent decade home automation is a issue that is becoming more and more popular due to its importance and Security purpose. Much real-time home appliance in terms of cloud can be connected and interfaced with internet connectivity. Due to its simplicity and equal accessibility of automation it has been peaked in the last few days. A cloud-based platform helps you connect to your facility's environment, allowing anyone, anywhere, anytime, and anything which is to be accessed in a user-friendly way through a custom website. Hence the final root cause to be cloud which stores the data related to home automation. Here we cover systems that allow devices to be controlled via a wireless network or a cloud-based approach. This project uses an IoT based home automation system. The automation system can be controlled from a central PC via the Internet or accessed remotely via a PC with a Windows-based operating system. Augmented reality is a successful technology that facilitates performing complex tasks. Reality Augmented combines practicality with reality, giving users new tools to ensure the efficiency of information transfer in some processes and in some places. The research community has proposed various solutions based on augmented reality. Especially augmented reality rehabilitation tools that offer new ideas and promise amazing progress.

I. INTRODUCTION

Our expectations for a higher standard of living are rising rapidly as automation advances day by day. A high standard of living means the use of smart devices that make human life easier. Smart homes appear to be “smart” because their computer systems can monitor various aspects of daily life [1]. In an era of technological advancement, automation is only a matter of time.

The purpose of home automation is to change people's lives. Home automation switches allow you to control your home appliances with your smart phone, smart glasses, or smart watch without using traditional switches. The recent technology models could be augmented by the IoT base platform in which sensors are distributed throughout the home environment to monitor users' health and enable remote assistance [2].

Introducing AR interfaces to automation has been a huge success, as demonstrated by the superior perception and interaction. Customer must provide a large website containing information about things and data that can be transferred into the environment. Therefore, the augmented reality proves to be a user-friendly interface to home automation and this model has image processing which serves as the backbone of the entire system. Our proposed model is based on Unity 3D and AR and uses the concept of image tracking and processing on background servers to control electrical and mechanical objects. In addition to the computing power of smart devices, their cameras (cameras) are also greatly improved, so the real potential is big enough to highlight the role of smart devices in the world of the Internet of Things. . Integrate the user, the physical world and the internet to take communication to

A major need in the manufacturing industry today is to save qualified labor and continuously collect and evaluate data from all processes at all levels. We are talking about digital twins, error prediction, service intervention or process models for optimization and production control. Digitally altered reality, along with the Internet of Things and artificial intelligence, will be a continuous and timely source of information, alerts, and events..

The aim of the module is to create a scheme that can control the Internet of Things using mixed reality. Developing such systems requires a multidisciplinary and comprehensive approach. Mixed Reality (MR) is the blending of the real and virtual worlds to create new environments and visualizations where physical and digital objects coexist and interact in real time. MR is overlay synthetic real-world content that is anchored to and interacts with the real world. A key feature of MR is that synthetic and real content can react to each other in real time. Mixed reality technologies include Microsoft HoloLens (Windows Mixed Reality platform), Apple ARKit, and Android ARCore.

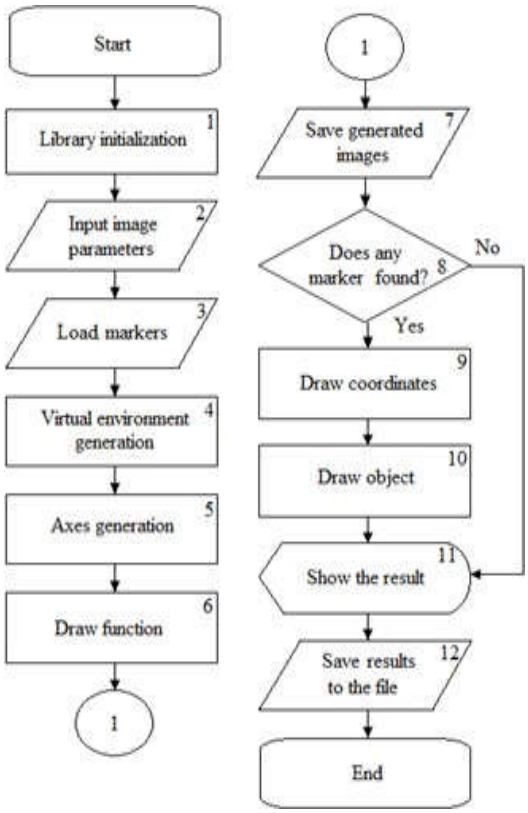

Fig. 1: Elementary Flow Chart of Augmented Reality

II. RELATED WORK

In analyzing the state of the art for the problems solved, we have placed great emphasis on scientific research and searching for existing solutions in this field. The idea found showed the following possibilities: Control and monitor mechatronic systems in IoT networks using augmented or mixed reality. Another important consideration is whether the project was developed and implemented using open source code.

[7, 8] mention the use of standard communication protocols that should be used when designing IoT systems that implement web standards. This creates the so-called Web of Things. The Web of Things is designed so that systems can be easily integrated into the modern web. Therefore, the idea is to build a common application layer for IoT based on web technologies and protocols. This idea was subsequently expanded to include the term augmented world in Ref. [6]. The augmented world concept can be defined as software applications that add digital objects to the surrounding physical environment (cities, buildings, spaces, etc.) with which a user or software agent can interact. The concept of the Web was born out of the combination of the Web of Things and the Augmented World.

The concept of extensions is presented in Ref. [4]. The idea is to create a database of digital copies of real-world objects (usually consumer electronics, for example) and associate various pieces of information with them. This is, for example, maintenance information, instructions for use, etc. After capturing a real-life object (a digital copy of which is in an augmented reality database), information about this real-life object is displayed in augmented reality on the screen of your mobile device.

The focus of the research is the concept of author Philip Lewicky [7]. He created a demonstration application that allows him to control his Phillips Hue smart bulb using a Microsoft HoloLens headset. With the help of HoloLens, I was able to select a specific light bulb light color with a simple gesture in augmented/mixed reality. The author realized that today's solution allows him to control the light bulb through a mobile application. Then you have to find the specific room and light bulb you want to control. This is not always practical. It is more convenient to use the headset to control. However the concept described does not apply further developed.

There is a concept by designer Ian Sterling and engineer Swaroop Parra[19]. This concept shows how to use gestures to control smart devices. It uses Microsoft HoloLens. The task was to provide his UI for an Android music player and an Arduino microcontroller with a lighted fan attached. As in the previous case, this is a single-purpose system rather than a complete system.

A better solution is given in reference [9]. The presented AR/MR-IoT framework uses standard and open source protocols and tools such as MQTT (Message Queuing Telemetry Transport), HTTPS (Hypertext Transfer Protocol Secure) and Node-RED. This solution is based on QR codes. This article mainly focuses on the temporal aspects of communication in the framework presented.

A comprehensive commercial software system for diagnosing and controlling mechatronic systems is Vuforia Studio [21] (previously called ThingsWorx Studio). The rebrand follows technology company PTC's acquisition of augmented and mixed reality library Vuforia. Such an acquisition was a natural step, as PTC has been very flexible with the emergence of Industry 4.0 and industrial IoT concepts. Vuforia Studio utilizes closed-source tools that allow you to capture and recognize mechatronic devices, then insert 3D and 2D objects that appear in augmented reality. This technology does not recognize devices directly, but uses a unique 2D ThingMark tag. This is actually a legacy technology similar to QR codes. The content is then visualized in Vuforia View.

ŠKODA AUTO announced a smart maintenance project that uses augmented reality for maintenance tasks [22]. A Microsoft HoloLens headset is used. This is a relatively simple software application that uses the HoloLens camera to recognize metal pipes with handles. The goal is to diagnose grip spacing that can change over time. With tube detection, the real object is covered with a digital tube with the handles in place. Using visual information, you can easily see the displacement and fix the handle to the position of its virtual counterpart. This type of maintenance simplifies and speeds up the technician's work as there is no need to constantly measure distances. A custom 3D engine was developed for the application. However, after actually testing the application within the solution in [23], we can say that the application was not responsive to lighting conditions and was also limited by the HoloLens headset. Holograms were too thin to copy objects properly. My field of vision was limited. So the real benefits of the presented solution are questionable.

III. DESIGN OF THE SYSTEM

A. Vuforia Engine

Vuforia is a popular taxpayer software development kit (SDK) for mobile devices that enables the creation of unpopular virtual apps. Track and track 3D images and objects in real time using computer-aided visual recognition technology. This image registration feature allows an engineer to position and align visual objects, such as 3D models and other media, to real-world objects when viewed by the handheld device's camera. increase. The object then tracks its position and location in the image in real time, so that the observer's view of the object matches that of the target. The Vuforia SDK supports his 2D and 3D models of targets, including unmarked images, 3D target models, and a customizable fiducial marker type known as VuMark. Other features of the SDK include local 6-degree room device creation, local occlusion using "visible buttons", timely image target selection, and the ability to systematically create and resize target sets on the fly. It is included. Vuforia uses Unity game engine extensions to provide application programming interfaces (APIs) for C++, Java, Objective-C++, and .NET languages. In this way, the SDK supports both native iOS, Android, and UWP upgrades while allowing AR Unity applications to be developed on both forums. Today's youngest generation focuses on character education and was born with ICT (Information and

Communication Technology). Therefore, I would like to recommend the use of ICT such as AR. AR (Augmented Reality) is a system that fills the real world with objects that appear to exist in the same space as the real world [3].

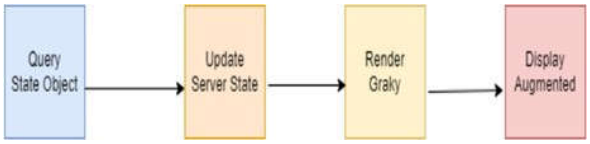

Fig. 3: Vuforia Engine Process

Software must be able to send and retrieve data from all existing system components. At the same time, it should be possible to integrate other components that may be added to the system in the future. The mobile application recognizes the selected object, displays selected information from the smart home's sensors in real time, and controls and modifies the selected component in a specific way based on what it obtains. Must be able to display mixed and augmented reality or generated virtual components. data.

B. Bylnk

The system is designed and operated by Blynk to monitor and control consumer electronics. Device performance is recorded and managed by the network coordinator. To do this, use a WiFi network that uses a modern ADSL WiFi router. SSID network and WiFi security parameters are pre-configured. Security target messages start the process using the Visual Home Algorithm and, if deemed safe, are rewritten and sent to the real home network devices. In the Blynk network, the Blynk controller sends messages to the end. Security and protection of all messages received by Visual Home algorithms help reduce system costs and influence adoption of Blynk communication system sequences. Many new breakthroughs were made during this period, including tools and systems that facilitate everyday human activities. To help with this, many organizations are trying to create human benefits such as systems, electrical devices, and robots [4].

C. UNITY 3D

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released as a Mac OS X-only game engine at Apple Inc.'s Worldwide Developers Conference in June 2005. Since then, the engine has been gradually extended to support various desktop, mobile, console and real-time platforms. Most popular for mobile game development on iOS and Android, used in games like Pokémon Go, Monument Valley, Call of Duty: Mobile, Beat Saber, and Cuphead. It is considered an easy-to-use tool for beginners and is popular for indie game development. This engine can be used to create three-dimensional (3D) and two-dimensional (2D) games, as well as interactive simulations and other animations. This engine is used in non-video industries such as film, automotive, construction, engineering and construction, as well as in the US military. The QR code name comes from Quick Response and the code is designed to be decoded quickly. This is a two-dimensional barcode printed on paper or digitally. You can use your mobile device's camera to decrypt encrypted information. A QR code is a square matrix made up of square modules. QR code color is black and white. Advantages of using QR Codes include the ability to quickly generate new QR Codes for building and extending application systems. The next advantage is that each device or sensor can have a unique QR code, so the QR code can be used to distinguish objects of the same shape. The drawback is that the mobile device must be kept parallel to the code and close enough to the device during the recognition process.

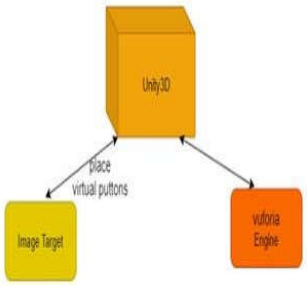

Fig. 4 : Augmented Reality Block for placing virtual buttons on the image target

The Unity game engine was launched in 2005 with the aim of "democratic" game development by opening it up to a wider audience. The following year, Unity won him second place in the Mac OS X graphics category at the Apple Inc. Design Awards. Unity was first released for Mac OS X and later supported Microsoft Windows and web browsers. Unity3D is a new kind of professional game engine with powerful magical features not limited to game development. Currently, the use of Unity3D is focused on the production of 2D and 3D games, the software is constantly being developed, the work is gradually being strengthened, and the use of other functions is gradually being deepened. Unity3D marks a new era in game development, with far-reaching prospects and big impact [5].

Proposed IOT Model Architecture

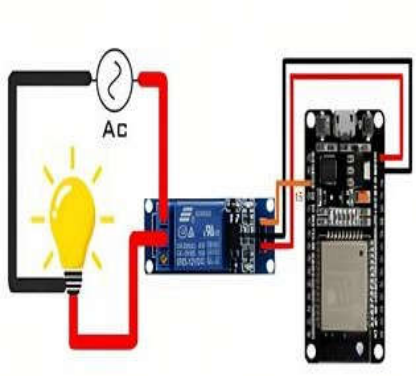

Fig. 5: Circuit Diagram of IOT Model

The circuit above represents an IoT connection for controlling an AC device, with esp32 connected to the input of a relay via one of its GPIO pins. Relay module is electronic activate the switch to turn the circuit on or off. The main purpose of the relay module is to handle higher voltages/currents than the microcontroller can handle. Use a 5V relay module. It consists of three connections called

terminators, which are NC (normally open), NO (normally closed) and COM connectors [17]. On the other side are the VCC, GND and IN pins that need to be connected. The relay module uses current to open and close the switch using a coil that attracts and pulls the contacts of the switch and a coil that pushes the contacts apart with a spring when the coil is not powered. The appliance cable is split into two parts, which are connected to the COM and NC ports, with the VCC pin connected to the Vin pin of the esp32. in a flashing android. The app creates a new project and places a button widget inside it. The Blynk app typically sends the API key token to the email address used to control the appliance. C++ code is written on Arduino.The IDE and code are uploaded to the esp32 board to control the consumer electronics. Used to control virtual pins on Blynk devices. The auth_token field will be replaced with the BlynkAPI key token and the "Pin" field is changed to "V1 (virtual pin)". And the value toggles on and off to 0 or 1. A block diagram of the IoT part is shown in the figure. Figure 2 shows how the communication process for controlling home appliances works. Figure 5 is an interface diagram of home appliances using esp32.

IV. PROPOSED TECHNIQUES

A target image indicates an image that the Vuforia engine can access and track. The engine recognizes and tracks images by comparing natural features extracted from camera images with known guided websites. Once an image target is detected, the Vuforia Engine tracks the image and easily adds content using market image tracking technology. A target image specifies an image that the Vuforia engine can access and track. The engine recognizes and tracks images by comparing natural features extracted from camera images with known guided websites. Once an image target is detected, the Vuforia engine tracks the image and easily adds content using market image tracking technology.

Visual buttons provide a convenient way to create targeted images based on images. Use OnButtonPressed and OnButtonrelease to manage events when the button appears to be stuck to the camera. When creating display buttons, size and placement should be carefully considered in relation to user information. There are several features that affect the responsiveness and usability of visual buttons. Augmented Reality (AR) is a new technology that already has potential for use in education. Most of the research has been done on AR, but there is also some research done in education. In recent years, the use of this technology has increased the number of AR courses [6].

- 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.

A multi-target is a collection of multi-image targets united into a geometric arrangement defined as a box. This enables tracking and discovery from all sides and can serve multiple use cases such as marketing, packaging and educational contexts. Start creating a multi-target Vuforia target manager and upload a multi-target size image. 2D images can be used to create augmented or mixed reality. The advantage of this approach is that one image is enough for one object and the image is easy to create, so no complex or sophisticated tools or devices are required. A mobile device is all that is required to develop and use the application. System expansion is also possible without problems. However, using images also has its drawbacks. Also, similar to QR codes, the mobile device must be close enough to the object when recognizing the object, and the mobile device must be parallel to the image or at the same angle as when the image was created.

Connect Blynk App to Wi-fi Module(ESP8266)

Download the Blynk app from the Google Play Store and sign up. Press the + icon at the top to create a new project. I gave the project a name. To connect like WiFi, select "Device" as "Arduino UNO Type" and click "Create". After creating an authentication token, the authentication token will be sent to your registered email address. You can also send it later in the Project Settings page (groove icon) -> Devices. To add a button, press + and select the button. Click the newly created button to edit it. Give it a name and set the PIN digit to Digital D13. Change the mode to CHANGE.

Extract APK from Unity

Installing Android Build Support allows you to change your project's build platform to Android. To do this, go to File > Create Configuration and select Android Arena. Then click the Change Field button. Change Build Platform Unity If you don't see the Change Platform button, your build platform is already set to Android. Creating the APK File Once the platform is switched to Android, the Change Fields button should be replaced with the Create button. Then download and install the APK on your phone.

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.

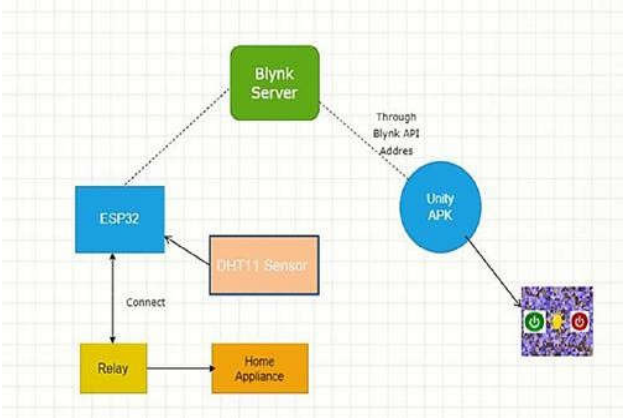

Fig. 6.: Unity 3d Model Design

APK files developed on Unity Hub are saved as multi-target APK files. This APK file will be installed on your phone and when opened on an image target you will see a virtual switch on the image target. These are used for ON diagrams and OFF Figure 6 is displayed for target 1. APK files developed on Unity Hub are saved as multi-target APK files. This APK file will be installed on your phone and when opened on an image target you will see a virtual switch on the image target. These are used for ON diagrams and OUT Figure 6 is shown for target 1. The Multiple Targets app displays virtual On and Off buttons as shown in Figure 6. This will only appear if the app's AR camera detects an image of Target 2. The target image used is shown in Figure 6.

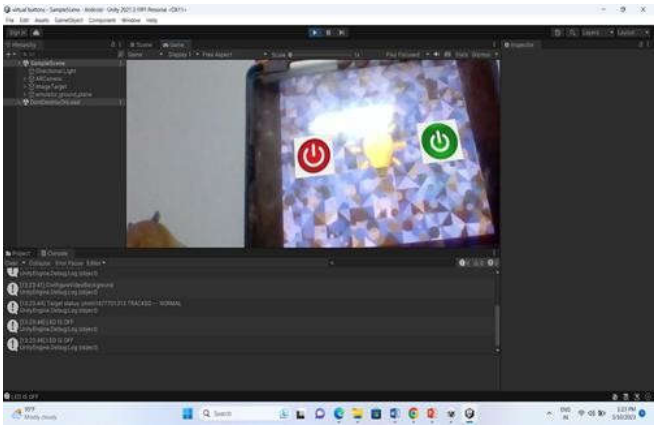

Fig. 7: Virtual Buttons of Android Application

The Advantages of Control and Monitoring of IoT Devices

Now it's easy to find the information you need in real time from (almost) anywhere. All you need is a smart device and an internet connection. Home automation systems have certainly made their mark in the area of energy savings. Automatic thermostat lets you preset temperatures based on time of day and day of week. Actual energy savings ultimately depend on the type of device selected and its default performance. However, on average, the manufacturer estimates that the system saves the consumer 10-15% on heating and cooling costs. Another key selling point of home automation devices is luxury, which virtually eliminates minor annoyances like turning off the lights before bed or setting the thermostat when you wake up in the morning. Many systems have remote power on the dashboard so you don't have to drive home if you forget to turn off your coffee pot before you leave. Simply drag the dashboard onto your smart device or computer and turn off your coffee pot in seconds. Remote monitoring makes you feel more comfortable on the go.

V. CONCLUSION

An IoT system that combines home appliances individually. Some of the methods available for home automation work with flexible construction controls for household tasks such as televisions, fans, power pipes, and refrigerators. After reading and understanding the literature review and other available activities, we suggest strategies to help you better understand the natural conditions of your home. It also notifies the user of any errors that occur on the device. In this article, we plan to eliminate most human interaction by introducing an intelligent system. Development of this program with Internet of Things technology. Through these programs, we are able to build truly low-cost smart homes, restore natural conditions, and enable flexible homes that correct mistakes through energy savings.

VI. FUTURE SCOPE

One of the future challenges of home automation is to make smart homes more efficient. Houses can be connected to sensors such as sensors, light sensors, temperature sensors, etc., enabling device-based automatic switching. You can save even more energy by turning on your appliances, checking the lights, and making sure your home is floating before turning them off if necessary. The system can be tightly integrated with home security solutions, giving homeowners more control and security.

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