IOT HOME AUTOMATION USING AUGMENTED REALITY

Submitted in partial fulfillment of the

requirements for the award of

Bachelor of Engineering degree in Computer Science and Engineering

By

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHOOL OF COMPUTING

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INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Rohith Raj V (39110857) and Saran Kumar S (39110902)** who carried out the Project Phase 2 entitled **"IOT HOME AUTOMATION USING AUGMENTED REALITY"** under my supervision from January 2023 to April 2023.

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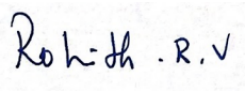
DECLARATION

I, **Rohith Raj V (39110857),** hereby declare that the Project Phase-2 Report entitled **"IOT HOME AUTOMATION USING AUGMENTED REALITY"** done by me under the guidance of **Dr. S. Dhamodaran, M.Tech., Ph.D.** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering**.



DATE: 20.04.2023
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ABSTRACT

Home automation is a topic that is gaining popularity every day, because of its great benefits. One can achieve home automation by simply connecting home appliances to the internet or cloud storage. 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 help connect to the object's surroundings for everyone to find it easy to access anything and everything at any time and place in an easy-to-use way using custom-defined sites. Therefore, the cloud serves as the ultimate access point for IoT.

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. Here we take the system that can control devices through a wireless-based network or **cloud-based** approach. In the project, we use an IoT-based Home Automation system which aims to develop a home automation system that gives the user complete control and overall remote-control features of his or her home.

The automation system will be able to be controlled from a centralized PC, Internet, and remotely accessed via a PC with a Windows-based operating system. Augmented Reality is a successful technology that can facilitate the execution of complex tasks. Reality augmented mixes practical and realistic, making available to the user new tools to ensure efficiency in the transfer of information through a few processes and in a few places. Various Augmented Reality-based solutions have been proposed by the research community: particularly in Augmented Reality rehabilitation tools that offer new ideas and promise amazing progress.

With roots going back to Ivan Sutherland's research in the 1960s, Augmented reality (AR) reached a plateau in the early 1990s.The latest formation of IoT is now converging to IOE (Internet of Everything). While using this technology, one can access each device, equipment, and machinery within its surrounding through any application or **“middleware system”.** Recently, smart speakers have become commercially common operation methods for controlling home appliances, and

they have solved some of the problems with remote control operations. It is difficult to use voice recognition in a noisy environment. In addition, it takes a long time to check the current status of home appliances because users must ask their smart speaker questions or give commands and wait for answers.

To investigate other remote operation methods, we propose AR Smart Home, which uses augmented reality technology and gesture recognition technology. Through evaluating the prototype system, we found that operating home appliances with gestures and interacting with virtual 3D home appliances instead of the actual home appliances are acceptable in terms of usability. In this project, we will use unity along with Vuforia to Make an **AR-based IoT Virtual Switch** that controls any device connected to a Local Network Controller through an HTTP request**.**

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

People can control and handle different appliances through their devices using different techniques. **Augmented reality (AR)** is one of the recent technologies that evolved for automation of the electrical appliances. This technology gives a virtual view of the devices generating a real environment. Augmented Reality brings virtual objects into the real world where we live. Augmented reality is used in many areas such as navigation in real-world environments, advertising, military, emergency services, art, games, architecture, sightseeing, education, entertainment, commerce, information visualization, translation, and so on. Home Automation system using IoT is a system that uses computers or mobile devices to control basic home functions and features automatically through the internet from anywhere around the world. An automated home is sometimes called a smart home.

Many times, people forget to switch off their electrical appliances when they leave their homes. Augmented reality usage in the field of home automation is a relatively new idea and there has been a growing interest in its implementation. The usage of AR gives us a significant advantage over other models since it can help us to control devices or machines in a real-time environment and helps anyone understand how to operate them. Using Augmented reality, users can control appliances more effectively and easily. Augmented reality gives users a virtual experience that helps them identify the different switches through their mobile devices.

1.1 AUGMENTED REALITY (AR)

It is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory, haptic, somatosensory, and olfactory. AR can be defined as a system that incorporates three basic features: a combination of real and

virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. The overlaid sensory information can be constructive (i.e., additive to the natural environment), or destructive (i.e. masking of the natural environment). This experience is seamlessly interwoven with the physical world such that it is perceived as an immersive aspect of the real environment.

Augmented reality is used to enhance natural environments or situations and offer perceptually enriched experiences. With the help of advanced AR technologies (e.g., adding computer vision, incorporating AR cameras into smartphone applications, and object recognition) the information about the surrounding real world of the user becomes interactive and digitally manipulated. Information about the environment and its objects is overlaid in the real world.

This information can be virtual. Augmented Reality is an experience that is artificial, and which adds to the already existing reality, or real, e.g., seeing other real sensed or measured information such as electromagnetic radio waves overlaid in exact alignment with where they are in space. Augmented reality also has a lot of potential in the gathering and sharing of tacit knowledge. Augmentation techniques are typically performed in real-time and in semantic contexts with environmental elements. Immersive perceptual information is sometimes combined with supplemental information like scores over a live video feed of a sporting event. This combines the benefits of both augmented reality technology and heads-up display technology (HUD).

1.2 COMPARISON WITH VIRTUAL REALITY

In virtual reality (VR), the users' perception of reality is completely based on virtual information. In augmented reality (AR) the user is provided with additional computer-generated information within the data collected from real-life that enhances their perception of reality.

For example, in architecture, VR can be used to create a walk-through simulation of the inside of a new building; and AR can be used to show a building's

structures and systems superimposed on a real-life view. Another example is utility applications. Some AR applications, such as Augment, enable users to apply digital objects into real environments, allowing businesses to use augmented reality devices to preview their products in the real world.

Similarly, it can also be used to demo what products may look like in an environment for customers, as demonstrated by companies such as Mountain Equipment Co-op or Lowe's which use augmented reality to allow customers to preview what their products might look like at home using 3D models.

1.3 HARDWARE

Hardware components for augmented reality are a processor, display, sensors, and input devices. Modern mobile computing devices like smartphones and tablet computers contain these elements, which often include a camera and microelectromechanical systems (MEMS) sensors such as an accelerometer, GPS, and solid-state compass, making them suitable AR platforms. There are two technologies used in augmented reality: diffractive waveguides and reflective waveguides.

1.4 TECHNOLOGY

Augmented reality (AR) differs from virtual reality (VR) in the sense that in AR part of the surrounding environment is actually 'real' and just adds layers of virtual objects to the real environment. On the other hand, in VR the surrounding environment is completely virtual. A demonstration of how AR layers object onto the real world can be seen with augmented reality games.

Wallace is an augmented reality game application that allows users to hide messages in real environments, utilizing geolocation technology in order to enable users to hide messages wherever they may wish in the world. Such applications have many uses in the world, including in activism and artistic expression.

CHAPTER 2

LITERATURE SURVEY

The following shows a survey done for Augmented Reality and Virtual learning for imaginary environmental automation through target image scanning with QR codes and physical image detection from an android application using electronic gadgets like tablets or mobile. Further, the study was extended to multiple operation platforms like Linux, Windows and IOS are discussed as follows.

[1]. Pranav Bedekar and Snehal Nargundi , IJSR “A Review on Home Automation using”, IJSR Transaction on Computer Science Engineering 2016. **Pros:** The target scaling factor is efficient throughout the multiple platform switching.

Cons: Slower transit cycles when compared to CoAP, low scalability and lack of security encryption.

[2]. Ali El-Moursy1, Fadi N. Sibai[2] , Jahanzeb Rehman[1] , Omar M. Gouda[1] , Abdelrahman T. Gaber[1], Ahmed M. Khedr[1], IEEE “Home Automation using Augmented Reality (HAAR)”, IEEE Transactions on Augmented Reality, 2021 **Pros:** Implementation IR Interface was an excellent Idea for creating universal remote.

Cons: The system Uses Infrared Radiation for data transfer which is much faster than CoAP but could be easily mapped with 38 kHz of regular frequency.

[3]. Avni Sharma, Rinkesh Patel, IJEEE “Home Automation Using Augmented Reality”, IJEEE Transactions on Electrical and Electronics Engineers, 2017 **Pros:** Fast and secure since the data encryption is 64bit ratio and it follows the MQTT protocol.

Cons: Does not support large database sizes, and it has no support for ROLE, COMMIT and stored Procedures.

[4]. Abdul Saboor[1], Aya Ihab Rexeika[2], Piotr Stawicki[3] and Felix Gembler[4], “Development_of_an_Online_Home_Appliance_Control_System_Using_Augmented_Reality_and_an_SSVEP-Based_Brain Computer_Interface”, Transactions on Artificial Neural Networks, 2019.

Pros: Bringing AR with Deep Neural schema is an Excellency, and this system can be integrated with the 7 senses of the future world.
Cons: It has a range of support between 3.5Hz to 75Hz which in turn directly matches with the neural frequency that potentially messes up sensory organs.

[5]. Manuel Alonso-Rosa, Aurora Gil-de-Castro, Antonio Moreno-Munoz, Joaquín Garrido-Zafra , Elena Gutierrez-Ballesteros and Eduardo Cañete-Carmona, MDPI “An IoT Based Mobile Augmented Reality Application for Energy Visualization in Buildings Environments”, MDPI Transactions on Applied Science, 2020

Pros: High Visual and Artificial Database was integrated which can be a link between and virtual and physical world. A creative contextual database has created a huge responsive factor.

Cons: Superimposing virtual environmental capacity has no range of lower frequency AR camera support.

[6]. Rosalino Rodríguez Calderón, Rafael Santillana Arbesú, Procedia Computer Science, “Augmented Reality in Automation”, Procedia Computer Science Transactions on mobile device, 2015
Pros: Implementing a local server reduces cognitive allocation in the server.

Cons: Error Factors are high since it is purely based on local server data. [7]. R. Silva, J. C. Oliveira, G. A. Giraldi, INCC “Introduction to Augmented Reality”, INCC Transactions on National Security Science and Computation, 2018

Pros: Only a few notable parameters throughout the project.
Cons: The rate of prediction is proportionally less when compared to real-world predictions.

[8]. Jonathan J. Hull, Berna Erol, Jamey Graham, Qifa Ke, Hidenobu Kishi, Jorge Moraleda, Daniel G. Van Olst, Research Gate “Paper-Based Augmented Reality”, Research Gate Transaction on Camera and Paper documentation, 2007 **Pros:** Augmented reality with virtual automation was brought to the physical world with paper content.

Cons: Linking patches of text will increase a lot of security reasons.

[9]. Mikko Kytö[1,2], Barrett Ens[2], Thammathip Piumsomboon[2], Gun A. Lee[2], and Mark Billinghurst[2], Research Gate “Pinpointing: Precise Head- and Eye- Based Target Selection for Augmented Reality”, Research Gate Transactions on Augmented Reality in Computer Science Engineering, 2018

Pros: Accuracy has reached 97% with a simple algorithm. **Cons:** 97% precise and accurate but depends purely on real-time saturation and hue point of target images.

[10]. Subramani Roy Choudri, A. Divija, G. V V N Vijayalakshmi, P. Vamsi, JARTMS “TOUCHLESS HOME AUTOMATION USING AUGMENTED REALITY”, JARTMS Transactions on Augmented Reality and Web Interface, 2021 **Pros:** Target Image can be linked to the Virtual world.

Cons: Target Image can be linked to automation with an augmented environment but in the case of wet hands this linking process will not produce tokens to respective servers.

2.1 INFERENCES FROM LITERATURE SURVEY

From the above-mentioned literature works, it is clear that there has been effective research on this topic has been done and many models have been proposed. It is evident that the above-mentioned systems have their own pros and cons. While some of the recent works involve hybrid technologies and provide better accuracies, they are still far from what is needed With higher accuracy, comes the need for low computational costs, high processing speed, and most of all, convenience of use.

2.2 OPEN PROBLEMS IN THE EXISTING SYSTEM

Voice commands are used to prompt different activities, from delivering news reports and playing music, to setting timers and checking train times As well as saving you time, they could also save you money by keeping your house energy efficient and secure. Recently, smart speakers have become commercially common operation methods for controlling home appliances, and they have solved some of the problems with remote control operations. It is difficult to use voice recognition in a noisy environment.

In addition, it takes a long time to check the current status of home appliances because users have to ask their smart speakers questions or give commands and wait for answers. To investigate other remote operation methods. SSVEP (Steady State Visually Evoked Potential) protocol is been used in current smart speaker designs. It has a range of support between 3.5Hz to 75Hz which in turn directly matches the neural frequency that potentially messes up sensory organs.

2.3 DISADVANTAGES OF THE EXISTING SYSTEM:

On considering a lot of environmental and virtual barriers still we face some limitations in our proposed model. We designed this algorithm which is suitable for Android and IOS-based platforms through unity. This works well only with Android but does not perform well in IOS. Still, we are trying to figure out the pipeline breakage failure for IOS. Some of the benchmark results show that IOS has strong security access for third-party application control for the installation of applications.

CHAPTER 3

REQUIREMENT ANALYSIS

3.1 FEASIBILITY STUDIES/RISK ANALYSIS OF THE PROJECT

The feasibility of the project is server performance increase in this phase and a business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis, the feasibility study of the proposed system is to be carried out. For feasibility analysis, some understanding of the major requirements for the system is essential. Three key considerations involved in the feasibility analysis are

- **ECONOMICAL FEASIBILITY**

This study is carried out to check the economic impact that the system will have on the organization. The amount of funds that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus, the developed system is well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

- **TECHNICAL FEASIBILITY**

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand for the available technical resources. This will lead to high demands being placed on the client. The developed system must have modest requirements, as only minimal or null changes are required for implementing this system.

- **OPERATIONAL FEASIBILITY**

The aspect of the study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The 20 level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him

familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system

3.2 MAJOR DISADVANTAGES TO OVERCOME:

Gestures have the power to act as effective tools for communication and Real-time Automation. Augmented Reality is that it creates unique digital experiences that blend the best of the digital and physical worlds. Augmented Reality presents information in neatly summarized digital snippets. AR can help users take quick decisions without cognitive overload. Augmented Reality is the integration of digital information with the user's environment in real-time. Our proposed system can show the live status of a machine to the operator through his AR glasses or tablet.

In our augmented reality application, the position of the label is determined by images, text labels or by QR codes. This methodology will make the user benefited by showing the live data from the unit when the camera of the label scans the corresponding card. Which in turn makes it possible to control your environment with augmented reality. Augmented Reality would be the one and only choice to handle impossible situations that occurs due to Fire, flood and other Natural Calamities.

3.2.1 DANGERS OF AR

In a paper titled **"DEATH BY THE POKEMON GO",** researchers at Purdue University's Krannert School of Management claim the game caused "a disproportionate increase in vehicular crashes and associated vehicular damage, personal injuries, and fatalities in the vicinity of locations, called Poké Stops, where users can play the game while driving. "Using data from one municipality, the paper extrapolates what that might mean nationwide and concluded, "the increase in crashes attributable to the introduction of Pokémon GO is 145,632 with an associated increase in the number of injuries of 29,370 and an associated increase in the number of fatalities of 256 over the period of 6 July 2016, through 30 November 2016."

3.2.2 REALITY MODIFICATIONS

The authors extrapolated the cost of those crashes and fatalities at between $2bn and $7.3 billion for the same period. Furthermore, more than one in three surveyed advanced Internet users would like to edit out disturbing elements around them, such as garbage or graffiti. They would like to even modify their surroundings by erasing street signs, billboard ads, and uninteresting shopping windows. So it seems that AR is as much a threat to companies as it is an opportunity.

Although, this could be a nightmare to numerous brands that do not manage to capture consumer imaginations it also creates the risk that the wearers of augmented reality glasses may become unaware of surrounding dangers. Consumers want to use augmented reality glasses to change their surroundings into something that reflects their own personal opinions. Around two in five want to change the way their surroundings look and even how people appear to them.

3.2.3 PRIVACY CONCERNS

The concept of modern augmented reality depends on the ability of the device to record and analyze the environment in real-time. Because of this, there are potential legal concerns over privacy. While the First Amendment to the United States Constitution allows for such recording in the name of public interest, the constant recording of an AR device makes it difficult to do so without also recording outside of the public domain. Legal complications would be found in areas where a right to a certain amount of privacy is expected or where copyrighted media are displayed.

In terms of individual privacy, there exists the ease of access to information that one should not readily possess about a given person. This is accomplished through facial recognition technology. Assuming that AR automatically passes information about persons that the user sees, there could be anything seen from social media, criminal records, and marital status.

3.3 HARDWARE & SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

3.3.1 HARDWARE

1. NodeMCU ESP8266 Wi-Fi Development Board
2. Single Channel Relay Module with Opto-Coupler

NodeMCU ESP8266 Wi-Fi Development Board

NodeMCU is an open-source firmware for which open-source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The firmware uses the Lua scripting language. The firmware is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. It uses many open-source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant to their project and build firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications (see related projects).

Single Channel Relay Module with Opto-Coupler

A relay is an electrically operated switch. It consists of a set of input terminals for single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low-power signal, or

Fig 3.1: NodeMCU ESP8266 Wi-Fi Development Board

where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

The traditional form of a relay uses an electromagnet to close or open the contacts, but other operating principles have been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems, these functions are performed by digital instruments still called protective relays. Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to the second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

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3.3.2 SOFTWARE

1. **Arduino IDE**
2. **Unity**
3. **BLYNK**

Arduino IDE

The Arduino Integrated Development Environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in functions from C and C++. It is used to write and upload programs to Arduino-compatible boards, but also, with the help of third-party cores, other vendor development boards. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring.

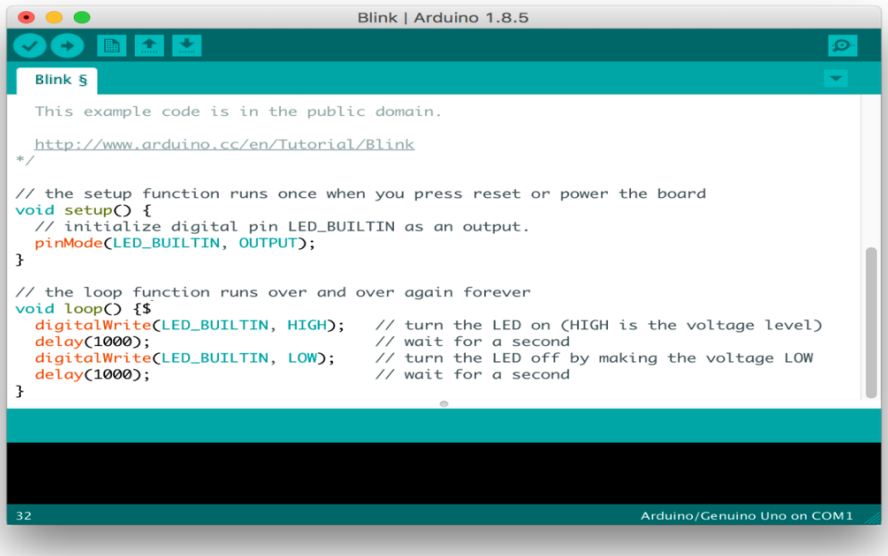

Fig 3.3: Arduino IDE

The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, which is compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program argued to convert the executable code into

a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

Unity

The Unity game engine was launched in 2005, aiming to "democratize" game development by making it accessible to more developers. The next year, Unity was named runner-up in the Best Use of Mac OS X Graphics category in Apple Inc.'s Apple Design Awards. Unity was initially released for Mac OS X, later adding support for Microsoft Windows and Web browsers. Unity 2.0 launched in 2007 with approximately 50 new features. The release included an optimized terrain engine for detailed 3D environments, real-time dynamic shadows, directional lights and spotlights, video playback, and other features. The release also added features whereby developers could collaborate more easily. It included a Networking Layer for developers to create multiplayer games based on the User Datagram Protocol, offering Network Address Translation, State Synchronization, and Remote Procedure Calls.

Facebook integrated a software development kit for games using the Unity game engine in 2013. This featured tools that allowed tracking advertising campaigns and deep linking, where users were directly linked from social media posts to specific portions within games, and easy in-game-image sharing. In 2016, Facebook developed a new PC gaming platform with Unity. Unity provided support for Facebook's gaming platforms, and Unity developers could more quickly export and publish games to Facebook.

Fig 3.4: Unity User Interface

The C# source code of Unity was published under a "reference-only" license in March 2018, disallowing reuse and modification. As of 2020, software built with Unity's game engine was running on more than 1.5 billion devices. According to Unity, apps made with their game engine account for 50 percent of all mobile games, and are downloaded more than 3 billion times per month, and approximately 15,000 new projects are started daily with its software. Financial Times reported that Unity's engine "powers some of the world's most lucrative mobile games", such as Pokémon Go and Activision's Call of Duty Mobile.

In June 2020, Unity introduced the Mixed and Augmented Reality Studio (MARS), which provides developers with additional functionality for the rules-based generation of augmented reality (AR) applications. Unity released Unity Forma, an automotive and retail solution tool, on December 9th, 2020. Unity acquired Finger Food Advanced Technology Group in 2020, as it aimed to bolster its non-video game uses and offer additional design help to customers. The company went public in September 2020, to further expand the use of its game engine into industries outside of gaming.

BLYNK

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, and can store data, visualize it and do many other cool things.
There are three major components in the platform:

1. **Blynk App** - allows to you create amazing interfaces for your projects using various widgets we provide.

2. **Blynk Server** - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. Its open-source could easily handle thousands of devices and can even be launched on a Raspberry Pi.

3. **Blynk Libraries** - for all the popular hardware platforms - enable communication with the server and process all the incoming and outcoming commands.

4. Every time we press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blink of an eye.

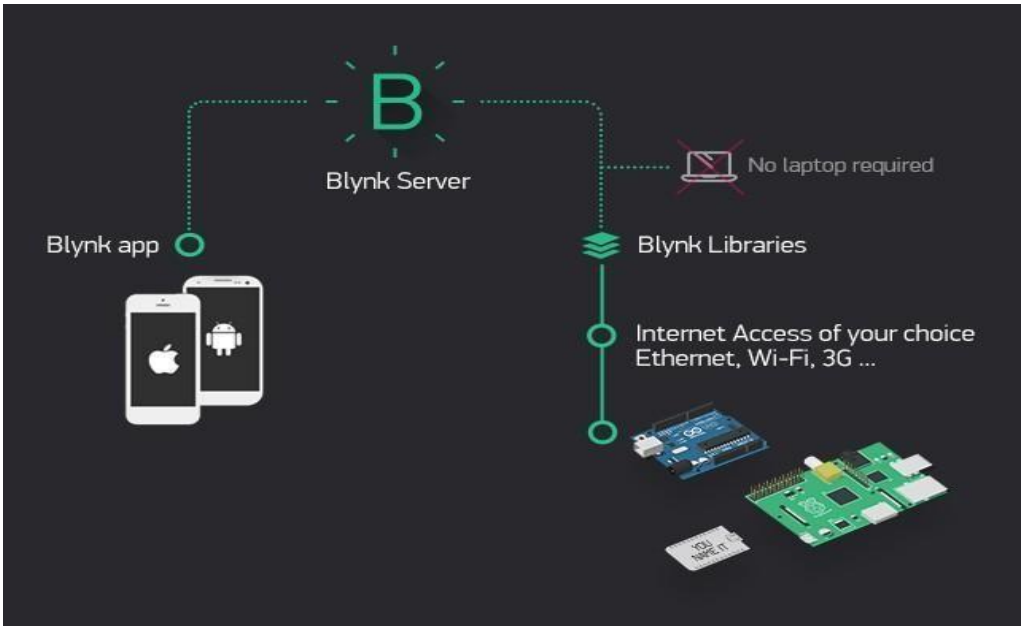

Fig 3.5: Blynk Application Support and Interface

CHAPTER 4

DESCRIPTION OF THE PROPOSED SYSTEM

4.1 PROPOSED SYSTEM

In our proposed system we use augmented reality as a medium of virtual communication. Everyone prefers less messy as well as user-friendly interface and hence we are moving towards augmented reality in home automation. AR allows a virtual pop-up whenever the user points his/her camera toward the object to be controlled or the switch. Focusing on AR, a software development kit (SDK) will be required. It provides Application build configuration and automatic file generation. Thus, we can build our very own AR app which enables virtual images mounted over real-time camera images which allows the user to choose the ON/OFF option when the camera of the smart device is pointed toward the object. AR uses the concept of image tracking, processing and communicating to control the applications.

4.2 ADVANTAGES OF THE PROPOSED SYSTEM

In our Proposed system we break through the barriers and limitations of network constraints, Security blockage, Firewall Breakage, Voice Amplitude errors, Physical Failure of wet hand access and 3d illusion error rate. Our working model is purely based on gesture-controlled virtual buttons which would be floating on air under the virtual environment.

4.3 APPLICATIONS

- Property Tours and 3D Real Estate Models
- Immersive Therapy
- Apprentice Training In Skilled Trades
- Heavy Machinery Training
- Oil and Gas Industry Training
- Specialized Auto Maintenance
- Retail/Hospitality Training
- Military Training and Readiness

4.4 COMPARISON BETWEEN THE EXISTING SYSTEM AND THE PROPOSED SYSTEM

In the existing system, we have practiced automating stuff based on reality. The difference between real-world automation and virtual-world automation sounds high. Here the impossible stuff can be made possible through the imaginary environment. In addition, we can understand what will happen in future if we practice with a real-world object.

Our proposal will reduce the cost of the environment rather than making it in real-time. It can clear primary doubt with handling the object physically. We are sure to suggest the future world will be solely dependent upon Virtual and Augmented reality gadgets. We have achieved an accuracy of 100% thus, eliminating the human error rate.

4.5 SELECTED METHODOLOGY OR PROCESS MODEL

To begin with, testing the model from the IoT part, we have used the BLYNK IoT platform. In, we just made a simple BLYNK project of adding a button in the dashboard which will send data 0 & 1 to virtual pin V1. After that, we made a code in which, if we receive the data 1 from pin V1, we just send the signal high to the digital pin of ESP8266 from Express if favour NodeMCU IoT development board which ultimately turns on Relay. And as soon as we receive 0 the relay gets turned off.

For AR, we will be using Unity Hub software on our computer, there are a lot of steps involved in setting up our Unity Hub software. The primary step is the attached Vuforia Engine with our project. It acts as a Virtual camera with 3D visual effects. And a C# script is required to handle the environment which is used to get an interface with the outside world from the computing platform of Blynk IoT. Finally, we need to make the GUI perpendicular to the screen for creating a virtual environment and the last step is to get the license from the Vuforia cloud server to access the real world with the virtual environment.

4.6 ARCHITECTURE / OVERALL DESIGN OF THE PROPOSED SYSTEM

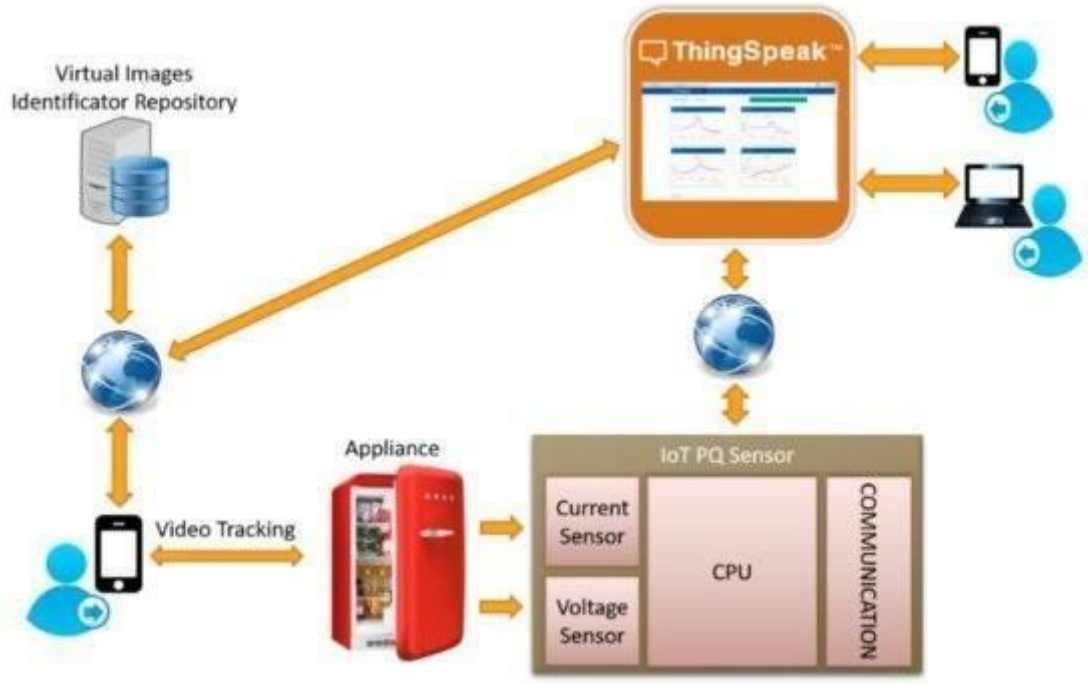

Fig 4.1: proposed system architecture

4.7 DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, which is compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware. With the rising popularity of Arduino as a software platform, other vendors started to implement custom open-source compilers and tools (cores) that can build and upload sketches to other

microcontrollers that are not supported by Arduino's official line of microcontrollers.

4.8 PROJECT MANAGEMENT PLAN

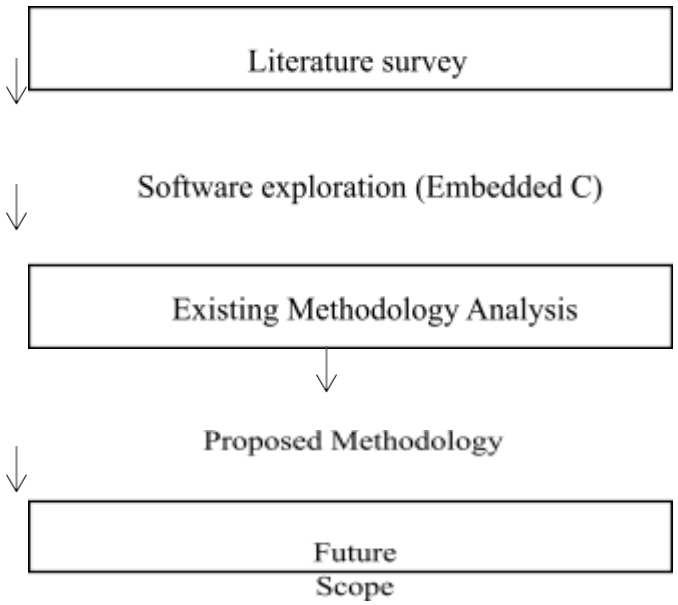

Fig 4.2: Project Plan

4.9 WORKFLOW DIAGRAM

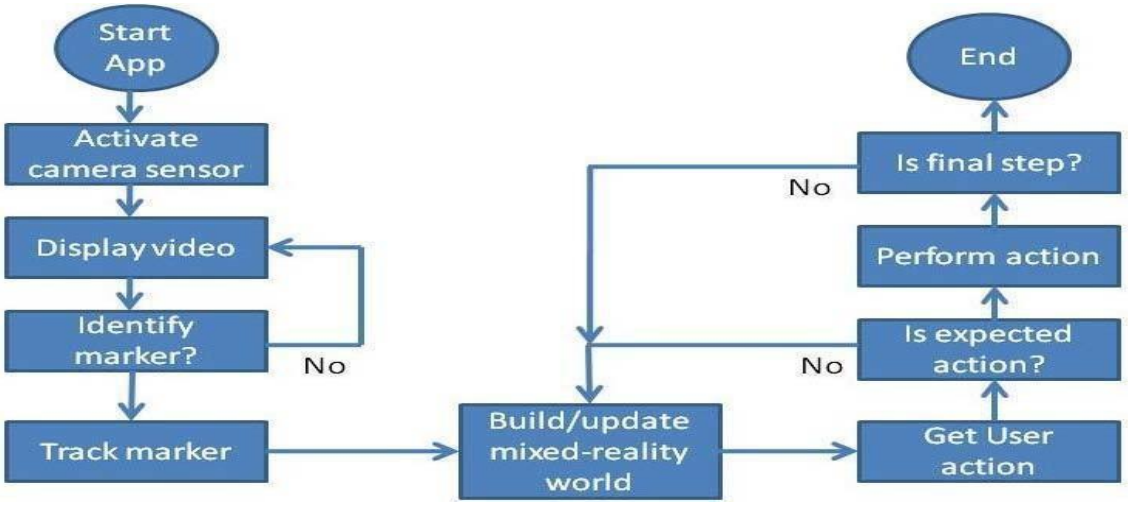

Fig 4.3: Workflow Diagram

CHAPTER 5

5.1 TRANSITION/ SOFTWARE TO OPERATIONS PLAN

The process of creating 3D models, and the feasibility of AR application development by teachers and students in school settings. Teachers are the common element in every different educational system and play a key role in the integration and acceptance of technology in education. Qualitative research was conducted in February 2019 in rural and suburban areas of North-Western Greece on secondary education teachers of different specialties and the results showed that AR application development is feasible under certain conditions.

The augmented Reality and Virtual Reality market have the potential to reach 151 billion USD with a paramount CAGR of 70.4% by 2022 (Source: Markets and Markets). It is true that AR and VR technologies have driven the gaming and entertainment industry, but it also has a very good potential to transform the healthcare industry since they can change a lot of traditional healthcare operations and branches in several ways, including radiology, oncology, training, and more.

Still, at a very early stage, digital reality (AR/VR) technologies are helping care delivery specialists to save lives and take critical decisions. Considering this potential of VR/AR, healthcare may revolutionize the way diagnostic practice is carried out to view MRI and CT images. Let’s talk about diagnostic imaging in oncology. However, there is an enormous potential for AR and VR applications in medical imaging across its different stages namely detection, diagnosis and treatment.

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