SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

AFFLIATED TO ANNA UNIVERSITY CHENNAI

ACCREDITED BY NAAC WITH "A" GRADE

INGENIOUS UOI BASED AUGMENTED REALITY USING SIFT FOR ATM

A PROJECT REPORT

SUBMITTED BY

SARVESH P (17EUEC134)

ASHWIN M (18EUEC501)

NAREN S (18EUEC510)

in partial fulfillment of award of the degree

of

BACHELOR OF ENGINEERING

in

ELECTRONICS AND COMMUNICATION ENGINEERING

MARCH 2021

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BONAFIDE CERTIFICATE

Certified that this project report "**INGENIOUS UOI BASED AUGMENTED REALITY USING SIFT FOR ATM**" is the bonafide work of "**SARVESH P**(17EUEC134), **ASHWIN M**(18EUEC501), **NAREN S**(18EUEC510)" who carried out the project work under my supervision.

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

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ABSTRACT

The Covid-19 pandemic has created a demand for technologies that allow us to avoid touching devices. Before the pandemic, the world had a difficult time understanding the importance of touchless technology, and even then, it was not imagined in this context. The gesture-based technologies that have been adopted in research have thus far not been popular outside of research labs. The global pandemic, however, has changed that view; today, the average person can certainly appreciate the need for touchless interaction. This technology is important not only for healthcare workers interacting with medical equipment, but also in the use of ATMs, vending machines, and learning devices. There are several issues in the design, development, and adoption of such technologies that should be addressed in the near future. Touch less interaction is possible with augmented reality technology, which uses gesture and interaction controller sensors to create a bridge between virtual and real environments. Therefore, the notion obtained separately develop AR applications that help the residence marketing department in the home market to show a 3D object of marketed house. So that prospective buyers get the information more interactive with real look 3D objects. This study uses a software named Vuforia (QCAR) to implement augmented reality in mobile applications for marketing residence. Vuforia provides convenience to the Android mobile platform in the shooting in 3D objects.

Keywords: ***QCAR, Augmented reality, 3D, ATM***

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LIST OF ABBREVIATION

AR	Augmented reality
ATM	Automated teller machine
VR	Virtual reality
OTP	One time passcode
UI	User interface
HW	Hardware
MAR	Mobile Augmented Reality
SDK	Software Development Kit
SLAM	Simultaneous Localization and Mapping
MCU	Microcontroller unit

CHAPTER 1

INTRODUCTION

In the development of the emerging smartphone technology today makes various changes to the delivery of information in society. Submission of this information could not be separated from marketing by some companies in order to increase sales volume which is usually done by exhibitions, advertising, and demonstrations.

Research has found that COVID-19 virus can transmit through public objects used by many people in similar fashion during the course of a day such as ATM keypad, Gas station keypad, self-checkout at grocery stores. Sanitizing keypad after every use is simply not feasible. So, we need a technology which can help us operate the keypad without physically touching it. At the same time, we need to consider cost of new system or enhancement.

Using Augmented Reality, we can impose virtual keypad on digital image at real time. There is no need for any additional hardware or camera to be installed. Mobile app powered by augmented reality.

1.1 ARATM FEATURES

ARATM machine which is simple, efficient and cost effective. Using this machine can user can withdraw money from atm using touching the keypad. The operation of the withdrawal is done using augmented reality. User doesn’t need to touch the keypad where keypad is made into virtual mode.

1.1.1 AUGMENTED REALITY FEATURES

Augmented Reality (AR) is a new technology which seamlessly integrates real world information and virtual world information. It includes multimedia, three-dimension modeling, real-time video display and control, multi-sensor fusion, Realtime tracking and registration, scenes fusion etc. AR has three distinguish features:

- It combines real and virtual
- It is interactive in real time

- It is registered in three dimensions.

With this feature of fuse the real scenario and virtual object, user may enhance understanding of reality, thus interacts between real world and virtual world. In recent years, with the development of mobile computing and popularization of mobile devices, Mobile Augmented Reality (MAR) has already become an important research direction of AR technology.

1.1.1.1 3D OBJECT TRACKING

3D object tracking allows developers to create apps in which three-dimensional objects can be used as AR markers. An augmented reality SDK without this feature would place significant limits on what types of experiences development teams could offer their users.

1.1.1.2 SMART GLASSES SUPPORT

Most augmented reality apps are designed for mobile devices. Users view the “new” reality of the app through the screen of their phone or tablet. This doesn’t allow for a truly immersive experience because users can still see the actual real world any time they look away from the screen.

1.1.1.3 SLAM SUPPORT

SLAM, or Simultaneous Localization and Mapping, allows an app to map out a space while also tracking its own movements. Ideally, the app would identify where exactly an object is in a given space, so the AR image could remain superimposed over it.

1.1.1.4 GEOLOCATION

Pokémon Go clearly illustrated why geolocation is a necessary feature for an AR SDK. Any development teams working on location-based apps need this feature in order to insert different virtual reality images into the user’s view of the world depending on their current location.

1.1.1.5 CLOUD-STORAGE

If a developer wants to release an app that recognizes numerous 2D markers, they need an AR SDK that offers cloud storage. Without it, the number of markers the app can recognize is

limited. An SDK for augmented reality that offers cloud-based storage will swiftly save markers to the cloud, giving developers the power to create apps that provide users with a wider variety of experiences.

1.2 USAGE OF ARATM

Augmented reality is now used in medical training. Its applications range from MRI applications to performing highly delicate surgery. At the Cleveland Clinic at Case Western Reserve University, for example, students are taught the ins and outs of anatomy using AR headsets or augmented reality glasses.

An automated teller machine (ATM) is an electronic banking outlet that allows customers to complete basic transactions without the aid of a branch representative or teller. Anyone with a credit card or debit card can access cash at most ATMs.

1.3 VUFORIA SDK

Vuforia is software development equipment for mobile devices by Qualcomm to create AR applications. Developers can easily add advanced computer vision functionality to any application that allows them to recognize images and objects or reconfigure real-world environments. Vuforia SDK supports types of 2D and 3D objects including multiple target configurations, images with some symbols and frame tags.

1.4 UNITY 3D GAME ENGINE PLATFORM

Unity 3D game engine is a cross-platform developed by Unity Technologies for creating video games and simulations for computers, consoles, and mobile devices. Games with Unity 3D engine can be operated via a web browser without any installation process thanks to the Unity Web Player plug-in. Another convenience Unity offers to the game makers is that a game developed with Unity can be compiled in accordance with different platforms (PC, Mac, Web, IOS, Android, and Windows Phone).

1.5 EMBEDDED SYSTEM

Embedded system does a very specific task, they cannot be programmed to do things. Embedded systems have very limited resources, particularly the memory. Generally, they do

not have secondary storage devices such as CDROM or floppy disk. Embedded systems have to work against some deadlines. A specific job has to be completed within a specific time. In some embedded system, called real time systems, the deadlines are string end. Missing deadlines may cause a catastrophe –loss of life or damage to the property. Embedded system are constrained for power. As many embedded systems operate through a battery, the power consumption has to be very low. Some embedded systems have to operate in extreme environment such as very high temperature and humidity. Embedded systems that address the consumer market is very cost sensitive. Unlike desktop computers in which the hardware platform is dominated by intel and the operating system is dominated by microsoft, there is a wide variety of processor and the operating systems for embedded system. So, choosing the right platform is the complex task.

1.6 NODE MCU

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 kits. Both the firmware and prototyping board designs are source. The firmware uses the Lau 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.

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 was 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).

1.7 SERVO MOTOR

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated

module designed specifically for use with servomotors.

Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system.

Servomotors are used in applications such as robotics, CNC machinery or automated manufacturing.

1.8 ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

User can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing. Over the years Arduino has been the brain of thousands of projects, from everyday objects to complex scientific instruments.

A worldwide community of makers - students, hobbyists, artists, programmers, and professionals - has gathered around this open-source platform, their contributions have added up to an incredible amount of accessible knowledge that can be of great help to novices and experts alike.

1.9 RFID

The term RFID stands for Radio Frequency Identification, as the name defines the operation of the device is based on the Radio frequency signals. The RFID systems consists of RFID Reader and a tag which is normally used in identification and tracking of objects. Before discussing more about the RFID, let’s see the uniqueness of this technology and its general application. Today in most cases barcodes are used for identifying an item in a warehouse or a supermarket using a barcode scanner, this existing system can be upgraded with the RFID technology. Similar to barcode the RFID can also give unique identification

number to all products but the added advantage is unlike the barcode system's line of sight, this system can detect the RFID tag within its proximity range.

Meaning you do not need a human to search for the barcode and point the barcode scanner on it. With this feature most of the system can be automated and human intervention can be minimized because the tag can be scanned and billed automatically when it reaches the RFID reader. RFID door locks and RFID attendance system are very popular now days and many hotels provide RFID tag to their customer to lock and unlock the door.

1.10 KEYPAD

A keypad is a set of buttons or keys arranged on a pad that bear digits, symbols, or alphabetical letters, which can be used as an efficient input device. A keypad may be purely numeric that is found on most computer keyboards, allowing an individual to easily enter numeric values into a computer.

It is mainly used for people who have to perform calculations or deals with numbers frequently with a software calculator. Numeric keypads are found on the devices that require mainly numeric input such as vending machines, Point of Sale devices, calculators, digital door locks, push-button telephones, and combination locks. A row of number keys is located on the upper side of a computer keyboard, including a separate numerical pad on the right side used for efficient data entry.

CHAPTER 2
LITERATURE SURVEY

The various studies carried out using existing techniques that have been applied in the field of augmented reality. An extensive survey, which includes current trends in augmented reality systems and related work on the automatic teller machine is presented. The review then focuses in detail on augmented reality and its applications. This chapter also reviews the current trends in touchless transaction for the user in gas stations, banks and grocery shops etc. Then a survey on the elimination of sanitizers for users in banks and its applications in virtual reality is also provided.

2.1 AUGMENTED REALITY USING VUFORIA FOR MARKETING RESIDENCE

In the development of the emerging smartphone technology today makes various changes to the delivery of information in society. Submission of this information could not be separated from marketing by some companies in order to increase sales volume which is usually done by exhibitions, advertising, and demonstrations. Augmented reality is one technique that can be used to improve marketing [1]. Augmented reality as a real-world view that has been augmented with elements coupled with computer-generated imagery in real-time [2]. Comparison between augmented reality with virtual reality is augmented reality is the opposite of virtual reality. If the virtual reality allows interaction between the user by using the simulation of the environment generated by computer (computer simulated environment), then augmented reality combines virtual object and the real object and then project it in real-time [10]. In this case augmented reality simply need a tool like a camera that can capture images of the surroundings to produce a 3D object that is used as a promotional tool to improve marketing residence. So that prospective buyers get the information more interactive with real look 3D objects. This study uses a software named Vuforia (QCAR) to build the augmented reality applications. Vuforia provides convenience to the Android operating system in a shooting in 3D objects. This study was made to produce an application by applying Augmented Reality on the Android platform that is intended for marketing promotions of residence. With the application of the AR user can more easily obtain information about the home in the form

of 3D models by aiming the camera at the relevant brochure. So that prospective buyers do not need to come to the location of the house to see a model home that you want to view.

2.2 IMPLEMENTATION OF MOBILE AUGMENTED REALITY BASED ON VUFORIA AND RAWAJALI

Augmented Reality(AR) is a new technology which seamlessly integrates real world information and virtual world information. It includes multimedia, three-dimension modeling, real-time video display and control, multi-sensor fusion, realtime tracking and registration, scenes fusion etc. AR has three distinguish features: It combines real and virtual; It is interactive in real time; It is registered in three dimensions. With this feature of fuse the real scenario and virtual object, user may enhance understanding of reality, thus interacts between real world and virtual world. AR technology can be widely[10] applied to various fields such as military, healthcare, architecture, education, engineer, film and entertainment. Early AR system adopted desktop computer, workstation or mainframe as the system operation platform, which strongly limited its motion-range thus it cannot be used in outdoor settings. In recent years, with the development of mobile computing and popularization of mobile devices, Mobile Augmented Reality (MAR) has already become an important research direction of AR technology. This paper implements Mobile Augmented Reality based on Vuforia and Rawajali. By Vuforia platform, it tracks and registers the objects of the real world and matches them with the objects of the virtual world, then controls the 3D model through Rawajali.

2.3 AUGMENTED REALITY AND MACHINE LEARNING BASED PRODUCT IDENTIFICATION IN RETAIL USING VUFORIA AND MOBILENETS

Augmented Reality and Machine Learning have a strong foothold in the retail industry as retail in the modern world can be integrated with the features of object detection and AR to provide a better overall experience to the customer.[11] Today's customers are inclined towards using more sophisticated retail services but in the modern era, the retail industry faces a number of challenges such as controlling labor costs, optimizing the time-intensive process of waiting in queues at supermarkets to purchase products, helping customers purchase various products while maintaining their specified available budgets and overcoming challenges

pertaining to language while providing instructions on how to use the product. This research work aims at conquering these challenges by combining the retail services with the real-world interaction of Marker-less Augmented Reality and ML-based object detection. This provides users with combined functionalities of accurate real-time product identification, one-click addition of products to customer's shopping carts and display of nutritional contents, video advertisements (highlighting steps to use the product) and product characteristics of different products, thus, eliminating the need of hiring salesmen and also speeding the customer's purchase process by getting rid of the tedious task of standing in long queues at supermarkets. The proposed work also allows the customers to purchase various products while maintaining their specified available budgets, thus, improving the overall customer experience. Object detection is a common problem of Computer Vision which approaches to identification and location of certain desired classes in the image. However, Augmented Reality provides immersive experiences by coupling a real-world view with computer generated imagery in real-time. In addition to the features of object detection and identification, AR allows superimposition of virtual entities on a real-world view, as opposed to Python-based object identification which does not provide such a functionality. With the help of Augmented Reality, user interface (UI) of the application as well as the overall experience of using the application are improved a lot. A number of studies have shown that AR can help in a better understanding of reading materials, providing an optimized task performance and an improved training outcome. AR based on Vuforia SDK includes: Improved speed of local target recognition, use of technology that can recognize millions of targets, highly-robust target tracking that is not easily affected by mobile devices and recognition of low-light and partly covered targets.

2.4 AUGMENTED REALITY APPLICATION FOR PRESCHOOL CHILDREN WITH UNITY 3D PLATFORM

Augmented Reality is a real-time and interactive technology created by combining perceived physical elements in the world around us with computer-based graphics, video, audio, GPS data, etc[12]. Thanks to the hardware and software used in Augmented Reality applications, it is enriched by adding virtual data on the real world we sense. Unlike Virtual

Reality, Augmented Reality does not include a computer-generated virtual simulation that will render the user away from reality, but it enriches the existing reality instead of this Many benefit of AR applications can be given as examples, such as transferring information to real environment, concretizing abstract information, increasing psychomotor skills, attracting students. AR technology has been applied to a wide range of areas: tourism, entertainments, marketing, surgery, logistics, manufacturing, maintenance, and others. AR, which offers an imaginative experience by combining virtual and real environments, varies according to the goals for which it was developed. There are three different types of AR according to the area and platforms where this technology is used. These are marker-based AR, marker less AR, projection-based AR and localization-based AR. In marker-based AR, by using predefined visual markers embedded within the system, physical world objects are detected for superimposition of virtual elements. Marker less AR includes a combination of dedicated sensors, camera systems, and complex mathematics to detect correctly and map the real-world environment, such as the walls' locations and intersection points. With an area's map, an AR-enabled application makes it possible to place virtual objects into a real context and have them stay in the space without any QR codes or images. Projection-based AR consists of a physical three-dimensional model on which a computer image is projected to create a realistic looking object. Location-based AR is based on GPS, accelerometer, digital compass and other technologies to identify user's location and position with a high level of accuracy. In this study, an augmented reality-based education application was developed using Unity 3D Platform and Vuforia SDK for preschool children. In the application developed for Android phones, when users display the card of one of the different animal pictures defined in the Vuforia database in the phone camera, they see the 3D character defined for that photo and hear the character's voice.

2.5 A MOBILE AUGMENTED REALITY SYSTEM FOR EXHIBITION HALL BASED ON VUFORIA

With the development of computer technologies and mobile internet technologies, the smart exhibition hall has become a necessity for the development of modern exhibition hall. The smart exhibition hall utilizes cutting-edge computer technologies, internet technologies

and mobile terminals to give an intelligent display of the traditional exhibition hall through internet technologies, realizes the smart management and smart visits on the exhibition hall and thus improves the scientific and technological experience of the exhibition hall.[13] Since the advent of Augmented Reality (AR), many domestic and oversea scientific and research institutions including universities, experiments and research institutions have paid attention to and made researches on AR. Over the recent years, with the successive introduction of mobile smart terminals like iOS and Android and the rapid development of mobile internet technologies, the AR technologies, though limited to experiments, have gone public. A great number of mobile internet AR applications based on the terminal positioning and image recognition technology start to appear and they are called the MAR application. The article to makes researches on the exhibition hall system using MAR technologies based on Vuforia. The system uses sensor devices including the high-quality camera of the smart phone, takes the display board of the exhibition hall as the AR recognition target, adopts technologies including the tracking register and highly-efficient rendering and thus realizes the MAR application targeted at the exhibition hall.

2.6 TOUCHLESS INTERACTION FOR FUTURE MOBILE APPLICATIONS

As mobile devices are increasingly becoming the means of accessing the internet and the number of mobile phones nearly exceeds the world population, while the number of devices already exceeds the population size in most developed countries, the demand for new applications and new ways of interacting with them grows rapidly.[14] Most of the smartphones available on the market are equipped with standard color cameras. However, devices with a ’real’ 3D sensor are just beginning to enter the market with primary focus put on tablet PCs with smart phones following, as questions like power consumption and heat development being the main issues of concern. Mobile devices have established multi-touch interfaces as defector standard for interaction as gestures provide a natural and intuitive means of control. Nevertheless, two-dimensional interaction faces certain restrictions, e.g., when trying to control objects in a virtual three-dimensional space. In such situations, space is limited on a device hence the interface has to be adapted accordingly. Three-dimensional gestures provide a solution by bringing along the third dimension for interaction while being more ’natural’ as

a means of control because manipulation of objects becomes more direct in the sense that cumbersome 2D-mapping can be omitted. We present a real-time 3D-gesture recognition system for mobile devices and demonstrate how it can be incorporated into various Human-Machine Interaction (HMI) scenarios. Due to lack of availability, we outsource the only step of data recognition via time-of-flight (ToF) technology onto a Laptop and implement the whole gesture recognition pipeline on a mobile device. We achieve recognition results of up to 90% on a 10-gesture set with a frequency of up to 20Hz. As the sensor technology is robust vs. any kind of lighting interferences, our system, being small in dimension, is applicable to possibly any kind of scenario. The rest of the paper is set up as follows: We provide an overview of the relevant contributions to this topic in Section II. We go on to describe our hand gesture recognition pipeline along with the established database in Section III. The algorithms at the core of our system are responsible for creating descriptive features which is outlined in Section IV. These features serve as in out for our Neural Network module which is responsible for the hand gesture recognition part described in Section V. The process of detecting static and dynamic gestures is presented in Section VI. We corroborate the functionality of our system with a series of experiments by demonstrating that stable, satisfactory results are achievable in real-time in Section VII. Finally, in Section VIII, we conclude with a brief discussion and an outlook on future work.

2.7 AUGMENTED REALITY BASED SMART SUPERMARKET SYSTEM WITH INDOOR NAVIGATION USING BEACON TECHNOLOGY (EASY SHOPPING ANDROID MOBILE APP)

This research targets on enhancing the customer satisfaction with the use of innovative technologies towards the grocery supermarket chain in Sri Lanka. The retail industry drives a larger proportion of the Sri Lankan economy and therefore plays an important role in building up the gross domestic income of the country. The supermarket chains in Sri Lanka have come up as a major segment within the retailing industry and the industry is showing signs of continued robust growth. A supermarket can be simply described as “a large self-service retail market that sells food and household goods”.[15] In the modern world people has a very tight schedule in their day-to-day life, hence they seek very quick and easy ways in order to fulfill

their shopping requirements. Since supermarket industry is a customer centric industry customer satisfaction is one of the most important as well as the most crucial factor which determines the profitability and competitiveness over supermarkets. This study is concerned with identifying prevailing problems faced by customers when they deal with supermarket industry as relates to Sri Lankan Supermarkets with a view of exploring how supermarket dealers can minimize these problems to achieve competitive advantage through customer satisfaction using the innovative technologies. The use of innovative technologies towards digitization to accelerate customer satisfaction and in return supermarket dealers can obtain competitive advantage. It is well known that supermarket dealers invest heavily on IT driven services. Supermarkets aims to attract more and more customers by introducing innovative functionalities to the supermarket chains of Sri Lanka. Among those services this research has studied about most essential and common problems faced by customers who have not been addressed by any of those modern applications. The traditional supermarket occupies a large amount of floor space, usually on a single level. It is usually situated near a residential area in order to be convenient to consumers. The basic appeal is the availability of a broad selection of goods under a single roof, at relatively low prices. As the ultimate outcome of this research, we propose to develop a mobile application which gives a solution to all aforementioned issues found by customers and improve the service quality of online shopping. This article describes the design and concept of Easy Mart, an Android-based, fullycellular software that supports, indoor navigation through AR, personalized advertising and marketing and context-sensitive shopping assistance and remote shopping functionality which takes the form of augmented imaging using Augmented Reality (AR) technologies and the content of the help is built on the idea of dynamic contextualization.

2.8 OTP BASED CARDLESS TRANSACTION USING ATM

Luther Simijan, an American inventor and businessman first invented the automated banking machine called Bankograph in 1960 which could deposit check or cash at any time of a day. In 1967, an idea of more comfortable and self-servicing technology came from the mind of Scottish inventor John Shepherd-Barron when he was in the bathtub thinking that if vending machines could dispense chocolate bars why couldn’t they dispense cash? This idea was

implemented by Barclays London Bank. It used printed paper voucher with radioactive ink. Later Donald Wetzel, a Dallas engineer and former professional baseball player used plastic card instead printed paper. A branch of Chemical Bank implemented this machine in 1969. After that the usage and familiarity of ATM is growing.[16]In today's world there are around 2 million ATMs across the globe. Now, banks are providing debit/credit/prepaid cards to customers to avail banking services through ATM. Every card consists of 16-digit numbers in which first six digits unique number is Bank Identification Number (BIN) by which acquirer bank (the bank who accepts the card) recognizes the customer belongs to which bank. The next 9 digit is card number and last 1 digit is the check digit. BIN is fixed for each bank, 9 digits are generated randomly or in sequence based on the bank's policy. A payment network such as VISA, Master Card (MC), American Express (Amex) etc has been introduced to connect different banks in different countries. Now customer of one bank can withdraw cash from ATM of another bank using this network. Each network has different types of cards like VISA Gold debit/credit, Platinum debit/credit, MC Platinum debit/credit etc. Each of the cards has different facilities which are provided by banks based on their policy. These cards use a magnetic strip or chip which is more secure than magnetic stripe card. Magnetic stripe contains sensitive customer information which is called track data. The chip also stores customer information along with authentication information. A Personal Identification Number is used to authenticate a customer. This PIN is mandatory for ATM transaction and in some cases in PoS also. The transaction cannot occur without card and PIN. Manual banking is based on paper and time-consuming. A customer has to go to branch physically, do cash withdrawal using a check or ask the teller to inform him about his balance which is very much annoying sometimes. ATM is invented to remove this hassle as it is self-servicing, no teller is needed. Customers can use this machine 24/7 basis. They can access it whenever they want whatever the time of day is. Life becomes very easy with the advent of ATM. People can access their bank account through balance inquiry, withdraw cash, transfer fund etc using ATM. It makes all these transactions paperless. To avail these facilities, the bank provides a plastic card to customers. But the plastic card has some disadvantages. It can be lost, damaged, expired or skimmed. To overcome these disadvantages, we have proposed a new model for the cardless transaction which uses BPIN and OTP for secure authentication. The BPIN is used to identify issuer institution; customer type and category of facilities are enrolled for that customer.

2.9 SECURE AUTHENTICATION FOR ATM TRANSACTIONS USING NFC TECHNOLOGY

Automated Teller Machines (ATMs) play a vital role in providing the people easy access to cash and carry out other banking activities. Thus, it is of paramount importance to safeguard users and provide them convenience while transacting using ATM. Physical ATM cards along with Personal Identification Number (PIN) are in widespread use all around the globe to authenticate at ATM kiosks.[17] However, there are some issues on the use of physical cards during ATM transactions. First, ATM skimming resulting to theft of card information and subsequently card cloning (even for chip-based cards) has become a burning issue nowadays. Second the magnetic strip/chip used in the cards get damaged and become non-functional due to repeated usage. Third, manufacturing large number of cards and transporting them to the end users involve considerable cost. Fourth, physical cards require relatively longer time to authenticate users leading to long queue at the ATM kiosks. Near-Field Communication (NFC) is a method that enables two electronic devices (or a device and a NFC Tag) to establish communication, by bringing them close to each other. NFC has advantages over Bluetooth, Radio Frequency Identification (RFID) and other communication technologies to carry out secure transactions. One of the advantages is that NFC tag doesn't need a power source – it is passive and is simply read or written to by the powered terminal. A Bluetooth tag requires power to broadcast its signal. Radio Frequency (RF) from another Bluetooth device is by far not enough to power a Bluetooth radio chip. Another advantage of using NFC is that for NFC technology to work, the distance between the respective devices needs to be very small (less than 4 cm). In case of Bluetooth, the data theft may occur because of the long distance (even up to 100 meters) provision for the data transfer. This makes NFC ideal for making payments and for other transactions involving sensitive/private data. NFC is faster and easier to set up than Bluetooth connection. Unlike RFID which enables a one-way wireless communication typically between an unpowered RFID tag and a powered RFID reader, NFC is capable of two way communication and can therefore be used for more complex interactions such as card emulation and peer to-peer (P2P) sharing. Some of the research work proposes different types of financial applications based on NFC. One of the applications of NFC technology is in contactless payment operation. An NFC purchase transaction between an NFC smartphone (or an NFC bank card) and an NFC point of sale terminal is performed

instantaneously and within a short range of communication (around 10 centimeters) without any physical contact. proposed an application called Pocketed which includes services such as Balance Reader, Currency Check, ATM Info and others. Balance Reader visualizes the balance of a bank account; Currency Check displays the actual value of foreign banknotes in the home currency and ATM Info could check fees of NFC-tagged ATMs. The objective of our proposed work is to replace physical ATM cards by smart phones in NFC Card Emulation mode during an ATM transaction to counter the issues prevalent with the use of ATM cards. The combination of NFC with smart devices has led to widening the utilization range of NFC. In card-emulation mode, a NFC device behaves like a contactless smart card. In this mode, the mobile phone does not generate its own RF field; the NFC reader creates this field instead. At the ATM kiosk, in order to authenticate, the user needs to swipe his/her mobile phone in front of the NFC reader. During an ATM transaction, an ATM card is not required and the system will still have a stronger security compared to the system in which ATM card was used. Through data encryption and secure channels, NFC technology keeps the customer information safe. Security analysis and threat modelling shown in this paper highlights the security strength of the system during authentication.

2.10 DEVELOPMENT OF INTERACTIVE MOBILE APPLICATION WITH AUGMENTED REALITY FOR TOURISM SITES IN BATAM

In some countries, tourism has become one of the fastest growing economic sectors. Tourism is important for a country.[18] Tourism affects the society, economy, and environment of the surrounding area. Indonesia has various tourism locations that spread in over 17,508 islands. Table 1 shows data published by The Ministry of Tourism and Creative Economy of Indonesia. In 2019, 16,106,954 foreign tourists visited Indonesia. That is an increase of 296,649 from the previous year. Three locations have the arrival numbers that reach above one million, and one of them is Batam. Batam is in the Riau Islands Province, Indonesia. Batam has become one of the tourist destinations in Indonesia. According to the report in Table 1, 1,947,943 foreign tourists visited Batam in 2019. The Government of Batam City has made several efforts to promote tourism in Batam. The promotion uses such as brochures, videos, or other types of digital advertisements. The Government of Batam City uses these

strategies are with the hope of attracting more tourists in visiting Batam. The COVID-19 pandemic brings a significant impact on the world. Governments in each country enforce their citizens to implement social distancing and lockdowns. Social distancing is needed to reduce the transmission of COVID-19 from one person to the other. The need for social distancing and lockdowns creates an impact on the economy because several services enforce to stop their activities.

The COVID19 has given a significant impact on several industries, such as automotive, aviation, healthcare, and tourism industry. COVID-19 has affected the tourism industry across the world. As declared by the World Tourism Organization (UNWTO), the rapid spreading of COVID-19 shuts down the tourism sector, as a result of the reduction in travel demand and supply. Some countries whose tourism industry is affected by COVID-19 are China, Vietnam, Thailand, Singapore, Cambodia, South Korea, Hong Kong, Malaysia, Japan, Australia, and Indonesia. Based on the data taken Coronavirus Disease Response Acceleration Task Force, as of 11 May 2020, there are 14,265 confirmed cases of COVID-19. The Indonesian government has ordered suspend all activities that relate to tourism or the creative economy in the meantime. The goal is to minimize the transmission of COVID-19. This causes a temporary shutdown in the tourism industry. Ministry of Finance of the Republic of Indonesia estimated that there would be a decline in terms of commodity export, tourism, and inflation, which reaches 2,9 percent of the Gross Domestic Product (GDP) this year.

PAPERS	DISADVANTAGES	PROPOSED METHODLOGY
I. LITERATURE SURVEY	Not real time data is received	Real time interaction with machine.
II. LITERATURE SURVEY	Implementation of NFC card/tags are not feasible	NFC cards are replaced by mobile app.
III. LITERATURE SURVEY	Limited to study and research	Vuforia engine is implemented in this project for best user interface/experience
IV. LITERATURE SURVEY	Usage of QR code is not reliable because the implementation on all sub atm machine cost more memory	Augmented reality is used as alternative way for transaction. No need of any code or hardware.
V. LITERATURE SURVEY	Use of hardware component to send and receive OTP as test message	Hardware component is eliminated by fire base database by Google.

Table 1.1: Literature survey

CHAPTER 3
PROPOSED METHOD & RESULTS AND DISCUSSIONS

3.1 PROPOSED TECHNIQUE

Augmented Reality is considered as a media that gives attraction and new experience for the users. Based on the previous research, it is stated that the use of Augmented Reality in banking brings a virtual experience for the users on transaction medium. A mobile application that uses Augmented Reality for banking may be considered as one of the methods to promote AR, because of the interactivity and virtual experience that the user can dispatch money from atm without touching the keypad.

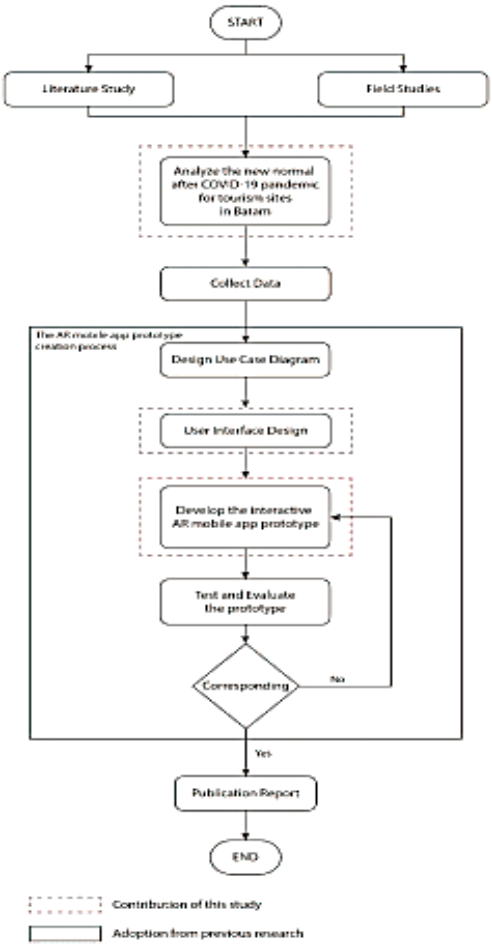

Figure 3.1: Flowchart of the research method

After the COVID-19 pandemic, it is expected that there will be an increase in money withdrawal. After months of undergoing lockdown and staying or working at home, people want to send and receive money. This study researches utilizing Augmented Reality and

mobile applications for banking in India. The utilization of Augmented Reality might be used as a medium to promote ATM in this pandemic period in India.

3.1.1 ADVANTAGES OF PROPOSED SYSTEM

- It offers a prototype of an interactive mobile application that uses Augmented Reality. The app is an approach of new normal in the banking sector in India after the COVID-19 pandemic.
- The design of the application is to ease users in finding information about ATM sites in India.
- The Augmented Reality provides interactive participation of visitors by scanning and displaying the objects from specific marker image.

3.1.2 BLOCK DIAGRAM

This is the block diagram of ARATM. This shows the overall view of ARATM circuit. The blocks connected here are LCD display, I2C module, Nodemcu, Arduino, RFID reader, Keypad, Servo motor, Power supply.

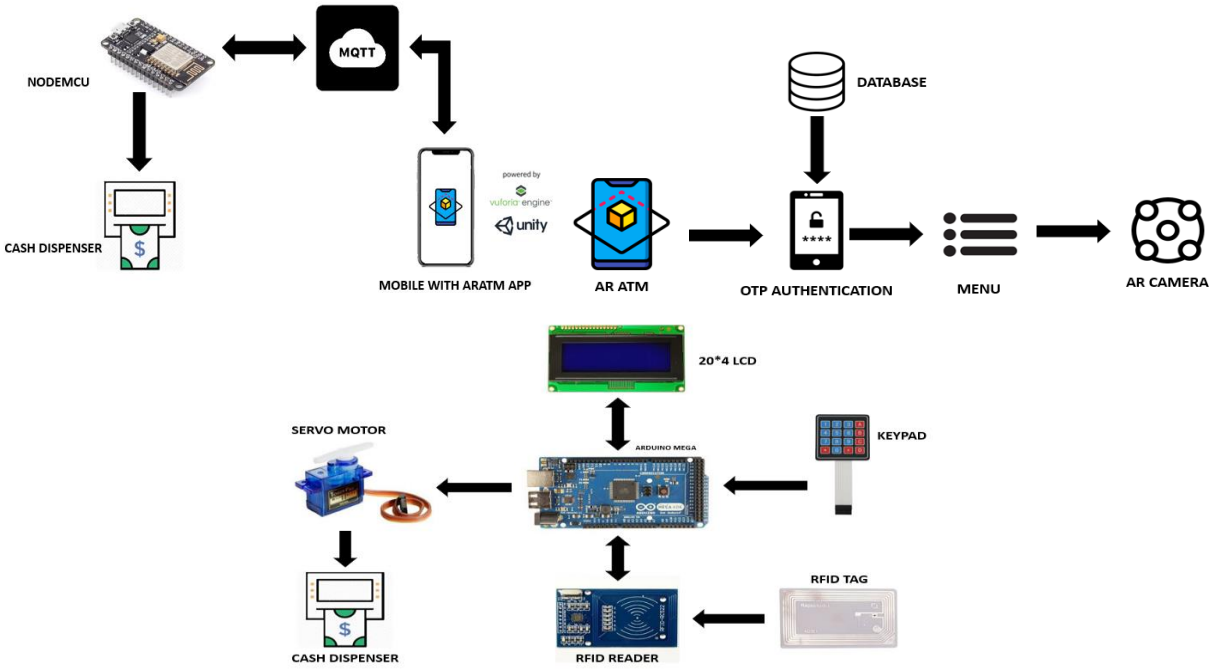

Figure 3.2: The overall block diagram

3.1.3 FLOW CHART:

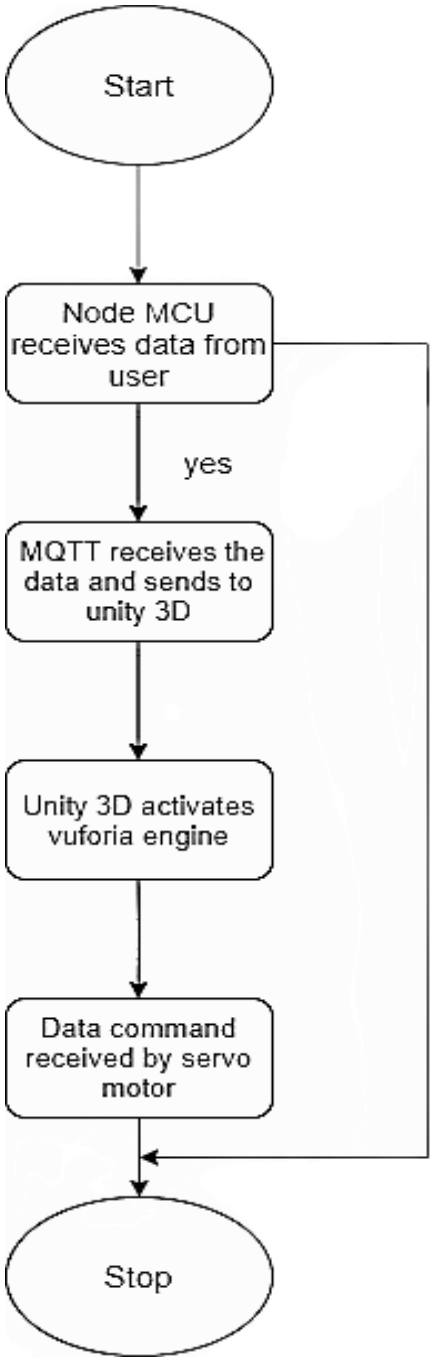

Figure 3.3: Nodemcu flowchart

The figure 3.3 shows the working of nodemcu. The nodemcu receives data from the user and sends to mqtt broker. Mqtt then sends the data to unity 3d where unity is combined with Vuforia engine for augmented reality. Once the data is send to the servo motor is turned on.

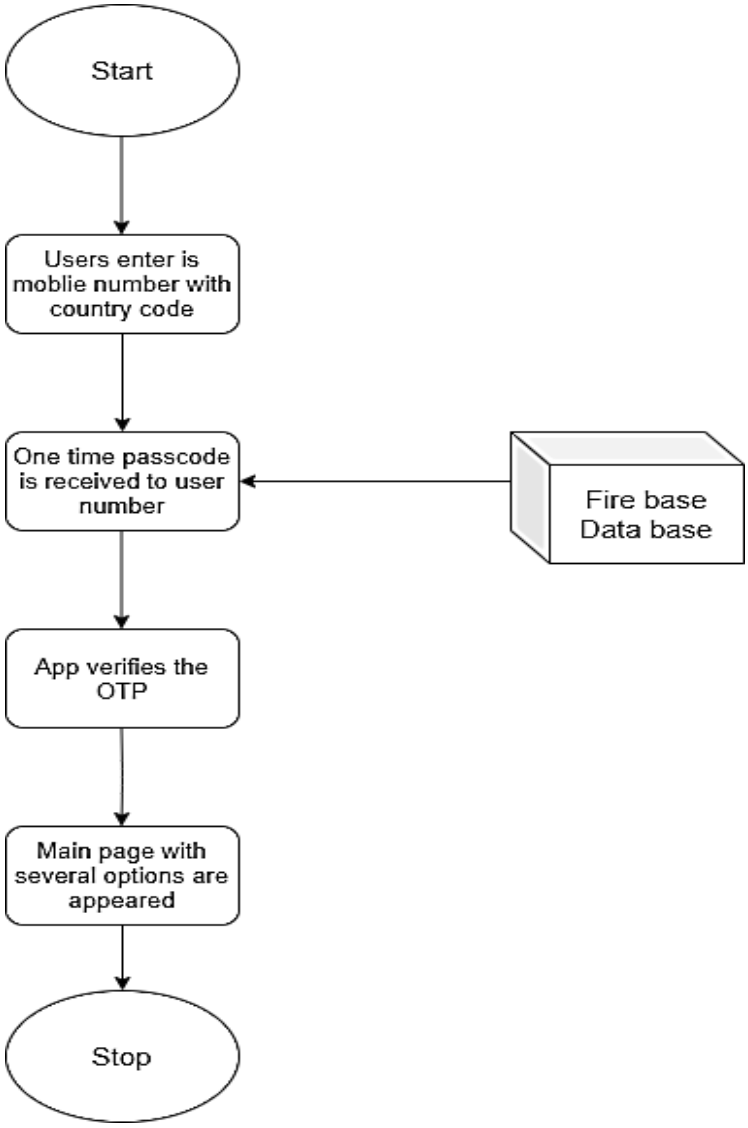

Figure 3.4: Application flowchart

The application starts when the user, enter mobile number with country code, after that an one tome passcode is received to user number, which is generated from the firebase database, after that app verifies the OTP, finally the main page will several options are appeared.

3.1.4 GRAPH:

The graph 3.5 shows the firebase, we have a graph for authentication, which allow the user to view information related to authentication with respective to countries and also, we can view the graph based on number of days

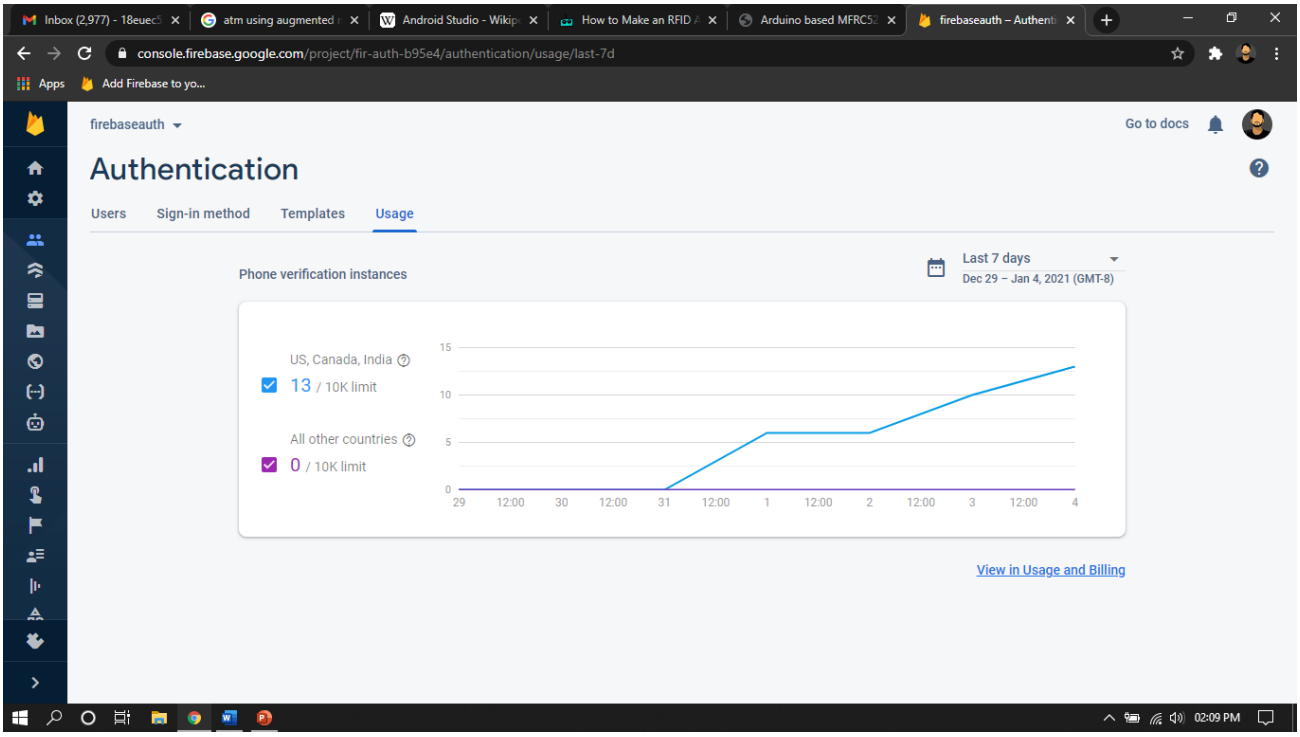

Figure 3.5: Otp recieving to firebase database

The graph 3.6 from firebase, we also have a graph for displaying the information of daily active users, Day 1 retention, we can also track from country our customer are user the app, which helps us to view and have an accurate data of total number of users accessing our application.

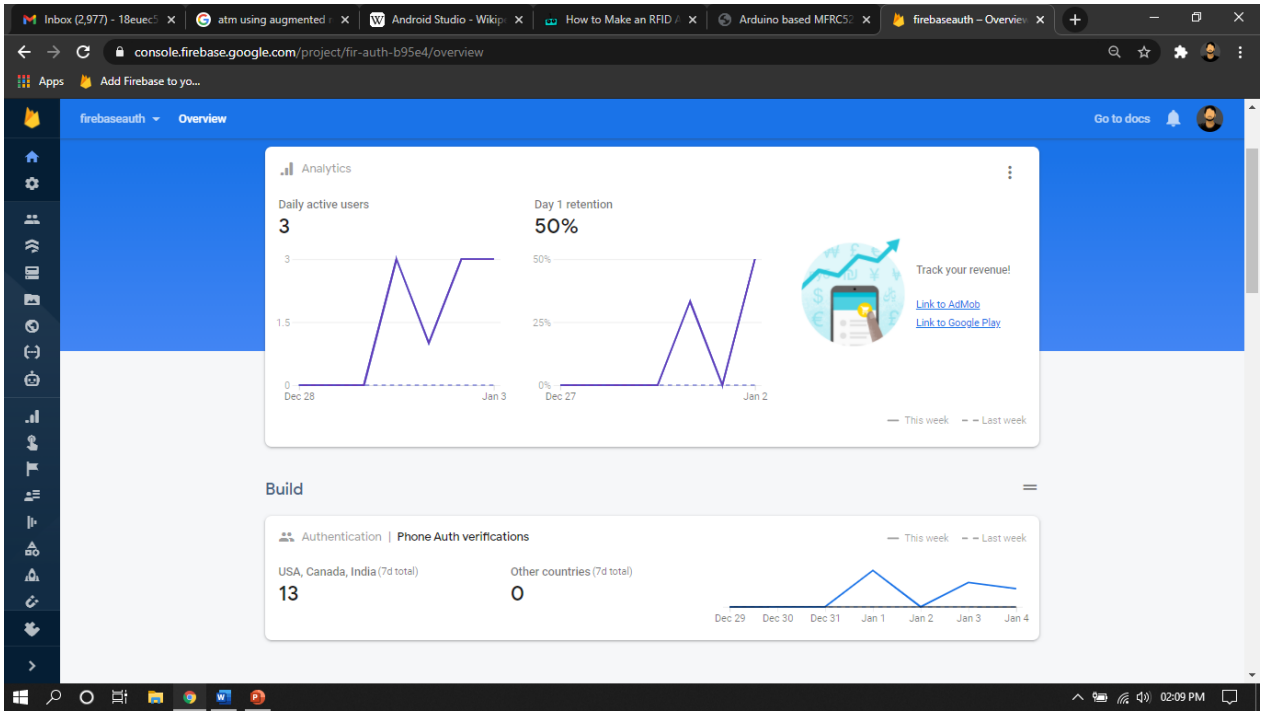

Figure 3.6: Total number of users accessing the application

3.1.5 CONCEPT AND OVERVIEW

There are many ways to implement an ARATM: The atm is implemented using augmented reality which is powered by unity 3d and Vuforia engine.

In this specific project, the instruction by user using touchless keypad which are designed by unity 3d.

In addition, we also decided to add the option for user to set the augmented reality camera from the application. The combination of MQTT and VUFORIA is used to integrated for a seamless connection between user and bank. After the instruction is received the firebase database verifies the OTP and gives access for the user to open AR camera.

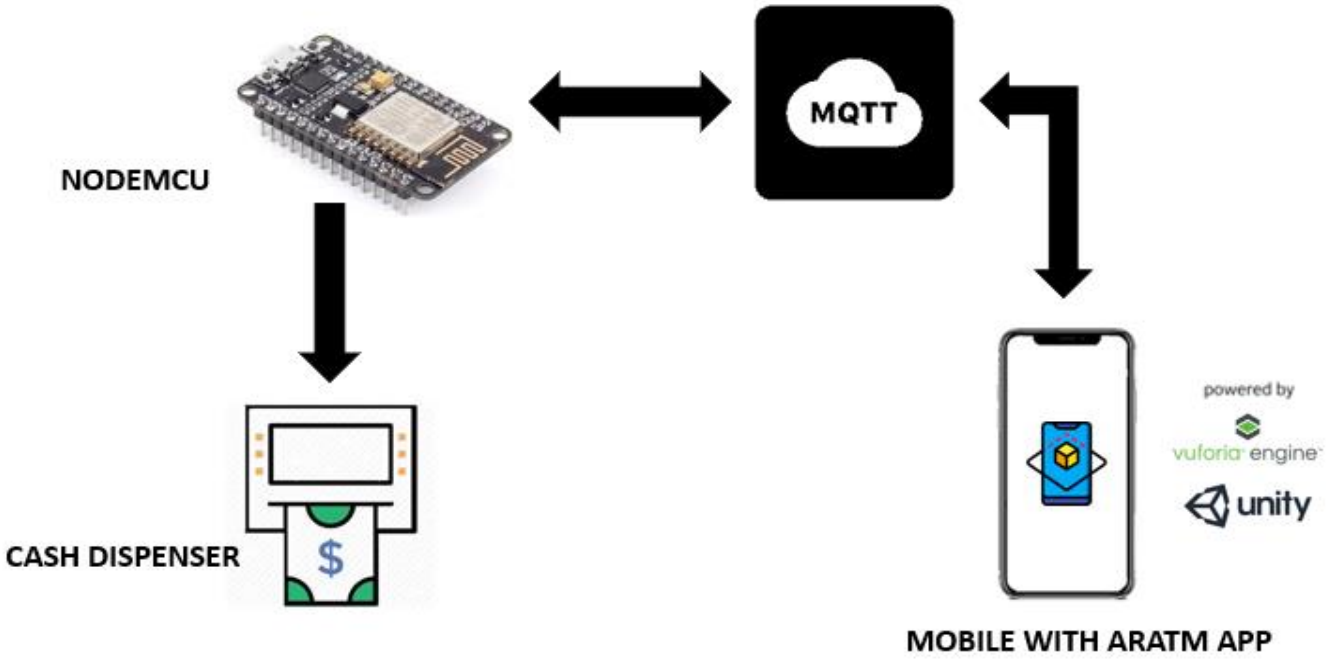

Figure 3.7 Overview of the system

3.1.6 MQTT INTEGRATION

MQTT stands for MQ Telemetry Transport. It is a publish/subscribe, extremely simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency or unreliable networks. The design principles are to minimize network bandwidth and device resource requirements whilst also attempting to ensure reliability and some degree of assurance of delivery. These principles also turn out to make the protocol ideal of the emerging

"machine-to-machine" (M2M) or "Internet of Things" world of connected devices, and for mobile applications where bandwidth and battery power are at a premium.

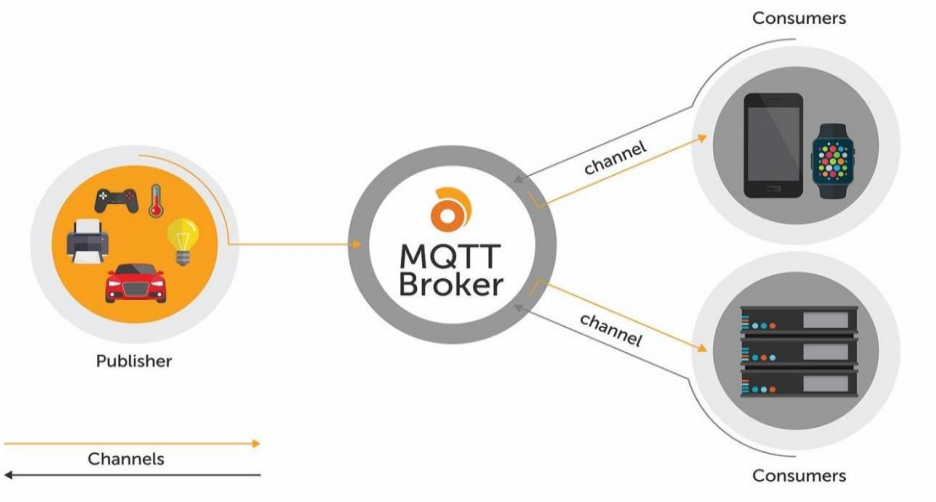

Figure 3.8 MQTT protocol

3.1.7 MOBILE AUGMENTED REALITY BASED ON VUFORIA

Vuforia is a free software development kit for implementation of Mobile Augmented Reality. It is launched by Qualcomm in 2010, and the latest version is 2.8. With support for iOS, Android, and Unity 3D, the Vuforia platform allows you to write a single native app that can reach the most users across the widest range of smartphones and tablets. Besides the basic function of Augmented Reality, Vuforia also provides various functions such as Text Recognition, Cloud Recognition, Multi-Targets, Frame Markers, Video Playback, Cylinder Recognition and Virtual Button Interactive etc. The overall architecture of Vuforia.

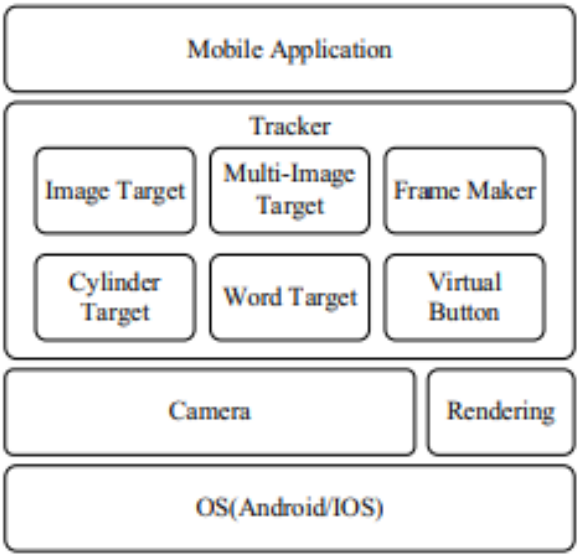

Figure 3.9 Vuforia architecture

There are two recognition methods in Vuforia SDK: image recognition and text recognition. In this paper, image recognition is used. Two methods of storing image database are provided: device database and cloud database. The main difference between them is that the former does not require network connection, time response is faster, is limited to 100 targets per downloaded device target database and has no metadata support whereas the later requires network connection and cloud recognition, time response is depends on network conditions, supports more target database (>1 million targets) and metadata. In this paper, device database is used. The process of development with Vuforia can be divided into four stages:

1) Create local image target database used for Augmented Reality.

2) Define the configuration of image target in XML files.

3) Load XML files and start image recognition in program.

4) Load 3D models and display it.

The Vuforia rendering context and render simple 3D content (e.g. static, textured models) using OpenGL ES 1.1 or 2.0. Vuforia does not provide support for loading standard model formats or rendering with animation. Third party solution can be used to simplify work in 3D modeling. ARATM is a 3D framework for Android built on top of the OpenGL ES 2.0 API. Its main purpose is to make things easy and to take away the hard work that's involved in OpenGL programming. The Framework enables the import and display of various types of 3D models that can be both static (stored in formats OBJ, 3DS, etc..) and animated (stored in formats FBX, MD2 or MD5), support object serialization and compression for optimization, provide material handling, light and fog handling and post processing effects handling. To implement MAR system, 3D objects need to be rendered accurately in the present scene. In order to reduce CPU and GPU consumes while processing 3D model files, ARATM provides a method for serialization to deal with 3D model file. This method consists three steps as follow:

1) Read obj files at first use.

2) Serialize object that is read, generate ser files.

3) Read relevant ser files when it is needed again.

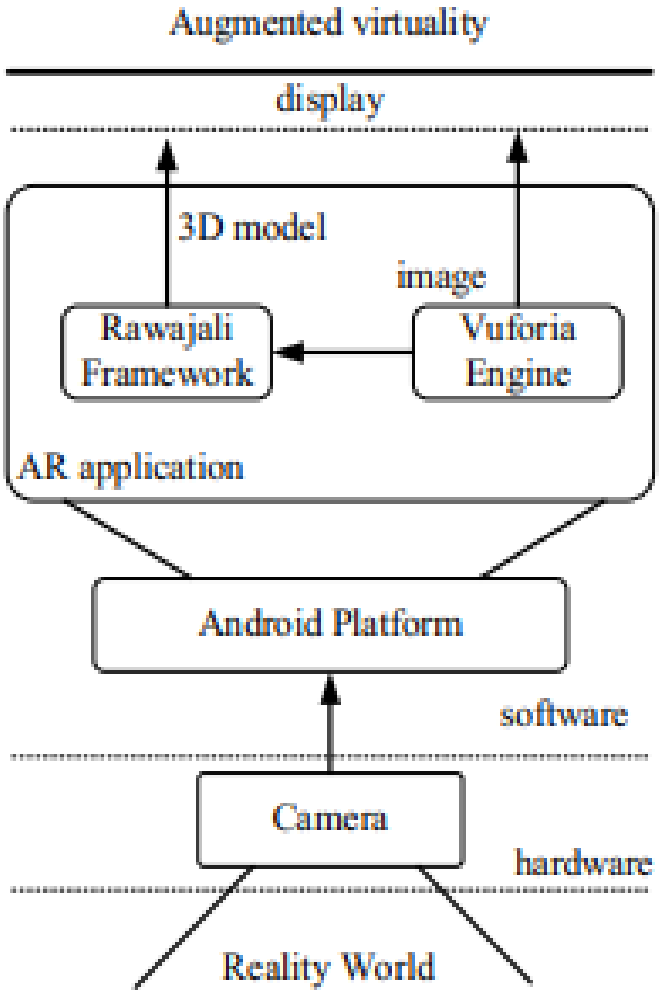

Figure 3.10 Application architecture on Android platform

Implementation of the Android platform On Android platform Augmented Reality mainly works on:

1) Make static 3D models by 3D software.

2) Choose suitable area in which collect images in target environment, generate target image on Vuforia platform, and then obtain target database files on Android platform.

3) Recognize the target in image database by Vuforia, realize the control of 3D model with the help of ARATM 3D framework.

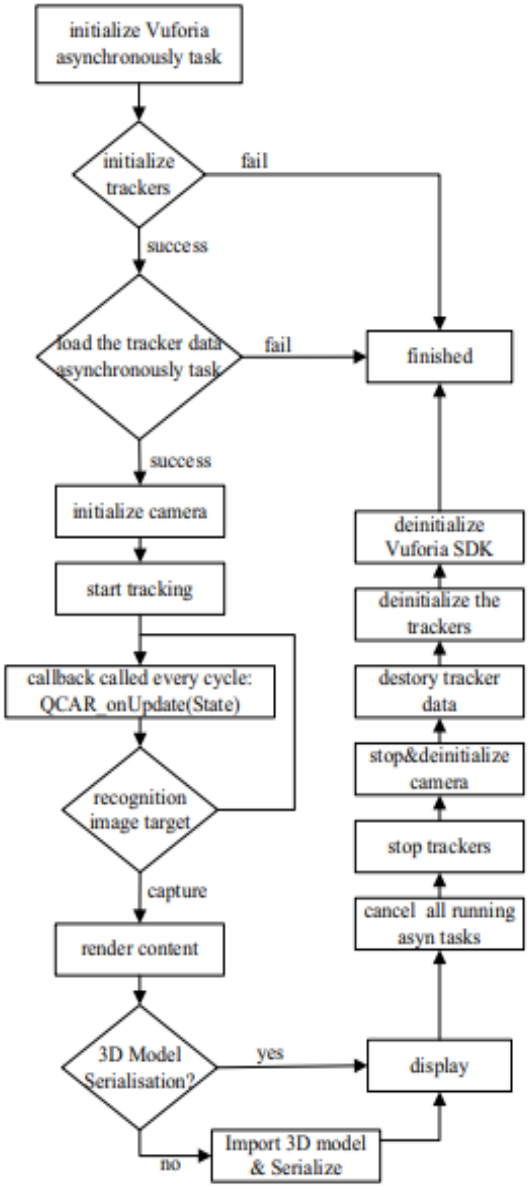

Figure 3.11 Application workflow

User turns on an app and points the camera at image object. Then the app captures target and recognizes it in the video area. If the recognized image matches with the image target database, specified 3D models will be uploaded and displayed on the screen.

3.2 HARDWARE DESCRIPTION

3.2.1 NODE MCU

3.2.1.1 FEATURES:

NodeMCU is an open source IoT platform. This includes firmware which runs on the ESP8266 Wi-Fi Module from Espressif Systems, and hardware which is based on the ESP- 12

module. The term “NodeMCU” by default refers to the firmware rather than the dev kits. NodeMCU firmware was developed so that AT commands can be replaced with Lua scripting making the life of developers easier. So, it would be redundant to use AT commands again in NodeMCU.

The ESP8266 is a low-cost Wi-Fi chip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif.

3.2.1.2 TECHNICAL SPECIFICATIONS

Developer: ESP8266 Open source
Community Type: Single-board
microcontroller Operating system: XTOS
CPU: ESP8266
Memory: 128kBytes
Storage: 4MBytes
Power By: USB
Power Voltage: 3v ,5v (used with 3.3v Regulator which inbuilt on-Board using Pin VIN)
Code: Arduino Cpp
IDE Used: Arduino IDE
GPIO: 10

3.2.1.3 POWER SUPPLY:

NodeMCU is an open source IoT platform including a firmware which runs on the ESP8266 with the Espressif Non-OS SDK, and hardware based on the ESP-12 module. The device features 4MB of flash memory, 80MHz of system clock, around 50k of usable RAM and an on-chip Wi-Fi Transceiver.

Power to the NodeMCU v2 is supplied via the on-board USB Micro B connector or directly via the “VIN” pin. The power source is selected automatically.The device can operate on an external supply of 6 to 20 volts. If using more than 12V, the voltage regulator may overheat and damage the device. The recommended range is 7 to 12 volts.

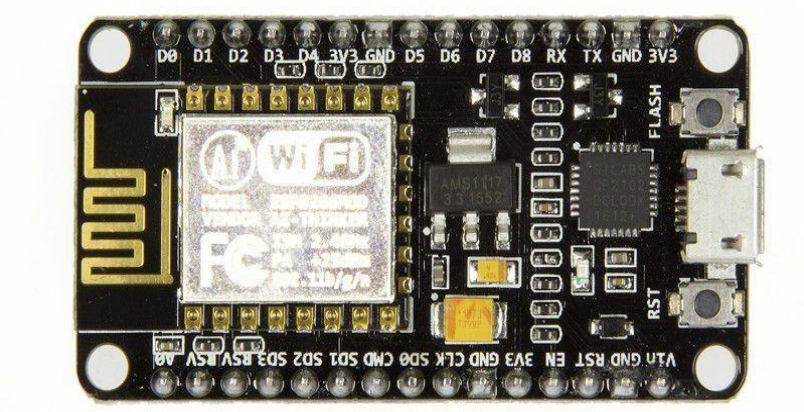

Figure 3.12: Overview of the NODEMCU

3.2.2 PIN DETAILS

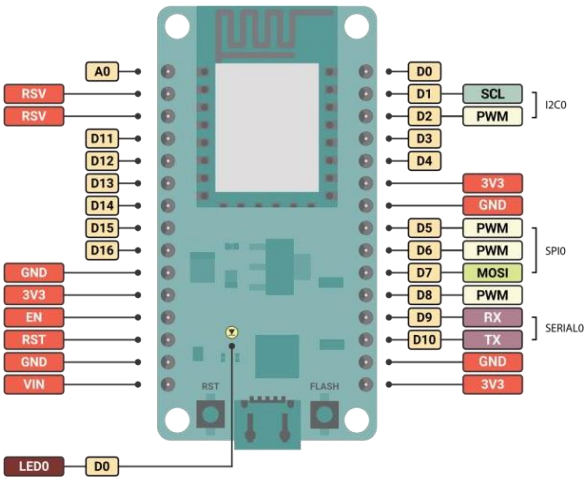

Figure 3.13: Clearer view of the NodeMCU

3.2.2.1 POWER PINS

VIN: The input voltage to the NodeMCU board when it's using an external power source (as opposed to be 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if

supplying voltage via the power jack, access it through this pin.

5V: The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.

3.3V: A 3.3-volt supply generated by the on-board regulator. Maximum current drawn is 50 mA.

GND: Ground pin

3.9.2.2 MEMORY

The ESP8266 has 32 KB of flash memory for storing code (of which 8 KB is used for the bootloader), 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library)

3.2.2.3 INPUT AND OUTPUT

Power Pins There are four power pins viz. one VIN pin & three 3.3V pins. The VIN pin can be used to directly supply the ESP8266 and its peripherals, if you have a regulated 5V voltage source. The 3.3V pins are the output of an on-board voltage regulator.
Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. Pins 0 and 1 are also connected to the corresponding pins of the Atmega8U2 USB-to-TTL Serial chip

- **External Interrupts: 2 (interrupt 0), 3 (interrupt 1), 18 (interrupt 5), 19 (interrupt 4), 20 (interrupt 3), and 21(interrupt 2).** These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- **PWM: 0 to 13.** Provide 8-bit PWM output with the analogWrite() function.
- **SPI: 50 (MISO), 51 (MOSI), 52 (SCK), 53 (SS).** These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language. The SPI pins are also broken out on the ICSP header, which is physically compatible with the Duemilanove and Diecimila.
- **LED: 13.** There is a built-in LED connected to digital pin 13. When the pin is in HIGH value, the LED is on, when the pin is LOW, it's off.
- **I2C: 20 (SDA) and 21 (SCL).** Support I2C (TWI) communication using the Wire library. Note that these pins are not in the same location as the I2C pins on the Duemilanove. The Mega328p has 6 analog inputs, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and analogReference () function.

There are a couple of other pins on the board:

- **Reset.** Bring this line LOW to reset the microcontroller.

3.2.3 COMMUNICATION

The NodeMCU has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The NodeMCU provides four hardware UARTs for TTL (5V) serial communication.

An NodeMCU on the board channels one of these over USB and provides a virtual com port to software on the computer (Windows machines will need a .inf file, but OSX and Linux machines will recognize the board as a COM port automatically). The NodeMCU software includes a serial monitor which allows simple textual data to be sent to and from the board. The RX and TX LEDs on the board will flash when data is being transmitted via the NodeMCU and USB connection to the computer (but not for serial communication on pins 0 and 1. A SoftwareSerial library allows for serial communication on any of the Mega's digital pins. The NodeMCU also supports I2C (TWI) and SPI communication.

3.2.4 PROGRAMMING

The NodeMCU can be programmed with the Arduino software The ESP8266 on the NodeMCU comes preburned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files). You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header.

3.2.5 AUTOMATIC (SOFTWARE) RESET

Software reset for ESP8266 is required when you get trouble to connect WiFi router. Let's see the use of software restart. This example program will show you software reset in a loop before it reaches to its max value.

ESP. reset() is a hard reset and can leave some of the registers in the old state which can lead to problems, its more or less like the reset button on the PC.

ESP. restart() tells the SDK to reboot, so it's a more clean reboot.

3.2.6 I2C MODULE

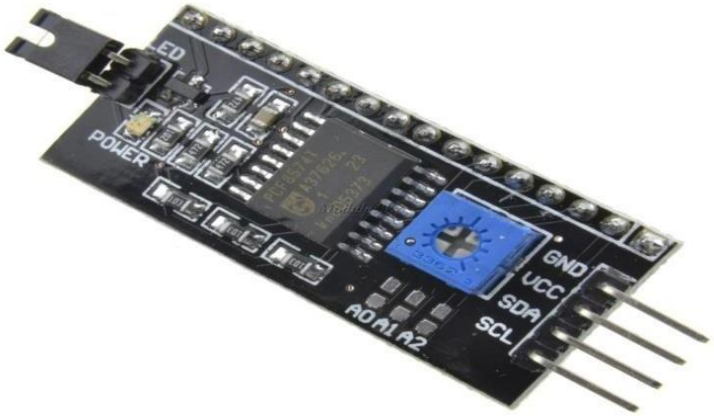

Figure 3.14 I2C module

I2C is a serial communication protocol, so data is transferred bit by bit along a single wire (the SDA line). Like SPI, I2C is synchronous, so the output of bits is

synchronized to the sampling of bits by a clock signal shared between the master and the slave. The clock signal is always controlled by the master.

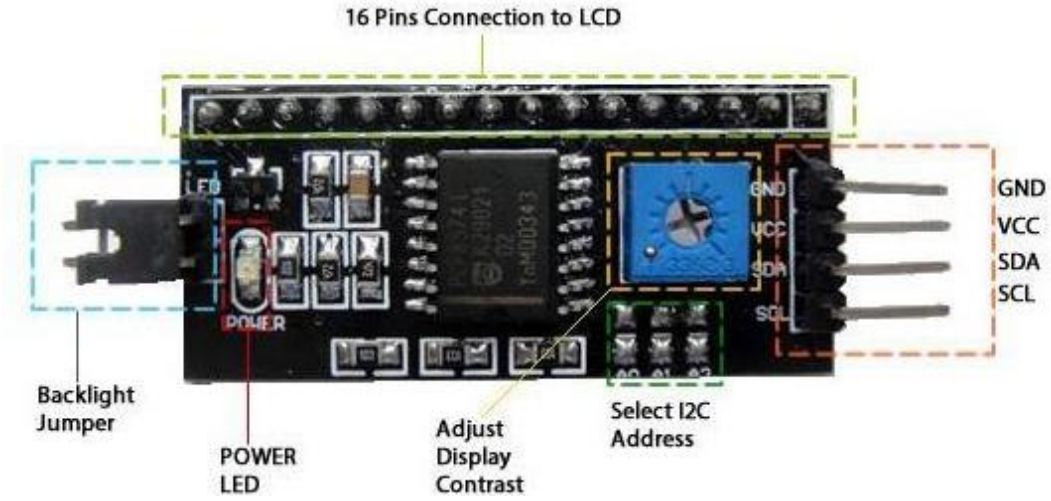

Figure 3.15 Pinout diagram for I2C module

Many slave devices are interfaced to the microcontroller with the help of the I2C bus through I2C level shifter IC for transferring the information between them. The I2C protocol used to connect a maximum of 128 devices that are all connected to communicate with the SCL and SDL lines of the master unit as well as the slave devices. It supports Multimaster communication, which means two masters are used to communicate the external devices.

3.2.7 LCD DISPLAY

The LCD works on the principle of blocking light. While constructing the LCD's, a reflected mirror is arranged at the back. An electrode plane is made of indium-tin oxide which is kept on top and a polarized glass with a polarizing film is also added on the bottom of the device.

An LCD is an electronic display module which uses liquid crystal to produce a visible image. The 16×2 LCD display is a very basic module commonly used in DIYs and circuits. The 16×2 translates of a display 16 characters per line in 2 such lines. In this LCD each character is displayed in a 5×7-pixel matrix.

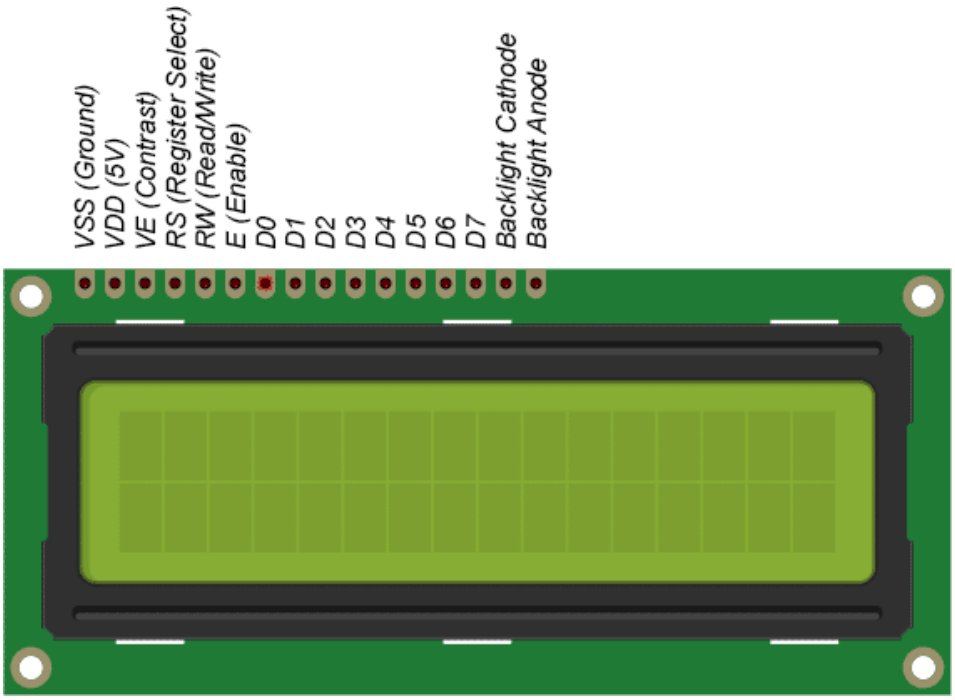

Figure 3.16 LCD 16X2 DISPLAY MODULE

3.2.8 SERVO MOTOR

Servo motor works on the PWM (Pulse Width Modulation) principle, which means its angle of rotation is controlled by the duration of pulse applied to its control PIN. Basically, servo motor is made up of DC motor which is controlled by a variable resistor (potentiometer) and some gears.

Figure 3.17 Servo motor

The applications used as actuators in many robots like Biped Robot, Hexapod, robotic arm. Commonly used for steering system in RC toys. Robots where position control is required without feedback. Less weight hence used in multi DOF robots like humanoid robots

3.2.9 ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board.

To do so you use the Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing.

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

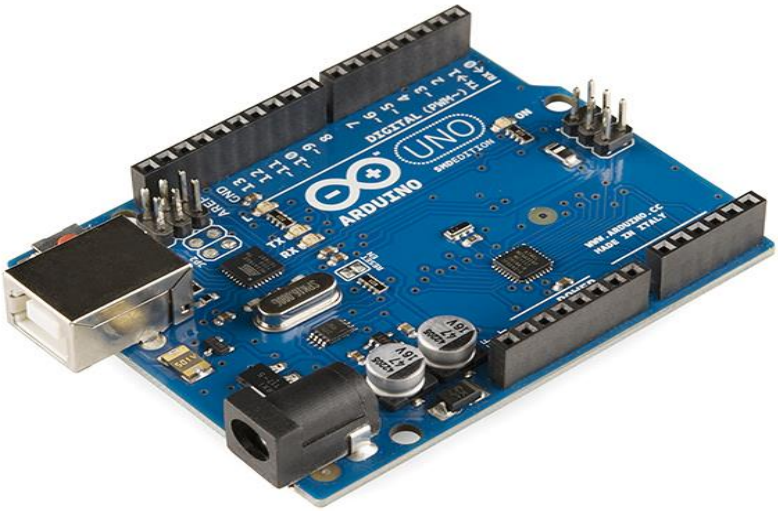

Figure 3.18 Arduino

The applications used are Music Instrument, Fingerprint Door Lock, Robot Car, Handheld Game Console, Home Automation, Car/ Truck Simulator.

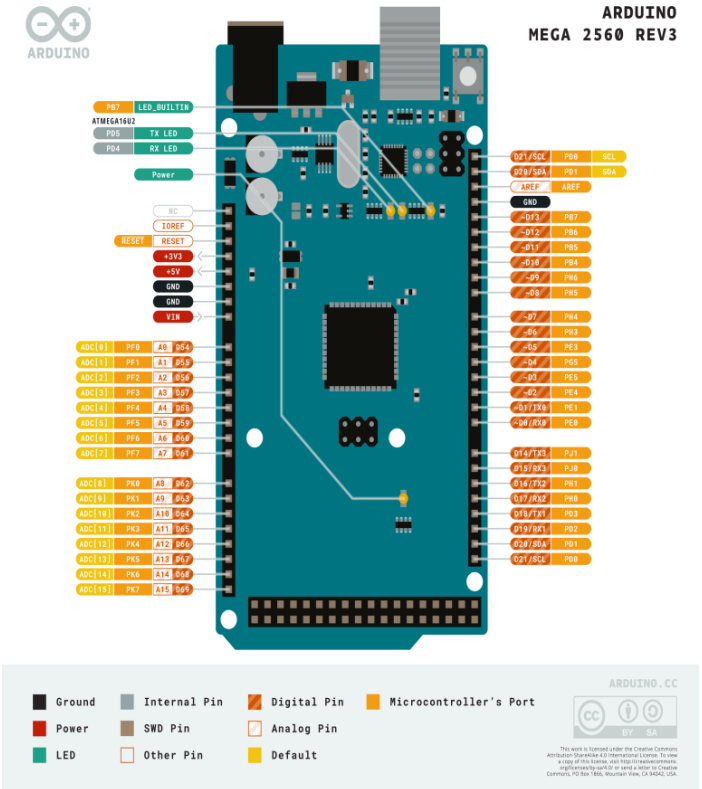

Figure 3.19 Arduino pinout

3.2.10 RFID

Long gone are the days when people used to stand and wait in long checkout lines at the grocery store. Thanks to the Radio Frequency IDentification (RFID) technology. With this

RFID based walk-through automatic checkout solution, you can fill up your cart and walk right out the door. No longer will you have to wait as someone rings up each item in your cart one at a time. Instead, the RFID tags attached to items will communicate with RFID reader that will detect every item in the cart and ring each up almost instantly.

For most of our RFID based Arduino projects, RC522 RFID Reader/Writer module is a great choice. It is low power, low cost, pretty rugged, easy to interface with and insanely popular among hobbyists.

Figure 3.20 RFID tag

DESCRIPTION

Frequency Range	13.56 MHz ISM Band
Host Interface	SPI / I2C / UART
Operating Supply Voltage	2.5 V to 3.3 V
Max. Operating Current	13-26mA
Min. Current (Power down)	10µA
Logic Inputs	5V Tolerant
Read Range	5 cm

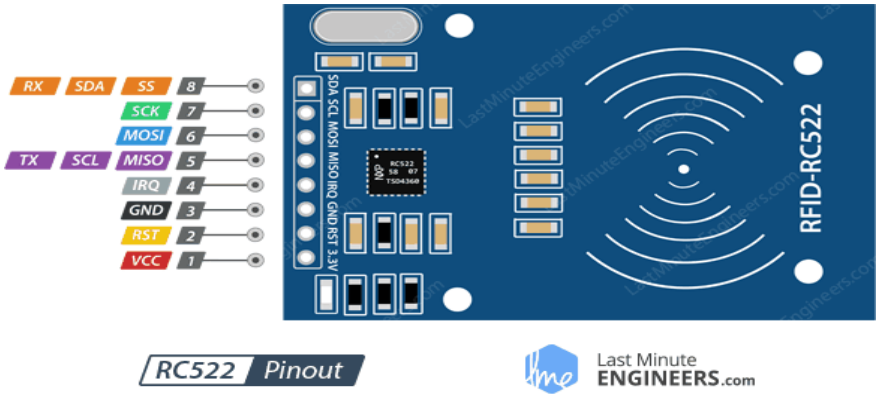

Figure 3.21 Rfid reader

3.2.11 KEYPAD

This 4x4 matrix keypad has 16 built-in pushbutton contacts connected to row and column lines. A microcontroller can scan these lines for a button-pressed state. In the keypad library, the Propeller sets all the column lines to input, and all the row lines to input.

Figure 3.22 Keypad

3.2.12 4X4 KEYPAD MODULE FEATURES AND SPECIFICATIONS

1. Maximum Voltage across EACH SEGMENT or BUTTON: 24V
2. Maximum Current through EACH SEGMENT or BUTTON: 30mA
3. Maximum operating temperature: 0°C to + 50°C
4. Ultra-thin design
5. Adhesive backing
6. Easy interface

7. Long life.

3.2.13 INTERFACING:

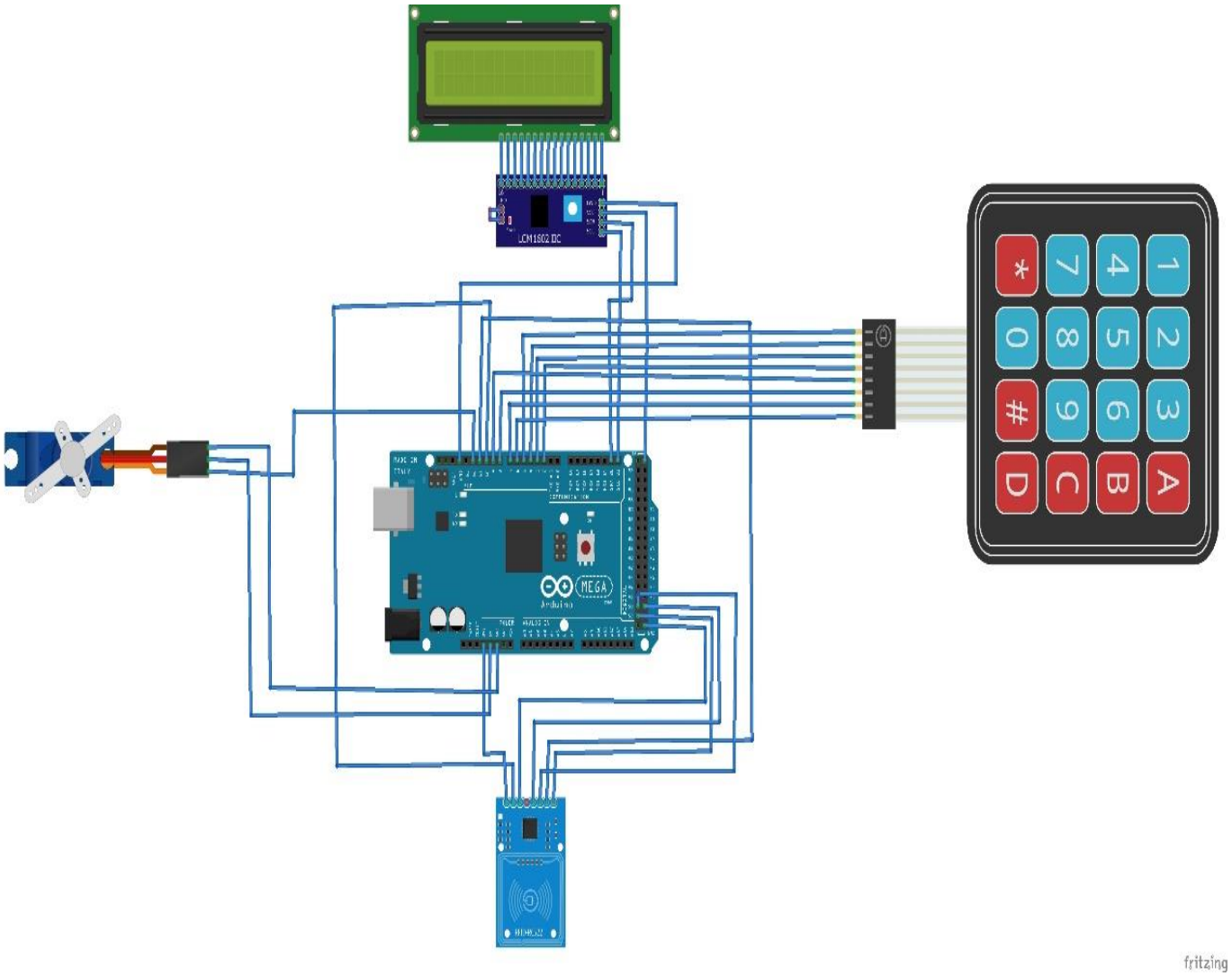

Figure 3.23 Arduino interface

The project consists of the following components such as 20*4 lcd, Arduino mega 2560, 4*4 Keypad, RFID rc522, i2c module and servo motor. The connections to all the components are given through the jumper wires. The serial data and clock pins of Arduino mega are given to i2c module.

The digital pins of Arduino named d9, d8 are given to servomotor. The d2,3,4,5,6,7,10,12,13 is given to keypad. The digital pins 48,49,50 is connected to RFID.

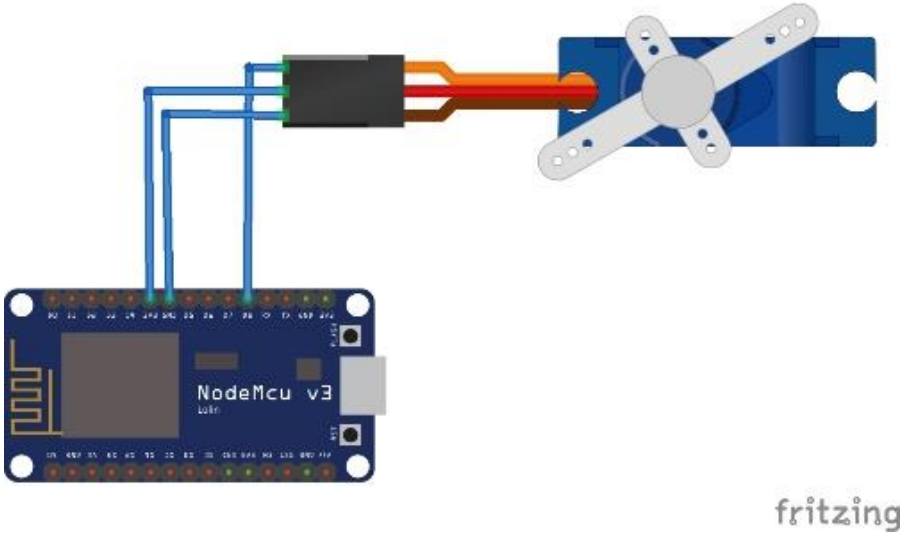

Figure 3.24 Nodemcu interface

The components which are available in this diagram are nodemcu and servomotor. Nodemcu pin D9,9 are connected to servomotor.

3.3 SYSTEM REQUIREMENT

3.3.1 HARDWARE REQUIREMENTS

A personal computer (PC) is any general-purpose computer whose size, capabilities, and original sales price make it useful for individuals, and which is intended to be operated directly by an end-user with no intervening computer operator. In contrast, the batch processing or time-sharing models allowed large expensive mainframe systems to be used by many people, usually at the same time. Large data processing systems require a full-time staff to operate efficiently.

A computer user will apply application software to carry out a specific task. System software supports applications and provides common services such as memory management, network connectivity, or device drivers; all of which may be used by applications but which are not directly of interest to the end user.

A simple, if imperfect analogy in the world of hardware would be the relationship of an electric light bulb (an application) to an electric power generation plant (a system). The power plant merely generates electricity, not itself of any real use until harnessed to an application like the electric light that performs a service that benefits the user.

Windows 7 includes a number of new features, such as advances in touch and handwriting

recognition, support for virtual hard disks, improved performance on multi- core processors, improved boot performance, Direct Access, and kernel improvements. Windows 7 adds support for systems using multiple heterogeneous graphics cards from different vendors (Heterogeneous Multi-adapter), a new version of Windows Media Center, a Gadget for Windows Media Center, improved media features, the XPS

Essentials Pack and Windows Power Shell being included, and a redesigned Calculator with multiline capabilities including Programmer and Statistics modes.

Many new items have been added to the Control Panel, including Clear Type Text Tuner, Display Color Calibration Wizard, Gadgets, Recovery, Troubleshooting, Workspaces Center, Location and Other Sensors, Credential Manager, Biometric Devices, System Icons, and Display.

The Windows Security Center has been renamed to Windows Action Center (Windows Health Center and Windows Solution Center in earlier builds), which encompasses both security and maintenance of the computer. Ready boost on 32bit editions now supports up to 256 Gigabytes of extra allocation.

The default setting for User Account Control in Windows 7 has been criticized for allowing untrusted software to be launched with elevated privileges without a prompt by exploiting a trusted application. Microsoft’s Windows kernel engineer Mark Russinovich acknowledged the problem, but noted that malware can also compromise a system when the users agree to a prompt. Windows 7 also supports images in the RAW image format through the addition of Windows Imaging Component-enabled image decoders, which enables raw image thumbnails, previewing and metadata display in Windows Explorer, plus full-size viewing and slideshows in Windows Photo Viewer and Windows Media Center.

3.3.2 NODEMCU BOARD

NodeMCU is open source platform, their hardware design is open for edit/modify/build. NodeMCU Dev Kit/board consist of ESP8266 wifi enabled chip. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 Wi-Fi Module. There is Version2 (V2) available for NodeMCU Dev Kit i.e. NodeMCU Development Board v1.0 (Version2), which usually comes

in black colored PCB.

NodeMCU Development board is featured with wifi capability, analog pin, digital pins and serial communication protocols. To get start with using NodeMCU for IoT applications first we need to know about how to write/download NodeMCU firmware in NodeMCU Development Boards. And before that where this NodeMCU firmware will get as per our requirement. There is online NodeMCU custom builds available using which we can easily get our custom NodeMCU firmware as per our requirement.

3.3.3 ARDUINO BOARD

The Arduino MEGA 2560 is designed for projects that require more I/O lines, more sketch memory and more RAM. With 54 digital I/O pins, 16 analog inputs and a larger space for your sketch it is the recommended board for 3D printers and robotics projects. This gives your projects plenty of room and opportunities maintaining the simplicity and effectiveness of the Arduino platform. This document explains how to connect your Mega2560 board to the computer and upload your first sketch.

3.3.4 SOFTWARE REQUIREMENTS

A program for Arduino hardware may be written in any programming language with compilers that produce binary machine code for the target processor. Atmel provides a development environment for their 8-bit AVR and 32-bit ARM Cortex-M based microcontrollers: AVR Studio (older) and Atmel Studio (newer).

The Arduino integrated (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to an Arduino board. It also contains a message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. 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. 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, that are 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 avr dude 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 is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as a Mac OS X-exclusive game engine. As of 2018, the engine had been extended to support more than 25 platforms. The engine can be used to create three-dimensional, two-dimensional, virtual reality, and augmented reality games, as well as simulations and other experiences.[4][5] The engine has been adopted by industries outside video gaming, such as film, automotive, architecture, engineering and construction.

Vuforia Engine is a software development kit (SDK) for creating Augmented Reality apps. Developers can easily add advanced computer vision functionality to any application, allowing it to recognize images and objects, and interact with spaces in the real world. Vuforia Engine supports AR app development for Android, iOS, Lumin, and UWP devices.

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems or as a subscription-based service in 2020. It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development.

3.4 RESULTS AND DISCUSSION

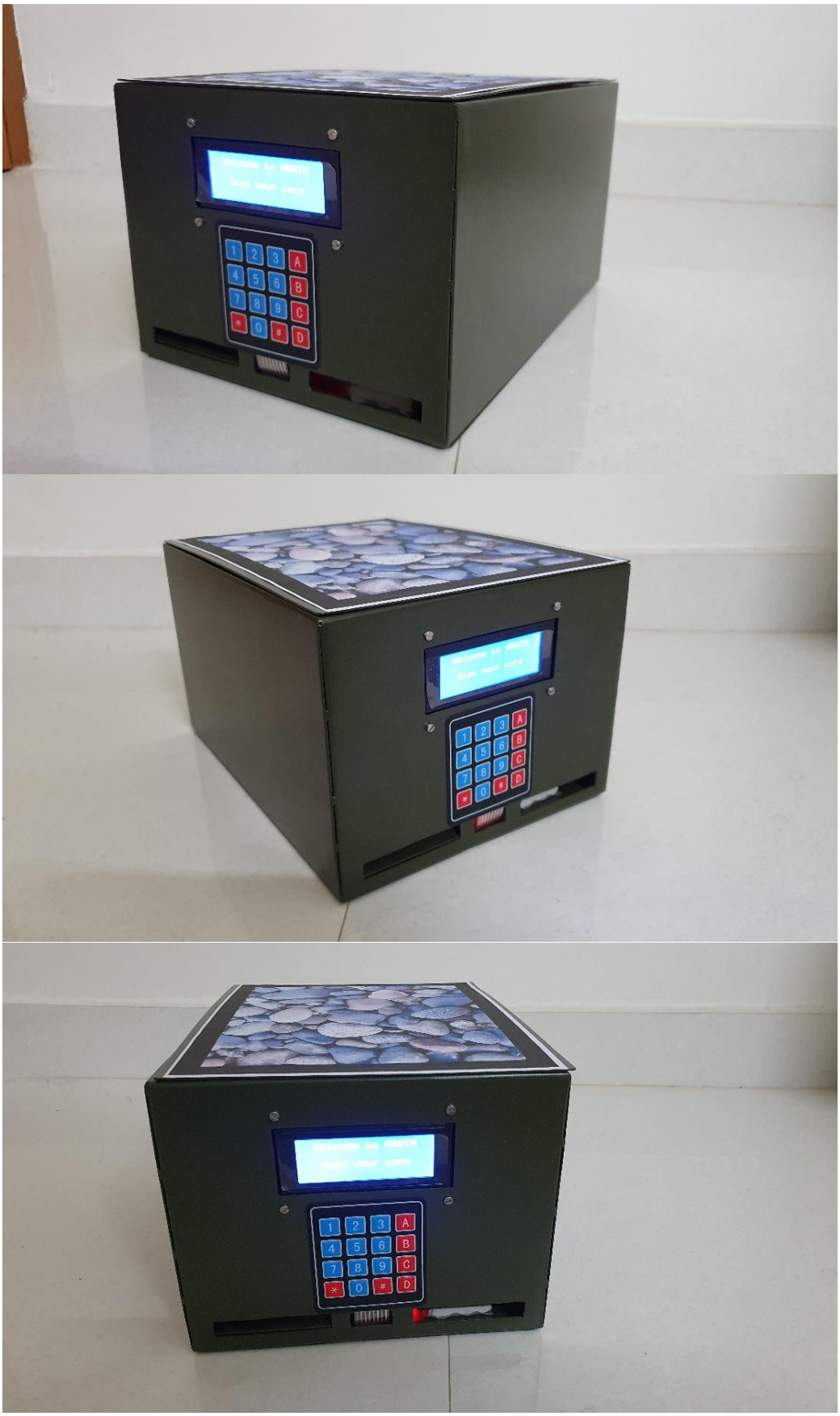

Figure 3.25 Hardware model

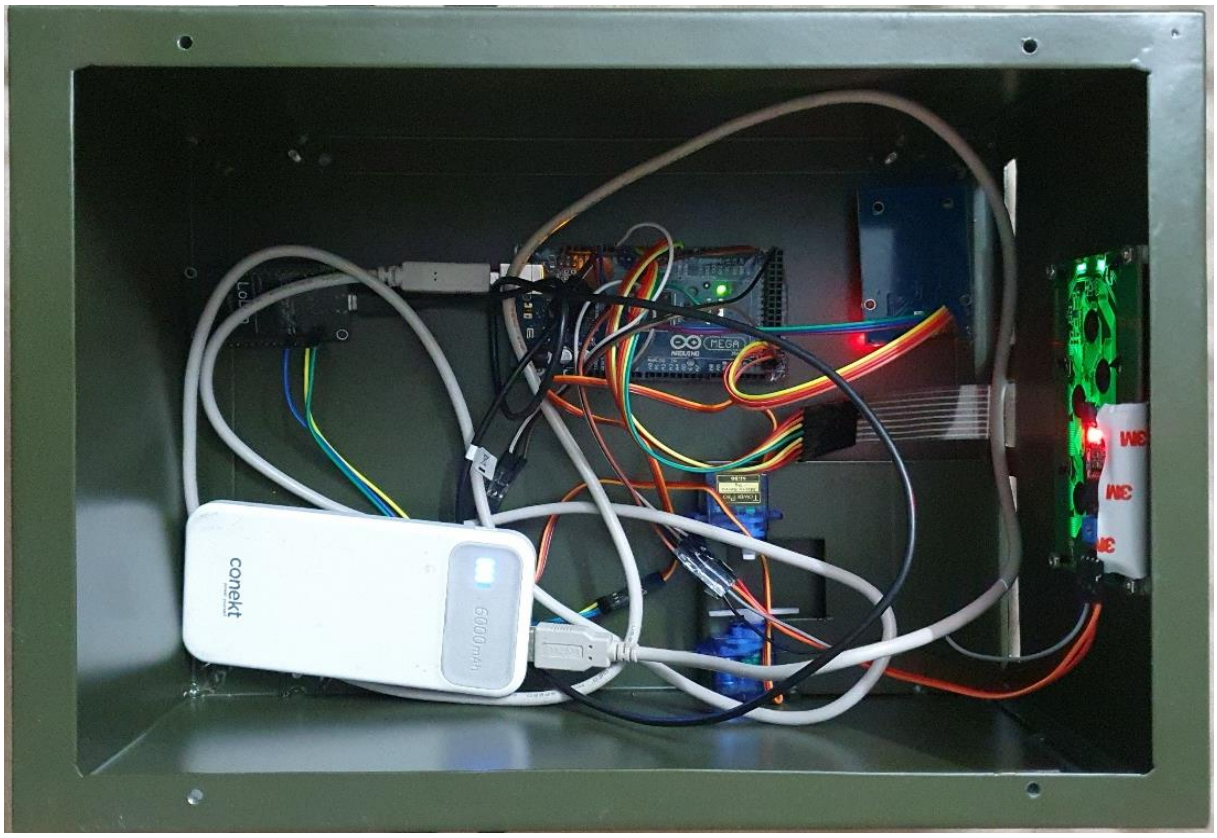

Figure 3.26 Hardware assembly

Figure 3.27 ARATM model

All the user are given with the ARATM mobile application. Fig 8.1 Once the application is

opened the phone number verification tab appears where the user needs to enter their mobile number with the country code.

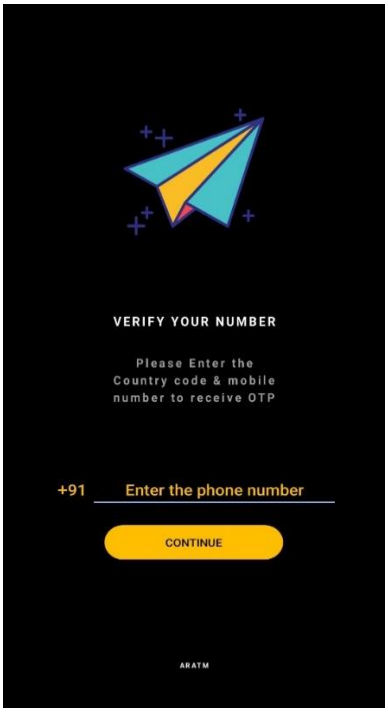

Figure 3.28: Phone number verification screen

After the user has entered the phone number and application verifies the number, country code and sends one time passcode to the user via firebase database. Fig 8.2

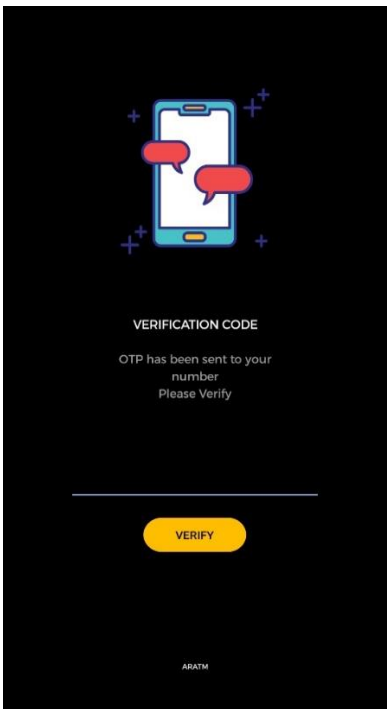

Figure 3.29: OTP receive screen

In the menu page, Fig 8.3 shows user phone number is shown and option such as open ar camera and logout. The ar camera activates the camera to show the ARBANK.

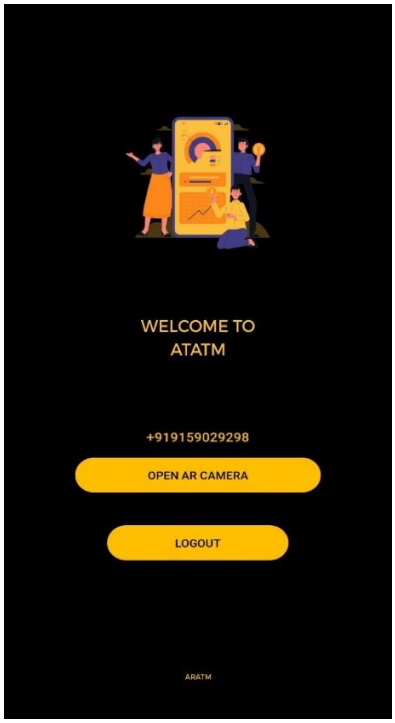

Figure 3.30: Menu page

The user now can interact with the augmented reality image. The image shows the UI of atm with various options such as:

- Cash withdrawal
- Account details
- Current/savings account
- Cash options: 100, 200, 500, 2000
- Enter the passcode.

Figure 3.31: AR Welcome screen

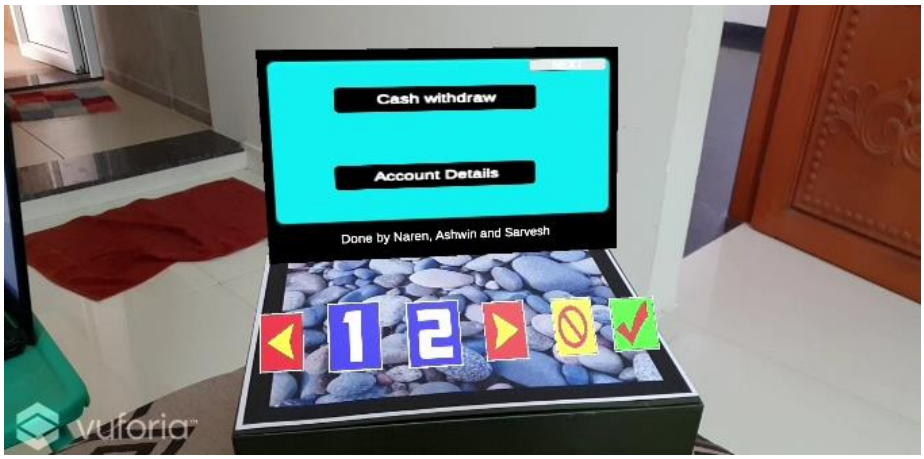

Figure 3.32: AR Options screen

Figure 3.33: AR Current/Savings account screen

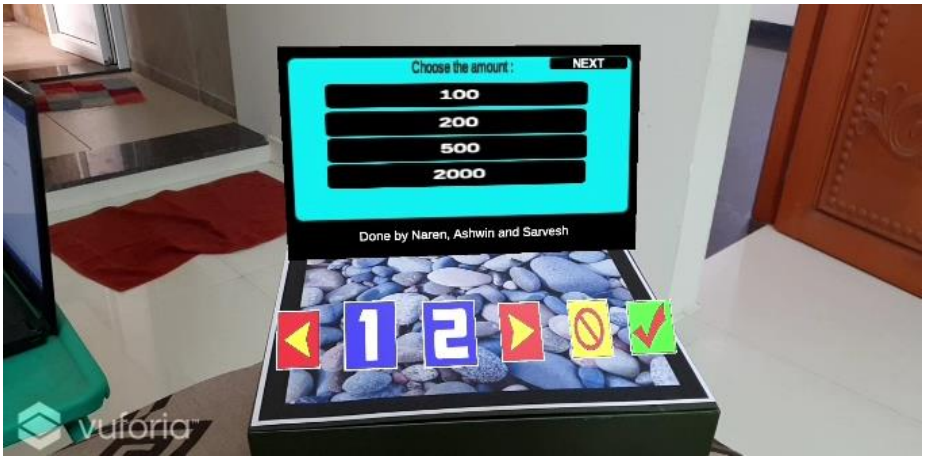

Figure 3.34: AR Cash screen

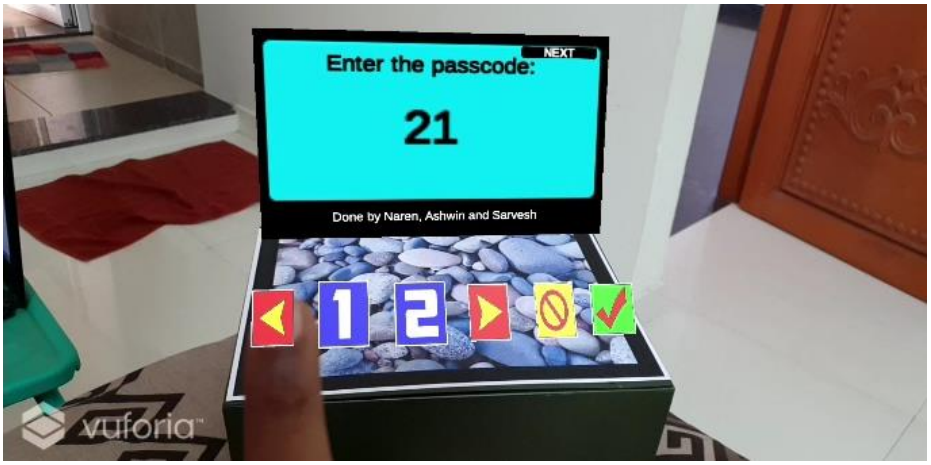

Figure 3.35: AR Passcode screen

Figure 3.36: AR Money dispatching screen

As an alternate way to withdraw cash rather than using AR is keypad. The below figures represent the cash withdrawal using traditional method such as atm card, lcd and keypad.

Figure 3.37: HW Welcome screen

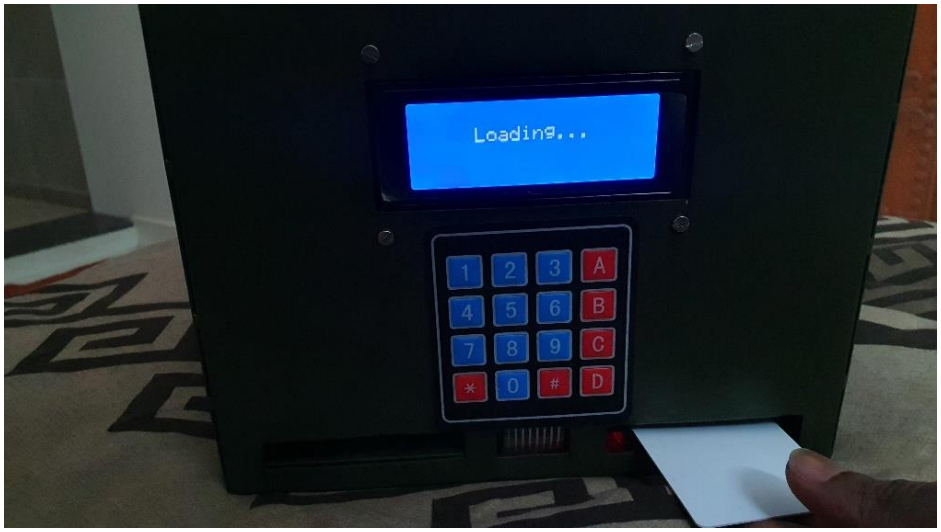

Figure 3.38: HW Card insert

Figure 3.39: HW Passcode enter

Figure 3.40: HW Dispatch money

3.5 CONCLUSION & FUTURE ENHANCEMENT

In this project, have been developed Augmented Reality applications that used to facilitate the banking application. Where this research applied Marker less Augmented Reality, using QCAR Vuforia software applied to the mobile platform (Android). An image with a good feature will have a minimum probability of error when Vuforia generate the target image into a 3D object. Further addition of database which includes the detail about the users in ARATM application. To get a good 3D Object, edge detection and light detection have become the main factor in image processing. The results of this research are to facilitate the marketing department of housing in the provision of facilities and specification information about the object home and present the products of brochures resulting visualization of 3D objects using augmented reality technology is applied to the mobile platform Android.

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APPENDIX

```
const char* ssid = "Naren";//put your wifi network name here
const char* password = "password@0987654321";//put your wifi password here
const char* mqtt_server = "broker.hivemq.com";
WiFiClient espClient;
PubSubClient client(espClient);
const byte n_rows = 4;
const byte n_cols = 4;
char keys[n_rows][n_cols] = {
  {'1','2','3','A'},
  {'4','5','6','B'},
  {'7','8','9','C'},
  {'*','0','#','D'}
};
byte colPins[n_rows] = {D3, D2, D1, D0};
byte rowPins[n_cols] = {D7, D6, D5, D4};
Keypad myKeypad = Keypad( makeKeymap(keys), rowPins, colPins, n_rows, n_cols);
Servo myservo;
String passcode="";
String myPasscode="2113";
void setup(){
  Serial.begin(115200);
  myservo.attach(15); //attach the servo on pin D8)
  myservo.write(0);
  setup_wifi();
  client.setServer(mqtt_server, 1883);
  client.setCallback(callback);
```

```
  //Serial.begin(9600);   // Initiate a serial communication
//  SPI.begin();      // Initiate  SPI bus
//  mfrc522.PCD_Init();   // Initiate MFRC522
}
void setup_wifi() {
    delay(100);
  // We start by connecting to a WiFi network
    Serial.print("Connecting to ");
    Serial.println(ssid);
    WiFi.begin(ssid, password);
    while (WiFi.status() != WL_CONNECTED)
    {
      delay(500);
      Serial.print(".");
    }
  Serial.println("");
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}
void callback(char* topic, byte* payload, unsigned int length)
{
  Serial.print("Message arrived in topic: ");
  Serial.println(topic);
  Serial.print("Message:");
  String message;
    for (int i = 0; i < length; i++) {
```

```
    Serial.print((char)payload[i]);
    message+=(char)payload[i];}
  if(message==myPasscode){
    publish("Approved");
    dispatchMoney();
  }else{
    publish("Denied");  }
  Serial.println();
  Serial.println("----------------------");}
void publish(String msg){
    char message[100];
     msg.toCharArray(message,100);
    client.publish("/ABC/ATM/ACK", message);
    delay(100);}

void reconnect() {
  // Loop until we're reconnected
  while (!client.connected()) {
    Serial.print("Attempting MQTT connection...");
    // Create a random client ID
    String clientId = "ESP8266Client-";
    clientId += String(random(0xffff), HEX);
    // Attempt to connect
    //if you MQTT broker has clientID,username and password
    //please change following line to    if (client.connect(clientId,userName,passWord))
    if (client.connect(clientId.c_str()))
    {
```

```
    Serial.println("connected");
   //once connected to MQTT broker, subscribe command if any
    client.subscribe("/ABC/ATM/RCV");
  } else {
    Serial.print("failed, rc=");
    Serial.print(client.state());
    Serial.println(" try again in 5 seconds");
    // Wait 6 seconds before retrying
    delay(6000);  } }} void loop(){
if (!client.connected()) {
    reconnect();}
  client.loop();}void dispatchMoney() {
Serial.println("Dispatching money...");
myservo.write(90);
delay(5000); myservo.write(0); }
```