ABSTRACT

The first section of this thesis describes the Smart Digital Lock Security System and its objectives to solve the problem which all of the people are facing in current times. Following chapters discuss about the outcome of the system and the components required for the system to work and its working principle. This also discusses about the modern problems of our security lock system and how we can improve it with help of IOT and Cloud Technology. This project uses Cloud database, raspberry pi and android app which has been integrated in such a way that it creates a low-cost flexible system. With the help Ultrasonic sensor and A low-cost web camera the system can capture the images of the culprit who is trying to break the door lock. Then this image can be downloaded for further analysis of culprit identity. In this system we have also implemented auto night lamp features with the help of LDR which further assists the system's web camera to capture the images with more clarity.

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CHAPTER 1

INTRODUCTION

Smart digital lock security system is designed using RASPBERRY PI 3B+ where once the correct code or password is entered, the door is opened and the concerned person is allowed access to the secured area. Smart digital lock security system using RASPBERRY PI 3B+ is a simple project where a secure password will act as a door unlocking system. Old time lock systems use mechanical locking and these can be replaced by new advanced techniques of locking systems. These methods are a combination of logic and electronic devices and are highly intelligent. One of the distinct features of these intelligent lock systems is their simplicity and high efficiency. Such an automated lock system consists of electronic control assembly, which controls the output load through a password. The example of this output load can be visible on a lcd screen or a lamp or any other mechanical/electrical load.

To secure a room at our home or office (perhaps a secret laboratory) so that no one can access the room without our permission and ensure protection against theft or loss of our important accessories and assets. There are so many types of security systems present today but behind the scene, for authentication they all rely on fingerprint, retina scanner, iris scanner, face id, tongue scanner, RFID reader, password, pin, patterns, etc. Off all the solutions the low-cost one is to use a password or pin-based system.

Smart digital lock security door lock security system is widely deployed in several spheres of life such as in the banks as well as home and office environments. It could be employed as a traffic regulator for controlling the inflow and outflow of individuals to and from an environment as seen in banks or could be used to restrict unwanted access to an environment access control.

Nowadays every device's operation is based on digital technology. For example, technology based identity devices are used for automatic door unlocking or locking. These locking systems are used to control the movement of doors and are functional without requiring a key to lock or unlock the door. These locking systems are controlled by a keypad and are installed at the side hedge of the door. The main objective of this project is to give safety at every common place like home, public places. This user would give a known password. The information will be stored in the database. When the correct passcode is entered, the microcontroller will give instruction to the servo motor. Servo motors will perform the action on door unlocking. Thus, what we want is digital technology to construct an integrated and well customized safety system at a price which is reasonable.

AIM & OBJECTIVES

In order to make sure that every door is safe to achieve the aim of this project is to design and implement a smart “ Smart digital lock security system “ using raspberry Pi and other electronics components such as LED, LCD lights, buzzer, HC-SR04. It could help advance the protection of doors at home and public buildings.

- To make a secure lock system for doors which works on with in a range.
- Password protected access eliminates the need to carry a key or any extra remote.
- Get the access to the door by putting the exact password and a different sound blows up to alert that someone is in the room.
- Getting the locking device connected to the keypad for giving the password and also enabling the Ultrasonic sensor module for short distance signaling.
- The Smart digital security lock system is a Raspberry Pi sbc based security system. This allows the access to authorized persons by verifying the specific password which is given to them.
- With the help of the internet and sending OTP through WhatsApp, now users can access the smart digital lock security system including downloading a snapshot nearby the lock security system as well.Apart from this user will get an Android application where they can access the lock security system.
- This process is less expensive and easy to implement so that common people can also get high security, the microcontroller permits the system installation in a more easy way compared to other existing systems and the applications of this system can be used in offices, banks etc.

CHAPTER 2

SCOPE OF THE PROJECT

Electronics devices have become an integral part of our lives. They allow you to forget the problems associated with handing over keys to relatives or guests from another city, restrict access to private premises or set up access control in an office building, as well as optimize the work of an administrator in a hotel. One of the problems that is relevant for modernity is the preservation of material or personal values. Previously, it was easily resolved using a conventional padlock or mortise lock. However, today such funds are not enough.

Modern electronic locks are much more convenient and efficient than their mechanical counterparts. You can unlock such a lock with a simple key, and in a more convenient way. As the detector unlocking the electronic lock, a magnetic card, a barcode, a fingerprint or an alphanumeric code entered from the keyboard can be used.

In the case of an RFID key card, the lock operates on the principle of a RFID reader. By type of actuator, electronic door locks are electromechanical or electromagnetic. The principle of operation of the electromagnetic lock is based, as the name implies, on the system of magnetization of metal surfaces located on the door and on the shutter body built into the door frame. Such a small device has a fairly high retention force.

LITERATURE SURVEY

Smartdoors have been implemented using different methods such as Radio frequency identification (RFID) and Biometric lock to unlock and lock doors. Both the RFID and biometric lock are real ideal and smart ways to make a door smart, due to necessity and limitations such as cloning of biometric prints or cards. The use of Bluetooth and smartphones is much simpler and easier to adapt and use. It gives you more access to communicate with the door and it also gives access to physically challenged persons that might not have a finger to use for biometric lock or is crippled to use RFID but with respect to this project physically challenged can simply open their door by single click in device. Adarsh V Patil et al (2008) did a similar project Android based smart door locking system which also employed the use of an android phone which is also a smartphone and also a GSM module to access the door. Also Agbo David et al (2017) did a somewhat similar project based on a door locking system using an android application. Shafarana A.R.F et al (2017) did android based automation and security systems for smart homes. There are many other projects done on smart doors in different countries. They are all different from each other in terms of designs, features, devices, and algorithms. They are mostly designed according to specific needs and availability of components in the respective areas. Some of them are cheap; some of them are very expensive. Availability of both hardware and software is necessary to work. After a long search, I have found a lot of articles. Searching for security purpose articles, also found some projects done for door security. These are mainly done in western countries. Many projects are done only for security purposes With Arduino or Raspberry Pi. Again, the projects are done only for controlling home Appliances using Arduino or Raspberry Pi. Most of the previous research encountered problems in their design especially in terms of cloning by other third parties and availability of components.

In general terms this project is a more user friendly project with easy access to users. People that have problems physically like cripples or half paralysis can have access to doors without the help of anybody, not even an assistant, as long as they are in the position of a smartphone. The physically challenged persons can open or lock any door they have permission to, or even lock or unlock a door while sitting on their wheelchairs, resting sofas or sleeping bed.

CHAPTER 3

COMPONENTS REQUIRED

HARDWARE COMPONENTS:

Raspberry PI 3B+

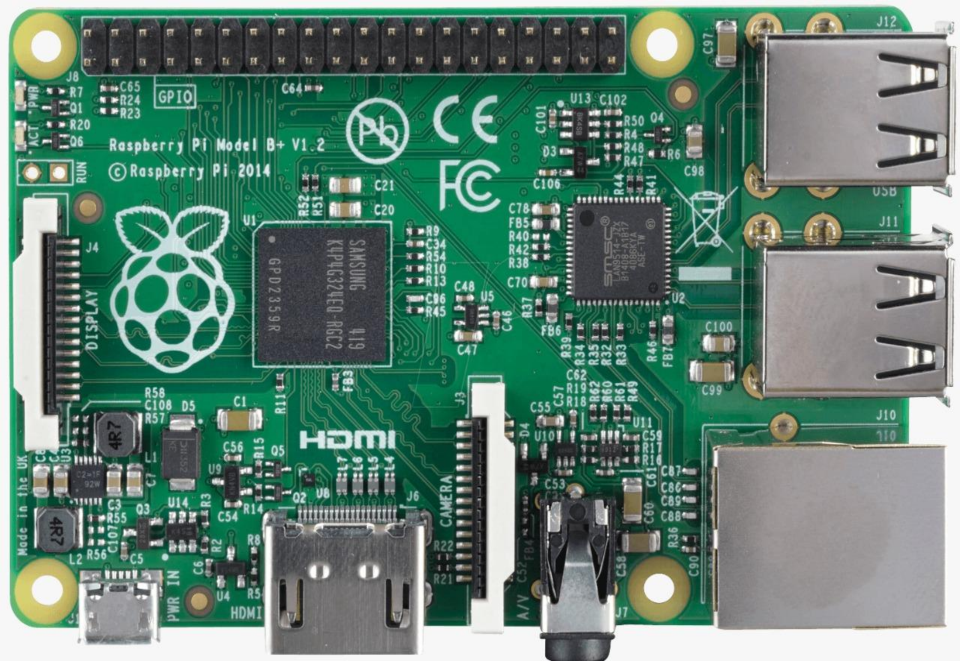


Fig. 3.1 : RASPBERRY PI 3B+

The Raspberry Pi 3 Model B+ is the latest Raspberry Pi 3 range, boasting a 64-bit quad core processor running at 1.4GHz, dual-band 2.4GHz and 5GHz wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and PoE capability via a separate PoE HAT The dual-band wireless LAN comes with modular compliance certification, allowing the board to be designed into end products with significantly reduced wireless LAN compliance testing, improving both cost and time to market. The Raspberry Pi 3 Model B+ maintains the same mechanical footprint as both the Raspberry Pi 2 Model B and the Raspberry Pi 3 Model B. Whilst it is powered, avoid handling the printed circuit board, or only handle it by the edges to minimize the risk of electrostatic discharge damage.

RESISTORS

A Resistor is an electronic component which has the property of resistance. Resistors are available in many different resistance values from fractions of (Ω) to millions of ohm. According to ohm’s law, the voltage (V) across a resistor is directly proportional to the current (I) flowing through it. Where the resistance R is the constant of proportionality.Dependent on the application, the electrical engineer specifies different properties of the resistor. The primary purpose is to limit the flow of electrical current; therefore the key parameter is the resistance value. The manufacturing accuracy of this value is indicated with the resistor tolerance and is expressed as a percentage of the resistance value. Many other parameters that affect the resistance value can be specified, such as long term stability or the temperature coefficient. The temperature coefficient, usually specified in high precision applications, is determined by the resistive material as well as the mechanical design.In high frequency circuits, such as in radio electronics, the parasitic capacitance and inductance can lead to undesired effects. Foil resistors generally have a low parasitic reactance, while wirewound resistors are among the worst. For accurate applications such as audio amplifiers, the electric noise of the resistor must be as low as possible. This is often specified as microvolt’s noise per volt of applied voltage, for a 1 MHz bandwidth. For high power applications the power rating is important. This specifies the maximum operating power the component can handle without altering the properties or damage. The power rating is usually specified in free air at room temperature. Higher power ratings require a larger size and may even require heat sinks. Many other characteristics can play a role in the design specification. Examples are the maximum voltage or the pulse stability. In situations where high voltage surges could occur, this is an important characteristic.Sometimes not only the electrical properties are important, but the designer also has to consider the mechanical robustness in harsh environments. Military standards sometimes offer guidance to define the mechanical strength or the failure rate.

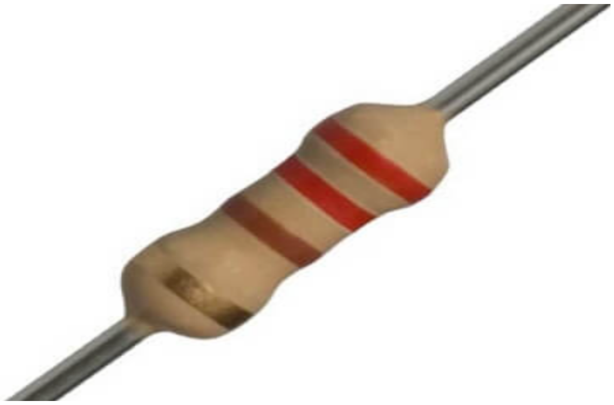


Fig. 3.2 : Resistors

BUZZER

There are many ways to communicate between the user and a product. One of the best ways is audio communication using a buzzer IC.An audio signaling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren.

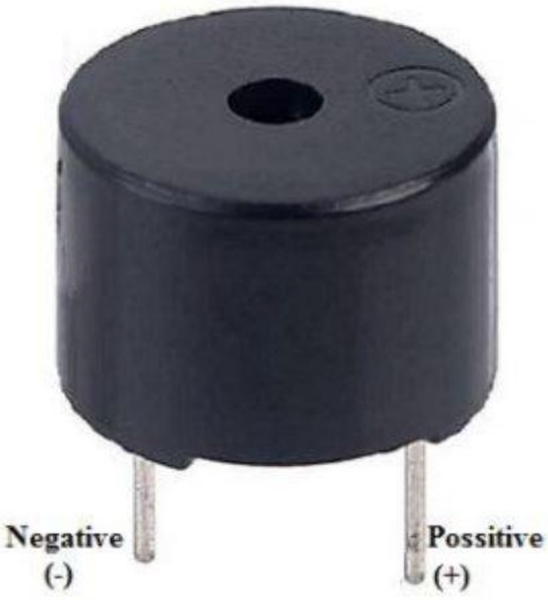


Fig.3.3: Buzzer Pin Configuration

The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6 Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

Electromagnetic buzzer is made with a magnet, solenoid coil, oscillator, housing, vibration diaphragm, and magnet. Once the power supply is given, the oscillator which produces the audio signal current will supply throughout the solenoid coil to generate a magnetic field.Sometimes, the vibration diaphragm will vibrate & generates sound under the magnet & solenoid coil interaction. The frequency range of this ranges from 2 kHz to 4kHz.

Mechanical is the types of buzzers are subtypes of electromagnetic, so the components used in this type are also similar. But the main difference is that the vibrating buzzer is placed on the outside instead of the inside.Electromechanical designing of these types of buzzers can be done with a bare metal disc & an electromagnet. The working principle of this is similar to magnetic and electromagnetic. It generates sound throughout the disc movement & magnetism.Magnetic such as piezo type, magnetic is also used to generate a sound but they are different due to core functionality. The magnetic type is more fixed as compared to the piezo type because they work through a magnetic field.Magnetic buzzers utilize an electric charge instead of depending on piezo materials to generate a magnetic field, after that it permits another element of the buzzer to vibrate & generate sound.The applications of magnetic buzzers are similar to the piezo type in household devices, alarms such as watches, clocks & keyboards.The working principle of a buzzer depends on the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors. Once a potential disparity is given across these crystals, then they thrust one conductor & drag the additional conductor through their internal property. So this continuous action will produce a sharp sound signal.A buzzer is an efficient component to include the features of sound in our system or project. It is an extremely small & solid two-pin device thus it can be simply utilized on a breadboard or PCB. So in most applications, this component is widely used.There are two kinds of buzzers commonly available like simple and readymade. Once a simple type is power-driven then it will generate a beep sound continuously. A readymade type looks heavier & generates a Beep. Beep. Beep. This sound is because of the internal oscillating circuit within it.The advantages of a buzzer include the Simply Compatible,Good frequency response,size is small,energy consumption is less,The range of Voltage usage is large and sound pressure is high.The disadvantages of the buzzer include the controlling is a little hard,generates annoying sound for long time and training is necessary to know how to repair the condition without just turning off.The applications of the buzzer include the Communication devices,electronics used in Automobiles,Household Appliances,Electronic Metronomes,Sporting Event,Security Systems,Annunciator Panels,GameShows,Alarm circuits,Portable Devices.It is an electromechanical, electromagnetic, mechanical, piezoelectric, electro-acoustic audio signaling device. This buzzer works through an audio signal source or oscillating circuit. A ring or beep or click indicates that a switch has been pushed. The buzzer is used for loud beep sound indicating the entry of the wrong password and low beep sound for the right password for 10 Second. non waterproof buzzer, it is necessary to prevent the buzzer from being placed in the center that may contact with water for non waterproof buzzer, rust, short circuit and vibration obstruction of product parts will be caused after water enters.Do not use it outside the marked working voltage when the voltage is too high, it will cause arcing phenomenon, which will lead to ceramic chip cracking and electric field attenuation.

LEDs

A light releasing diode is an electric component that emits light when the electric current flows through it. It is a light source based on semiconductors. When current passes through the LED, the electrons recombine with holes emitting light in the process. This means that an LED allows the flow of current in its forward direction while it blocks the flow in the reverse direction.. Based on the semiconductor material used and the amount of doping, an LED will emit a colored light at a particular spectral wavelength when forward biased.LEDs are “directional” light sources, which means they emit light in a specific direction and LEDs are able to use light and energy more efficiently in a multitude of applications. However, it also means that sophisticated engineering is needed to produce an LED light bulb that shines light in every direction. Common LED colors include amber, red, green, and blue. To produce white light, different color LEDs are combined or covered with a phosphor material that converts the color of the light to a familiar “white” light used in homes. Phosphor is a yellowish material that covers some LEDs. Colored LEDs are widely used as signal lights and indicator lights, like the power button on a computer.The brightness of an LED is directly dependent on how much current it draws. That means two things. The first being that super bright LEDs drain batteries more quickly, because the extra brightness comes from the extra power being used. The second is that you can control the brightness of an LED by controlling the amount of current through it. But, setting the mood isn't the only reason to cut back your current.

Fig. 3.4 : Leds

HC-SR04

The HC-SR04 Ultrasonic distance sensor consists of two ultrasonic transducers. The one acts as a transmitter which converts electrical signal into 40 KHz ultrasonic sound pulses. The receiver listens for the transmitted pulses. If it receives them it produces an output pulse whose width can be used to determine the distance the pulse traveled. The sensor has 4 pins. ***VCC*** and ***GND*** go to ***5V*** and ***GND*** pins on the Arduino, and the ***Trig*** and ***Echo*** go to any digital Arduino pin. Using the ***Trig*** pin we send the ultrasound wave from the transmitter, and with the ***Echo*** pin we listen for the reflected signal. It emits an ultrasound at 40 000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance. In order to generate the ultrasound we need to set the Trig pin on a High State for 10 µs. That will send out an 8 cycle ultrasonic burst which will travel at the speed of sound. The Echo pin goes high right away after that 8 cycle ultrasonic burst is sent, and it starts listening or waiting for that wave to be reflected from an object. We actually know both the speed and the time values. The time is the amount of time the Echo pin was HIGH, and the speed is the speed of sound which is 340m/s. There’s one additional step we need to do, and that’s divide the end result by 2. and that’s because we are measuring the duration the sound wave needs to travel to the object and bounce back.The range of the device depends on the material that it's directed at (because it uses high frequency sound waves, so soft objects generally absorb the sound and make a low return rate) but onto a hard surface, like a wall, the range is generally between 5 - 7 feet.Each sensor has its own timing crystal, so even if multiple sensors are triggered simultaneously, the emissions are produced at slightly different times. Also, multiple sensors should be pointed in different directions to prevent the acoustic signals interfering with each other. It's ideal for any robotics projects which require the user to avoid objects, by detecting how close they are to the user and can steer away from them. HC-SR04 uses non-contact ultrasound sonar to measure the distance to an object.t's low cost, can be powered via the Raspberry Pi's 5V output, and is relatively accurate.Ultrasonic transmitter emitted an ultrasonic wave in one direction, and started timing when it launched. Ultrasonic spread in the air, and would return immediately when it encountered obstacles on the way. At last, the ultrasonic receiver would stop timing when it received the reflected wave. As Ultrasonic spread velocity is 340m/s in the air, based on the timer record t, we can calculate the distance (s) between the obstacle and transmitter, namely: $s = 340t/2$, which is so- called time difference distance measurement principle and The principle of ultrasonic distance measurement used the already-known air spreading velocity, measuring the time from launch to reflection when it encountered an obstacle, and then calculating the distance between the transmitter and the obstacle according to the time and the velocity. Thus, the principle of ultrasonic distance measurement is the same with radar.

Distance Measurement formula is expressed as: L=CXT

In the formula, L is the measured distance, and C is the ultrasonic spreading velocity in air, also, T represents time (T is half the time value from transmitting to receiving).

Ultrasonic Application Technology is the thing which developed in recent decades. With the ultrasonic advance, and the electronic technology development, especially as high-power semiconductor device technology matures, the application of ultrasonic has become increasingly widespread. Ultrasonic pulses travel outward until they encounter an object, The object causes the wave to be reflected back towards the unit. The ultrasonic receiver would detect the reflected wave and stop the stop timer. The velocity of the ultrasonic burst is 340m/sec. in air. Based on the number of counts by the timer, the distance can be calculated between the object and transmitter The TRD Measurement formula is expressed as: D= CXT which is know as the time/rate/distance measurement formula where D is the measured distance, and R is the propagation velocity (Rate) in air (speed of sound) and T represents time. In this application T is divided by 2 as T is double the time value from transmitter to object back to receiver.

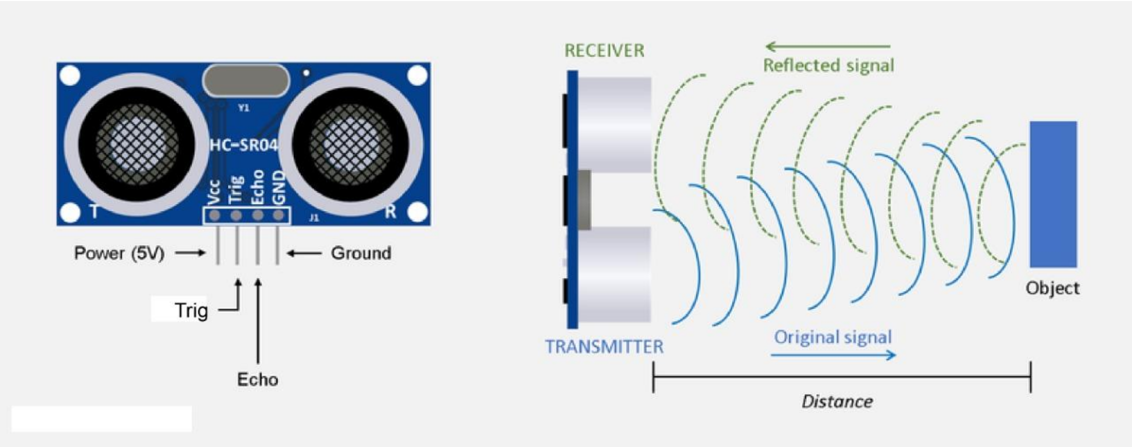


Fig. 3.5 : HC-SR04

LDR

An LDR or light dependent resistor is also referred to as photo resistor, photocell, photoconductor. Because its resistance varies on the intensity of light (photon) falling on its surface. If the light falls on the resistor, the resistance of LDR will change When the light falls on the resistor, the resistance of LDR will change. These resistors are often utilized in many circuits where it is required to sense the presence of light. These resistors have a variety of functions and resistance. This operation of resistor works is based on the principle of photoconductivity. It is nothing but, when the light falls on its surface, the photon in the incident light collides with the electron in the valence band. Because the photon of incident light has energy greater than the band gap of the semiconductor material, the electrons to jump out from the valence band to conduction band and it causes the electron flowing from the valence band to the conduction band and it appears as a current, i.e. the resistance of LDR decrease. So, when light falls on the LDR the resistance decreases, and increases when no light falls on the LDR. When a LDR is kept in the dark place, its resistance is high and, when the LDR is kept in the light its resistance will decrease. So, whenever there is no light around an LDR it has high resistance causing no flow of current. Whereas in contrast, when there is light it has low resistance. Basically, an LDR is used to detect the presence of light.It is relatively easy to understand the basics of how an LDR works without delving into complicated explanations. It is first necessary to understand that an electrical current consists of the movement of electrons within a material.Good conductors have a large number of free electrons that can drift in a given direction under the action of a potential difference. Insulators with a high resistance have very few free electrons, and therefore it is hard to make the them move and hence a current to flow.Intrinsic photoresistors or LDR are called Undoped Semiconductors and These are made of pure semiconductor materials such as silicon or germanium. Electrons get excited from valence band to conduction band when photons of enough energy fall on it and the number charge carriers are increased.Extrinsic photoresistors or LDR are semiconductor materials doped with impurities which are called dopants. These dopants create new energy bands above the valence band which is filled with electrons. Hence this reduces the bandgap and less energy is required in exciting them. Extrinsic photo resistors are generally used for long wavelengths.Light dependent resistors have a low cost and simple structure. These resistors are frequently used as light sensors. It is also found that extrinsic LDR tend to be more sensitive to longer wavelength light and can be used for infrared. However when working with infrared, care must be taken to avoid heat build-up caused but he elating effect of the radiationThese resistors are mainly used when there is a need to sense the absence and presence of the light such as burglar alarm circuits, alarm clock, light intensity meters, etc. LDR resistors are mainly involved in various electrical and electronic projects. For better understanding of this concept, here we are explaining some real time projects where the LDR resistors are used.Majority of street lights, outdoor lights, and a number of indoor home appliances are typically operated and maintained manually on many occasions. This is not only risky, however additionally it leads to wastage of power with the negligence of personnel or uncommon circumstances in controlling these electrical appliances ON and OFF. Hence, we can utilize the light sensor circuit for automatic switching OFF the loads based on daylight’s intensity by employing a light sensor. This article discusses in brief about what is a light dependent resistor, how to make a light dependent resistor circuit and its applications.One important aspect associated with photoresistors or light dependent resistors is that of the latency, or the time taken for the electronic component to respond to any changes. This aspect can be particularly important for a circuit design.It takes a noticeable amount of time from any changes in light level before the LDR / photoresistor attains its final value for the new level of light and for this reason the LDR / photoresistor is not a good choice where there are reasonably rapid changing values of light. However when the light changes take place over a period of time they are more than adequate.The rate at which the resistance changes is called the resistance recovery rate. The LDR / photoresistor normally responds within a few tens of milliseconds when light is applied after total darkness, but when light is removed it can take up to a second or so for the resistance to reach its final level.It is for this reason that one of the specifications normally quoted in the electronic component datasheets for photo-resistors is the dark resistance after a given time, typically in seconds. Often two values are quoted, one for one second and another for five seconds. These give an indication of the latency of the resistor.

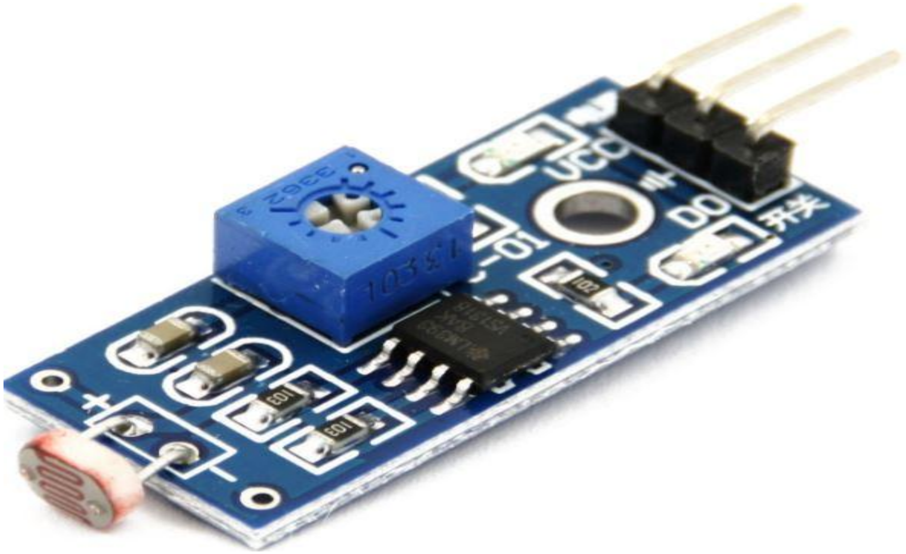


Fig.3.6 : LDR Module

Camera

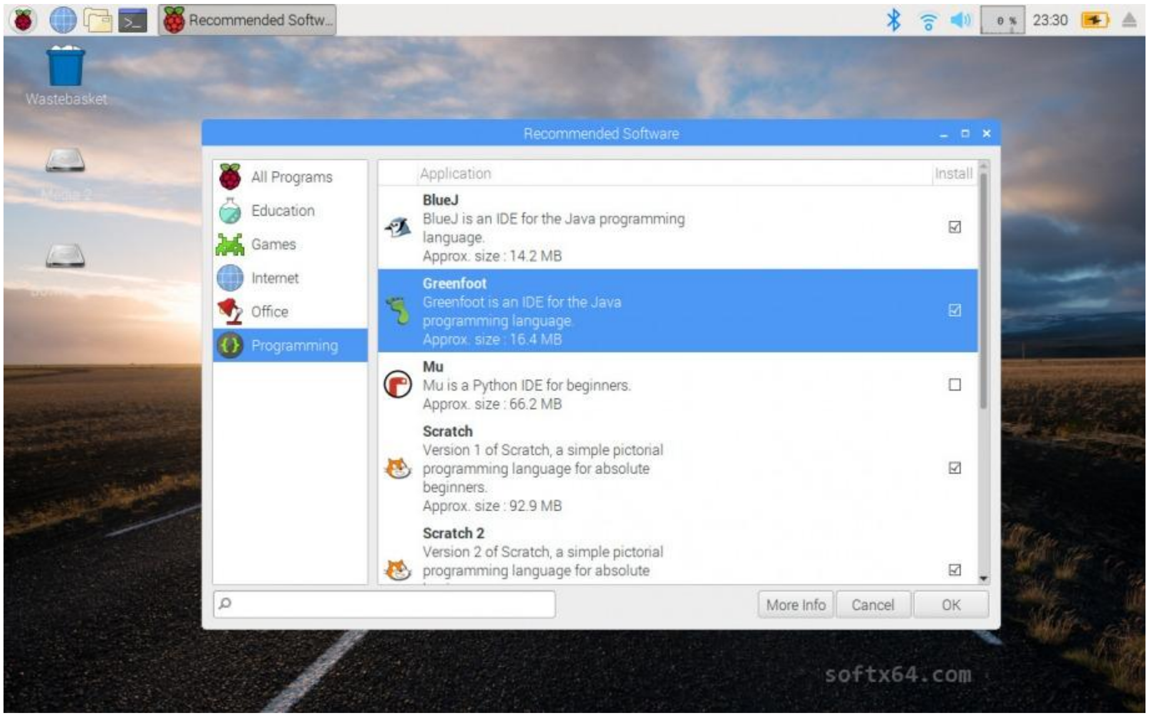
Depending on what user plans to use the webcam for, there will be certain specifications and features should be prioritized. No matter what you need the webcam for, there are also many quality-of-life features that can benefit any user. Webcams generally have a 16:9 aspect ratio, which is considered rectangular or widescreen. Some webcams have an optional 4:3 aspect ratio.720p and 1080p will suffice for most home offices or remote learning tasks. Higher resolution webcams in the 2K or 4K range are overkill for routine video meetings or the classroom but may be perfect for video editing professionals who want to record 4K and use/produce later or use the footage for green screening.all modern webcams are capable of at least 30 fps, which is still considered high quality and is suitable for any occasion, with some being as high as 120 fps. Typically, as you up the frame rate, higher resolutions may not be available. It is common for a webcam to be able to capture 60 fps at 720p and only 30 fps at 1080p.Basically, higher frame rates, like higher resolutions, are not necessary for most webcam users but can be a must for some professions or hobbies.he strength of your internet connection, bandwidth, lighting conditions (more exposure needed = lower frame rate), CPU/GPU and your webcam software also play a part in frame rate.The best way to ensure that your webcam is safe from malicious parties is to unplug it. If your device is unplugged, no hacker or scammer in the world could get access to it. With built-in webcams, however, unplugging your webcam is not possible. In that case, the best solution is inexpensive and straightforward, providing an excellent way to physically hide the video from your webcam. Lens covers typically clip to the device itself and can be quickly closed or opened to hide or share your video.

Fig. 3.7: Webcam

SOFTWARE COMPONENTS

RASPBERRY PI OS:

Every Raspberry Pi board comes with the official Raspberry Pi OS. Initially titled Raspbian, it is an Operating System made specifically for the Raspberry Pi. Although the first instances of the board weren't running this OS, the Raspberry Pi Foundation quickly created it, so any board after June 2012 was compatible with it.The initial version of the Raspbian OS was made by Mike Thompson and Peter Green as an entirely independent endeavor. The Operating System was rooted in Debian, which is a kind of Linux operating system. This puts the Raspbian OS firmly into the UNIX-Like family of operating systems.The initial versions of the Raspbian operating system were 32-bit and Debian-based. However, more recent editions of the OS have switched to being 64-bit, and have abandoned the use of Debian as their base.The Raspberry Pi OS was made specifically with the Raspberry Pi in mind, and it'll run on every single kind of Raspberry Pi board, apart from the Pico edition, due to its far smaller size and computing power. The Raspberry Pi OS uses a modified version of the Lightweight X11 Desktop Environment(or LXDE) as its desktop environment. LXDE is a desktop environment specifically made for single-chip computers and those with low resources.It uses an Openbox stacking window manager together with its own unique theme to bring a cohesive and unique user experience.



Application	Install
BlueJ BlueJ is an IDE for the Java programming language. Approx. size : 14.2 MB	☑
Greenfoot Greenfoot is an IDE for the Java programming language. Approx. size : 16.4 MB	☑
Mu Mu is a Python IDE for beginners. Approx. size : 66.2 MB	□
Scratch Version 1 of Scratch, a simple pictorial programming language for absolute beginners. Approx. size : 92.9 MB	☑
Scratch 2 Version 2 of Scratch, a simple pictorial programming language for absolute	☑

Fig.. 3.8 : Raspberry Pi OS

PYTHON

Python is a general-purpose, versatile and popular programming language. It’s great as a first language because it is concise and easy to read, and it is also a good language to have in any programmer’s stack as it can be used for everything from web development to software development and data science applications.

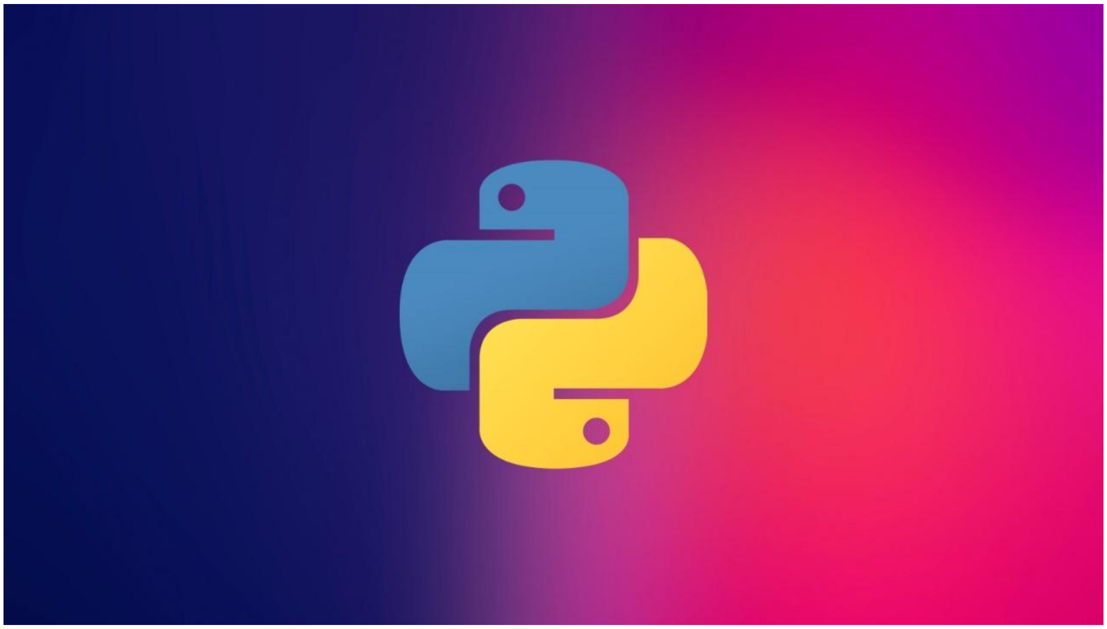
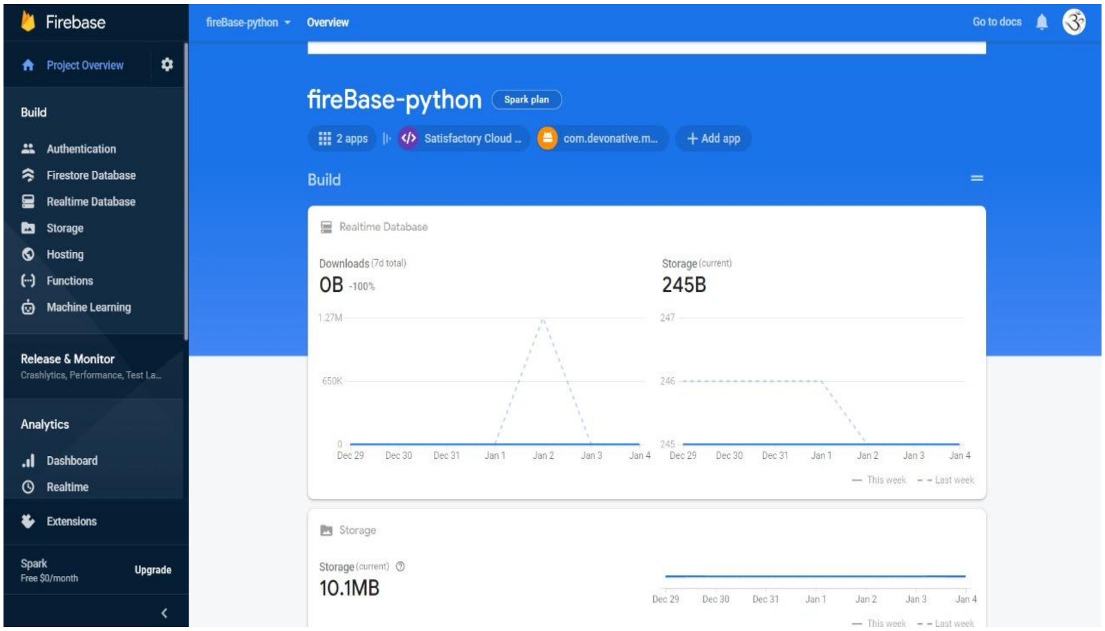


Fig. 3.9: Python Symbol



fireBase-python

Realtime Database

Downloads (7d total) 0B -100%

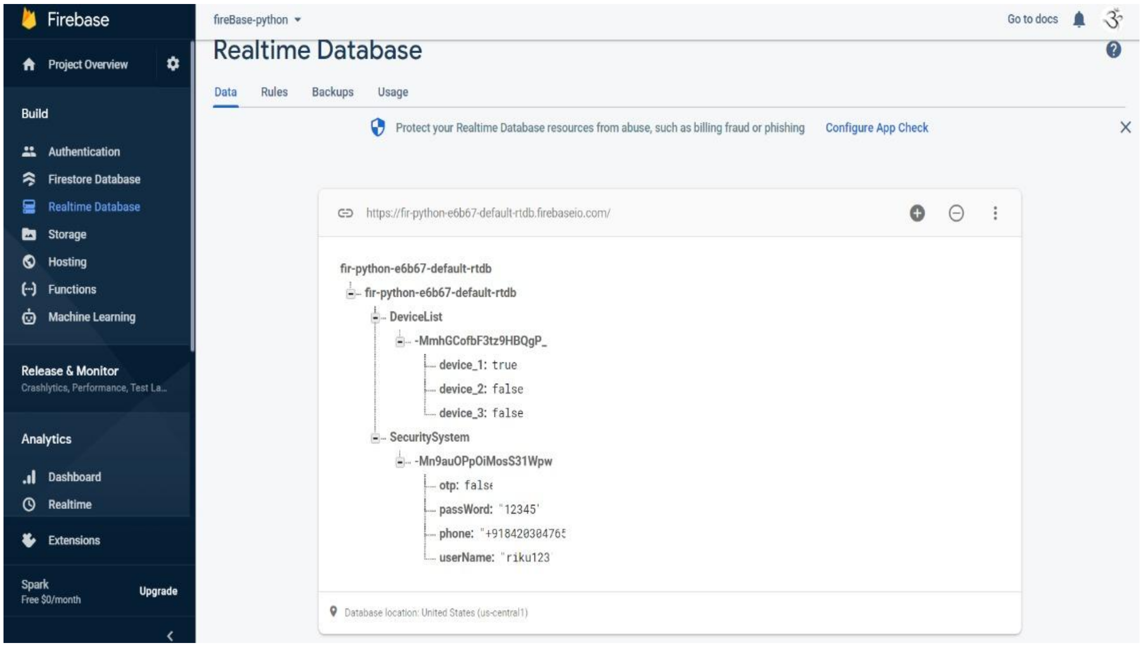
Storage (current) 245B

Storage

Storage (current) 10.1MB

Fig. 3.10 : Python using on google firebase

GOOGLE FIREBASE



Protect your Realtime Database resources from abuse, such as billing fraud or phishing

https://fir-python-e6b67-default-rtdb.firebaseio.com/

```
fir-python-e6b67-default-rtdb
  fir-python-e6b67-default-rtdb
    DeviceList
      -MmhGCofbF3tz9HBQgP_
        device_1: true
        device_2: false
        device_3: false
    SecuritySystem
      -Mn9auOPpOiMosS31Wpw
        otp: false
        passWord: "12345'
        phone: "+918420304765
        userName: "riku123
```

Database location: United States (us-central1)

Fig. 3.11 : google firebase realtime database

Firebase is a popular backend-as-a-service company, letting developers sync their apps and websites to Firebase's cloud without having to worry about database management and scalability.

Firebase also just added hosting for web assets, like HTML, JavaScript, and image files, so developers don't have to set up separate accounts for web pages that are simply going to communicate with Firebase's backend.The Firebase Realtime Database lets you build rich, collaborative applications by allowing secure access to the database directly from client-side code. Data is persisted locally, and even while offline, realtime events continue to fire, giving the end user a responsive experience. When the device regains connection, the Realtime Database synchronizes the local data changes with the remote updates that occurred while the client was offline, merging any conflicts automatically.

The Realtime Database provides a flexible, expression-based rules language, called Firebase Realtime Database Security Rules, to define how your data should be structured and when data can be read from or written to. When integrated with Firebase Authentication, developers can define who has access to what data, and how they can access it. The Realtime Database is a NoSQL database and as such has different optimizations and functionality compared to a relational database. The Realtime Database API is designed to only allow operations that can be executed quickly.

Firebase is a Google platform that is used to create mobile and web applications. It was originally an independent company that was founded in 2011. In 2014, Google acquired the platform, and it is now their flagship offering for app development.Firebase evolved from Envolve, a prior startup founded by James Tamplin and Andrew Lee in 2011. Envolve published an API that enabled developers to integrate online chat into their websites. Upon releasing the chat service, Tamplin and Lee discovered that it was being used for passing application data that was not chat messages. Developers were using Evolve to sync application data such as game state across users in real time.The top-level entity in Firebase is a Firebase project. You can register your Apple, Android, or web apps in a project. After registering your apps with Firebase, you can use the SDKs for any of the Firebase products.

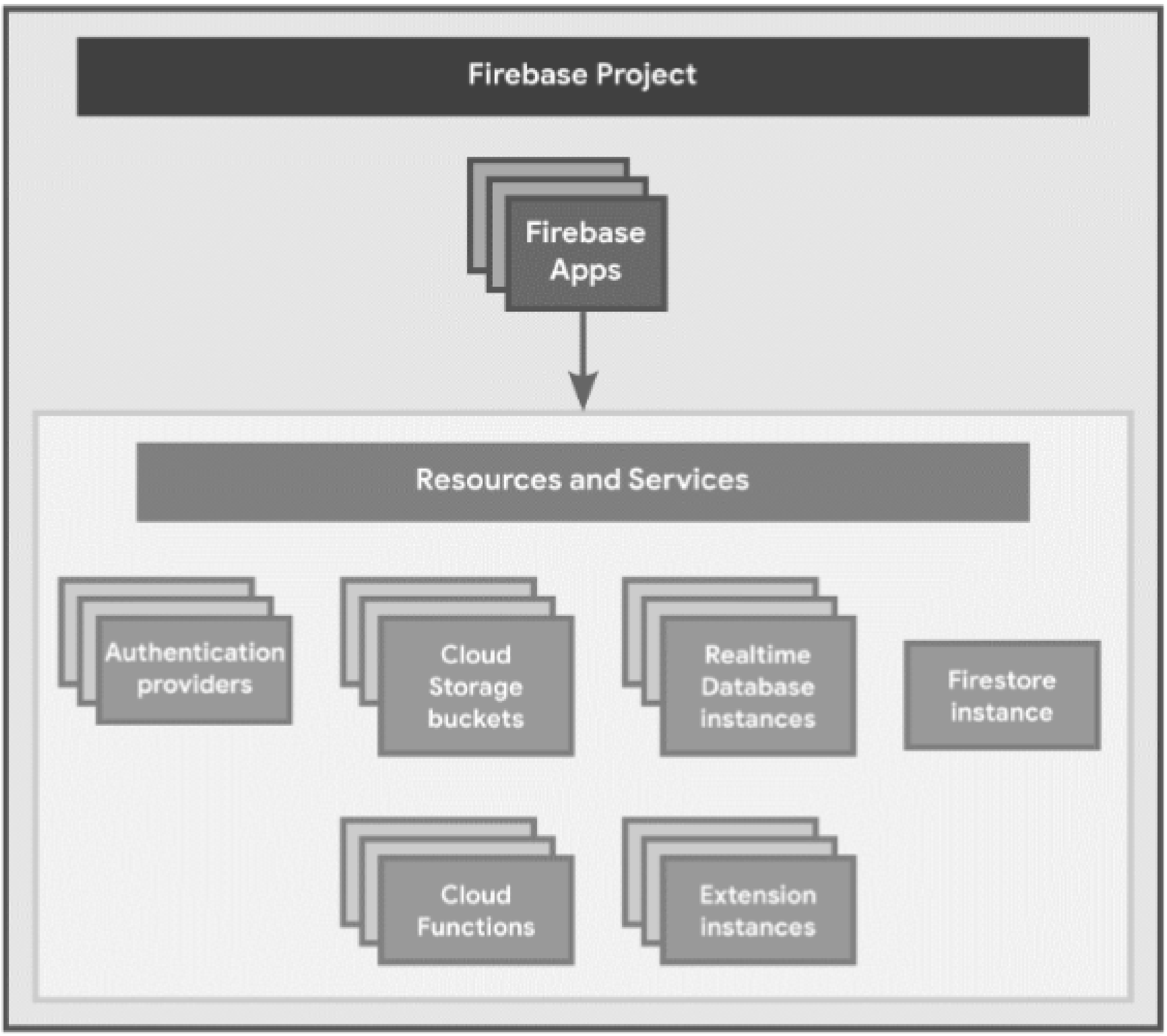


Fig. 3.12 :Firebase Project Architecture

- A Firebase project is like a container for all your apps and any resources and services provisioned for the project.
- A Firebase project can have one or more Firebase Apps registered to it (for example, both the iOS and Android versions of an app, or both the free and paid versions of an app).
- All Firebase Apps registered to the same Firebase project share and have access to all the same resources and services provisioned for the project. Here are some examples:
    - All the Firebase Apps registered to the same Firebase project share the same backends, like Firebase Hosting, Authentication, Realtime Database, Cloud Firestore, Cloud Storage, and Cloud Functions.
    - All Firebase Apps registered to the same Firebase project are associated with the same Google Analytics property, where each Firebase App is a separate data stream in that property.

When we are creating a firebase project, what actually happens under the hood is we are implicitly creating a google cloud project behind the scenes. We can also create a Google Cloud project first then add the firebase functionality later on to the project. So, we can say that Google Cloud project is a virtual container for data, code, configuration and services.

As Google firebase is an google cloud project at the end of the day: -

- We can interact with a project in the Firebase console as well as in the Google Cloud Console and in the Google APIs console.
- We can use products and APIs from both Firebase and Google Cloud in a project.
- Billing and permissions for a project are shared across Firebase and Google Cloud.
- Unique identifiers for a project (like project number and project ID) are shared across Firebase and Google Cloud.
- Deleting a project deletes it across Firebase and Google Cloud.

Firebase falls under BaaS(Backend as a Service) of cloud. It is a next generation of web and app development platform on GCP(Google Cloud Platform). Firebase frees developers to focus on crafting fantastic user experiences. You don’t need to manage servers. You don’t need to write APIs. Firebase is your server, your API and your datastore, all written so generically that you can modify it to suit most needs. Yeah, you’ll occasionally need to use other bits of the Google Cloud for your advanced applications. Firebase can’t be everything to everybody.

Google firebase can be pretty much used for any type of tasks not all but most. They can be used for Realtime database purposes, file storage, authentication system with supported google and Microsoft IDs and for web hosting as well as Android app hosting. So we can say we can make android apps with firebase as backend which is the workflow we did for this Smart Digital lock security system.

The features of Firebase BaaS are discussed below: -

- Realtime Database - Most databases require you to make HTTP calls to get and sync your data. Most databases give you data only when you ask for it. When you connect your app to Firebase, you're not connecting through normal HTTP. You're connecting through a WebSocket. Web Sockets are much, much faster than HTTP. You don't have to make individual WebSocket calls, because one socket connection is plenty. All of your data syncs automatically through that single WebSocket as fast as your client's network can carry it. Firebase sends you new data as soon as it's updated. When your client saves a change to the data, all connected clients receive the updated data almost instantly.
- File Storage -Firebase Storage provides a simple way to save binary files — most often images, but it could be anything — to Google Cloud Storage directly from the client. Firebase Storage has it's own system of security rules to protect your Google Cloud bucket from the masses, while granting detailed write privileges to your authenticated clients.
- Authentication - Firebase auth has a built in email/password authentication system. It also supports OAuth2 for Google, Facebook, Twitter and GitHub. We'll focus on email/password authentication for the most part. Firebase's OAuth2 system is well-documented and mostly copy/paste. Firebase Auth integrates directly into Firebase Database, so you can use it to control access to your data.
- Hosting - Firebase includes an easy-to-use hosting service for all of your static files. It serves them from a global CDN with HTTP/2. The BrowserSync + Superstatic development environment is slick. BrowserSync handles reloading your development app across all connected devices and Superstatic replicates Firebase hosting locally in such a way that you can deploy straight to Firebase for production use.
- Full Featured App platform -The Firebase team has integrated a bunch of new and existing Google products with Firebase. A bunch of these features apply to iOS and Android but not to web. Remote Config, Test, Lab, Crash , Notifications, Dynamic Links, AdMob sor some features of firebase can be used on our mobile applications by integrating firebase plugin from android studio for android development.

The advantages of firebase include Email & password, Google, Facebook, and Github authentication, Realtime data, Ready-made API, Built in security at the data node level, File storage backed by Google Cloud Storage, Static file hosting, Treat data as streams to build highly scalable applications and provides under the hood solid google cloud platform infrastructure.

The major disadvantages of firebase are Limited query abilities due to Firebase's data stream model, Traditional relational data models are not applicable to NoSQL; therefore, your SQL chops will not transfer and No on-premise installation.

For our project we have added firebase connectivity in our android studio project, there are several ways to achieve and add firebase to our android project such as Add Firebase using the Firebase console and Add Firebase using the Firebase Assistant. The latter method is better and easier for us to work with which will be discussed briefly below.

The Firebase Assistant registers your app with a Firebase project and adds the necessary Firebase files, plugins, and dependencies to your Android project — all from within Android Studio.To enable that we have to follow some few steps which are discussed here pen your Android project in Android Studio, then make sure that you're using the latest versions of Android Studio and the Firebase Assistant for Windows / Linux: Help > Check for updates. Open the Firebase Assistant: Tools > Firebase. In the Assistant pane, choose a Firebase product to add to your app. Expand its section, then click the tutorial link (for example, Analytics > Log an Analytics event). Click Connect to Firebase to connect your Android project with Firebase. Click the button to add a desired Firebase product (for example, Add Analytics to your app). Sync your app to ensure that all dependencies have the necessary versions. In the Assistant pane, follow the remaining setup instructions for your selected Firebase product. Add as many other Firebase products as you'd like via the Firebase Assistant.After the initial setup is done we now have the privilege to select which services of firebases to use with our android studio in that way it would only load those framework. Gain insights on user behavior with Analytics.We can Set up a user authentication flow with Authentication, Store data, like user information, with Cloud Firestore or Realtime Database, Store files, like photos and videos, with Cloud Storage., Trigger backend code that runs in a secure environment with Cloud Functions., Send notifications with Cloud Messaging and Find out when and why your app is crashing with Crashlytics.

In our project we have used only two of the core components or features of google firebase including Realtime database and Cloud storage. As we have discussed before how Google firebase is the heart of our project because every interaction data Read/ Write operations are done into our Realtime database.

The Realtime database stores information such device state, customer’s credentials, phone number, OTP switcher and as well as sensor data which may be used in future for processing. The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in Realtime to every connected client. When you build cross-platform apps with our Apple platforms, Android, and JavaScript SDKs, all of your clients share one Realtime Database instance and automatically receive updates with the newest data.

Some of the key features of Realtime database in google firebase are as follows: -

- Realtime - Instead of typical HTTP requests, the Firebase Realtime Database uses data synchronization—every time data changes, any connected device receives that update within milliseconds. Provide collaborative and immersive experiences without thinking about networking code.
- Offline - Firebase apps remain responsive even when offline because the Firebase Realtime Database SDK persists your data to disk. Once connectivity is reestablished, the client device receives any changes it missed, synchronizing it with the current server state.
- Accessible from Client Devices - The Firebase Realtime Database can be accessed directly from a mobile device or web browser; there’s no need for an application server. Security and data validation are available through the Firebase Realtime Database Security Rules, expression-based rules that are executed when data is read or written.
- Scale across multiple databases - With Firebase Realtime Database on the Blaze pricing plan, you can support your app's data needs at scale by splitting your data across multiple database instances in the same Firebase project. Streamline authentication with Firebase Authentication on

your project and authenticate users across your database instances. Control access to the data in each database with custom Firebase Realtime Database Rules for each database instance.

The Firebase Realtime Database lets you build rich, collaborative applications by allowing secure access to the database directly from client-side code. Data is persisted locally, and even while offline, realtime events continue to fire, giving the end user a responsive experience. When the device regains connection, the Realtime Database synchronizes the local data changes with the remote updates that occurred while the client was offline, merging any conflicts automatically.

The Realtime Database provides a flexible, expression-based rules language, called Firebase Realtime Database Security Rules, to define how your data should be structured and when data can be read from or written to. When integrated with Firebase Authentication, developers can define who has access to what data, and how they can access it.

The Realtime Database is a NoSQL database and as such has different optimizations and functionality compared to a relational database. The Realtime Database API is designed to only allow operations that can be executed quickly. This enables you to build a great realtime experience that can serve millions of users without compromising on responsiveness. Because of this, it is important to think about how users need to access your data and then structure it accordingly.

In our project we have used Google firebase cloud storage to store the thief’s image which is captured by raspberry pi camera when the motion was detected. This image data is stored in the cloud storage for further processing and to retrieve those images for image identification of thief’s identity. Cloud storage can be used for any type of files including images, videos, text anything which can typically be store on general file systems. Cloud Storage for Firebase is built for app developers who need to store and serve user-generated content, such as photos or videos.

Cloud Storage for Firebase is a powerful, simple, and cost-effective object storage service built for Google scale. The Firebase SDKs for Cloud Storage add Google security to file uploads and downloads for your Firebase apps, regardless of network quality. We can use our SDKs to store images, audio, video, or other user-generated content. On the server, you can use Google Cloud Storage APIs to access the same files.

Some of the key capabilities of Google firebase Cloud storage are as follows: -

- Robust operations - Firebase SDKs for Cloud Storage perform uploads and downloads regardless of network quality. Uploads and downloads are robust, meaning they restart where they stopped, saving your users time and bandwidth.
- Strong security Firebase SDKs for Cloud Storage integrate with Firebase Authentication to provide simple and intuitive authentication for developers. You can use our declarative security model to allow access based on filename, size, content type, and other metadata.
- High scalability Cloud Storage is built for exabyte scale when your app goes viral. Effortlessly grow from prototype to production using the same infrastructure that powers Spotify and Google Photos.

Developers use the Firebase SDKs for Cloud Storage to upload and download files directly from clients. If the network connection is poor, the client is able to retry the operation right where it left off, saving your users time and bandwidth.Cloud Storage for Firebase stores your files in a Google Cloud Storage bucket, making them accessible through both Firebase and Google Cloud. This allows you the flexibility to upload and download files from mobile clients via the Firebase SDKs for Cloud Storage. In addition, you can do server-side processing such as image filtering or video transcoding using the Google Cloud Storage APIs. Cloud Storage scales automatically, meaning that there's no need to migrate to any other provider. Learn more about all the benefits of our integration with Google Cloud.The Firebase SDKs for Cloud Storage integrate seamlessly with Firebase Authentication to identify users, and we provide a declarative security language that lets you set access controls on individual files or groups of files, so you can make files as public or private as you want.

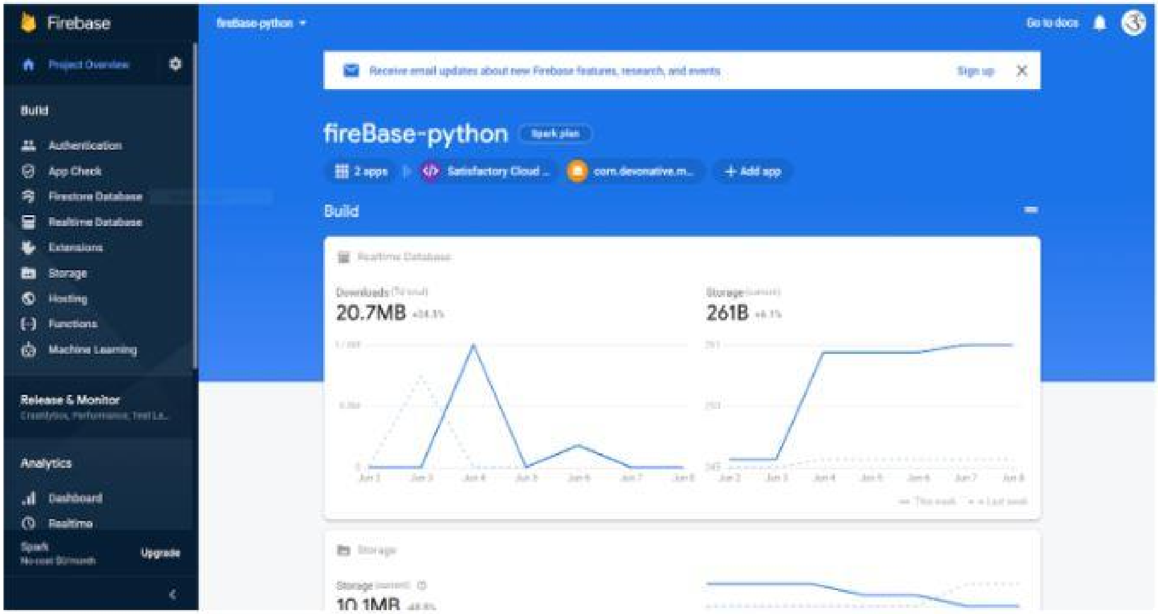
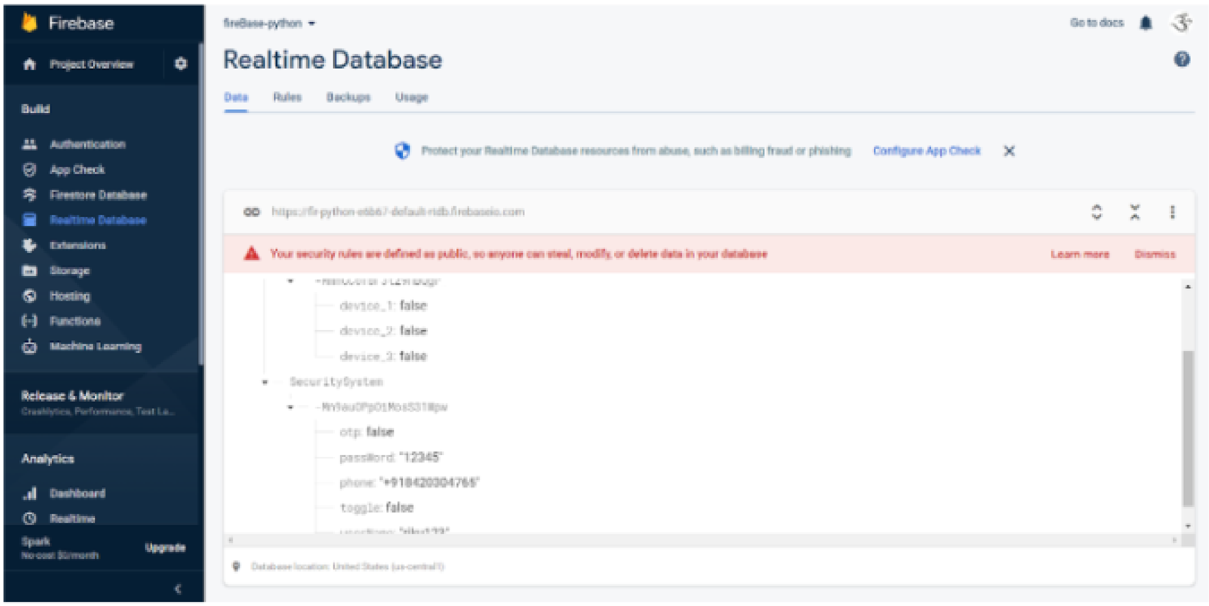


Fig. 3.13: Firebase Console Project Overview



Protect your Realtime Database resources from abuse, such as billing fraud or phishing

https://fir-python-e8b67-default-rtdb.firebaseio.com

Your security rules are defined as public, so anyone can steal, modify, or delete data in your database

```
    device_1: false
    device_2: false
    device_3: false
SecuritySystem
  -MY9auOPpO1MosS31Mpw
    otp: false
    password: "12345"
    phone: "+918420304765"
    toggle: false
```

Database location: United States (us-central1)

Fig. 3.14 Firebase Realtime Database Structure

As We All know that to work with any type of cloud storage we first required to create a storage bucket which will have its own unique GS(google storage) address which you can see from the below figure we have created we can see the unique address of our google bucket. But before working these cloud buckets externally specifically in our case to interact with raspberry pi we required python API and bucket rules to configured in such a way that it could be possible to store the files directly to this cloud bucket.

This is the configuration of our cloud storage: -

```
{
      rules_version = '2';
      service firebase.storage {
        match /b/{bucket}/o {
          match /{allPaths=**} {
            allow read, write;
          }
        }
      }
```

ANDROID STUDIO

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.Android Studio was announced on May 16, 2013, at the Google I/O conference. It was in the early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0. On May 7, 2019, Kotlin replaced Java as Google's preferred language for Android app development. Java is still supported, as is C++.

It has features of the current version of android studio such as Gradle-based build support,Android-specific refactoring and quick fixes,Lint tools to catch performance, usability, version compatibility and other problems,ProGuard integration and app-signing capabilities,Template-based wizards to create common Android designs and components,A rich layout editor that allows users to drag-and-drop UI components, option to preview layouts on multiple screen configurations,Support for building Android Wear apps,Built-in support for Google Cloud Platform, enabling integration with Firebase Cloud Messaging (Earlier 'Google Cloud Messaging') and Google App Engine,Android Virtual Device (Emulator) to run and debug apps in the Android studio.Android Studio provides the fastest tools for building apps on every type of Android device.Some of the key features of android studio are Visual layout editor, APK Analyzer, Fast emulator, Intelligent Code editor, Flexible build system, Realtime Profilers

- Visual Layout editor which creates complex layouts with ConstraintLayout by adding constraints from each view to other views and guidelines. Then preview your layout on any screen size by selecting one of various device configurations or by simply resizing the preview window.
- APK Analyzer creates complex layouts with ConstraintLayout by adding constraints from each view to other views and guidelines. Then preview your layout on any screen size by selecting one of various device configurations or by simply resizing the preview window.
- Fast Emulator Installs and run your apps faster than with a physical device and simulate different configurations and features, including ARCore, Google's platform for building augmented reality experiences.
- Intelligent Code editor has the ability to Write better code, work faster, and be more productive with an intelligent code editor that provides code completion for Kotlin, Java, and C/C++ languages.
- Flexible build system which is powered by Gradle, Android Studio's build system allows you to customize your build to generate multiple build variants for different devices from a single project.

- Realtime Profilers are built-in profiling tools that provide Realtime statistics for your app's CPU, memory, and network activity. Identify performance bottlenecks by recording method traces, inspecting the heap and allocations, and see incoming and outgoing network payloads.

The System requirements for this application requires us either of the following OS with these minimum specific configurations: -

- For Windows-

  64-bit Microsoft® Windows® 8/10,x86_64 CPU architecture; 2nd generation Intel Core or newer, or AMD CPU with support for a Windows Hypervisor,8 GB RAM or more,8 GB of available disk space minimum (IDE + Android SDK + Android Emulator),1280 x 800 minimum screen resolution

- For Mac-

  MacOS® 10.14 (Mojave) or higher,ARM-based chips, or 2nd generation Intel Core or newer with support for Hypervisor.Framework,8 GB RAM or more,8 GB of available disk space minimum (IDE + Android SDK + Android Emulator),1280 x 800 minimum screen resolution

- For Linux –

  Any 64-bit Linux distribution that supports Gnome, KDE, or Unity DE; GNU C Library (glibc) 2.31 or later.,x86_64 CPU architecture; 2nd generation Intel Core or newer, or AMD processor with support for AMD Virtualization (AMD-V) and SSSE3,8 GB RAM or more,8 GB of available disk space minimum (IDE + Android SDK + Android Emulator),1280 x 800 minimum screen resolution

- For Chrome OS –

  8 GB RAM or more recommended,4 GB of available disk space minimum,1280 x 800 minimum screen resolution,Intel i5 or higher (U series or higher) recommended

Android Architecture-

Android architecture contains a number of components to support any android device needs. Android software contains an open-source Linux Kernel having a collection of C/C++ libraries which are exposed through an application framework.

Among all the components Linux Kernel provides main functionality of operating system functions to smartphones and Dalvik Virtual Machine (DVM) provides a platform for running an android application.

Applications is the top layer of android architecture. The pre-installed applications like home, contacts, camera, gallery etc and third party applications downloaded from the play store like chat applications, games etc. will be installed on this layer only.
It runs within the Android run time with the help of the classes and services provided by the application framework.

Application Framework provides several important classes which are used to create an Android application. It provides a generic abstraction for hardware access and also helps in managing the user interface with application resources. Generally, it provides the services with the help of which we can create a particular class and make that class helpful for the Applications creation.

It includes different types of services activity manager, notification manager, view system, package manager etc. which are helpful for the development of our application according to the prerequisite.

Application Runtime environment is one of the most important parts of Android. It contains components like core libraries and the Dalvik virtual machine(DVM). Mainly, it provides the base for the application framework and powers our application with the help of the core libraries.

Like Java Virtual Machine (JVM), Dalvik Virtual Machine (DVM) is a register-based virtual machine and specially designed and optimized for android to ensure that a device can run multiple instances efficiently. It depends on the Linux kernel for threading and low-level memory management. The core libraries enable us to implement android applications using the standard JAVA or Kotlin programming languages.

Platform libraries –

The Platform Libraries include various C/C++ core libraries and Java based libraries such as Media, Graphics, Surface Manager, OpenGL etc. to provide support for android development.

- Media library provides support to play and record an audio and video formats.
- Surface manager responsible for managing access to the display subsystem.
- SGL and OpenGL both cross-language, cross-platform application program interface (API) are used for 2D and 3D computer graphics.
- SQLite provides database support and FreeType provides font support.
- Web-Kit This open source web browser engine provides all the functionality to display web content and to simplify page loading.
- SSL (Secure Sockets Layer) is security technology to establish an encrypted link between a web server and a web browser.

Linux Kernel is the heart of the android architecture. It manages all the available drivers such as display drivers, camera drivers, Bluetooth drivers, audio drivers, memory drivers, etc. which are required during the runtime.

The Linux Kernel will provide an abstraction layer between the device hardware and the other components of android architecture. It is responsible for management of memory, power, devices etc.

The features of Linux kernel are:

- Security: The Linux kernel handles the security between the application and the system.
- Memory Management: It efficiently handles the memory management thereby providing the freedom to develop our apps.
- Process Management: It manages the process well, allocates resources to processes whenever they need them.
- Network Stack: It effectively handles the network communication.
- Driver Model: It ensures that the application works properly on the device and hardware manufacturers responsible for building their drivers into the Linux build.

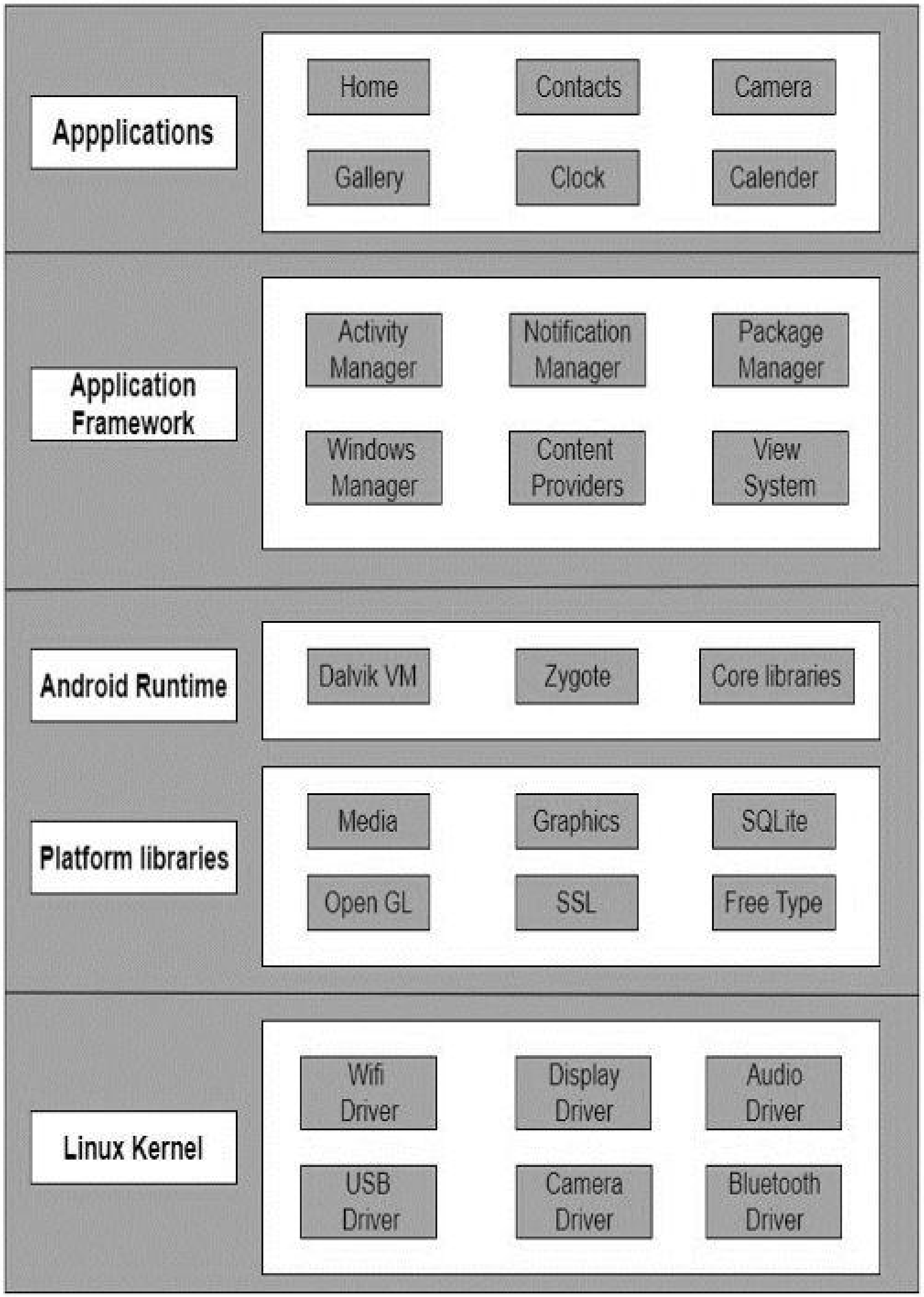


Fig. 3.15: Architecture of Android

There are many ways to develop android apps using android studio we can pick any of the following programming languages as all of them are supported by the Android Studio

Some of the languages and for which they are specific purpose used for developing apps are as follows: -

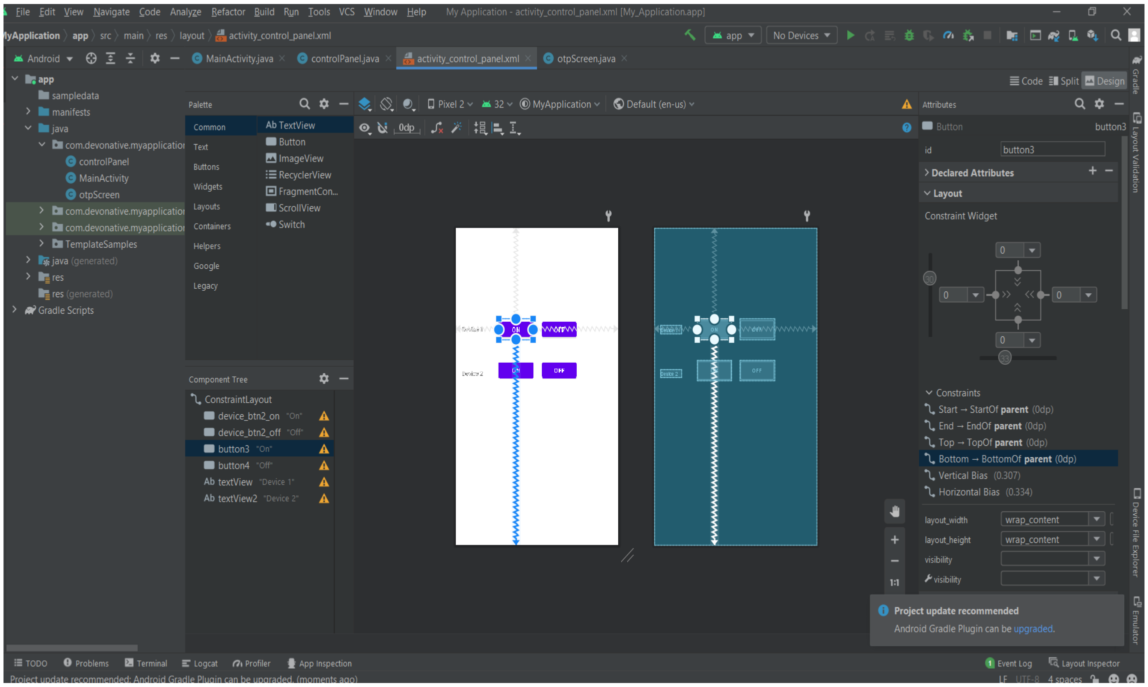
- Java is an official language of Android development and is supported by Android Studio. It has been an official language longer than Kotlin, and it is also popular outside of Kotlin development for many other purposes. Java and Android Studio have a steep learning curve, however.
- Kotlin is another official Android language. It is similar to Java in many ways but is a little easier to get your head around. It is also now Google's preferred language of choice, though it is not as widely used outside of Android Studio. This may make it slightly less appealing for those hoping to work as developers across numerous projects.
- Android Studio also supports C++ with the use of the Java NDK. This allows for native coding applications, which can be handy for things like games. C++ is more complicated though, and this option is mostly only going to appeal to large, professional teams. C++ is also supported by Unreal Engine.
- C# is a more beginner-friendly alternative to C or C++ that obfuscates more code. It is also a little less difficult than Java, though the two languages are extremely similar. It's supported by some very handy tools like Unity and Xamarin, which are great for game development and cross-platform development. C# with Unity is the best option for many mobile game developers.
- Another cross-platform tool built on LUA. It massively simplifies the app-building process while stilling allowing you to call native libraries.
- If you already know how to build interactive web pages, then you can use this knowledge with PhoneGap to build a more basic cross-platform app.

For this project we have chosen java as the programming language for developing apps as java is very popular language and its been there over 2 decades so there are lot of options, libraries, frameworks and community support available in java. Also java is the first official language of android studio even android was written in java in its origin years.

With the help of java programming, xml , android studio visual editor and Gradle build tools we are able to build successfully our android app which is a part of our project for interacting with both raspberry pi and google cloud firebase, Realtime database as well as cloud storage bucket

Android Layout Editor / XML

We have mostly designed the app using android layout editor and few of the xml coding to change some of the constraints of our layout as well as each element of the layout parameters such as color, opacity, text size and etc. The Layout Editor enables us to quickly build layouts by dragging UI elements into a visual design editor instead of writing layout XML by hand. The design editor can preview our layout on different Android devices and versions, and we can dynamically resize the layout to be sure it works well on different screen sizes



id button3

Start → StartOf parent (0dp)
End → EndOf parent (0dp)
Top → TopOf parent (0dp)
Bottom → BottomOf parent (0dp)
Vertical Bias (0.307)
Horizontal Bias (0.334)

layout_width wrap_content
layout_height wrap_content
visibility
visibility

Project update recommended
Android Gradle Plugin can be upgraded.

Project update recommended: Android Gradle Plugin can be upgraded. (moments ago)

Fig. 3.16: Android Layout UI Editor

The above Figure shows the Android Layout Editor screen and the numbering shows which components does what works which has been explained below briefly.

1. Palette: Contains various views and view groups that you can drag into your layout.
2. Component Tree: Shows the hierarchy of components in your layout.
3. Toolbar: Click these buttons to configure your layout appearance in the editor and change layout attributes.
4. Design editor: Edit your layout in Design view, Blueprint view, or both.
5. Attributes: Controls for the selected view's attributes.
6. View mode: View your layout in either Code code mode icon, Design design mode icon, or Split split mode icon modes. Split mode shows both the Code and Design windows at the same time.
7. Zoom and pan controls: Control the preview size and position within the editor.

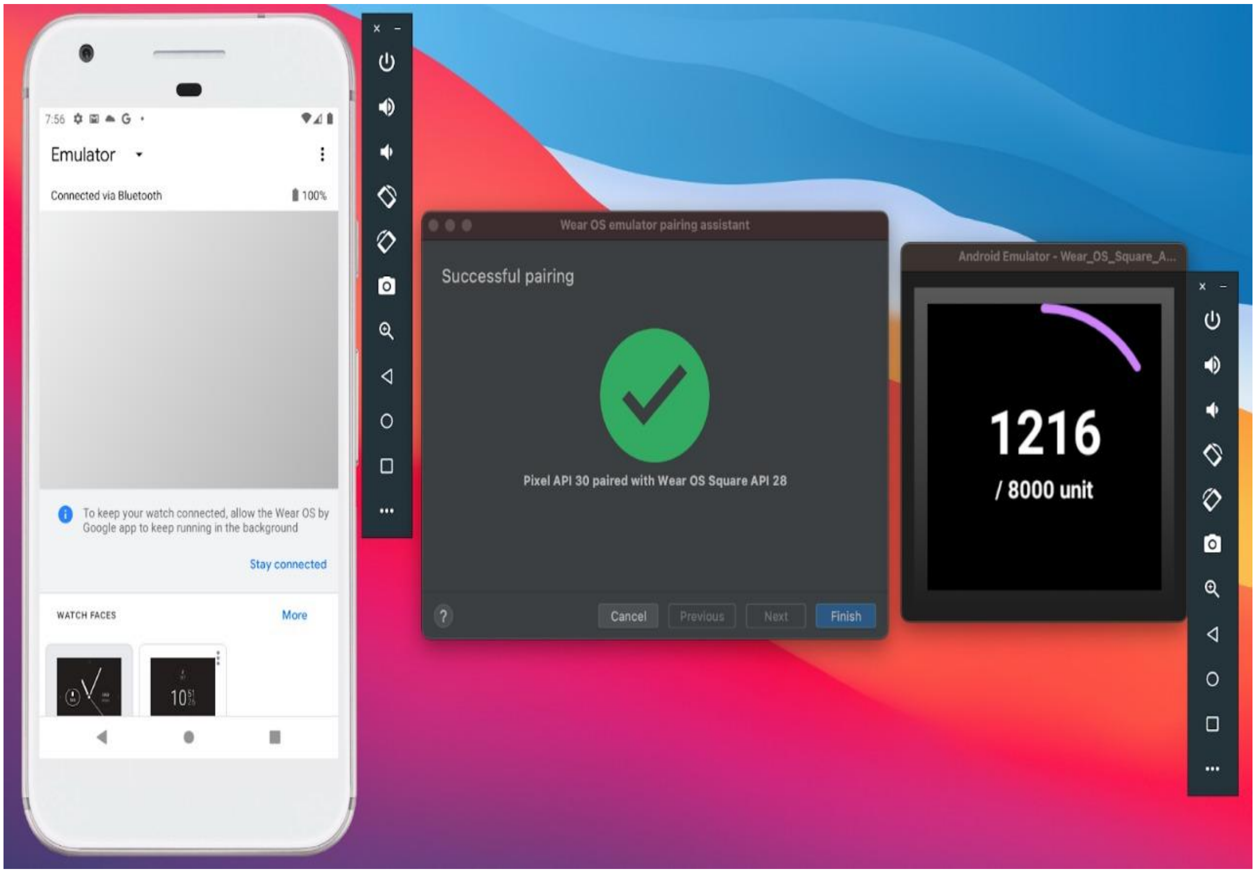
Android Emulator

The Android Emulator simulates Android devices on your computer so that you can test your application on a variety of devices and Android API levels without needing to have each physical device.The emulator provides almost all of the capabilities of a real Android device. You can simulate incoming phone calls and text messages, specify the location of the device, simulate different network speeds, simulate rotation and other hardware sensors, access the Google Play Store, and much more.Testing your app on the emulator is in some ways faster and easier than doing so on a physical device. For example, you can transfer data faster to the emulator than to a device connected over USB.The emulator comes with predefined configurations for various Android phone, tablet, Wear OS, and Android TV devices.We have also integrated google cloud firebase in our android studio project for database and cloud storage connectivity which will be discussed in firebase module.

Each instance of the Android Emulator uses an Android virtual device (AVD) to specify the Android version and hardware characteristics of the simulated device. To effectively test your app, you should create an AVD that models each device on which your app is designed to run. To create and manage AVDs, use the Device Manager.

Each AVD functions as an independent device, with its own private storage for user data, SD card, and so on. By default, the emulator stores the user data, SD card data, and cache in a directory specific to that AVD. When you launch the emulator, it loads the user data and SD card data from the AVD directory.

With AVD we can create any number of virtual android device which is fully compatible with our app depending on android SDK version, we can create AVM(Android Virtual Machine) with any number of features and android version. We can also work on wear OS pairing with regular android VM. The Wear OS pairing assistant guides you step-by-step through pairing Wear OS emulators with physical or virtual phones directly in Android Studio. The assistant can help you get the right Wear OS Companion app installed on your phone and set up a connection between the two devices.


Connected via Bluetooth

To keep your watch connected, allow the Wear OS by Google app to keep running in the background

Successful pairing

Pixel API 30 paired with Wear OS Square API 28

Fig.3.17: Android VM emulators

As we all know running both android studio for development and as well as android emulator simultaneously on a single pc requires lots of RAM. We had only 8 GB of Ram to do all the work so instead of using android virtual machine with emulator we have used USB debugging of our android phone to experiment and prototype our app before packing it as and APK(Android Application Package).

To use our android phone as to view our app rapid development in action we required an USB cable, a android phone with compatible SDK of our project, where we had to enable developers option in our android phone in order to enable the phone to be used as an application preview in action. After that we just plugged in the USB to our computer then android studio automatically detects the port and device name from the device manage section and the code run button is now available.

Once we click on the run button the java codes get compiled into byte code and with the help Gradle build tools the xml skeleton of our app and backend logic of java bytecode gets build. Then the last stage is all about making the package and installing the app on our mobile phone directly via USB cable and its debugging option.

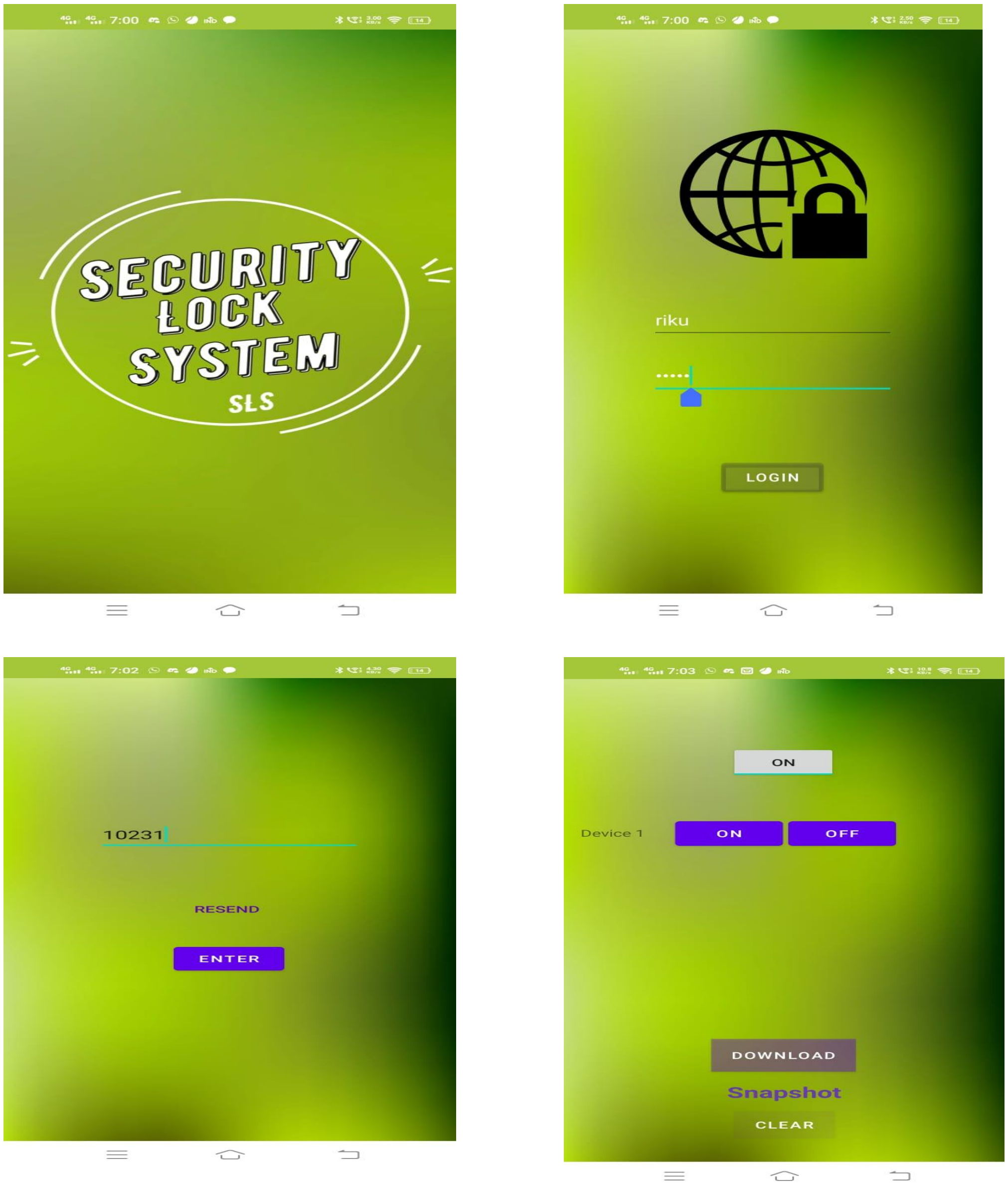
The Android build system compiles app resources and source code, and packages them into APKs or Android App Bundles that you can test, deploy, sign, and distribute. Android Studio uses Gradle, an advanced build toolkit, to automate and manage the build process, while allowing you to define flexible custom build configurations. Each build configuration can define its own set of code and resources, while reusing the parts common to all versions of our app. The Android plugin for Gradle works with the build toolkit to provide processes and configurable settings that are specific to building and testing Android applications.

Gradle and the Android plugin run independent of Android Studio. This means that you can build your Android apps from within Android Studio, the command line on your machine, or on machines where Android Studio is not installed (such as continuous integration servers). The output of the build is the same whether you are building a project from the command line, on a remote machine, or using Android Studio.

We have also integrated google cloud firebase in our android studio project for database and cloud storage connectivity. We first add to enabled firebase within our android project from tools additional plugins firebase. After that we had to login to our firebase account in order to authorized the android project connectivity with firebase project which allows us further to enable cloud Realtime database and cloud storage options interactivity within our app.

MOBILE APPLICATION

A mobile application, most commonly referred to as an app, is a type of application software designed to run on a mobile device, such as a smartphone or tablet computer. Mobile applications frequently serve to provide users with similar services to those accessed on PCs.We have created the below application in order to have an interactive connection with our smart digital lock security system. With the help of this application, now users can login to our app using whatsapp based OTP confirmation system. After login to the app the user has the privilege to toggle between the security status of our security system and download images nearby the lock system from the cloud database into the user's mobile gallery.The applications are a departure from the traditional integrated software systems seen on PCs. Instead, each app offers a single, limited feature, such as a game, calculator, or mobile web browsing. Although early mobile devices' restricted hardware resources prevented programmes from multitasking, their uniqueness is now part of their appeal because it allows consumers to choose what their devices can and cannot accomplish.The most basic mobile apps are just PC-based software that have been ported to a mobile device. This strategy is becoming less effective as mobile apps become more sophisticated. A more advanced method involves building expressly for mobile devices, taking advantage of both their limitations and benefits. Apps that incorporate location-based features, for example, are created from the ground up.Native applications and web apps are the two types of apps available. Native apps are designed specifically for a mobile operating system, most commonly iOS or Android. Native apps have superior performance and a more refined user interface (UI), and they often go through a far more rigorous development and quality assurance process before being launched.Because web apps are run through a browser, they are written in HTML5 or CSS and use very little device RAM. The user is forwarded to a specific web page, and all data is saved in a database on the server. The use of web apps necessitates the availability of a reliable internet connection.in contrast to those designed for desktop computers, avoid including software systems. If all other factors are equal, each versatile application provides segregated and limited utility. It could be a game, a number cruncher, or a portable internet browser, for example. Examples of mobile applications operated by those processes include Candy Crush Saga, The Sims Mobile, Among Us!, Subway Surfers, and others.The initial mobile application provided general-purpose information and information services on the global network, including email, calendar, stock market, listings and weather information. However, the demand of mobile device users, along with the ability to develop the mobile application extends into other categories, such as mobile games, factory automation, GPS. The explosion in the number and variety of applications has developed into large and diverse areas. Many services nowadays need the help of mobile application technology such as identifying location and internet banking, for tracking, purchasing tickets and even mobile medical services.The native mobile application is the kind of app in which it is created and developed for a specific type of device platforms such as Android or IOS, using a specialized coding language. To build a native application, the coding language that is chosen by developers must be given access by the device platform. Typical application features for this category could be offline mobile games, dictionary apps, etc.The fundamental benefit of native applications is that they provide a superior and beautiful user experience. Designers who create them, on the whole, use native UI devices. Access to a large number of APIs also speeds up development and expands the application's capabilities. Native applications must be acquired from app stores and installed directly on mobile devices. That is why they must first go through a rigorous distribution process. Normally, all of the visuals, music, and stages in the game are downloaded so that the player can play it without an internet connection (some games require you to have an internet connection because they need to log in, buy or sell items inside, or because they are online games). Another well-known and common example is Facebook. Web applications are software programmes that run on mobile devices in the same way as native mobile applications do. There are, nevertheless, significant distinctions between native and online programmes. For the uninitiated, web applications run in browsers and are often developed in CSS, HTML5, or JavaScript. Such apps take users to a URL and then give them the option of installing the programme. As a result, online apps compel users to save a particular page for future reference. That is why they demand the least amount of memory. Web applications are similar to native applications in terms of organization, but they are accessed through a website browser on your mobile device. They are not stand-alone applications. A mobile website is like some other site. It comprises program-based HTML pages connected and accessed over the Internet (for portable ordinarily Wi-Fi or 3G or 4G organizations). The conspicuous trademark that recognizes a mobile website from a standard site is the way that it is intended for the more modest handheld presentation and contact screen interface. Progressively, responsive website design turns into the new norm for mobile well-disposed websites, yet that can scale to any measured gadget – from work area down to tablet and handheld cell phones. The objectives are fundamentally identified with marketing or public communications, a mobile/responsive website is quite often going to make sense as a practical initial step in your mobile effort strategy. This is because a mobile website has various intrinsic benefits over applications, including more extensive availability, similarity, and cost-effectiveness. The purpose of these cross-platform apps is to solve the hybrid performance problem and the cost problem when writing a variety of native languages for each mobile platform. Although we often confuse Hybrid apps and Cross-platform apps, in fact, they are completely different. Perhaps the only common feature between them is the ability to share source code. Programmers only need to program once and compile or translate into many Native app versions corresponding to each different platform. The most important tool for executing Cross-platform application projects is Cross-platform frameworks. There are many cross-platform frameworks out there. Each type will have different strengths and weaknesses. Depending on the goal of building the app, the programmer will choose the suitable framework.This is the most well-known classification for mobile apps. It'd be surprised at the number of customers that have games installed on their phones. Because it is a particularly lucrative industry, companies devote a significant amount of time and resources into developing games and mobile versions of well-known stationary games. Educational game applications are a fantastic tool for children. Many educational applications become well-known among educators, who use them to improve their teaching methods or to increase their own knowledge.



riku

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10231

Fig. 3.18: Mobile Application Interface

METHODOLOGY

In this project we are able to finally integrate an android application to use it to another level where the user has flexibility to control the smart home AC appliance and toggle between the security system. With help of Google firebase, we are able to build NoSQL databases in JSON format. For this project we need RASPBERRY PI 3B+ , ultrasonic sensor and other components. By default Android Studio provides the open source platform where all the software work has been done and able to make an android application where an user can use it with a phone. ultrasonic sensor which is available for security reasons able to be used more sufficiently and the internet which has been included where a user can instruct the lock system even though he is far outside from the house. In this project with a minicomputer raspberry pi different input and output is interfaced. In the input section there is a bell & camera. In the processing section a minicomputer raspberry pi is utilized. Raspberry pi is equipped with Wi-Fi. And on the output terminal there are Lcd, magnetic door lock, electronically mailing accommodations. A calling bell is placed on the door so that if someone visits the facility the person will press the bell and the bell will engender a signal to raspberry pi denoting the presence of a person. Most paramount input contrivance is the camera. It is utilized to take a snapshot of that person and transmit it to raspberry pi. Raspberry pi processes these inputs like whenever it gets a calling bell as input it transmits a signal to camera to capture an image of the visitor. Within the time it receives the picture it engenders a Gmail alerting the user that someone has arrived in front of the door. After receiving the image raspberry pi sends a mail to utilize affixing the picture. Utilize can control the magnetic lock through Gmail. If utilize wants to sanction the visitor access he can turn on the lock and if he wants to abnegate access for any reason utilize will authoritatively mandate the person to record his voice in voice recorder place near the door bell.

BLOCK DIAGRAM

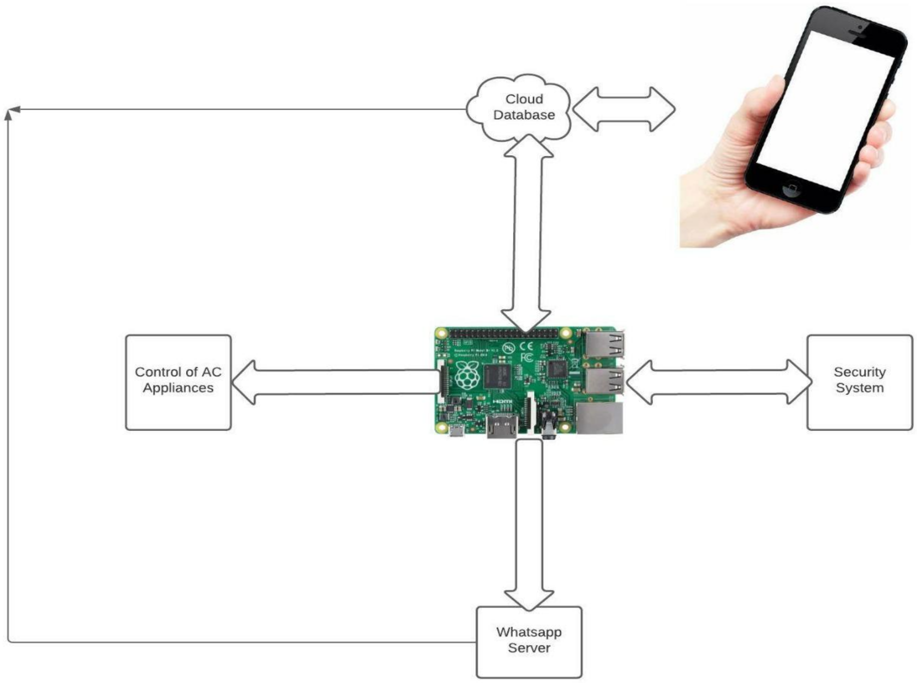


Fig. 3.19: Basic block diagram

This project comprises four core features consisting of control of AC appliance, Cloud database, security system and WhatsApp server for automated OTP. Int the block diagram as we can see that raspberry pi is in the center which is the brain of our project where all the logic and data processing is being done there as well as interacting with physical electronic components. While the Google cloud Firebase is the heart of our project responsible for data ingestion and retrieval to feed those data into our app and raspberry pi.

The security system consist of LDR , ultrasonic sensor, LED, web camera which are responsible for collecting images and sending to the cloud data storage and switching the LED as night lamp during the nighttime for better clarity of images captured by the camera when someone is near the motion get detected with ultrasonic sensor.

FLOWCHART

The Flowchart below is all about how the app logic works with our project and how it actually impacting the changes to the database engine and Raspberry pi.When we are first opening the app, we would be greeted with our app logo animation, after few seconds the app will load login page intent. In the login page we have two input fields one for the username and one for the password along with that we have a login button which if we press without giving proper credentials it will show credentials incorrect toast message in our android app. When we are giving inputs to the password field it automatically hides the password letters just like any traditional login page. After pressing the login button, the app will download login credentials information from the google cloud firebase Realtime database which has been previously configured, as we can see in the flowchart "Process with google cloud firebase block". After retrieving all the information our app backend logic tries to validate whether the input credentials are the same as of the database or not. If it does the app will now load us to the OTP Screen intent where we have to enter an OTP soon to be sent to our register WhatsApp number as a text message.In the OTP screen Intent, we have only one text field for input, one login button and one resend OTP button. In case we haven't received the OTP to our registered WhatsApp number, we have the option to resend the OTP again, if we press on the Resend button it will be disabled for 30 sec and send another OTP to our number. If we enter the incorrect OTP, it will again show some toast messages on our app as "Incorrect OTP". When we entered the correct OTP, the app will finally load to the control panel screen Intent of our app.Now we are finally in the control panel UI of our app from where we can control our AC appliances as well as toggle between security system ON/OFF state along with downloading the images of unauthorized access we tried to approach and open the door. In top of this screen, we have toggle button then below it we have security on and off button separately and on the bottom, we have download button and clear memory button.While we have toggle button for changing the state of the LED or AC appliance connected the raspberry pi, it doesn't change them directly. This change in the state is achieved with the help of google cloud Realtime database which is the heart of our project as raspberry pi is the brain of the project. So whenever we are pressed on the toggle button it changes the Boolean value of our key -value pair which has been designed in our database. Now our raspberry pi is also programmed using python to detect any changes in the database and tries to read the information from the cloud. If the desired key-value pair Boolean value is True then the AC appliance or LED would be automatically turned ON and if the value is False then AC appliance or the LED would be turned OFF.We also have the security button switch ON and OFF, similarly to the toggle button we also have another key-value pair datastore in our database which changes the Boolean value state depending upon the soft switch we pressed in our app as we can see in the flowchart. Similarly, the Raspberry pi again reads the information from the cloud database and switches the security status in raspberry pi. The internal working of the security system is discussed in the working principle. Along with this we have the download button which downloads the images from the cloud storage buckets where the images of unauthorized person's have been unloaded when he/she tries to breach the security. And finally the clear button is used to clear the data storage memory in case we have downloaded the previous images also further optimizing the workflow of the project.

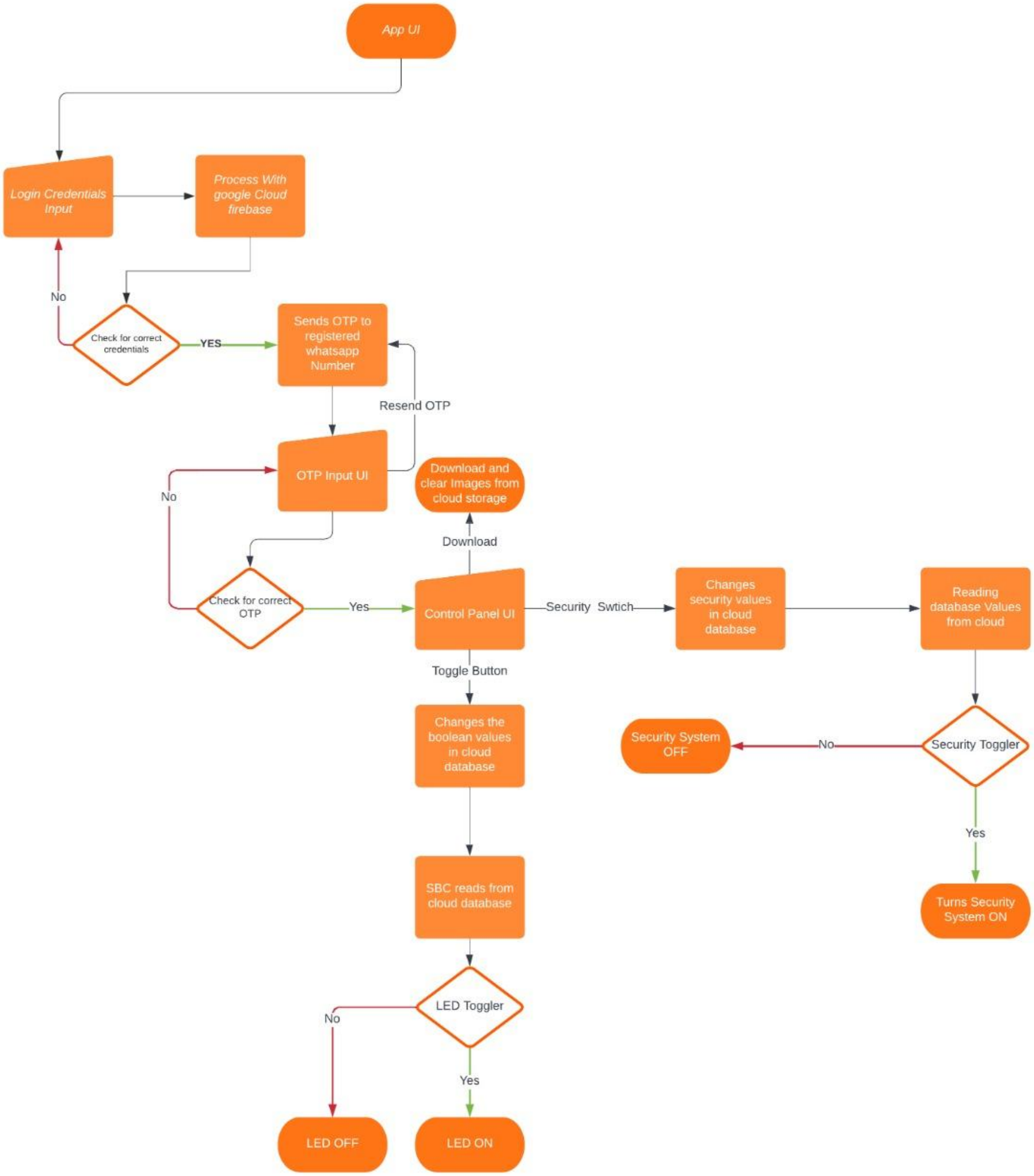

App UI
Login Credentials Input
Process With google Cloud firebase
No
Check for correct credentials
YES
Sends OTP to registered whatsapp Number
Resend OTP
OTP Input UI
No
Download and clear Images from cloud storage
Download
Check for correct OTP
Yes
Control Panel UI
Security Swtich
Changes security values in cloud database
Reading database Values from cloud
Toggle Button
Changes the boolean values in cloud database
Security System OFF
No
Security Toggler
Yes
Turns Security System ON
SBC reads from cloud database
No
LED Toggler
Yes
LED OFF
LED ON

Fig. 3.20: Flowchart

WORKING PRINCIPLE

In this project we have used the ultrasonic sensor HC-SC04 to detect whether a person has entered the room or not . The ultrasonic sensor catches the reflected 40Khz wave and calculates the duration based on this we can get a distance calculation. Here the sensor looks for a person within the predetermined range. If a person is detected then only the alarm will activate and it will produce very loud sounds to inform the surroundings and a photo of the person will be taken at the same time. The photo will be sent to the registered mobile number through a cloud database. This process will be done immediately to inform the user about the person who tries to enter the home.

Apart from the above application, Our project's core is designed by using the internet of things(IoT) where the internet plays an important part of it. With the help of the internet, have implemented smart features such as control of AC appliances near the palm of your hand. We have developed an android application where all things are included to use the digital security and smart-home features. In the android application, the user needs to provide the login credential after pressing the login button the backend JAVA logic will validate the entered user details with cloud database user details. If the output is false then the application will tell the user to enter the correct credentials through android TOAST. If the output is true then the application will redirect to the OTP screen along with sending an OTP to the registered Whatsapp number. In the OTP screen the user has the option to resend the OTP after two minutes in case the user does not receive OTP at the first time.Upon entering the correct OTP the application will load control panel activity where we can control the smart home features and enable or disable the digital security system of our project.

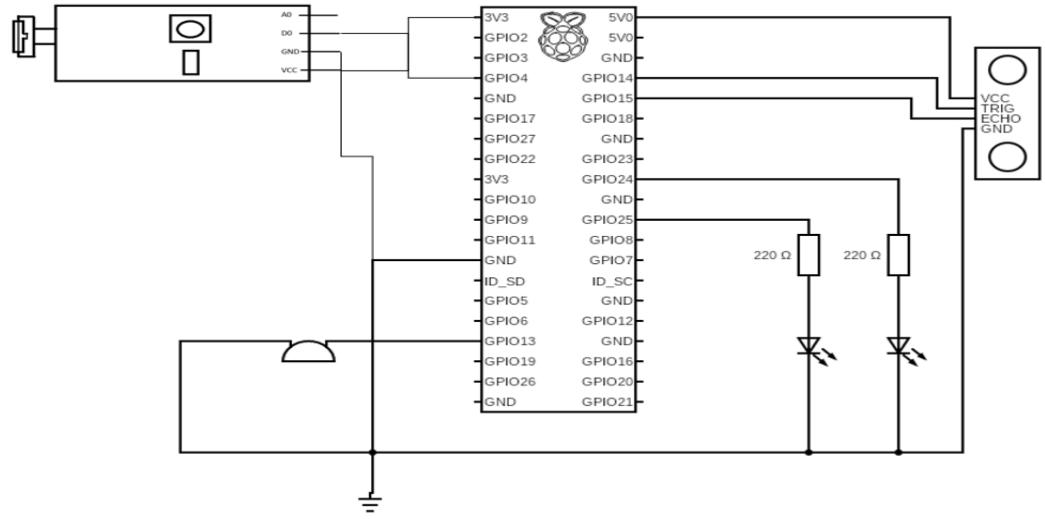


Fig. 3.21 : Circuit diagram

When the security status Soft toggle button is ON then the security system is running. The distance sensor is searching for any close person based on the distance programmed. If it isn't found nothing will happen. If a person is found then the webcam will take photo of the person and send it to the cloud storage bucket and the buzzer will be ON for 3-5 secs Now from the Android app which we have redesigned will also have the option to download those photos with download button and it will be stored in our phone galleryOnce downloaded we have provided a clear memory option which will clean the cloud storage so optimizing the whole Read and write process to the database.

If the light falls on the resistor, the resistance of LDR will change When the light falls on the resistor, the resistance of LDR will change. These resistors are often utilized in many circuits where it is required to sense the presence of light. These resistors have a variety of functions and resistance. So based on this principle, the LDR is scanning for light source such as sunlight or any bright artificial light in our case if it finds the light then our other LED which helps us to lit during dark for better clarity images captured by the camera and if there is enough amount of light then the LED will be turned off saving some of the energies we can assume some AC light source instead of LED during the actual production unit.

CHAPTER 4

ADVANTAGES

The main advantages of Smart door locks security systems include. If you enter the room you won't have any of the inconveniences that come with keys, as all you will need is your phone to enter your home. Smart door locks and security systems keep track of who and when someone enters your house. You can check at what hour your child arrived home, or who had access to your house when you were on vacation. You can even programme a special code for someone to enter your house when you are not around, like a housekeeper or a relative. You can even set an expiration date for that code so they won't have access all the time. It will save you money in terms of changing who has access to your house. If you just bought a property, you won't need to change the entire lock; just change the codes and you're done. As a security expert providing video conferencing solutions with end to end encryption.One of the most appealing features of smart locks is their ability to integrate with smartphones. After downloading the software that works with a smart lock, a person can lock and unlock the door from afar. That ensures they have no excuse to turn around to return home if they go on a road trip and forget to lock the front door until an hour into the drive. They will simply open the app and use their phone to protect their house. August smart locks, for example, allow you to check if the door is locked or not via an app. Rather than straining your memory to recall the actions you took right before leaving the home, you can rely on the software to do it for you. Rather than straining your memory, to recall the actions you took right before leaving the building, you may rely on the software to confirm that you accomplished what is probably the most valuable role in home security. While smart locks provide you that advantage of smart locks, for example, only fit with deadbolts. The smart. lock can not protect the deadbolt as intended until the door is securely locked. Even putting that aside, some homeowners do not like the fact that most smart locks will only regulate one of your door's locks, rather than all of them. So, if you're a double-door-locker like me, this may not be a worthwhile investment. Understandably, people are hesitant to embrace new technologies, particularly when it comes to anything as important as home security. If you're considering Installing a smart lock in your home, make sure to read a variety of reviews to get a good idea of which ones are most likely to meet your needs.

DISADVANTAGES

The main disadvantages of Smart digital lock security system include it relies on a phone connection and, most of the time, on Wi-fi. If you lose your phone, or if there's a power outage you will be locked out of your house if you don't have a backup plan. They are more expensive than regular door locks. There's always the risk of getting hacked especially if you don't buy the lock and the system from a reliable company. Hacking is the smart lock's biggest disadvantage, Although they reduce the risk of lock picking, hackers may bypass the device and gain access to your house. To gain access to your network, they can target poor digital security protocols on the lock. In this case, you are putting your security at risk. You may want to invest in a virtual private network, as you would for other Internet-of-Things devices (VPN). With the new encryption technology, setting up a VPN on your router will secure the connections of your smart lock or other devices. Even if hackers steal your virtual key, they won't be able to decrypt it. The main disadvantages of the Smart digital lock security system are that it relies on a phone connection and, most of the time, on Wi-fi. To enter the house the user will require his or her phone. If our phone is lost, if there's a power outage or if there is a problem with a phone like if the phone's battery runs out or phone falls prey to technical failure the user will be locked out of his or her house if he or she didn't have an arranged backup plan. They are usually more expensive than regular door locks. The user is always at the risk of getting hacked especially if he or she doesn't buy the lock and the system from a reliable company.

USAGE APPLICATION

BASIC USAGE OF APPLICATION:

Electronic doors have become an integral part of our lives. They allow you to forget the problems associated with handing over keys to relatives or guests from another city, restrict access to private premises or set up access control in an office building, as well as optimize the work of an administrator in a hotel.One of the problems that is relevant for modernity is the preservation of material or personal values. Previously, it was easily resolved using a conventional padlock or mortise lock. However, today such funds are not enough.

Modern electronic locks are much more convenient and efficient than their mechanical counterparts. You can unlock such a lock with a simple key, and in a more convenient way. As the detector unlocking the electronic lock, a magnetic card, a barcode, a fingerprint or an alphanumeric code entered from the keyboard can be used.In the case of an RFID key card, the lock operates on the principle of a RFID reader. By type of actuator, electronic door locks are electromechanical or electromagnetic.

ADVANCED USAGE OF APPLICATION:

The principle of operation of the electromagnetic lock is based, as the name implies, on the system of magnetization of metal surfaces located on the door and on the shutter body built into the door frame. Such a small device has a fairly high retention force.The main feature of electromechanical locks is the electronic bolt control system. As practice has shown, in the scarcity of enterprises where a large number of people go, it is preferable to use electromagnetic models of locks.

The scope of these devices is very large. The sensor, which serves to open the electronic lock, can fulfill other roles. For example, in entertainment and sports facilities, a key card or electronic bracelet serves as an entrance ticket, as well as a key to a personal locker, and an electronic means of payment.Digital Door Locks for hotels are much demanded today. They allow you to keep a separate record of the movements of staff: maids, technicians and other employees. At the same time, guests can enjoy the increased comfort that modern technologies provide.

CHAPTER 5

RESULT

This project is productive in providing enough security as long as the password is not shared. In future this “Smart digital lock Security System” can be provided maximum security by the above enhancements in order to completely satisfy user’s needs. Hence, a common man can afford to buy such a locking system at minimal cost to keep his valuables safely without any worries. The main aim of this paper is to design a smart door security system using Raspberry Pi and Ultrasonic sensors, so that people can feel safe about their home whether they are away from home or are in the house. This project is based on raspberry pi 3+, and the coding is done on raspberry pi 3+ ide platform using the raspberry pi 3+ application. At the end of this research the aim and objectives of the project was achieved. People can now feel more secure about their doors all the time. Doors can be controlled conveniently to those with access. Physically challenged people can open or lock doors from their fingertips without asking for help from anybody. It is safe to say that the main objectives and the aim of the project were achieved at the end of the project.

First process of the project:

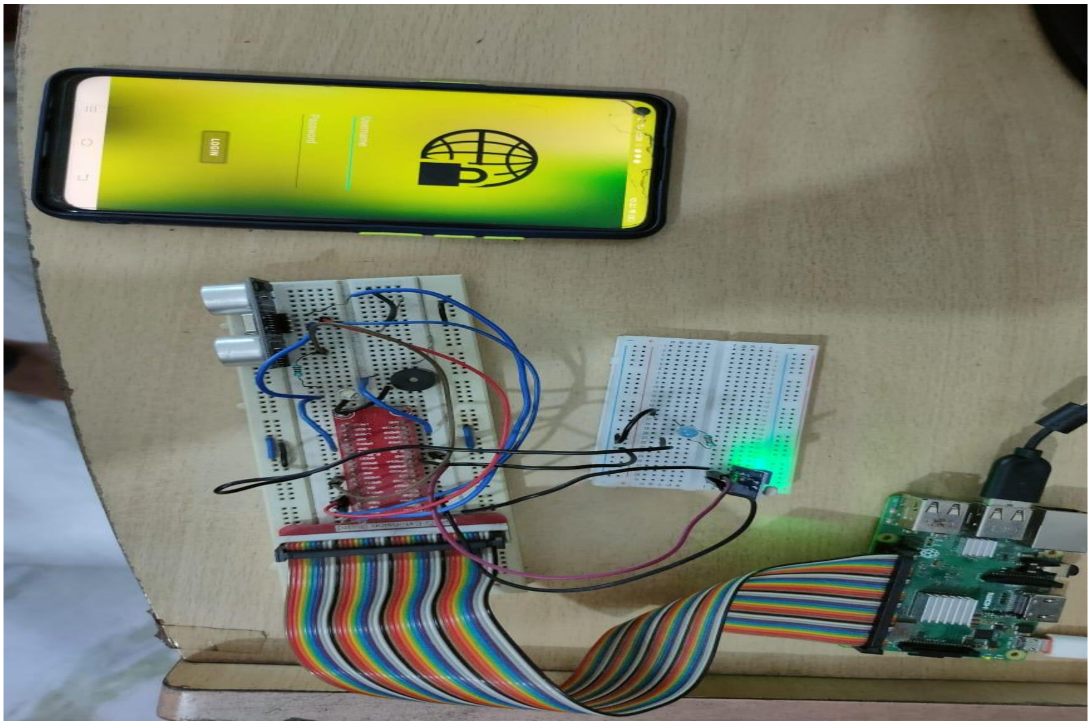


Fig. 5.1: Assemble hardware components and login interface of application

All of the basic components and some of the advanced components of hardware are assembled in a way that gives us the flexibility to make this project and easily able to integrate mobile applications with the system for the user to unlock the smart digital lock security system with the help of the internet. Before unlocking the system, the user needs to put the information which is required for a mobile application to process in the next step.

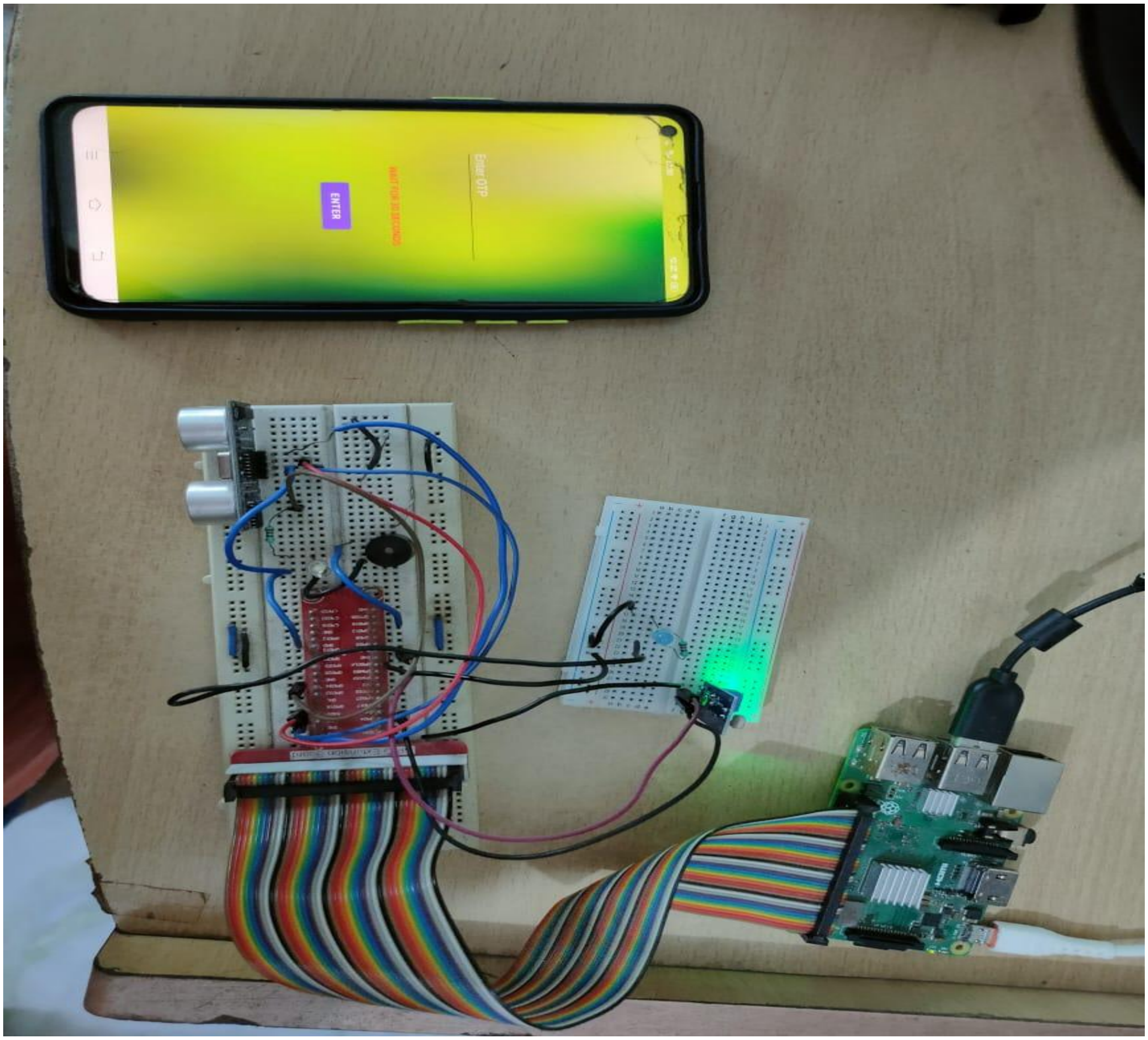


Fig. 5.2: OTP Screen of mobile application

In the next step of the process the user needs to provide the One Time Password for final authorization of the lock system without OTP, it is not possible to unlock the system and give the wrong passwords well. So,only the right credential or password will work. Apart from that the user will be receiving the OTP via whatsapp for that reason the internet is required to receive the OTP into whatsapp.

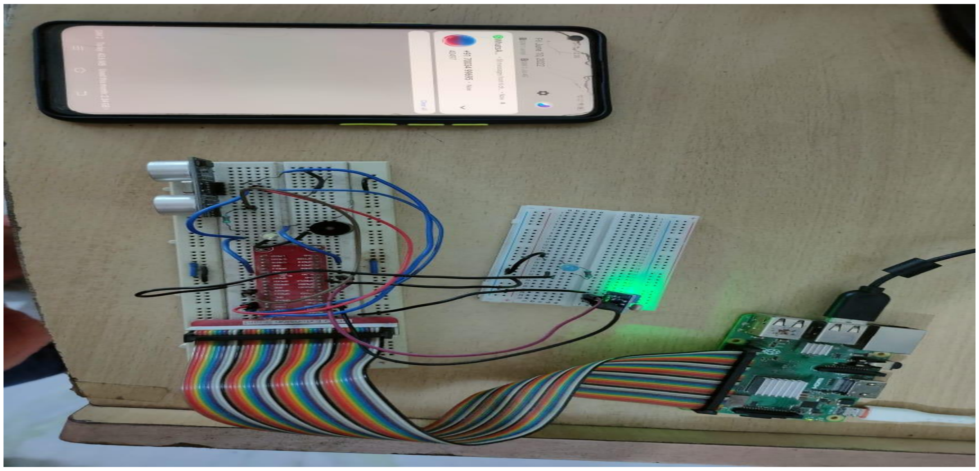


Fig. 5.3 : OTP generates into the whatsApp

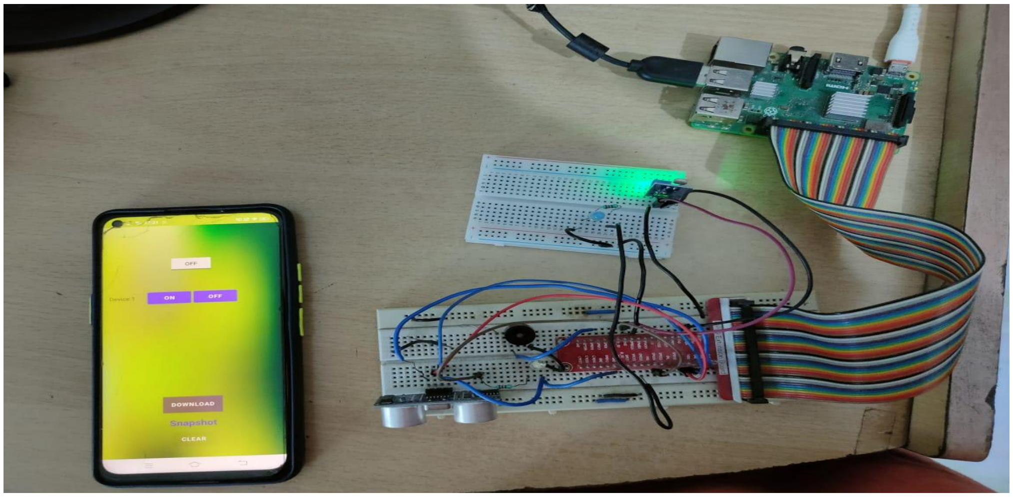


Fig. 5.4 : Control panel for the user

Now the user can access the lock system and is easily able to unlock the lock system by clicking on the virtual button or switch in the application and again lock the system by clicking the same virtual button or switch.

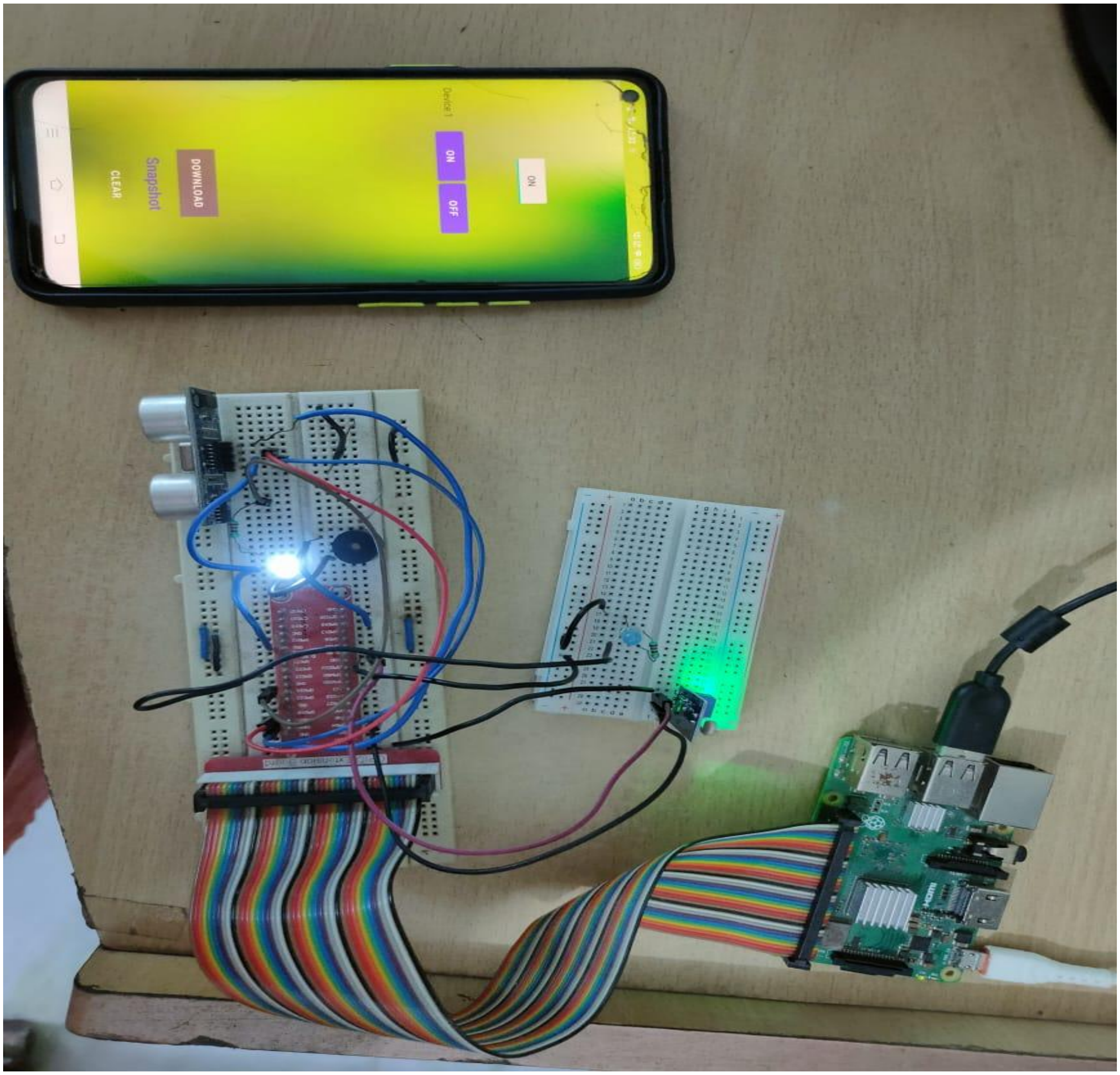


Fig. 5.5 : Turning on lock system in the application

The smart digital lock security system has various types of functionality where the lock system will capture the image of the user or anybody in general who is nearby the lock system and it can be downloaded through mobile application later. A camera along with the system helps to capture the face of the user and in the meantime a light will blink to indicate that it takes the photo and saves it into cloud storage.

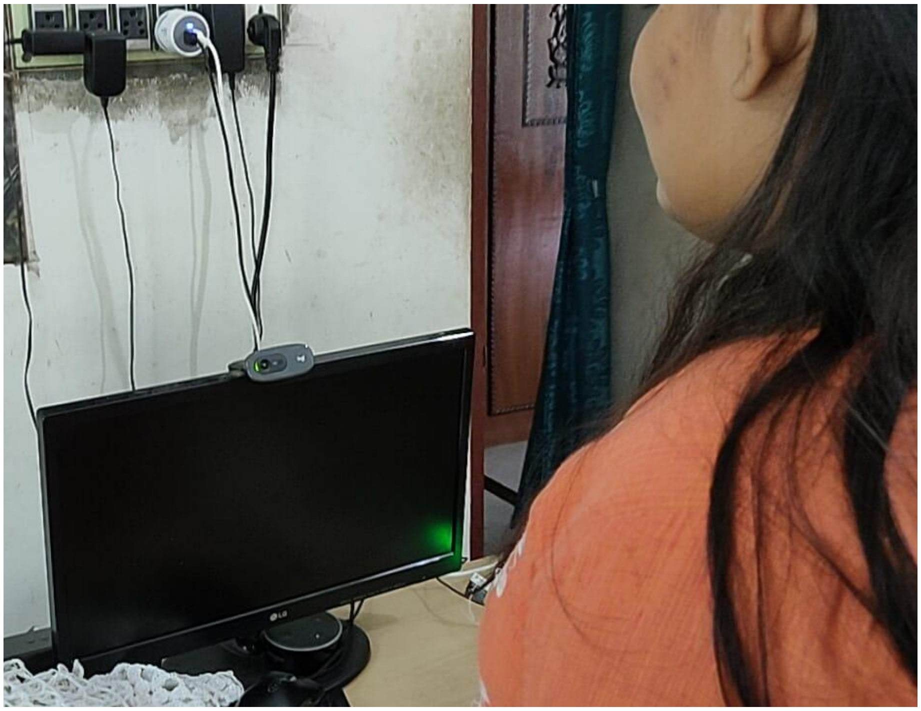
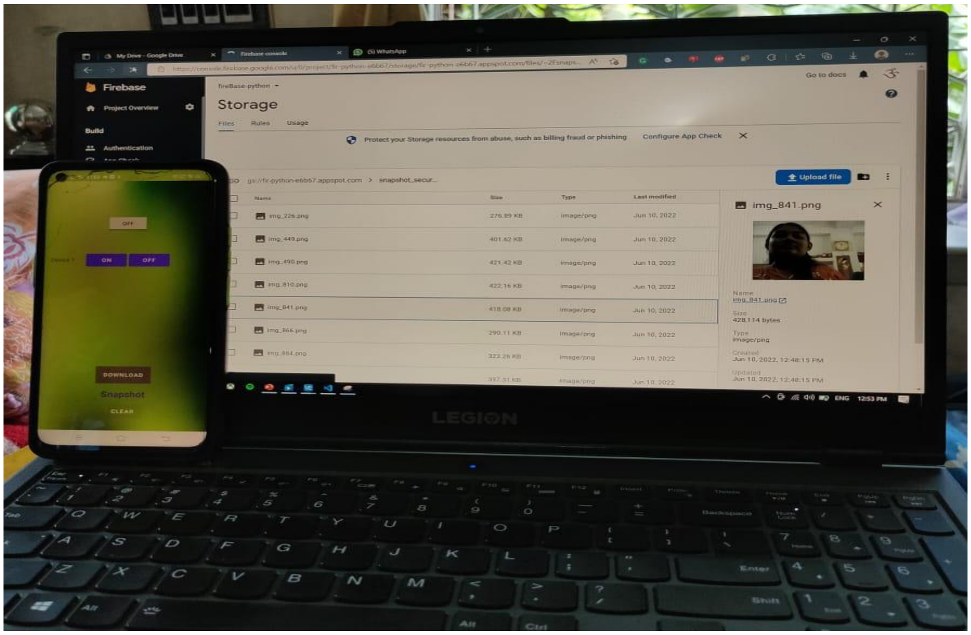


Fig. 5.6 : Human face recognition via camera

Now the realtime firebase is having all of the snapshots into the storage system and users can get all of the snapshots by clicking the Download button which is right bottom of the application. It will straight up go into the mobile gallery. So, users can able to see the snapshots into the phone gallery.



fireBase-python
Storage
Files
Rules
Usage
Protect your Storage resources from abuse, such as billing fraud or phishing
Configure App Check
gs://fir-python-e6b67.appspot.com > snapshot_secur...
Upload file
OFF
ON
OFF
DOWNLOAD
Snapshot
CLEAR
LEGION

Name	Size	Type	Last modified
img_226.png	276.89 KB	image/png	Jun 10, 2022
img_449.png	401.62 KB	image/png	Jun 10, 2022
img_490.png	421.42 KB	image/png	Jun 10, 2022
img_810.png	422.16 KB	image/png	Jun 10, 2022
img_841.png	418.08 KB	image/png	Jun 10, 2022
img_866.png	290.11 KB	image/png	Jun 10, 2022
img_884.png	323.26 KB	image/png	Jun 10, 2022
	397.31 KB	image/png	Jun 10, 2022

img_841.png

Name
img_841.png

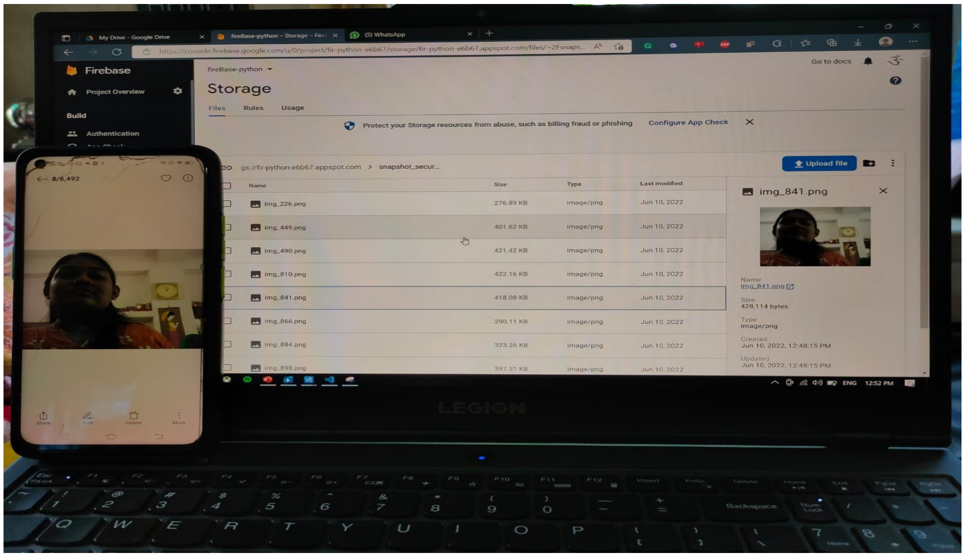
Size
428,114 bytes

Type
image/png

Created
Jun 10, 2022, 12:48:15 PM

Updated
Jun 10, 2022, 12:48:15 PM

Fig. 5.7: Capture snap into firebase



fireBase-python
Storage
Files
Rules
Usage
Protect your Storage resources from abuse, such as billing fraud or phishing
Configure App Check
gs://fir-python-e6b67.appspot.com > snapshot_secur...
Upload file
LEGION

Name	Size	Type	Last modified
img_226.png	276.89 KB	image/png	Jun 10, 2022
img_449.png	401.62 KB	image/png	Jun 10, 2022
img_490.png	421.42 KB	image/png	Jun 10, 2022
img_810.png	422.16 KB	image/png	Jun 10, 2022
img_841.png	418.08 KB	image/png	Jun 10, 2022
img_866.png	290.11 KB	image/png	Jun 10, 2022
img_884.png	323.26 KB	image/png	Jun 10, 2022
img_898.png	397.31 KB	image/png	Jun 10, 2022

img_841.png

Name
img_841.png

Size
428,114 bytes

Type
image/png

Created
Jun 10, 2022, 12:48:15 PM

Updated
Jun 10, 2022, 12:48:15 PM

Fig. 5.8: Snapshots capture download into the mobile gallery

The user can remove unwanted cloud storage by clicking on the clear button after downloading the snapshots from the cloud and it will help in the future to maintain the storage system so that it always gets the desired output.

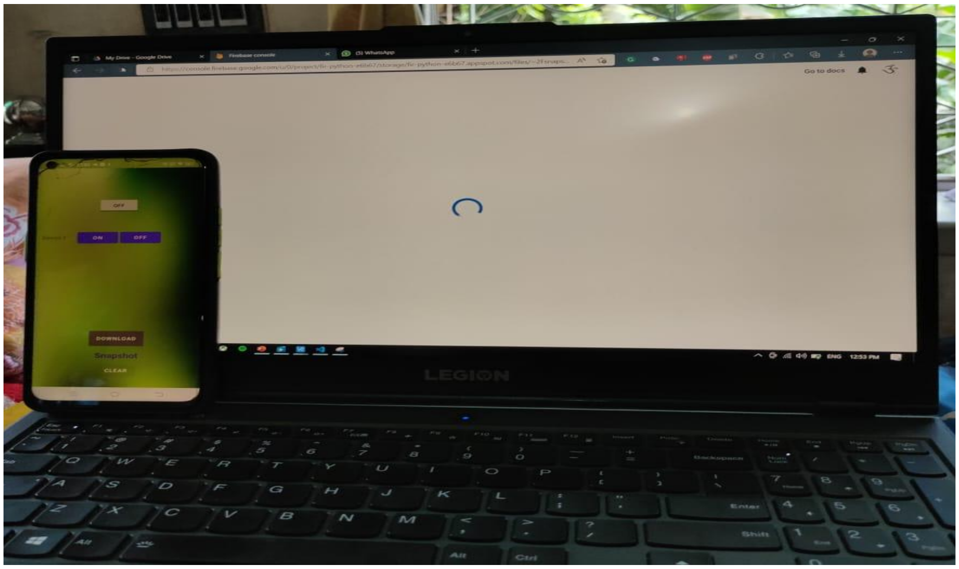


Fig.5.9: Clearing the cloud system

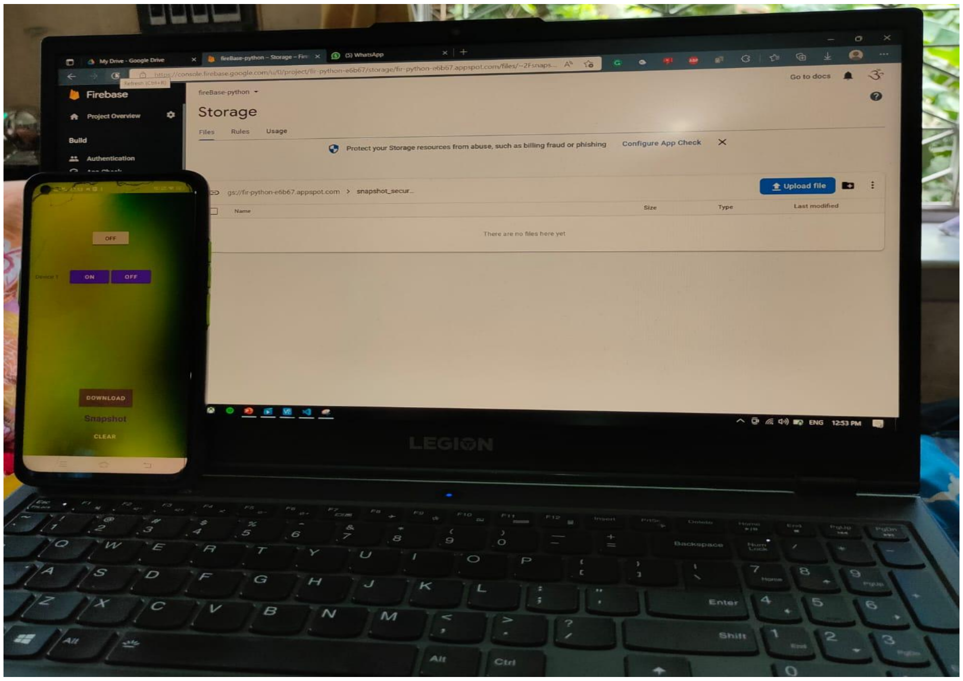


Fig. 5.10 : Clear google firebase storage by using mobile application

CONCLUSION

Smart digital lock security system is one of the most popular digital consumer devices because of its ease of use and low cost, this is one of the most popular digital consumer gadgets. In reality, it is displacing a wide range of traditional locks. This study attempts to offer a door access and monitoring control system that is divided into many stages: By using a keypad and a camera, the owner of the Smart digital lock security system may be identified. Obtaining the user's id, verification, information, and processing in accordance with the request. A low-cost authentication system based on Raspberry pi 3B+ system and face recognition makes home automation systems more secure and cost efficient. This technology can surely make a change in society to lower the percentage of crimes. Both can be used in securing home but implementation cost and availability of supply to hardware requirements is not up to the mark. But the Raspberry Pi system is a low cost and efficient device for such purposes. In future, the android application should display support in controlling more doors, windows and basic home electronic appliances. An auto trigger report of the attempt to theft can be sent to the nearest police station along with the domestic address. This idea can be considered to make the proposed system better.

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