Smart Door with Facial Recognition

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Abstract – *Nowadays , smart home technology has became one of the leading IoT based projects , as a result of that there are lots of new IoT based products available in the society that gives people to live more convenience and security lifes at homes. Many people are aware of these technology, and the smart home applications helps people to manage their schedules home lightings , electricity bills , groceries list , and also their home security . Everything can be controlled from different places as well as different people with single phone. There are lots of door locks and bells like FL1000 from ZKTeco, Corum Security, EKEN (WiFi door bell) ... etc , these give more security for any room , office , garages soon. Literally, Nowadays facial and finger print recognition is well established and popular process to keep more secured home , here facial recognition helps to detect and identify faces whom we want to allow to our home. For that we have to setup a display monitor connected with HD camera infront of the door. We can even able to give voice lock processing by texting voice with Raspberry Pi ARM processor and it gives messages to the owner. Where we can even see and talk who enter near to the door. We have been using set of electromagnets which will be controlled by microcontroller and acts as a lock. By these people can easily access with facial recognition and also can interact. Here the facial recognition done by operating over Microsoft Visual Studio IDE, which will be detected over 0.2 sec. These facial lock detection majorly helps to old people and who are staying away from home , that helps to open or close door by the app with mobile or any remote controller. And also we can keep accessing who came inside and also we can interact with people standing front of the camera. If we don't want to allow anyone inside or any unknown face detection occurs then we can get a alert message to the owner. We can give access to many people to enter into the home and also we can keep time limit too for accessing the lock.*

*Key Words***: Face recognition door, HD camera, home security system, Raspberry Pi, IoT, solenoid lock.**

1.INTRODUCTION :

In today's modern technology everything become bit easier and convenient for working , in that these facial recognition helps to open the door by detecting the face if the face is already is register the only it will open otherwise the alert message will be sent to the owner. The major concept of these technology is to make life easier and to convert normal door to smart door it will helps to turn open immediately when we came front of the door. we can also open the door when someone else physically present and also we can communicate and see who came front of the door . The camera will be recorded and those recorded data can be stored by using cloud-computing. Here the set of electromagnets which will be controlled by micro controller and Raspberry Pi used and interfaced with drivers along with it can help to develop a desktop application. We can capture live with high quality HD camera and it is connected with the same processor and the captured vedio can be saved by cloud-computing. Where the captured face can be processed by the app and it will detect and send it to Microsoft FACE API for detecting whether to open or not . Here everything works under the developed code(mostly c# , python).

There are advantages and also disadvantages of using this smart door , firstly let we see disadvantages : here the main drawback is that anyone can access our phone and can enter into the home , so it should have high security and privacy to our password(if we keep password). If one have access to enter by them many can enter , these is one of the major drawback .where the advantages are if we have oldage or sick people at home they can easily access the door with phone or remote control and closing and opening the door become more easy . If anyone enter without access then alert message will be sent to the owner and also we can see who comes and goes into the home with timings.

These makes life more easier and smarter , we can be even more convenient with automatic accessing . Day by day everything become automatic, so in future almost every home and office become automated. But these is little expensive but safer and privacy.

Literature survey / existing system :

Since past few years most of the industries are working in the fields of machine learning, artificial intelligence , big data analytics, IoT based project the major moto of all these is to make things easy and smart. These became need for digitalizing with lot security tools by these our daily life locks become smart and also introduced the locks movable

with stepper motor and need to digital number pad to get input from user , and it need to add infrared or any Bluetooth module to operate all these devices. A major difference in face recognition door lock is that no need to use stepper motor and the application detects the face with stored images in the application program in our application. We have eliminated unwanted components of stepper motor and drivers which are in existing models .we have added newer and unparalleled features of facial detection as an access point to open or close the door. Where it is the combination of relay module and solenoid lock for opening the door and it is unique and user friendly. Here have been used USB attachable with HD WebCam to do efficient and dependable facial detection and it can be stored by using cloud computing for future need.

This facial recognition door model allowing people to get more interested in because of its features and advantages and also due to its functionality. There are some of drawbacks in that based on that the industries working in this field and improving the security models day by day.

Currently, there are lots of fraud things and thefts are going on, became significant issues for all. Even if we have locks to the door, others can enter inside by getting key but if we have password lock also they can get and access it by these modern technology. By these the facial recognition doors become more secure in these field, here we can use biometric for face recognition, so others can not enter inside. In this new era face recognition plays important role for security and privacy purpose. These face recognition identify the people, who the person is, if the face is matched with stored database then it will automatically opens the door otherwise it will be sent an alert message to the owner.

Most of the researchers and industries use embedded device like Raspberry Pi for the training and identification purpose. Why only these component means Raspberry Pi is low at cost , has high handling limit and it has capacity to adjust in various programming. It also resolve the limitations of pc like size, weight, power consumption. It has been divide into three major parts one can maintain recording images , another for training and another for face recognition purpose. So these Raspberry Pi has more convenient features compared to others.

Where IoT based face recognition applications such as smart classroom, all home security systems, refrigerator, smart surveillance, unmanned arial vehicle and many other applications with biometric manner . These normal door to smart door converting idea actually started in 1950 but it was implemented in 1970. Now it has lots of modifications and got into high featured door with facial recognition , voice sensing , finger print door locks. For every applications have their own drawbacks and advantages. But it is more safer and smarter than normal door and door lock , now a days it is most important because of increasing threats and hacks.

So everyone need to keep high security password and it should be in high programmed manner.

Methodology / design and development:

For developing face recognition door we need set of electromagnetics like ESP32 CAM (for capturing face), UART TTL programmer, Relay module, Solenoid lock, LED(red and green), Breadboard (for connections) , 12v power supply or battery also we can use , 7805 regulator (it gives 5 volt), 100uf 16v Capacitor and wires for connecting.
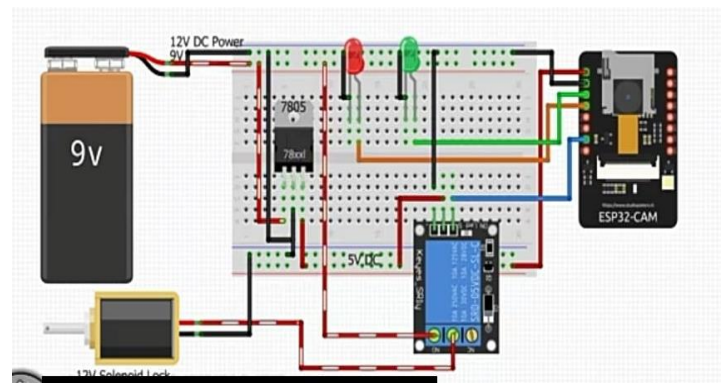

Fig 1: electromagnetics connections on breadboard

Now lets see the connections are made for face detection automatic door lock system with ESP32 cam board . First 3volt power module (if we have any error with 3v we can shift to 5v also) and ESP32 cam should be connected to breadboard in the breadboard holes and then wires should be connected in bread board , where red wires indicates -ve and green wires indicates +ve.

Then we need a code (mostly c# will be used) for developing these in that code we should add Wi-Fi name(Wi-Fi SSID) and Wi-Fi password ,before moving to futher steps we need to select few options from tools tab . Then we have to upload breadboard details and code to it by jumper cap which is from IO 0 and ground. We have to select baurd rate and need to restart to get IP address for further process , then we will get IP address that we need to copy the address and open it in our browser . After that we need to connect all the components of the project to breadboard where we have 7/8 0-5 regulator to get 5 volts from 12 volts because the ESP32 cam will work on 5volts and also our relay module works on 5volts. The reason for using 12 volt or a 9 volt battery is that our solenoid lock works on 12 or 9 volts , if we are separately using 5volt then we no need to use regulator. After completion of all connections, we can see red LED light turns on that indicate the power is on. Then we need to the browser and open our IP Address then the pages will open for further process. Then we need go and select face detection and recognition, then it will start capturing images and after enrolling face it will store in database . Same as we can enroll many faces in the database. If the

module will find similar face by detecting ESP32 can and images in database it will turn on the relay module and then the solenoid lock will be open within few seconds. We can also enroll multiple faces. We can even store these vedios we entered and timings too in the database by cloud – computing. If any unknown face detects it will give alert message to the owner.
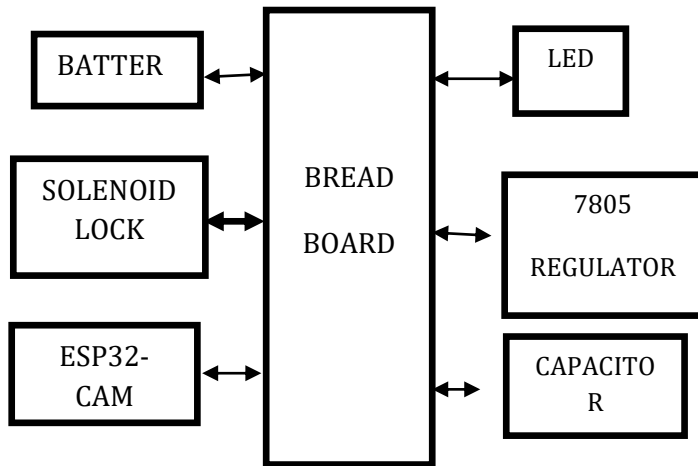
Fig-2 : sample connections in breadboard

Result and analysis :

Face recognition will test on both tested image and untested image . We stored some tested images in database (those people only have access to enter) , if those images matches to the real time image then only the door will open otherwise the alert message will be sent to the owner. When someone enters infront of the camera then it will scan the face and try to check the images with stored images in database whether both matches or not , if it matches then the door will open otherwise the owner gets alert message. Even we can have conversation with the people and we can store the recorded video in the database and we can even open the door when we are physically absence .

These projects helps in case of unknown person tries to enter then the system sends alert message to the authorized person and at the same time buzzer beeps for the security purpose.
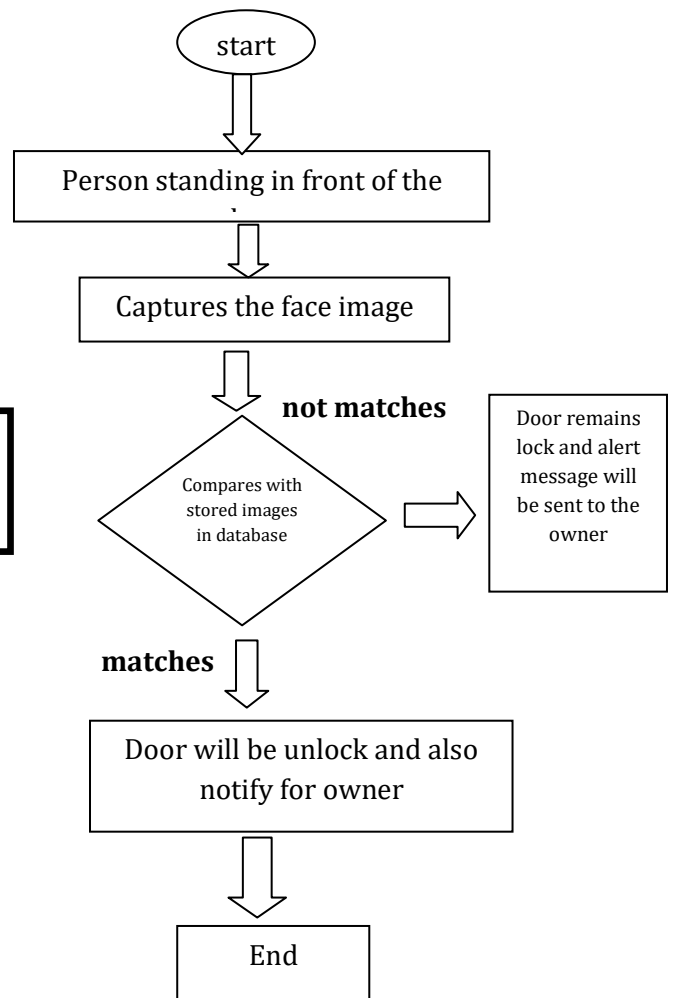
Fig -3: Flow chart for face recognition process

CONCLUSIONS

As a conclusion, the security system of face recognition have been successfully leading in IoT field. It is user friendly .Even the growth of the technology also increasing day by day. This face recognition can be used mostly where high security is needed for confidential information to keep more secure. I t helps to reduce problems of frauds and thefts .The major advantage is nothing but if any known or unknown persons enters we can get notification. These recognition technique makes life more safer and privacy. But it is some what expensive and work depends on the connections, we can even loose security sometimes . Nowadays slowly everything comes under IoT based, in future everything depends on these sensors and remote controllers. Most of the industries slowly growing in these IoT field.

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