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THIS SYSTEM USES RASPBERRY PI TO RECOGNISE FACES AND UNLOCK DOORS.

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ABSTRACT

In today's world, every household is required to have a home security system installed. Before recently, most doors could be opened using traditional methods such as keys, security cards, passwords, or pattern locks, but this has changed. Accidents like losing a key, on the other hand, have resulted in much more concerning scenarios such as robbery and identity theft than the loss of a key itself. This has progressed to the point that it is now considered a major problem. In order to overcome this problem, the development of facial recognition technology was conducted, and the Internet of Things (IoT) was also used in the effective installation of a door access control system. In addition to serving as the primary controller for face recognition, the youth system, and the locking system, the Raspberry Pi is also employed as a tiny computer board that can be programmed. The person who is standing in front of the door is photographed with the aid of a camera, which is mounted on the wall. If the face is not recognised by the system, a warning will be generated. Using Internet of Things (IoT) technology, a user *may control the access to a door.*

Key words: Facial recognition, RasepberryPi , Internet of things (IOT) ,Home security system

1. INTRODUCTION

People entering and leaving the house are the most critical features of any home security management system, and this is especially true for video surveillance systems. Instead than relying on passwords or pins to keep track of things, unique faces may be used since they are a biometric property that can be tracked. It is impossible to modify or steal them since they are inherent in the individual. Face detection may be used to increase the degree of security at a location. As a result, a novel hardware system for human face identification has been created, which makes use of the Raspberry Pi. The Raspberry Pi is a line of single-board computers that are very tiny. It functions similarly to a fully working CPU, with functionality that is comparable to that of a desktop computer. The facial recognition system operates in the following manner: initially, a photograph is taken by a camera. The piece of code identifies the characteristics of a certain person. Following the detection, the acquired picture is compared to the photographs stored in the database, which is done with the help of the Raspberry Pi. Then it is determined if the two faces are identical or not. It sounds an alarm if an intruder attempts to gain entry into the

building. The equipment that was employed is readily accessible and may be used in a variety of situations. ("The method, which operates on a LINUX operating system, was written in the Python programming language," says the author). All members of that family whose photographs will be saved in the database are granted access. In the event of visitors (a face that is not recognised, rather than a particular invader), an alert is sounded and authentication is supplied by them.

The system that has been presented has been created to overcome the shortcomings of the existing security system while simultaneously improving the security, adaptability, and efficiency of the new system. The installation of a security camera system may be unfeasible in certain cases owing to the high expenditures involved during the installation process. Banks, attendance systems, and authentication networks are just a few of the places where this technology has been implemented. The system is being enhanced on a regular basis. Some photographs of the authorised user are utilised as the system's data base, and the system will train the facial recognition algorithm on its own initiative. As a result, the precision is improved. Security systems for homes are an example of Internet of Things (IoT) applications. The Internet of Things (IoT) refers to a network of physically connected things that are capable of interacting and exchanging information among themselves without the need for human intervention. The Internet of Things (IoT) is a future technology in which gadgets and the internet are linked. Due to the fact that the internet exceeds connection by enabling any embedded circuit to interact with each other utilising the present internet infrastructure, it distinguishes itself from the internet.

2. LITERATURE SURVEY

2.1 Face recognition technology

In recent years, there has been a considerable rise in the number of thefts and incidents of identity fraud, which have become serious problems. To get access to a private asset or enter a public location, conventional methods of personal identification need the use of an external element, such as a key, security password, RFID card, or identity card, among other things. Passwords are required for many procedures, such as withdrawing money from banks, which require the use of a computer. To park in any other form of private area, you would need to get a parking ticket from the local police department. Depending on the household, the home key may be quite useful. However, there are several disadvantages to using this method, including the chance of losing the key or forgetting the password in the process. When this happens, it is possible that recovery may be time-consuming and difficult.

This technique is rapidly being phased out in favour of biometric technologies, which are the most promising way of addressing these types of problems. To collect information for the vast majority of biometric applications, this technique necessitated the use of specialised hardware such as fingerprint scanners, palming print scanners, and DNA analyzers, and the target objects had to come into contact with the hardware in order for the information to be obtained. Because

biometrics is a technology that identifies physical traits of individuals, it has a broad variety of applications in security frameworks and is often regarded as one of the most secure methods now available to identify individuals. Biometrics may be classified into two categories: physical biometrics and behavioural biometrics. Physical biometrics are those that can be measured physically. Academics have lately begun to take an interest in face recognition technology, which is rapidly replacing conventional biometric security frameworks in terms of efficacy. Depending on who you ask, face recognition is often referred to as photo matching in certain quarters. In a fast developing area, it has the potential to completely replace the traditional approach. Face recognition is more stable when compared to other biometric identification methods because it is based on the human face, which results in high accuracy, the lowest false recognition rate, and the fact that it does not change with people's lives, as opposed to other biometric identification methods. As a consequence, face recognition technology is very beneficial for a broad variety of applications, like unlocking a house door using facial recognition.

3. PROPOSED SYSTEM

At this time, we are in the process of transitioning to a new technological environment. On a worldwide basis, the frequency of identity theft and fraud has increased significantly in recent years. The creation of a face recognition and detection system that runs on the Raspberry Pi microcomputer was one way to solve this issue. The purpose of this project is to design a security access control application that will make use of facial recognition technology to protect sensitive information and ensure that individuals' privacy is protected.

We make use of the components shown in the block diagram in creating these documents. Whenever a person enters your area and attempts to open the door, the camera catches their face and communicates it to the data base in the raspberry pi, which checks to see whether the face is recognised in the data base and, if it is, the door automatically opens. If a face in the image is recognised in the database, the system will sound an alarm, alerting you that someone is attempting to gain entry into your home or other protected location by taking your photograph. It may be used in a range of situations, including workplaces, institutions, residences, and secure locations, and has a number of advantages. It is probable that as a result of these measures, the problems linked with theft and unidentifiable members may be alleviated.

4. Method used for face recognition

Face recognition has become more vital in today's technologically advanced world, particularly when it comes to security and surveillance reasons. A system that is both efficient and economical is thus necessary as a result of this. Individual identity identification and verification may be done via the use of facial recognition technology as a result of this development, among other things. Face recognition methods are used to determine whether or not a person is who they claim to be by comparing the person's picture with images recorded in a computer database. Face recognition techniques are defined as those that are used to recognise, differentiate, and analyse

the features of a person's facial expression. Face recognition has been a prominent means of identifying people in the field of user identification as technology has advanced. For face recognition, a variety of approaches 4 are available, with the Principal Component Analysis (PCA) being one of the most frequently used techniques in this field. When used in conjunction with other mathematical procedures, the principle component approach may be used to transform a collection of potentially linked variables into a collection of uncorrelated variables. It is one of many techniques to data analysis that are available. The Eigen faces will most likely be used in conjunction with the PCA approach for face identification in the vast majority of cases when it comes to face recognition. Using this method of expressing pictures into the Eigen faces component, it is one of the most effective and efficient methods of doing so, since it has the ability to significantly decrease the size of the database containing the test image. The creation and use of a wide range of ways to enhance the performance of facial recognition technology is still in the early stages of development.

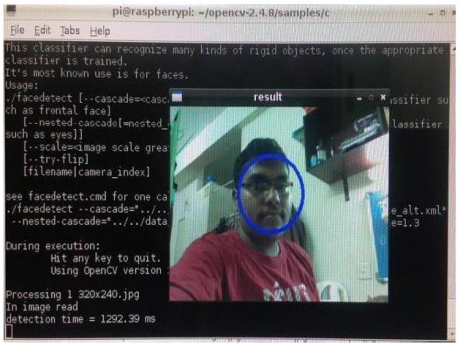
Table 1 Image Resolution versus Processing Time

Image Resolution	Processing Time (ms)
1920x1080	109945
1280x960	25081
640x480	5695
320x240	1451

4.1 Face recognition in raspberry pi

Because of the findings, facial recognition was first investigated within the discipline of psychology in 1950, with the results being published in 1951 as a result of those findings. The development of automated machine identification systems for face recognition began to make significant advances in 1970, with the first successful recognition happening in 1971. Following extensive study, it was discovered that there are two kinds of face recognition methods: image-based face recognition and video-based face recognition. Image-based face recognition is the most often used form of face recognition. Face recognition based on images is the more prevalent of the two methods. The techniques for identifying 3D pictures from 2D photos are video-based face recognition and image-based face recognition, respectively. A person trains a computer to recognise faces by displaying a sequence of still photographs taken with an electronic camera to the computer. The term "Face Recognition System" refers to a framework that recognises and confirms the identification of a person using digital photographs or video footage from a video source, as well as other information, for the purposes of this article. Many researchers have chosen to utilise an embedded device known as the Raspberry Pi to train and identify their subjects in order to save time and money. High handling capacity, cheap cost, and the ability to vary its capacity via a variety of programming modes are the primary arguments for

picking this specific component for your application. It is possible to overcome the limitations of the PC, such as its weight and size, as well as its excessive power consumption, with the aid of the Raspberry Pi. On the software side of things, the Raspberry Pi is a device that can be separated into three portions, each of which includes features such as picture recording, training, and face recognition. The software aspect of the system is comprised of three components: imaging, training, and face recognition. These three components are grouped together as the software element. It has been stated that the system is growing smaller, lighter, and consumes less power as the usage of the Raspberry Pi as an image capture system becomes more widespread more widespread (Figure 1). As a result, it is more convenient than a facial recognition system, which relies on a computer to identify a person.



4.2 IOT in face recognition

With the Internet of Things, it has been used in face recognition in a variety of applications including unmanned aerial vehicles (UAVs), smart classrooms, home security systems, smart residences, and smart surveillance, among many other things, as well as many more applications (IoT). Traditional face recognition approaches such as local binary patterns, neural networks, support vector machines, and k nearest neighbour were used in the early implementations of the Internet of Things in face recognition to achieve their objectives.

5. RESULT

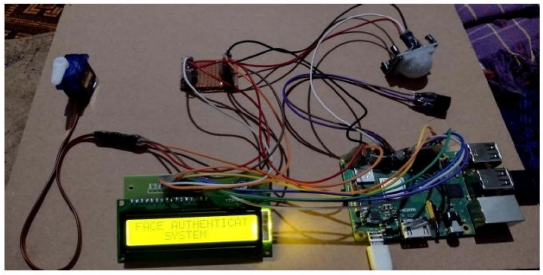


Fig 5.1 Final report on Face recognition using raspberry pi

Design and implementation of the proposed face recognition system, which will make use of the Raspberry Pi, have been completed successfully. It was discovered that the performance of the circuit might be increased in a number of different ways. Because of the circuit's design, it was possible to find faces in the data bank while not interfering with human operations. It was a resounding success. In order to test the circuit, a range of faces were used, both those that were already in the data bank and those that were not. A rapid response time is provided, and the motion sensor module is in perfect working condition. It responds appropriately to motion and face recognition, as well as other input. Because of the Internet of Things, we were able to keep prices as low as possible while simultaneously enhancing efficiency. If you're talking about high-speed technology, its deployment in the circuits of major companies has played a big role.

When an unlawful candidate is displayed in front of the camera, the system compares the candidate's face to one that is already in the database to determine whether it is the same as the previously recognised face. If the face does not match, the system generates a beep sound and shows the words "illegal access" as it appears on the screen.

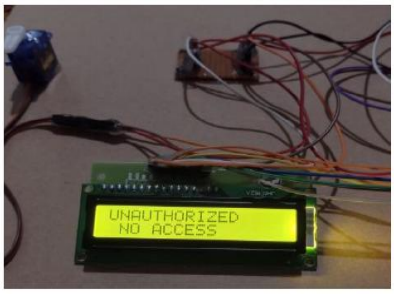


Fig 5.2 shows unauthorized access

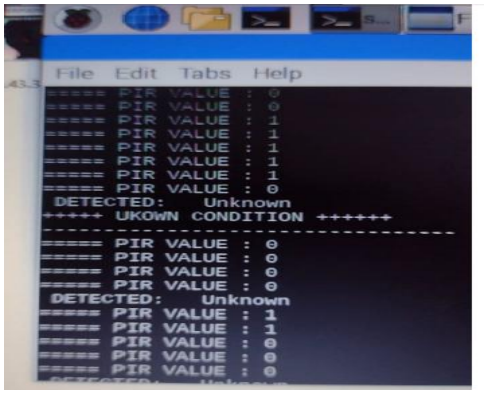


Fig 5.3 DETECTED UNKNOWN FACES

6. PROBLEM STATEMENT

In today's rapidly evolving technological environment, security has become a need, and it is now an intrinsic element of daily life. Information theft, a lack of security, and a violation of privacy,

among other things, are among the most critical components that must be protected. In recent years, smart safe solutions for locking and unlocking doors have grown in popularity as a result of their convenience. This strategy is being adopted by many countries, and first-class countries such as the United States, Japan, and other industrialised nations are already using it in their operations. This system offers either a facial recognition security function or a keypad that lets you to enter a pass code to unlock the door and allow you to enter. Both of these features are available. This feature, although improving the security of doors, has numerous drawbacks, which are as follows: In the first place, if the system is predicated solely on a facial recognition module, there is a small chance that the face will not be recognised at certain times, and the door will not be able to be opened as a result. Another issue to consider is that if an individual must enter a pass code in order to open the door, there is a risk that the key may be recorded or may be seen by others without the user's knowledge or consent (see below). An automated two-stage verification system is in the process of being developed, with facial recognition acting as the first step and a pass code serving as the second part of the authentication process. The newly designed system, on the other hand, suffers from the same issues as the old one. Therefore, a new model is now being developed that solves all of the issues described above.

7. CONCLUSION

A face recognition system built around the Raspberry Pi may be smaller, lighter, and use less power than a standard PC-based face recognition system, making it more convenient to use than the traditional PC-based face recognition system. It is more freeing to develop apps on the Linux platform since the code is available as open-source. The HOG+SVM approach is used to carry out the face recognition and detection operation on the subject. As an extra precaution, send a security alert message to the person who has been selected. A face detection system has been developed using the Raspberry Pi microcontroller. The Python programming language was used to develop the software that runs the system. We conducted this investigation using both real-time face detection and face detection based on pre-determined photographs (also known as object recognition). The rate at which faces were discovered served as a measure of the system's overall efficacy. As a result of the inquiry, it was determined that the suggested system demonstrates excellent performance efficiency even when using low-quality photographs, and that it may be used for facial recognition.

8. FUTURE SCOPE

In order to utilise the present project, which is based on the Raspberry Pi, an Infrared camera interface must be added. This project may be used in a Smart Surveillance Monitoring security system, which can be used for any sort of public security that involves live body detection or spying. A class attendance system can also benefit from this feature. It is also possible to construct certain complex applications using the interface of the Raspberry Pi and Arduino UNO board, such as sensor applications for smartcard switching, finger detection, alcohol detection,

agricultural humidity detecting, temperature sensing using a web server, and many other applications. In fresh testing, images are being processed on the GPU of the Raspberry Pi, with higher results, according to the researchers, being reached via the use of certain libraries.

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