RASPBERRY PI FACE DETECTION DOOR LOCK

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ABSTRACT

A home security system is a need in today's world. However, the usage of keys, security cards, passwords or pattern locks to open most doors has recently been outlawed. Yet robbery and identity theft are much more dangerous repercussions of key loss than the actual loss of a key itself Consequently, this has been deemed a severe problem. A door access control system was successfully installed thanks to the usage of the Internet of Things (IoT). As well as serving as the primary controller for face recognition, youth system, and locking system, the Raspberry Pi is employed as a compact computer board that can be programmed. The guy standing in front of the entryway is captured by a camera on the wall. Whenever the system fails to recognise a person's face, a warning will be sent. Using the Internet of Things, a user may control who has access to a door (IoT). Facial recognition, Rasberry Pi, Internet of things (IOT), and home security systems are some of the terms we'll be using today.

INTRODUCTION

Video surveillance systems, in particular, rely heavily on the ability to monitor who is entering and exiting the residence. Since unique faces are a biometric trait that can be recorded, they may be used instead of passwords or pins to keep track of items. They cannot be altered or stolen since they are intrinsic to the person. Increased security may be achieved with the use of face detection technology. Because of this, a new hardware solution for identifying human faces using the Raspberry Pi has been developed. Single-board computers the size of a credit card are available from the Raspberry Pi brand. It performs like a fully functioning CPU, with the same capabilities as a desktop computer. Face-recognition technology works as follows: A camera is used to take the first picture. Each letter in the snippet of code represents a distinct personality trait. Acquired images are compared to the database's photos using a Raspberry Pi once they have been detected. Finally, whether the two faces are identical or not, it is decided. At the first sign of an intruder, an alarm will ring. The tools utilised here are easily available and may be put to use in a wide range of circumstances. A LINUX operating system and Python programming language were used to create the approach, according to the author. This database is open to all members of that particular family whose photos will be included. An warning is raised and validation is provided by visitors (a face that is not recognised, rather than a specific intruder).

As a result of this research, a new security system was developed to improve on the previous one's flaws while also increasing the system's flexibility, efficiency, and security. A security camera system may not be possible in certain circumstances because of the high costs associated with installing it. It has been used in banks, attendance systems, and authentication networks to name a few. The system is always being improved. The system will train the face recognition algorithm on its own accord using some of the authorised user's images as the system's data base. In turn, this leads to an increase in accuracy. Internet of things (IoT) applications include home security systems. Physically linked devices that can communicate and exchange information without human intervention are known as the Internet of Things (IoT). Connected devices, or IoT, is a future technology that enables products to communicate with the internet. Since every embedded circuit may communicate with each other using the current internet infrastructure, the internet separates itself from the Internet because of this.

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1. LITERATURE SURVEY

1.1 Face recognition technology

There has been a significant increase in thefts and occurrences of identity theft in recent years, which have become major issues. Conventional methods of personal identification need the use of an external element, such as a key, security password, RFID card, or identity card, in order to get access to a private item or enter a public area. If you're going to use a computer to do anything like withdraw money from the bank, you'll need to remember your passwords. Getting a parking citation from the local police is the only way to park in a non-public location. The home key might be quite handy depending on the family. Using this approach has a number of drawbacks, including the potential for the key to be misplaced or forgotten. When this occurs, the rehabilitation process may be lengthy and challenging.

These techniques are increasingly being phased out in favour of biometric technologies, which hold the most promise for solving these kinds of issues. In order to collect information for the vast majority of biometric applications, this technique required 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 to obtain the information.. It is widely accepted that biometrics, which use a person's unique physical characteristics to determine their identity, is one of the most secure means of identifying an individual now accessible. Physical and behavioural biometrics are the two main types of biometrics. The term "physical biometrics" refers to measurements that can be made using physical biometrics. Face-recognition technology, which is quickly replacing traditional biometric security systems in terms of effectiveness, has recently caught the attention of academics. Face recognition is sometimes referred to as "photo matching" depending on who you ask. It has the ability to fully replace the old method in an area that is rapidly growing. Unlike other biometric identification technologies, face recognition is more stable since it is based on the human face and so has a higher accuracy, a lower false recognition rate, and the fact that it does not change over time. Facial recognition software therefore has a wide range of applications. variety of applications, like unlocking a house door using facial recognition.

2. PROPOSED SYSTEM

As of right now, we are in the midst of a technological shift. Recently, identity theft and fraud have become more common across the globe. One solution to this problem was the development of a face-recognition and detection system that runs on the Raspberry Pi microcomputer. Design a security access control application that uses face recognition technology to secure sensitive information and preserve the privacy of persons is the primary goal of this project.

These papers were created using the components shown in the block diagram. Anyone entering your area and trying to open the door will have their face captured and sent to a database on the raspberry pi, which will then check to see whether the person's face is recognised and then automatically unlock it. In this case, the system will sound an alarm to let you know that someone is trying to get into your house or other secure area by capturing a picture of your face. If this happens, you will be alerted. There are several benefits to using it in a variety of settings, from companies and universities to houses and safe sites. It's possible that these procedures may help ease some of the issues associated with theft and unidentified members.

Method used for face recognition

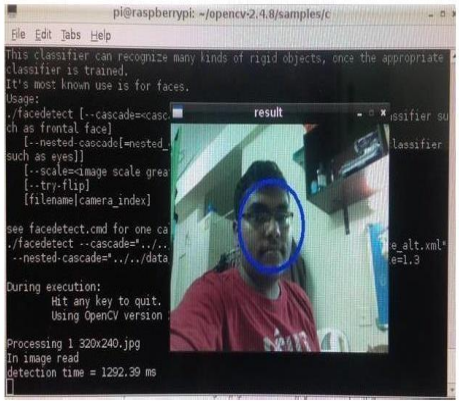
Face recognition is becoming more important in today's technologically sophisticated society, especially for security and surveillance purposes. This necessitates a system that is both efficient and inexpensive. Facial recognition technology, among other things, might be used to identify and verify an individual's identity. Face recognition technologies compare a person's photo to a database of previously captured photographs to assess whether or not they are who they say they are. Recognition, differentiation, and analysis of elements of a person's facial expression are all aspects of face recognition. As technology has progressed, face recognition has become a common method of identifying individuals. Face recognition may be accomplished using a number of different methods, the most common of which being Principal Component Analysis (PCA). The principle component technique may be used to turn a set of potentially correlated variables into a set of uncorrelated variables when used in combination with other mathematical processes. It is only one of several methods for analysing data. In the great majority of situations, face recognition will rely on both Eigen faces and the PCA technique to identify faces. This is one of the most efficient and effective ways to express photographs into the Eigen faces component, since it reduces the size of the database holding the test image greatly. It's still early days for developing and using a broad variety of methods to improve the performance of face recognition technology.

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

As a consequence of these discoveries, researchers in the field of psychology began looking into face recognition in 1950, with their findings appearing in a paper published in 1951. The first successful recognition of a face by an automated machine identification system occurred in 1971, and the development of such systems started in 1970. Face recognition may be divided into two categories depending on how the data is captured: image-based and video-based. Face recognition based on images is the most widely used method. Using photos to identify a person's face is the more common way. Video-based face recognition and image-based face recognition are the methods used to distinguish 3D images from 2D ones. simply showing the computer images obtained using an electronic camera, one may teach a computer's ability to recognise faces camera to the computer. The term "Face Recognition Referring to a framework for recognising and verifying the identify of an individual using digital pictures or video footage from a source video, as well as other information, the term "System" is used here. To save time and money, several researchers are using an embedded device called the Raspberry Pi to train and identify their subjects. The key reasons for selecting this particular component for your application are its high handling capacity, low cost, and the flexibility it offers in terms of changing its capacity. The Raspberry Pi may help overcome the PC's drawbacks, such as its bulk and weight, as well as its high power consumption. Software-wise, the Raspberry Pi is a device that can be divided into three parts, each of which provides functions like photo recording and training. Imaging, training, and facial recognition are all part of the system's software. The software consists of these three components. As the use of the Raspberry Pi as an image capture system grows more prevalent, it has been claimed that the device is becoming smaller, lighter, and more energy efficient (Figure 1). A more practical alternative to a face recognition system, which depends on computers to identify users, is voice recognition.



4.2 IOT in face recognition

Unmanned aerial vehicles (UAVs), smart classrooms, home security systems (HSS), smart homes and intelligent surveillance are just some of the numerous uses for the Internet of Things' facial recognition (IoT). Early implementations of the Internet of Things employed traditional facial recognition algorithms such local binary patterns, neural networks, support vector machines, and k closest neighbour to accomplish their goals.

RESULT

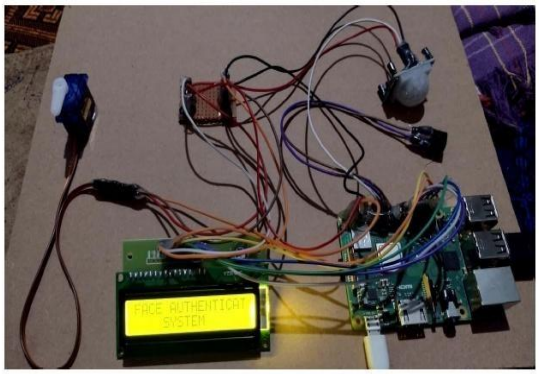


Fig 5.1 Final report on Face recognition using raspberry pi

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.

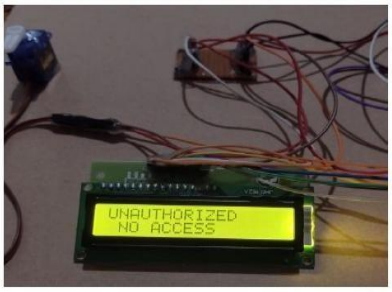


Fig 5.2 shows unauthorized access

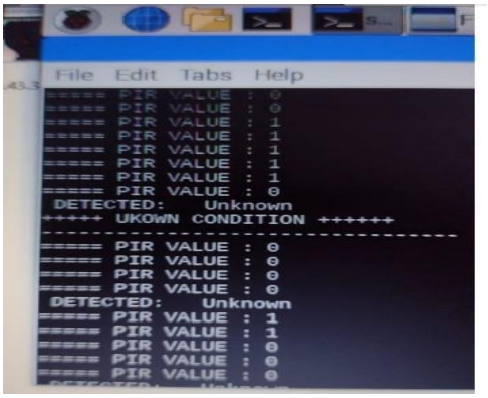


Fig 5.3 DETECTED UNKNOWN FACES

3. 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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