DESIGN AND VALIDATION OF GATEAI: INTELLIGENT FACE RECOGNITION ACCESS SYSTEM

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ABSTRACT

These days, security is a problem in every way. Therefore, we must use modern technologies to address these problems. The face recognition module is being used in this project to take pictures of people and compare them to pictures that are kept in a database. The ability to identify who enters and exits the house is the most crucial component of any home security system. One may utilize unique faces, which are a biometric characteristic, to monitor that instead of using passwords or pins. Our goal is to develop a smart door that safeguards the entrance based on our identity. Our goal is to create a Raspberry-pi 3 system that will only enable admission to the house after your face has been identified using Open CV library recognition algorithms. In the meanwhile, you will be granted entry by the home's owner, who may keep an eye on your entry from a distance. When someone approaches the door, it detects their face, unlocks it if it is registered, sounds an alert on the phone, takes a photo, and sends it to the registered number if the face is not registered. This is the system's operation.

KEYWORDS: Raspberry Pi, OpenCV, USB Camera

INTRODCUTION

A popular biometric for identifying individuals is the face. Because of human activity in forensic, airport, face tracking, criminal detection, and other security applications, face recognition has drawn a lot of attention from security guards. in contrast to other biometric characteristics,[1] such as finger prints, palm prints, etc. They may be used for security-based applications including face monitoring, criminal detection, airport security, forensics, and more, and they can even be collected without the visitors' awareness. Using a webcam to capture a facial picture is known [2] as face recognition. They take a picture of the visitor and match it to the database that is maintained. Sort them into recognized categories before storing them in the database. Researchers find face biometrics to be a difficult topic because of the many restrictions placed on machine face identification, such as changes in lighting, head postures, facial expressions, occlusion, aging, [3] and so forth. Researchers proposed a number of strategies to get over the mentioned. Face detection, face recognition, and feature extraction are all part of automatic face recognition. Geometric feature-based and picture template-based face recognition

algorithms are the two categories into which they fall. To determine the identification of a face, template-based approaches calculate the correlation between the face and one or more model templates. Face templates are made using principal component analysis, kernel approaches, linear discriminate analysis, etc. Explicit local characteristics and their geometric relations are analyzed using geometric feature-based techniques. Pattern recognition, computer vision, and image processing have all found use for multi-resolution tools like Ridgelets, which analyzed the information content of pictures. The proposed method and the paper as organized as I. Introduction Section II as literature survey section III as existing method and its operation section IV Proposed method block diagram and its operation and section V conclusion and its future scope

II.LITRATURE SURVEY

We found a number of publications related to the security framework. In [1], the author presented a unique face recognition method based on supervised classification and Gabor filtering. A high facial identification rate is achieved by using the 2D filter bank to generate 3D robust faces for vector average distance, which are then employed in supervised classifiers and threshold-based face verification methods. In [4], the author put out an effective face detection system. In order to reduce computations and provide a detection technique that is both efficient and quick, this work presents the ideas of integral images, efficient AdaBoost classifiers, and cascade of classifiers. In [5], the author suggested a method to guarantee car security. The Arduino-based technology takes a picture of the individual attempting to start the car. PCA is the face recognition algorithm. The writers in [6] made use of an embedded platform that was very distinctive and simple to use. They suggested a method for taking pictures in an embedded system that uses a Raspberry Pi board. The project "Raspberry Pi Face Recognition in Treasure Box" by the author in [7] is an excellent illustration of how to combine Open CV's computer vision algorithms with the Raspberry Pi and Pi camera. It can access the newest and most intriguing computer vision techniques, such as facial recognition, by building the most recent version of Open CV. Using the OPENCV library and Eigen face approach, the author in [8] created a system on a Raspberry Pi running Raspbian OS that could identify faces and simultaneously recognize them. The authors of [9] suggested using a Raspberry Pi 2 B+ model with a camera interface to take pictures and use a digital processing image technique to turn those pictures into grayscale. By creating a MATLAB code utilizing an image capture toolbox based on the fundamental method of PCA employing Eigen faces, the author in [10] suggested the real-time implementation of the Face Recognition idea. The creators of [11] had put in place a security system that let the user to see the person standing at the door using a camera from a distance and alerted the house owner via email and Twitter if someone arrived.

III. EXISITING METHOD

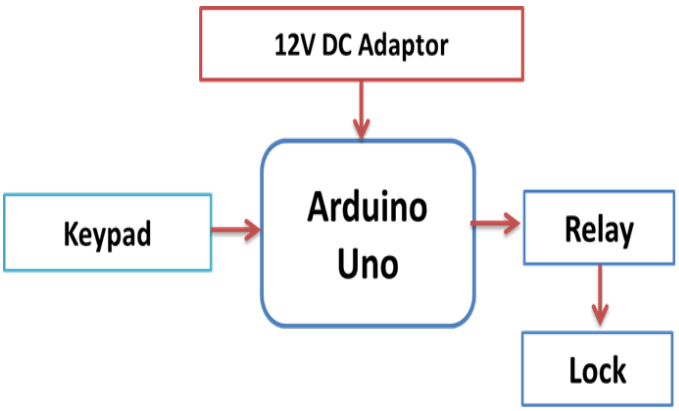

Fig.1.Exisiting Method Block Diagram

OPERATION:

Current solutions like biometric fingerprint sensors, RFID-based doors, and password-protected entry have a number of drawbacks, including low durability, unapproved sharing, and hygienic issues. Additionally, they don't have automated logging and don't provide visible logs of access attempts, which makes them less accountable in high-security settings.

IV PROPOSED METHOD

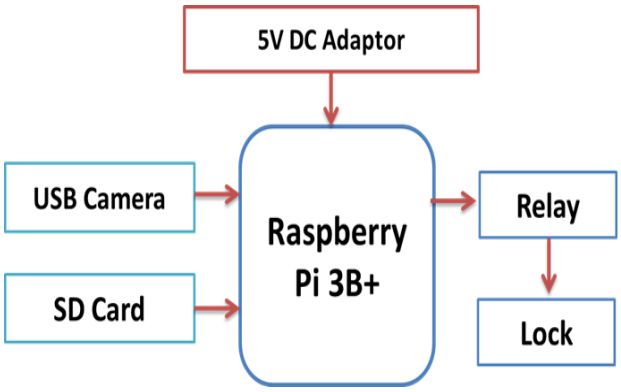

Fig.2.Proposed Method Block Diagram

OPERATION:

After turning on, the Raspberry Pi uses the Python and OpenCV libraries to load the facial recognition software. When no one is in front of the USB camera, it goes into standby mode.

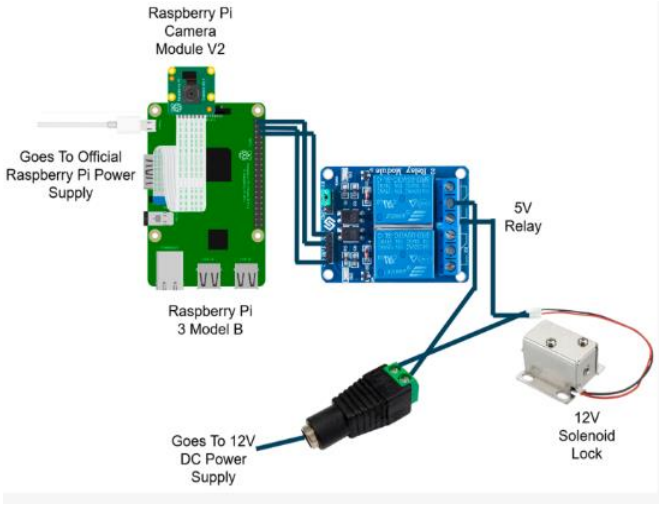

Fig.3.Proposed Method Block Diagram

The camera takes a picture when it detects a face, then uses LBPH (Local Binary Pattern Histogram) algorithms or Haar cascades to compare it to a pre-trained dataset. The Raspberry Pi activates the relay to open the gate or door if a match is detected. The picture and timestamp are simultaneously recorded on the SD card along with the access attempt. The system reports the [12] event for administrative review and blocks access if there is a discrepancy.

A mix of hardware and software components power the Raspberry Pi-based Intelligent Face Recognition Access System. This is a summary of how the circuit works:

Components of hardware

The brain of the operation, the Raspberry Pi is in charge of processing and evaluating face recognition data.Pi Camera: [13] Takes pictures of faces so they may be identified. By locking or unlocking the door, a solenoid lock regulates entry. The relay module provides the required power by interacting with the solenoid lock and the Raspberry Pi. The components are connected using jumper wires.

Parts of Software

- OpenCV Library: Used for facial recognition and detection.

To train the model to[14] detect certain faces, use the Facial Recognition Library.

- Python scripts: Manage facial recognition, image processing, and detection.

CIRCUIT FUNCTION

1. Face detection: Using Haar cascades, the OpenCV library recognizes faces in photos taken by the Pi Camera.

2. Face Recognition Using eigenfaces or LBPH (Local Binary Pattern Histogram), the identified face is compared to a database of previously recorded faces.

3. Authentication: Should a match be discovered, the Raspberry Pi notifies the relay module.

4. Door Control: The door is unlocked when the relay module turns on the solenoid lock.

V CONCLUSION AND FUTURE ENHANCEMENT

This paper presents an autonomous door entry system that uses facial [15] recognition and detection. Neural networks take care of automatic facial identification. Following a successful output from the PC, the Raspberry Pi controller regulates door access. Both the door and the monitor respond instantly. This is not appropriate for real time as the door stays open indefinitely. It is thus necessary to establish the right time in a real-time context. This technology may be utilized in several locations where security is crucial and cannot be compromised.

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