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Students Attendance Monitoring & Accessing Control Based Raspberry - PI

Dr.I.Hemalatha[1], B.Sree keerthi[2], G.Hema Bindu[3], B.Nithin[4], D.Bhuvaneswari[5], CH.Puja sree[6]
[1, 2, 3, 4, 5, 6]*Department of ECE, Sir CR Reddy College Of Engineering, Eluru, India*

Abstract: ***This project is "IOT based facial recognition attendance monitoring system". In order to maintain student attendance records, this project focuses on facial detection and radio frequency identification cards for an attendance recorder system. In class databases, student faces are already preserved. If the image from the database and the one taken by the raspberry pi camera match, the student's attendance will be tracked over time. Additionally, RF ID cards are utilized to regulate entry in certain areas. The ARM1176JZF-S core is used by the credit card-sized Raspberry Pi single-board computer. System on a Chip is a technique for packing all the circuitry required to run a computer onto a single chip. An operating system is required for Raspberry Pi to launch. In order to cut costs, the Raspberry Pi does not have any on-board non-volatile memory, which is typically used to hold file systems, Linux kernels, and boot loaders in more conventional embedded systems. To accomplish this, an SD/MMC card slot is included. the application-specific boot load after.***

Index Terms: Image Processing, OpenCV, Facial Recognition ,em-18,RFIDTags, RFID Readers, Raspberrypi

I. INTRODUCTION

In person attendance marking is still commonplace at many universities, colleges, and schools. It takes a long time to manually calculate attendance using this traditional method, and occasionally students may not respond to their allocated numbers. Utilising biometric techniques, the method for automatically tracking attendance. One of the biometric techniques is fingerprint identification. This process is used to collect and store each student's fingerprints in the database. When the thumb is positioned on the fingerprint sensor, it turns on, records attendance, and then checks it against the database[1].

However, this system has the drawback that students must wait in line to turn in their prints, making the procedure time-consuming. Iris scanning is the other biometric technique. With this approach, each student's iris or eyeball is photographed and entered into a database[2]. Attendance is taken when eyeballs match the database. This strategy takes a lot of time, and it is challenging to use in real life.

The most reliable biometric method for recording attendance is face recognition. This technique is used to gather and store each student's face in the database. when the pupil first enrols.It registers attendance by capturing photographs of those in front of the camera and comparing them to the database. This process is quicker, more accurate, increases security, and has a low fraud rate. Numerous industries, including healthcare, finance, advertising, retail, academics, and corporate settings might use this facial recognition technique. Lighting, stance, facial expression, ageing, hair, and spectacles are some of the issues that can hinder face recognition. Because RFID tags have information that can be electronically saved, they are employed in access control systems. a conventional access control system based on RFID. however, only uses RFID cards to identify individuals[2].

The teacher will be able to carry on instructing without any mismanagement, dishonesty, or carelessness.No pupil shall be denied the opportunity to receive an excellent education. In this study, we proposed an attendance system that employs Face Recognition and RFID verification to identify people and recognise their faces in order to check attendance and save data.The Real Time Clock (RTC) module's ID and entry and exit times are listed. This data may be logged using an SD card or uploaded to the internet using an Ethernet shield, depending on the needs of the client[3].

II. LITERATURE SURVEY

Alex Pentland and Matthew Turk use the 1987 Eigen Faces method developed by Sirovich and Kirby to classify faces. This approach derives a set of eigenvectors from the image using principal component analysis in order to detect variation among the gathered faces and compare it to individual faces[2]. The probability distribution throughout the high-dimensional vector space of face pictures' eigenvectors is generated from the covariance matrix of those matrices..

The local binary pattern histogram approach, a potent feature extraction method, was first described in 1994.

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This application divides the grayscale image into 3X3 matrix cells. The intensity range of the pixels serves as a representation of the resulting matrix. Each pixel value is compared to the threshold, which is the value in the centre of the matrix. The pixel receives a 1 if its value is greater than the threshold; else, it receives a 0. An 8-digit binary value can be easily converted to a decimal value[3]. Following the compilation of the histogram over the cells and frequency of each integer, the histograms of all the cells are concatenated to create the feature vector. The photos are categorised using this feature vector.

R.A. Fisher's 1936 invention is the foundation of the Fisher faces algorithm. This method outperforms the linear discriminant analysis-based Eigen faces technique.The linear discriminant analysis is used to find the linear combination of traits that distinguishes or defines two or more classes of faces.The resulting mixture is employed to lessen dimensionality. This algorithm is employed when there is a great deal of variance in the lighting and face expressions[4].

Numerous sophisticated algorithms have been created in the last ten years.But in order to execute these algorithms without trouble, more hardware is required than is currently accessible.

III. IMPLEMENTED SYSTEM

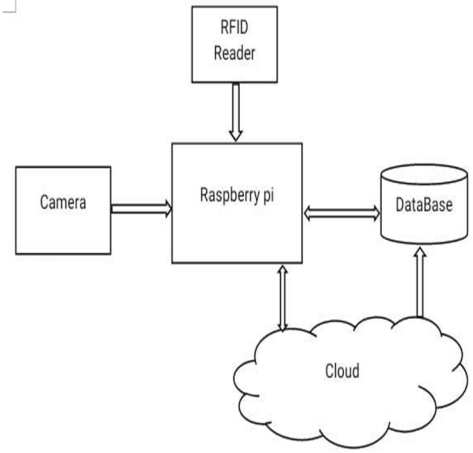


Fig: Block Diagram

The RFID Verification Attendance System with Face Recognition. Face recognition involves a number of stages. Since our Python code in Open CV generates 2D grayscale photos of the students who work as input, and after being trained on those images, the system can eventually recognise faces on live video feeds.

At the appointed moment, this system executes RFID detection and video processing.

Video streaming starts when the scheduled start time comes, and the RFID reader switches into reading mode to look for RFID tags. The camera takes pictures at a 30 frames per second rate.

To create the image per second, these frames are combined together for a second. It is processed using the Amazon recognition API, and faces are identified. The faces that are recognised are stored in a cloud collection (folder) on AWS. Until the time is up, this process is repeated once every second. However, as soon as the RFID is identified, a database availability search is performed. The system fetches an identification photo from the database and compares it to the identified faces in the AWS collection when RFID is matched with the database. If there is a face match with a similarity score higher than 85, attendance will be noted in the database as "Y". To the point where the system reaches the end time, this process is continuously repeated.. The system turns off face recognition and RFID detection when the timeout expires. For any user IDs that are absent (not found), the system then logs "N" in a database. Through the Android application, the Admin can manage the time allotted for maintaining the database and taking attendance. Individual users and administrators can examine attendance information.

A. RFID Detection

The chip in passive RFID tags is powered by the tag itself rather than a battery. Instead, the RF signals picked up by the tag and transmitted by the Reader. These RF impulses cause the antenna of the tag to produce current, which is subsequently used to activate the chip. The tag then replies by sending information to the Raspberry Pi over the coiled antenna that the reader identified in the tag.

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B. Face Recognition

Based on their visual geometry, faces are matched using face detection. As, specific features like the nose, mouth, left eye, right eye, and left and right mouth are discernible. when the pictures analysed, a bounding box is created .When the images are examined. Amazon Recognition is used in this paper for face detection and further comparison.

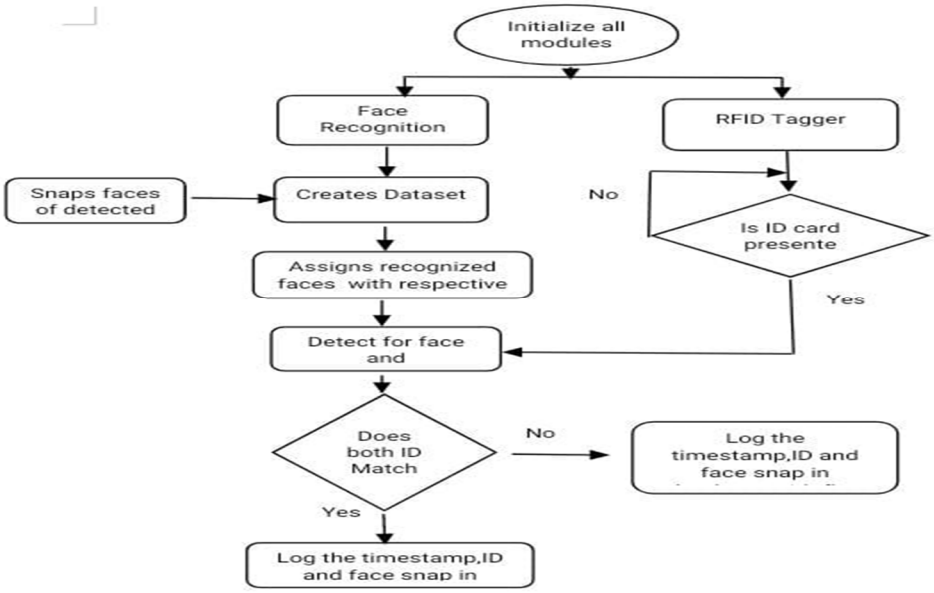


Fig : Flow Chart

IV. EXPERIMENTAL SETUP AND RESULTS

The Face Recognition and RFID Verification Based Attendance System is divided primarily into two parts: the hardware side and the software side. Each student who enters the classroom is tracked by the system, which also allows authorised individuals to log in and do searches. It is also possible to register new pupils using the ID on each tag and the student's facial image.

Radio frequency identification, or RFID, has gotten a lot of attention lately. This technology uses electromagnetic fields to automatically identify and track previously written RFID tags, which store a very limited amount of data, approximately 2 Kilo Bytes (KB), which generally includes all of the user's basic information (considered to be a person). RFID technology can be used to grant access to places with limited accessibility, particularly in educational institutions, as well as for attendance monitoring/tracking.

5 pupils are photographed for this project, and 50 photographs of each are saved in a database along with their particular identifying number. Face recognition software has been installed on these 50 photos. The camera module, which is positioned in the center of the classroom, takes 100 pictures of the space while also identifying people in them. A face is recorded as present if its likelihood is more than 50 otherwise, it is marked as absent. As a result, an excel sheet with an attendance report is made, the department head is sent an email with the list of absentees, and the parents of the absentees receive SMS messages.

The most difficult and successful aspect of the system, though, is the integration of Face Recognition. It guarantees that the system will correctly identify the authorised person. We can argue that the system is a virtually perfect identification and counting system because face recognition is validated by another RFID-developed technology. However, we also intend to connect the two systems so that they can work together and to include a storage system, which will enable us to keep all the data.



Fig:Experimental kit setup

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V. HARDWARE AND SOFTWARE USED

A. Hardware Implementation

We will discuss how to implement the Attendance System based on Face Recognition and RFID in the next part. Verification hardware into place for our planned project. through 11 show the hardware implementations. depicts our project's basic circuit design.

B. Software Implementation

Webcam detection and dataset data gathering. The next action we will do is depicted by the ID that is displayed when the camera recognises the face. The software will ask you for the student's photo after you have entered your name and ID. The subject must stand in front of the camera, which will then take and store 20 photographs simultaneously. One thing to keep in mind is that we need to move our faces at various angles and have enough light for precision. We can see that the two pupils whose data and pictures were entered into the database were accurately identified by the system. If a student is permitted and stands in front of the camera, his ID his attendance will be automatically entered in the main database and displayed in the square block.He can then enter the classroom with ease.

Items are given RFID tags so they can be tracked with an RFID reader and antenna.RFID tags transmit information about an item via radio waves to an antenna and reader combo.

When the tag receives a transmission from the reader/antenna, the energy is transferred to the tag's chip via the internal antenna. Smart Credit cards are thought to be useful in providing information transfer as well as transporting business in a convenient manner, but they also have security functions.

The face is recognized after matching with previously stored data. When a face is recognized, a unique identification for that face is displayed. Face recognition and RFID identification can be combined into a single system, and we can expand our concept by include a storage system. Due to a lack of time, we were unable to install the feature.

C. Software

In this project the EM-18 Reader module is used for reading the RFID card the em-18 card is interfaced with the raspberry pi. The reader reads the radio waves from RFID card and the associated data is sent to raspberry pi and then it is transferred to store data in the database

VI. RESULTS

The RFID Module and the camera are both attached to the Raspberry Pi. The "students attendance monitoring and access control using based Raspberry Pi" has finished construction and performance testing. The real-time database stores the scheduled time for the face detection and RFID detection operations.

Our smart attendance system is being tested with a small group of students to ensure that it is working properly. Attendance is tracked and saved in the database. Both the administrator and users of the Android application can access their own sites to view the recorded attendance.

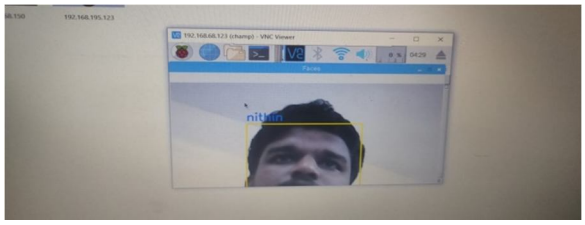


Fig 1:The phase of face detection and feature extraction

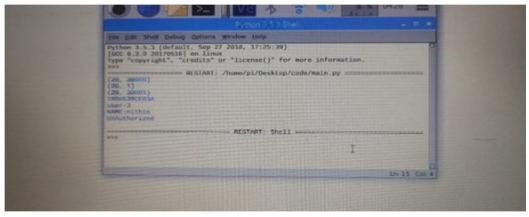


Fig 2: Face identification and attendance phase

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VII. CONCLUSION

Planning and carrying out the verification was the main goal of the paper.The first two elements function as predicted, which makes it successful. Our suggested approach has the potential to replace the manual attendance system because it is effective and valuable, which goes without saying. Our approach is simpler to use and yields the most precise and well-organized data. Our system can be used in any secure institution with a few minor adjustments.

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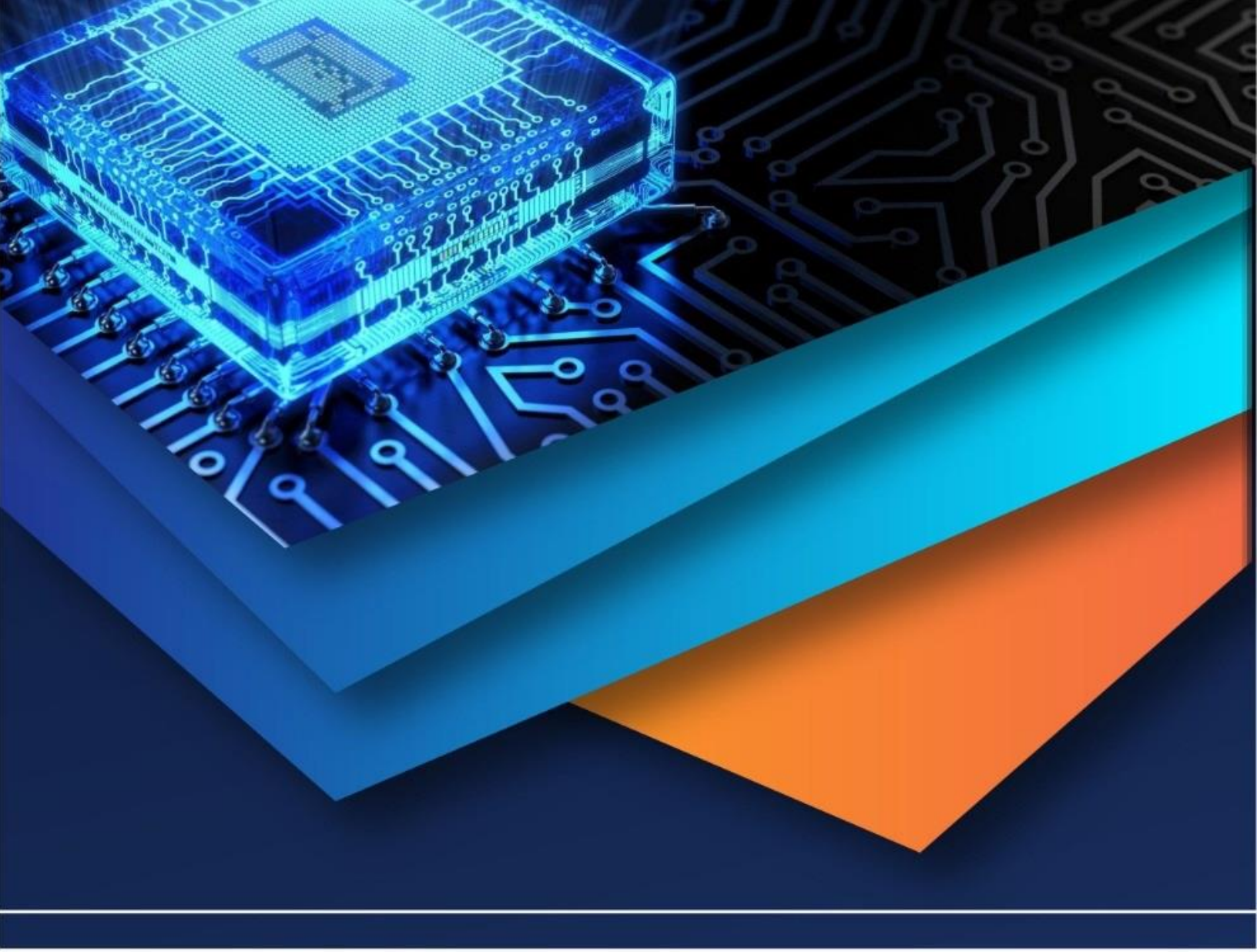
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