



ATTENDANCE MONITORING SYSTEM USING FACE RECOGNITION AND RFID WITH RASPBERRY PI

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Abstract: The world is moving towards an automated environment everywhere. Student attendance is one of the regular procedures, but it follows the formal way of recording attendance which is a time-consuming method. On the other hand, a minimum of 70% attendance for each subject is mandatory to avoid being barred from the exam. Student attendance management system deals with a maintenance of the student's attendance data. In this paper, this attendance system has entirely automated by the combination of face recognition and RFID technology. The combination of RFID with face recognition improves the accuracy and prevents from the unwanted activities. The information regarding the presence and absence of students can be viewed by parents and students with an app.

Keywords: student attendance, face recognition, RFID, Raspberry pi, Open CV, python.

1.INTRODUCTION

Attendance monitoring and attendance system play a vital role in educational institutions. Taking attendance in a class is very essential as it affects the final grades of the students. Typically, there are two methods for recording the attendance of students. The first and foremost method is the manual method in which the teacher calls out the name of each student and marks the appropriate attendance for them. For a large strength of students, the above method seems to be a time consuming one and it affects the lecture time vastly. Another method is automated method which includes RFID based systems, biometrics-based systems, etc.

RFID based method has several down sides such as students may carry the RFID tags of other students to mark their attendance even if they were not present in the class. The biometrics involves face recognition, fingerprint, palm print, hand geometry, iris recognition, etc. Biometrics is an efficient tool to identify and verify individuals as it related to the characteristics of individuals. This paper synthesizes the features of RFID and face recognition techniques in order to provide great accuracy.

2.SYSTEM ARCHITECTURE

From fig.1 the Camera is connected to the raspberry pi camera slot. Live video stream of scholars is captured in the class with the camera, Raspberry pi takes those images as input images and recognizes the images. Matched images have unique RFID values accordingly. The verified RFID value from the recognition is compared with the RFID value from the user and attendance is marked with date and time in the local data base. A unique RFID card is given to the students, when students enter the classroom show their faces to the camera and swipes the RFID card attendance will be marked with date and time. Students can view their profile with the login id and password.

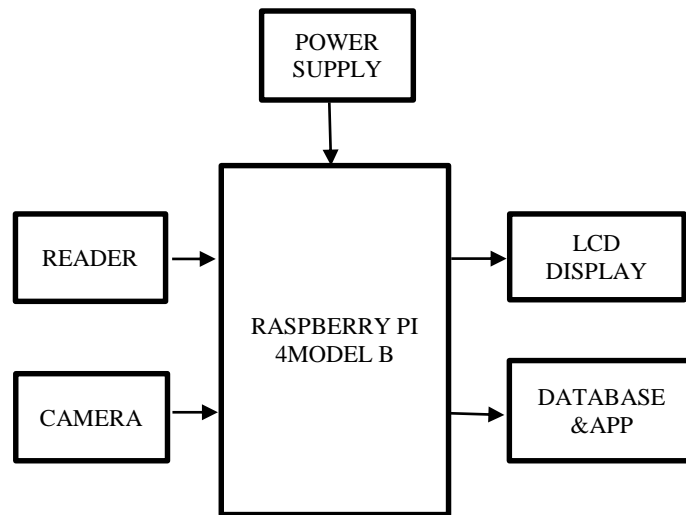


Figure.1 Block Diagram

3. HARDWARE DESCRIPTION

3.1 Raspberry Pi



Figure2. Raspberry pi 4 model B

Raspberry pi is a small size computer that uses the ARM processor architecture, which is often used by most modern phones.

3.2 RFID Reader

RFID reader is a module that uses RF waves to transmit data between itself and a RFID tag in order to identify, check, categorize and track assets.

3.3 Camera

A camera is an optical instrument used to record or capture images which can be stored locally, transmitted to another location, or both. The camera is a remote sensing module as it senses subjects without any contact.

3.4 LCD Display

Liquid crystal display is a type of flat panel display that uses liquid crystals in its primary style of function.

4. PROPOSED SYSTEM

The system covers RFID with face recognition for the attendance monitoring and management. Firstly, students are permitted to register the attendance within the allotted time interval using RFID technology. Radio frequency identification (RFID) system is based on two components which are a reader and a tag. The tag is attached to an object and the reader identifies the proper object. The data is transmitted by using radio wave. The RFID tag acts as a transceiver.

A typical RFID tag contains of two parts, an integrated circuit and an antenna. The integrate circuit is used for gathering and running information. The function of the antenna is to receive and transmit a signal. There are three types of RFID tags and they are active, passive, battery assistive passive. The RFID tags are equipped with non-volatile memory storage. The RFID reader transmits an encoded radio signal to the RFID tag by using a two-way transmitted receiver which is known as transceiver and interrogate. The Facial Recognition is done using OpenCV library and running the appropriate codes on Python. We have used

OpenCV and respective library files. From the camera, respective persons are identified then, they are permitted to show their card in front of the RFID reader. If both matched the attendance will be marked.

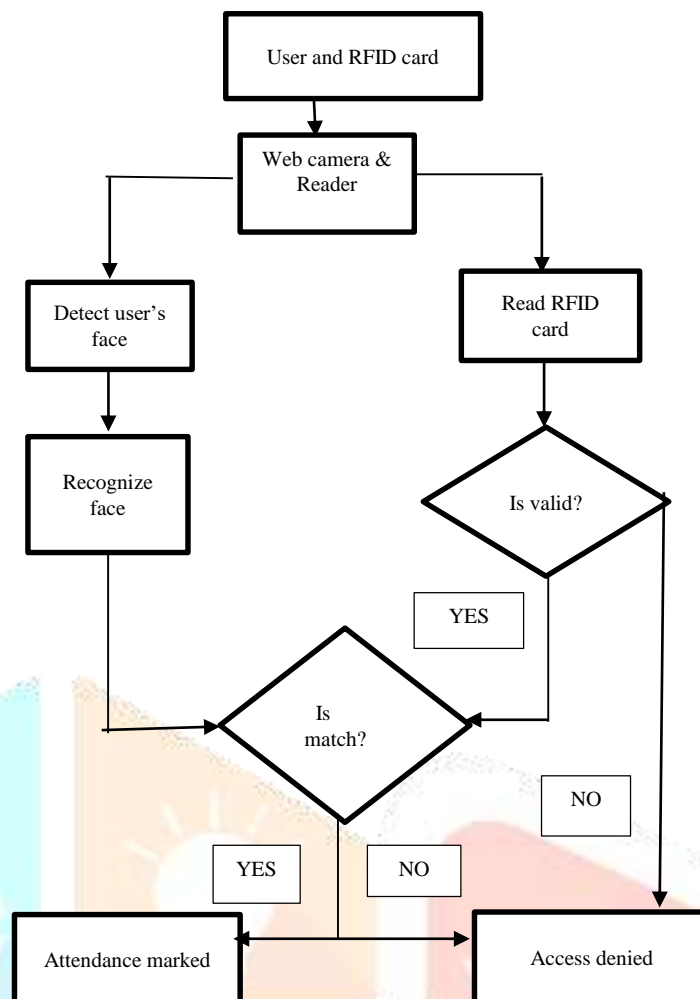


Figure3. Flow diagram of proposed system

5.DETAILED DESCRIPTION

The proposed system has two distinct categories, one is face recognition system and another one is RFID based system.

1. Face detection and recognition

1.1 OpenCV's haar cascade detection method is utilized here and LBP face recognizer is used to identify the faces. For face detection in viola jones we have 4 steps they are:

- Selection of Haar features
- Integral images
- Adaboost
- Cascade Classifier

a) Selection of Haar features:

Haar features are used to detect the presence of the features in the given image. Each feature results in a unique value which is computed by the subtraction of sum of pixels under white rectangle from the sum of pixels under black rectangle.

$$\text{Val} = \text{sum}(\text{pixels in black region}) - \text{sum}(\text{pixels in white region}).$$

b) Integral images:

The sum of values in a rectangular subset of a grid within the image processing domain it is known as integral image. The value at pixel (x, y) is the sum of pixels above and to the left (x, y).

$$ii(x, y) = \sum_{x' \leq x, y' \leq y} i(x', y')$$

c) Adaboost:

In adaboost there are two classifiers they are strong and weak classifiers. The adaboost produces a strong classifier has a linear combination of the weak classifier.

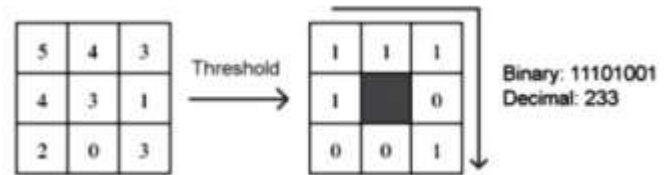
$$F(x) = \alpha_1 f_1(x) + \alpha_2 f_2(x) + \alpha_3 f_3(x) + \dots$$

$F(x)$ = Strong classifier
 $\alpha f(x)$ = Weak classifier

d) Cascade Classifier:

The cascade classifier is used for the composition of stages where each stage contains a strong classifier when all the features are joined into different stages where each stage as number of features. Those each stage is used to determine whether it's a face or not a face.

1.2 The face recognition is done by implementing Local Binary Patterns (LBP). The image features are extracted using LBPs, then LBPs algorithm compares the extracted features with the trained datasets. Local Binary Pattern is an efficient texture tool which is employed to label pixels of an image that is obtained from detection. LBP thresholds the neighborhood of every pixel and produces a



binary number. The first step in this is to construct grayscale image.

For each pixel in the gray scale image, neighborhood of pixel size r is surrounded by the center pixel. The LBP value is computed for this center pixel and stored in the output array with the same width and height of the input image. Since every centered pixel has 8 pixels-3x3 surrounding neighbors, it can be denoted as a binary number. If any neighbor is greater or equal than the central pixel then a logic '1' bit is replaced for that pixel, else logic '0' bit is replaced for that pixel. Then, the 8 bits binary number is converted to decimal which represents the threshold of that centered pixel value. The last step is to calculate histogram over the output LBP array.

2. RFID based system

After face recognition, students are allowed to show their RFID tags over the reader which reads the tag value. Then, the tag value obtained from face recognition is compared with this tag value. If it is matched, the attendance will be marked.



Figure4. Implementation method

The attendance is stored in the respective database which is enrolled with the student's details in prior to have the attendance management system up-to-date. LCD display is placed to show the respective results over the system working. According to the student's entry the system is proposed to identify them and made to be reliable to use in real time applications.

5.CONCLUSION:

Thus, in this way we proposed a system which works on the combination of RFID and face recognition. And with just few modifications we can use our system in any secured facilities. Usage of Python and Open CV in Raspberry Pi made our project flexible and adoptable to any required future changes. This paper gives the efficient and accurate method of attendance in educational institutions which replaces the manual method. It is highly flexible and reliable to use. As the attendance percentage affects the grades of the student, it is very useful when it gets automated which provides accurate results and user friendly. Hence, this automated system can be a great model for managing the attendance.

6.FUTURE SCOPE:

The proposed method is established for recording the attendance for students and staffs in educational institutions. This system can be implemented in many work sectors such as banks, companies etc. The implementation can be made in both private and government sectors. Instead of face recognition any other biometrics may combined with RFID system. In ATMs, this face or IRIS recognition approach can be utilized for accessing the accounts-which could be a more successful and authorized way of banking. Instead of raspberry pi this system can be made with ODROID XU4 portable computer.

7. REFERENCES

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