
MONITOR AND RECOGNISE OF ATTENDANCE OF STUDENTS – A SMART TECHNOLOGICAL SOLUTION

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ABSTRACT

In educational institutions, attendance system was brought into practice to maintain discipline and to help students grasp utmost knowledge. The traditional attendance system was more time consuming and it included a lot of paper work. Hence, there was a need for a new method which could eliminate the drawbacks of the conventional system. This project aims to build a user friendly, less time consuming and efficient attendance system which includes three types of authentications. They are Radio Frequency Identification, Fingerprint Detection and Face Recognition. These modules are interfaced to Raspberry Pi.

Keywords: Radio Frequency Identification, Fingerprint Detection, Face Recognition, Raspberry Pi

1. INTRODUCTION

The proposed system is designed in such a way that the limitations of the traditional attendance system are reduced. Earlier there were two main ways of marking attendance. Either the teacher used to call out the names or take the signature of the students in a piece of paper. Since the other person could mark the attendance of the actual person, the data accuracy of earlier attendance was low. In the proposed system, the individual card or fingerprint or the face of the student is recognized and the attendance is recorded in a CSV file automatically. It stores the name and time at which the

attendance is recorded. By using this system, data accuracy is increased and it simplifies the overall process of marking attendance and saving the database of students. This proposed system can be used in any field where attendance plays a vital role.

2. COMPONENTS USED

The proposed system is developed by using the following components:

- A. SD Card: The operating system for the raspberry pi i.e., Raspbian, database and the code are stored in the SD Card.



Fig. 1 SD Card

- B. Raspberry Pi: It is a miniature computer which can be plugged into computer monitors or TV and can be programmed using different languages to get real-time output. The engineering concepts can be converted to interactive electronic modules. Raspberry Pi is an ARM Cortex processor with dual band wireless LAN, Bluetooth, fast Ethernet, USB ports and improved thermal management.



Fig.2 Raspberry Pi

C.RFID: This module consists of mainly two components. They are RFID reader and tags. The tags encode digital data which are captured by the reader using radio waves. Every tag has a unique digital data. Hence, the reader identifies every tag uniquely.



Fig.3 RFID Module

D. Fingerprint sensor: The sensor scans the fingerprint optically. It controls the encryption and transfer of data through the USB interface to the Raspberry Pi



Fig. 4 Fingerprint Sensor

E. Pi Camera: The camera module is used to capture images and videos. Raspberry Pi of all version supports Pi camera. In the process of face recognition, the camera is fixed in a specific distance or is counted to a wall from where the faces of every student is detected. It captures the video of a class concurrently and send it to the system for further processing.



Fig 5. Pi camera

3. METHODOLOGIES

1. RFID

The RFID system is mainly based on the concept of radio waves. The RFID tags include an integrated circuit and an antenna. The data is transmitted to the reader by them. The RFID tags can be passive or active. Passive tags do not have a battery and need to be powered by the reader whereas the active tags are powered directly with power supply like a battery. The data which is transmitted by the tags is then converted to more understandable form. RFID uses AIDC (Automatic Identification and Data Capture) method which means that it identifies the object, and stores its data automatically without any human intervention. This system is similar to a barcode system but has one advantage over it. That is, RFID reader can read the tag even if it is not in direct line of contact with the tag unlike the barcode reader.

The RFID systems are mainly of three types. They are Low Frequency, High Frequency and Ultra High Frequency systems. Another type is a Microwave RFID. The Low Frequency RFID system ranges vary between 30kHz to 500kHz. The transmission range of these systems is generally as short as few inches. The High Frequency RFID system ranges vary between 3MHz to 30MHz.

The transmission range can be several feet. The Ultra High Frequency RFID system ranges vary between 300MHz to 960MHz. The transmission range of these systems is more than 25 feet. The Microwave RFID systems operate at a frequency of 2.45GHz and transmission range can be more than 30 feet.

The RFID module used in this project is RC522. The frequency band at which this module operates is 13.56MHz. It is designed to communicate at a data rate of 10Mbps over a Serial Peripheral Interface (SPI). It can also use I2C or UART standards for communication. The system is able to do 2 functions mainly. They are registering a new tag and identifying already registered tag.

The following flowchart describes the working of RFID based recognition system.

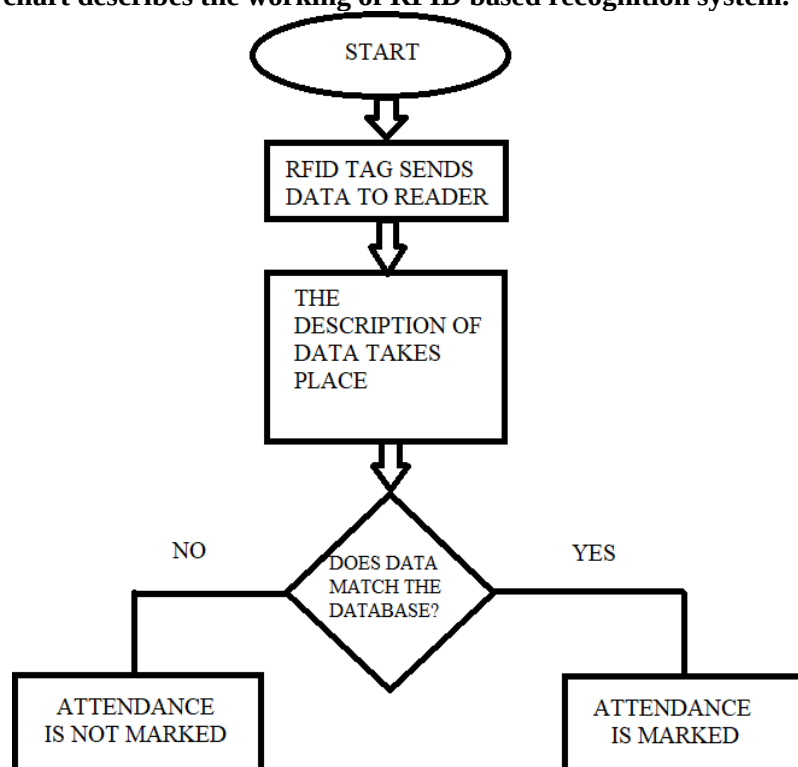


Fig.6 Flowchart of RFID based recognition system

4. FINGERPRINT BASED RECOGNITION SYSTEM

Authentication using biometric is one of the popular technologies which has high rate of accuracy in noting attendance. The whole system can be constructed using an embedded computer i.e., Raspberry Pi where database is created, fingerprint reader is accessed and the process of authentication and recognition is done.

Every person has a unique fingerprint, this feature was taken as an advantage to recognize an individual person and hence this system came into existence. This mode has proved to be the most reliable mode to identify individual.

This system mainly contain a USB serial port converter and fingerprint reader connected to Raspberry Pi. The USB serial converter is an important device which allows the serial devices or sensors to directly plug into USB ports. It supplies both 3V and 5v output.

The fingerprint reader can be programmed in two operating systems i.e. Linux and Windows. When the user touches the screen of the reader that is the glowing window, it scans the fingerprint optically. The reader used here is R307. It can detect the existing fingerprint and enroll new fingerprints. The reader itself stores the fingerprints. It has the capacity to hold 1000 fingerprints. The data of fingerprint comparison, collection, search and deletion can be taken place using this reader.

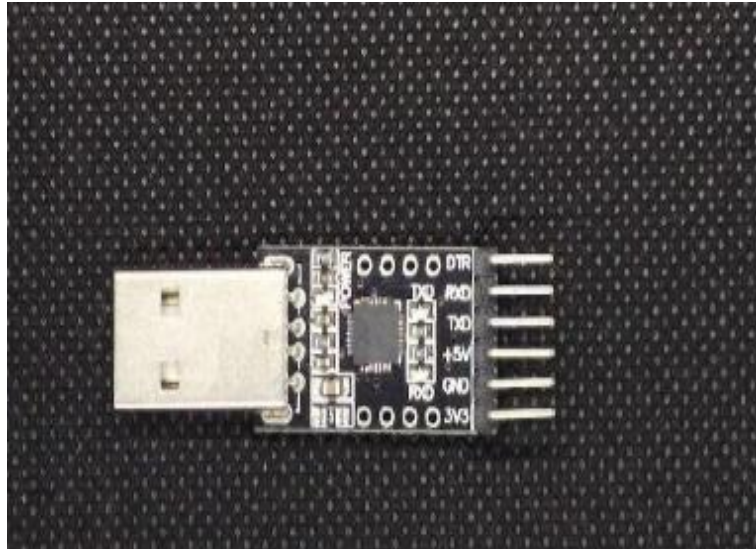


Fig.7 USB serial converter

The following flowchart describes the working of fingerprint based recognition system.

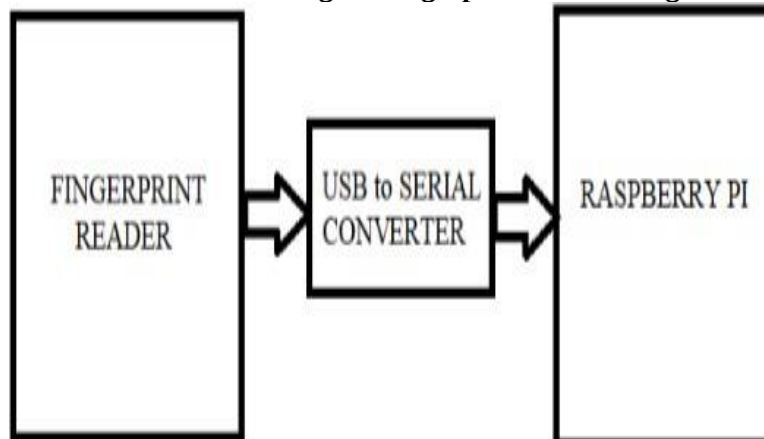


Fig. 8 Flowchart of fingerprint based recognition system.

5. FACE RECOGNITION SYSTEM

The process of identifying a person and authenticating the identity is called face recognition.

Face recognition system: The system that validates the captured face with the dataset provided. The face recognition is carried out in two ways:

- Authentication / Validation of a facial image: It compares the captured image with the related facial image of the user requiring the authentication.
- Identification: It compared the captured image with the facial data set provided to find the matching face.

CONCURRENT FACE RECOGNITION

The proposed system is called concurrent face recognition. The objective of this process is to capture the face of every student and update the data in the CSV file accordingly.

The following flow chart shows the working of the concurrent face recognition.

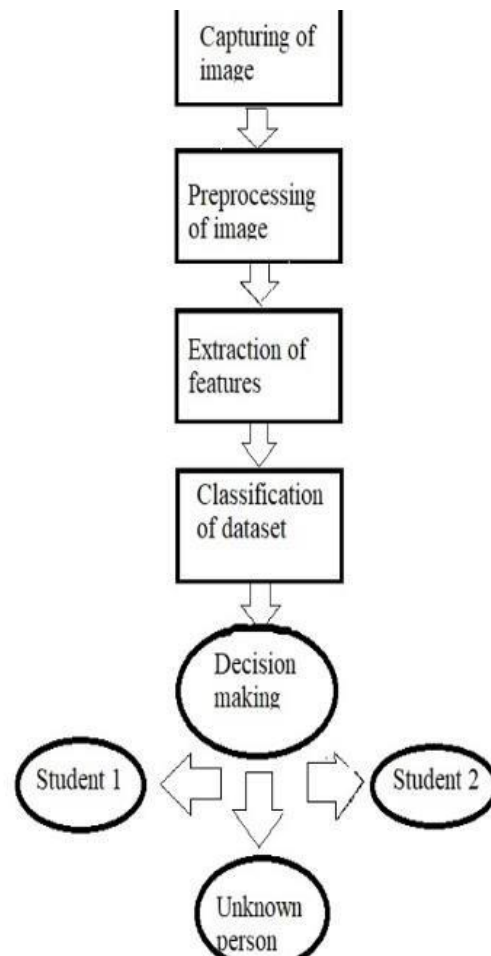


Fig. 9 Flowchart of RFID based recognition system

- A. Capturing the image: The faces are captured in such a way that all the features are detected.
- B. Image processing: It involves the steps to compose images before they undergo model training and deduction. Model training mainly included analysis of features. Model training of images also includes correction of size, orientation and color.
- C. Feature extraction: In this process the data is divided to feasible parts. For eg, A captured image have many characteristics. These characteristics need to be computed. They are selected and combined together to form a best feature. This feature represents the originality of an image and has high accuracy.
- D. Classification: Since the feature vary from image to image, the dataset is accordingly differentiated and stored.
- E. Decision making: After the classification of dataset/images, the decision is made by the system as to which image belongs to which individual.

If the extracted feature from the captured image matches the data set, the face of the student is recognized.

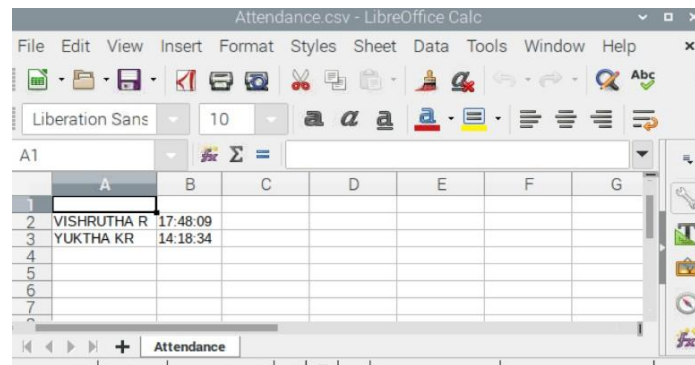
CSV FILE

Comma Separated Values are abbreviated as CSV

file. It is a text file that allows the storage of data in

A table format. The information of the student is stored in the following format:

- First name
- Last name
- Time of check-in

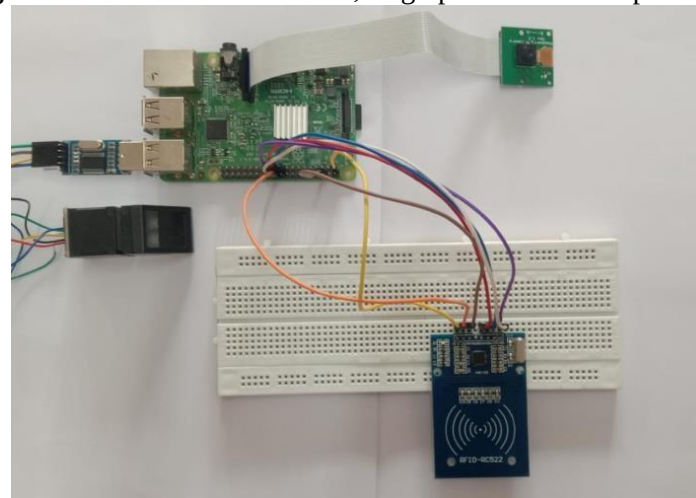


	A	B	C	D	E	F	G
1							
2	VISHRUTHA R	17:48:09					
3	YUKTHA KR	14:18:34					
4							
5							
6							
7							

Fig.10 CSV File

INTERFACING ALL THREE AUTHENTICATION

Fig.11 Interface of RFID module, fingerprint sensor and pi camera.



6. CONCLUSION

This attendance system which includes RFID based recognition system, fingerprint based recognition system and face recognition system works in such a way, that the marked attendance of each individual is stored precisely. Aim of the project is to improve the attendance management in the institutions. This system is less time consuming and more efficient than the traditional method. The attendance is stored in a digital database hence it is eco-friendly. Since the attendance are secure it can be accessed anytime anywhere. This smart way of monitoring attendance is low-cost and yet more effective. To conclude, this project accesses all the database and picks up different functions. This system overcomes many limitations of the traditional system of attendance and results the report flexibly.

7. ADVANTAGES

- A. High level of authentication: The attendance would be more exact since there are three modes.
- B. Effective in cost: Since the whole procedure of marking and calculation is done by the computer itself, the cost of paper and extra employees are saved.
- C. Increased security: As the system stores the time of check in, it is more secured.
- D. Cautious: During the time of pandemic, it is very much essential to maintain individual hygiene and social distancing. The process of face recognition would help students maintain the same.

REFERENCES

1. Abhishek. Jha, "Class Room Attendance system using facial recognition", Proc, ISSN: 2319 - 8125, volume-2, issue-3.
2. H. JIA and Y. ZHANG, 2009. "Multiple Kernels Based Object Tracking Using Histograms of Oriented Gradients", Acta Automatica Sinica, vol. 35, no. 10, pp. 1283-1289,
3. Nandhini R, Duraimurugan N, S.P. Chokkalingam 2019. "Face recognition based attendance system", Proc, ISSN: 2249 - 8958, Volume-8, Issue-3S, February

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4. N. Sudhakar Reddy,M.V.Sumanth,Sudarsanam Suresh Babu, 2018. “ A Counterpart Approach to Attendance and Feedback System using Machine Learning Techniques”, Computer Science,Journal of emerging technologies and innovative research,
 5. Ofualagba Godswill, Omijie Osas, Orobor Anderson, IbhadodeOseikhuemen, OdieteEtse“Automated Student Attendance Management System Using Face Recognition”.
 6. Prajakta Lad, Sonali More, Simran Parkhe, Priyanka Nikam, Dipalee Chaudhari , 2017. “Student Attendance System Using Irisdetection”, JARIIE, ISSN(O)-2395-4396 ,Vol-3 Issue-2
 7. Yongzhong Lu, Jingli Zhou, ShengshengYu, 2003. “A Survey of Face Detection, Extraction And Recognition”, Computing and Informatics, Vol. 22