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AUTOMATED CLASS ATTENDANCE SYSTEM BASED ON FACE RECOGNITION USING RASPBERRY PI

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ABSTRACT: This paper describes the method of detecting and recognizing the face in real-time by utilizing Raspberry Pi. The traditional way of taking attendance consumes more time and manual work. Attendance can be manipulated in the process of manual work, to avoid the drawbacks we proposed an automation of attendance system by using face recognition. The primary identification is face for any human. The required information is stored in database; this process helps to recognize the students. This paper derives an efficient algorithm using open source image processing framework known as Open CV. This approach has five modules – Face Detection, Face Pre processing, Face Training, Face Recognition and Attendance Database. The face database is collected to recognize the faces of the students. Initially, the system is trained with the student's faces which is collectively called student database.

KEY WORDS: RFID, Face recognition, detection, accuracy, OpenCV.

I.INTRODUCTION

Monitoring Checking the performance of the students and maintaining the attendance is a tedious process for an institute. Each institute has adopted their own method of taking attendance i.e. calling the names or by passing the sheets. Currently popular automatic attendance systems are in use like RFID, Iris, fingerprint etc. However, making queue is essential in these cases. Thus, it requires more time and it is intrusive in nature. If Any damage occur to RFID card, it can make inappropriate attendance. Apart from this deploying these systems on large scale is not cost efficient. In order to have a system both time and cost efficient with no human intervention, facial recognition is the

suitable solution. face is people's preliminary scheme of person identification. With the rapid development in the fields of image processing such as pattern recognition, facial recognition and signature recognition the efficiency of this system is keep on increasing. This system is attempting to provide an automated attendance system that carries out the face recognition task through an image/video stream to record the attendance in lectures or sections and keeping the database of attendance. After creating the database of the students/ candidates, it requires almost zero efforts from the user side. Thus intrusive nature is absent in this system and makes the system effective. Face Recognition technique is one

of the most efficient biometric technique for identification of people. We can utilize it in the field of education for managing the attendance of students. There are a lots of colleges and schools in which thousands of students are taking the education. In every classroom there are about ninety to hundred students are studying. Face recognition technology emulates the capabilities of human eyes to detect faces. Smart computing that creates face bunch that consists of 70 nodal points does this[6]. Features are extracted from the face and saved as templates. These templates are compared to the face detected. For this research, we interfaced an Camera to the Raspberry Pi board. We have made a real time application, which compares the scans to records stored in the Raspberry Pi, Face detection and tracking has been used for the purposes of surveillance, security, human computer interaction, etc. Various methods of face detection are reported in literature, they include Viola Jones, Hari's corner, Principle component analysis, Haar classifier. Now days the entire period attendance is stored in register and at the end of the gathering the reports are generated. Staff is not concerned in creating report in the intermediate of the session or as per the pre-requisite because it takes more time in calculation. In this project, Raspberry pi is utilized as microcontroller which stores all the records of the students and yields the results. Pi is a tiny affordable cost computer that can be used as a Single board computer. The hardware implementation includes the camera to capture the image of the classroom, buzzer- to buzz at the set time. The main controller unit is Raspberry-pi.

The software platform used is Raspbian (Linux OS), Python programming language and Open CV image processing library. The working procedure starts with a buzzer giving a beep sound which aims at attaining attention of the students towards the camera to capture the image. The camera captures the snapshot of classroom in which, the Open CV detects the faces and thus are processed and are compared with the student image database. The matched faced students are marked present and the remaining students are considered to be absent. then alert message will be send to their parents and HOD. In the process of this face recognition system is divided into various steps. The important steps are detection of face and recognition of face. Firstly, marking the data of students. And the image of students' faces will be required. The classroom image can be snapped from the camera device, which will be placed in the classroom at a suitable location from where the whole classroom can be covered. This image will act as input to the system. For the effective face detection, the image needs to be enhanced by using some image processing techniques like grayscale conversion of image and histogram equalization.

II. LITERATURE SURVEY

An Attendance Management System which is developed using bio-metrics, in our case face, generally consists of Image Acquisition, Database development, Face detection, Preprocessing, Feature extraction, and Classification stages followed by Post-processing stage. At current era human being always try to develop a system that

minimizes manual human efforts by implementing automation in the existing system with the help of software and hardware platform's available. By considering above fact, we decide to implement an automated attendance system that will put attendance of student if he/she will come in front of camera. The main activities carried out during attendance system are to detect and recognize a human face. This type of attendance systems are already available in a number of organizations, but these systems have the limitation that student need to come in front of camera i.e. Active participation from the student's required to have attended. The attendance maintaining system is difficult process if it is done manually. The smart and automated attendance system for managing the attendance can be implemented using the various ways of biometrics. Face recognition is one of them. By using this system, the issue of fake attendance and proxies can be solved. The major steps in this system are detecting the faces and recognizing them. After these, the comparison of detected faces can be done by crosschecking with the database of student's faces. Face Recognition Based Attendance Marking System is based on the identification of face recognition to solve the previous attendance system's issues. This system uses camera to capture the images of the employee to do face detection and recognition. The captured image is compared one by one with the face database to search for the worker's face where attendance will be marked when a result is found in the face database. The main advantage of this system is where attendance is marked on the server which is

highly secure where no one can mark the attendance of other.

Moreover, in this proposed system, the face detection algorithm is improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are invested in the accuracy of the face detection algorithm, the system is yet not portable. This system requires a standalone computer which will need a constant power supply that makes it not portable. This type of system is only suitable for marking staff's attendance as they only need to report their presence once a day, unlike students which require to report their attendance at every class on a particular day, it will be inconvenient if the attendance marking system is not portable. Thus, to solve this issue, the whole attendance management system can be developed on an embedded design so that it can be work similarly with just batteries that makes it portable. Kumar Yadav proposed a solution of using fingerprint to mark the attendance. This system is using 2 microcontrollers to deal with the fingerprint recognition process. Firstly, the fingerprint pattern will be obtained through a fingerprint sensor, then the information will be transmitted to microcontroller 1. Next microcontroller 1 will pass the information to microcontroller 2 to do the checking with the database that resides in it. After finding a student's match, the details are sent to the PC through serial communication to be displayed. This design is good as it accelerates development while maintaining design flexibility and simplifies testing. But again, this system is attached to a PC which make it not portable. Other than

that, the database information cannot be accessible easily. Meaning that, for the parents whom are interested in knowing their child's attendance cannot easily or conveniently access the information. Therefore, to provide accessibility of the student's information to the legitimate concerned party, the information can be uploaded to a web server for easy access. While the authentication for the appropriate access can be enforced through a login screen.

Hussain proposed solution is almost similar to the first research journal where RFID technology is used to improve the older attendance system. In this system, a tag and a reader is again used as a method of tracking the attendance of the students. The difference between the first journals with this is where attendance's information can be accessed through a web portal. It provides more convenient for information retrieval. Again, this system is imperfect in the sense that, firstly, it is not portable, as the RFID reader can only work when it is connected to a PC. Secondly, the RFID tag is not a genuine information that can uniquely identify a student, thus, resulting in the inaccuracy of the collected attendance information.

III. PROPOSED SYSTEM

The present day attendance system is manual. It wastes a considerable amount of time both for teachers and students. The waiting time of the students is increased if attendance is taken manually. There are still chances for proxies in the class when attendance is taken manually. Manual attendance always have a cost of human error. Face is the essential recognizable

proof for any human. So automating the attendance process will increase the productivity of the class. To make it available for every platform we have chosen the Raspberry pi 3 for face recognition. A Webcam is associated with the Raspberry Pi module. Face identification separates faces from non-faces and those countenances that can be perceived. This module can be utilized for different applications where face acknowledgment can be utilized for validation. In this proposed system we take the attendance using face recognition which recognizes the face of each student during the class hours. The below figure (1) shows the architecture of proposed system. In this we use raspberry pie, pi camera, micro SD card, and Ethernet cable. Let us discuss each device in detail manner.

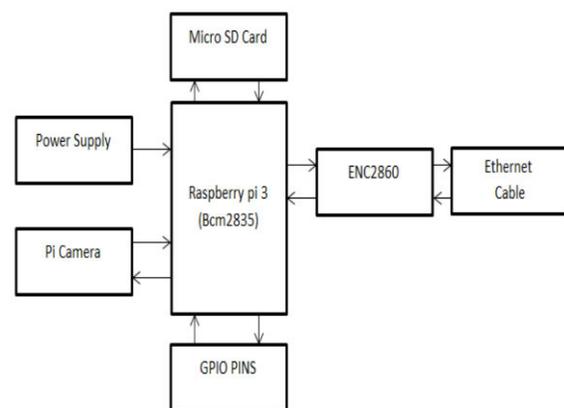


Fig. 1: PROPOSED SYSTEM

A. Raspberry Pi 3

The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. This Raspberry pi equipped with

ENC28J60 which is a Ethernet chip to get connected with internet.

There are two giant upgrades in the Pi 3. The first is a next generation Quad Core Broadcom BCM2837 64-bit ARMv8 processor. The second giant upgrade (and this is the one we're personally most excited about) is the addition of a BCM43438 WiFi chip BUILT-IN to your Raspberry Pi.

B. Camera

A camera is an optical instrument for recording or capturing images, which may be stored locally, transmitted to another location, or both. The images may be individual still photographs or sequences of images constituting videos or movies. The camera is a remote sensing device as it senses subjects without any contact.

C. GPIO Pins

General-purpose input/output (GPIO) is a generic pin on an integrated circuit or computer board whose behavior—including whether it is an input or output pin—is controllable by the user at run time. The GPIO connector has a number of different types of connection: -True GPIO pins that can use to turn LEDs on and off etc.-I2C interface pins that allow to connect hardware modules with just two control pins -SPI interface with SPI devices, a similar concept to I2C but uses a different standard -Serial Rx and Tx pins for communication with serial peripherals.

D. Power Supply

The Power Supply is a Primary requirement for the project work. The required DC power supply for the base unit as well as for the recharging unit is derived from the mains

line. For this purpose center tapped secondary of 12V012V transformer is used. From this transformer we getting 5V power supply

E. SD Card

The OS required for raspberry pi is raspbian and the minimum recommended card size is 8 GB.

In above figure (1) power supply is connected to the raspberry pi which is the heart of the proposed system. Pi camera is connected to the raspberry pi camera slot. Camera captures the images of the students who are present in the class. Raspberry pi takes those images as input images and compares the input images with the existing image. This happens due to importing the open CV packages at the initial stage of the development of the system. The result is displayed on the monitor screen which is connected to the raspberry pi through the Ethernet cable.

IV. RESULTS



Fig. 2: HARDWARE IMPLEMENTATION

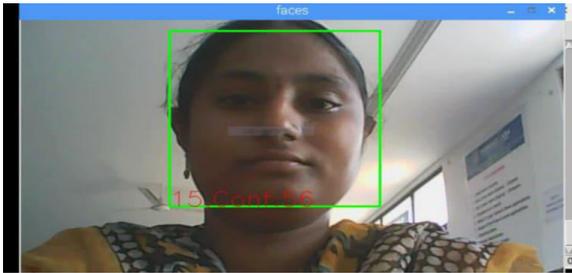


Fig. 3: TEST OUTPUT

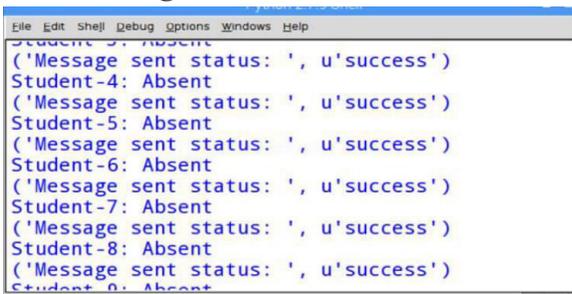


Fig. 4: FINAL OUTPUT

V. CONCLUSION

The smart and automated attendance system can be proven as an efficient system for classroom attendance. By using this system the chances of fake attendance and proxies can be reduced. There are a lot of Biometrics Systems which can be used for managing attendance, but the face recognition has the best performance. So, we need to implement a reliable and efficient attendance system for classroom attendance which can work for multiple face recognition at one time. We found the solution for light intensity problem and head pose problem for which we can use the Illumination Invariant algorithm. Also, to implement this system, no any specialized hardware is required. A camera device and a standalone PC, database servers are sufficient for constructing the smart attendance system,

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