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Smart Attendance system Using Raspberry PI

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***Abstract*—** Attendance is most important in schools, colleges and also in workplaces. In schools, colleges and educational institutions, attendance plays an important role. In educational institutions attendance is used to monitor student activity. Attendance is a key parameter which needs to be monitored which helps in visualizing the student progress in academics in day-to-day life. Attendance is helpful for parents who may notice their child going only to schools or college. In work places attendance plays a key role which enhances the work schedule and determines the workload of the employee and the contribution of the employee in his work. It is very mandatory to decide the salary of the employee based on the number of days he has worked. Logging down the attendance in institutions level is done by instructors, who are responsible to take attendance in each lecture hour. This mark down of attendance on an hourly basis is basically tedious work. In some academic regulations loss of attendance due to manual errors may result in mark reduction or attendance shortage may recorded. To automate the process of logging attendance in an autonomous way, this study has designed an efficient solution to log attendance each and every lecture hour without the intervention of the course instructor. The proposed system helps the educational institutions and instructors to focus on the academics rather than logging attendance manually.

***Keywords*—** Raspberry Pi, Security Camera, LCD Display

INTRODUCTION—

Organizations of all sizes use attendance systems to record when student or employees start and stop work and the department where the work is performed. Some organizations also keep detailed records of attendance issues such as who calls in sick and who comes in late. An attendance system provides many benefits to organizations. Traditional approach for attendance is professor calls student name & record attendance. It takes some time to record attendance. Suppose duration of class of one subject is about 50 minutes & to record attendance takes 5 to 10 minutes. For each lecture this is wastage of time. To avoid these losses, we are about to use automatic process which is based on raspberry pi. In this novel approach, we are using face detection & face recognition system. This face detection differentiates faces from non-faces and is therefore essential for accurate attendance. The other strategy involves face recognition for marking the student's attendance. The Raspberry pi module is used for face detection & recognition. The camera will be connected to the Raspberry pi module. The database is collected. The database includes name of the person, their images. One of the unique features of our brain is that it can think only in images not in words. Once you may forget to keep your Car's key but you will never forget to bring a face with you. God has given everyone a unique face. Face is the most important part of our body, so that it can reflect many emotions of a person. There are traditional ways are being utilized even today but with vast resources wanted to be more secured. There are two types of biometric as physiological characteristics (face, fingerprint, finger geometry, hand geometry, palm, iris, ear and voice) and behavioural characteristics (gait, signature and keystroke dynamics). Sometimes your behavioural traits may change because of illness, fear, hunger etc. Face detection and recognition system is more expensive, exact, easy to understand and non-intrusive process as compare to other biometrics. The system will fall into two categories as face detection and face recognition. In the face detection we have to classify between face versus non face region while in recognition process, we have to compare that single face image with multiple images from the input image. While capturing an image from a webcam we have to come across some problems like pose (position of camera), presence of structural components (spectacles and beard), facial expression, occlusion (obstructed by someone), image

orientation (variation in rotation), imaging condition (lightning and camera characteristics) etc. A Face Detection and Face recognition System is a system which automatically identifies and/or verifies the identity of a person from digital images or a video frame from a video source. A general statement of the face recognition problem (in computer vision) can be formulated as follows: Given still or video images of a scene, identify or verify one or more persons in the scene using a stored database of faces.

LITERATURE REVIEW—

Two researchers Visar Shehu and Agni Dika proposed in [1] a system which introduces an attendance marking system, which integrates computer vision and face recognition algorithms into the process of attendance management. The system is implemented using a non-intrusive digital camera installed on a classroom, which scans the room, detects and extracts all faces from the acquired images. After faces have been extracted, they are compared with an existing database of student images and upon successful recognition a student attendance list is generated and saved on a database. This paper addresses problems such as real time face detection on environments with multiple objects, face recognition algorithms as well as social and pedagogical issues with the applied techniques.

In [2] PAN Xiang described work process of a system: When a person wants to enter the access control system, he used the RFID card to swiping card by non-touch way. The system reads the information in the card and meanwhile the video camera is started to take photos of the person. Then the face can be detected in a short time. The identity information in the card is compared to the information from the database and the corresponding face data will be obtained. If the identity information and the face data are all matched to the information from the database, the person will be passed. Else he can't enter. The manager can do the manage work such as query the records.

In [3] Mr. Jawale described a technique based on ear is also introduced that is a photo of the subject 's ear is taken and fed into the computer. Edge detection is carried out on this picture. From this detected edge, is separated a reference line with respect to which other features are identified. These extracted features are stored in a database in the form of a vector, each vector corresponding to a particular image in the database. The feature vector of the test image obtained is compared with those in the vector database, for creating and maintaining database for records of individuals and feature vectors, which are used for the purpose of comparison and decision making, linking of MATLAB and some data base using ODBC Drivers is carried out according to which a match is calculated. This match is compared with a predicted threshold value, which decidesthe identity of the person.

The [4] Jian Xiao, Gugang Gao, Chen Hu, Haidong Feng proposed a framework for fast embedded face detection system based on three modules. One fast face detection method based on optimized AdaBoost algorithm with high speed and high detection rate, one SOC hardware framework to speed up detection operations and one software distribution strategy to optimize the memory sub-system.

The [5] describes a Real Time System developed for multi-face detection. As most of the system are based on software algorithms. This proposed system is based on hardware design to enhance the processing time. The different stages of this hardware design include skin colour detection, morphology, Fast connectedcomponent labelling algorithm, Implementation of the Fast connected-component labelling algorithm, Lip feature extraction, Horizontal edge detection.

PROPOSED WORK—

The aim of our dissertation is to provide an attendances system using face detection and recognition on Raspberry Pi board and send on internet server. This will increase the security of our Dissertation. Whatever the system that we have to implement it should work in real time with low false detection rate. shows the flow chart diagram for real time face detection and recognition system that will contain various hardware and software components.

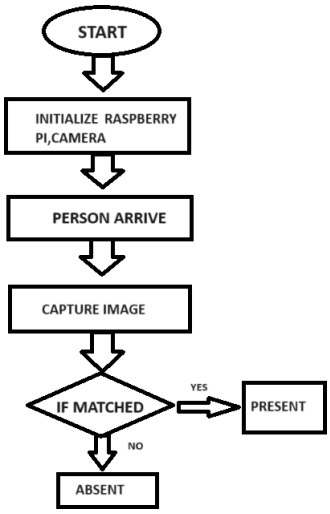


Fig 3.1. Flow chart diagram

The proposed work follows:

The first part was booting the Raspberry Pi board by installing the Operating system Raspbian OS and installing the essential libraries and packages.

1) Interfacing of camera module with raspberry pi B3 model. Capture face image using USB Webcam i.e. image acquisitiontake place.

2) Create a database of authorized person using face detection process. After created database save into folder.

3) Capture current face, compare with data base image. Using face detection and face recognition process. Algorithms areused for face detection and recognition.

Working Algorithm

Flow of working of the system and flow of the programme are shown in these following steps:Steps Included:

STEP 1: Start.

STEP 2: Initialization of Raspberry pi, Camera, Sensors.

STEP 3: If any person comes, camera captures the picture/image and sends to the Raspberry PiSTEP 4: Raspberry Pi matches the received image with images stored in its memory.

STEP 5: Store the data on sheet.

WORKING—

Step 1: Setting up Raspberry PI SD card into the SD card slot on the Raspberry Pi, which will only fit one way. Next, plug the USB keyboard and USB mouse into the USB slots on the Raspberry Pi. Make sure that the monitor or TV is turned on, and that the right input is selected. Then Connect the HDMI cable from your Raspberry Pi to the monitor or TV. If the Raspberry Pi is needed to be connected to the internet, plug an Ethernet cable into the Ethernet port next to the USB ports. When all the required cables and SD card are plugged then, plug in the micro-USB power supply. First of all, the Linux OS is installed into the Raspberry Pi board via Micro SD card and appropriate code is written in Python language for the object detection using the Open CV libraries and is dumped in the board. The USB Camera is interfaced; the GPIO pins are programmed using commands in Linux and Python in this stage. The camera is interfaced to the Pi via the USB port and the door lock module is interfaced via the GPIO pins on the Pi.

Step 2: Image Acquisition Webcam connect to the raspberry pi kit. When person standing in front of camera then webcam capture face image of that person. Resize the captured face image.

Step 3: Pre-processing The data which is collected from Input unit that is captured Image and Video frames input is fed into the processing unit in the processing unit. Here the processing unit is nothing but a Raspberry Pi board. Along with code scripts of the implemented modules.

Step 4: Face detection in face detection process PuTTY cascade algorithms is used for face detection.

- First capture face image by using webcam then resize the image.
- PuTTY-like features are digital image features used in object detection.
  - Initially, the algorithm needs a lot of positive images (images of faces) to train the classifier. Then we need to extract features from it. In this face detection process, captured colour face image is converted into black and white image i.e. Gray scale image. It reduces the number of pixels for simplification of detection. Then selection of ROI take place i.e. face detection process is done.

Step 5: Create Data base of Authorized Person in Face detection process first create database of authorized person. The captured face of current poses creates a data base of the authorized person and stores this. At the next time camera module will capture the current live face of the person. All this process is done in Raspberry pi module. Create our own database. The images stored in a folder, storing database images and store it as a train face in the test 1 folder.

Step 6: Face Recognition The most important step of our dissertation is facing recognition. In Face recognition process LBPH algorithms are used.

  - The image is divided into small connected regions called cells, and for the pixels within each cell, a histogram of gradientdirections is compiled.
  - For improved accuracy, the local histograms can be normalized by calculating a measure of the intensity across a largerregion of the image, called a block, and then using this value to normalize all cells within the block.
- The final step in object recognition using Local binary pattern (LBP) algorithm.

RESULT —

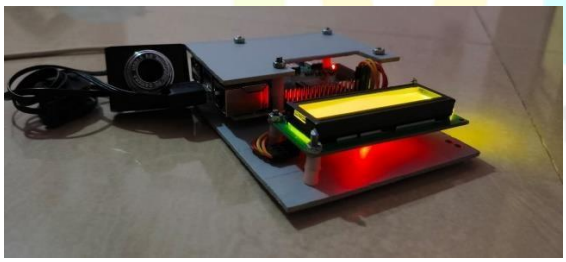
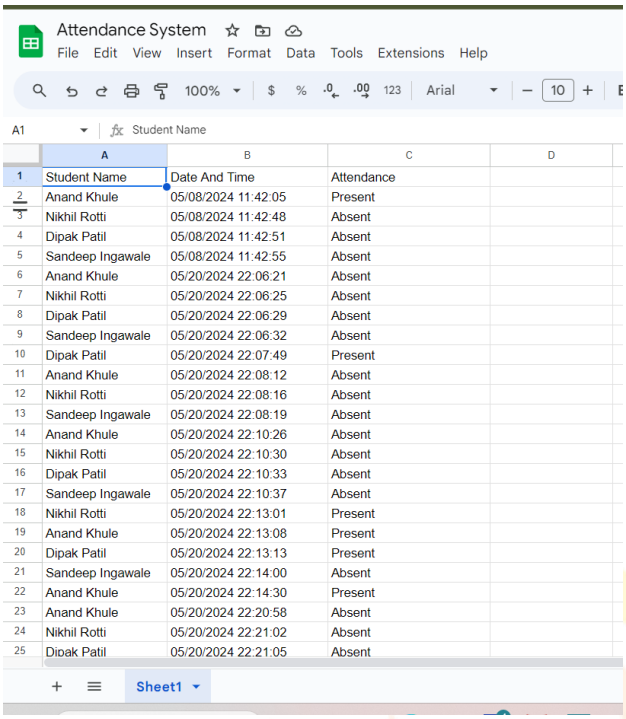


Fig 4.1 : Final Hardware



Attendance System

File Edit View Insert Format Data Tools Extensions Help

A1 Student Name

	A	B	C	D
1	Student Name	Date And Time	Attendance	
2	Anand Khule	05/08/2024 11:42:05	Present	
3	Nikhil Rotti	05/08/2024 11:42:48	Absent	
4	Dipak Patil	05/08/2024 11:42:51	Absent	
5	Sandeep Ingawale	05/08/2024 11:42:55	Absent	
6	Anand Khule	05/20/2024 22:06:21	Absent	
7	Nikhil Rotti	05/20/2024 22:06:25	Absent	
8	Dipak Patil	05/20/2024 22:06:29	Absent	
9	Sandeep Ingawale	05/20/2024 22:06:32	Absent	
10	Dipak Patil	05/20/2024 22:07:49	Present	
11	Anand Khule	05/20/2024 22:08:12	Absent	
12	Nikhil Rotti	05/20/2024 22:08:16	Absent	
13	Sandeep Ingawale	05/20/2024 22:08:19	Absent	
14	Anand Khule	05/20/2024 22:10:26	Absent	
15	Nikhil Rotti	05/20/2024 22:10:30	Absent	
16	Dipak Patil	05/20/2024 22:10:33	Absent	
17	Sandeep Ingawale	05/20/2024 22:10:37	Absent	
18	Nikhil Rotti	05/20/2024 22:13:01	Present	
19	Anand Khule	05/20/2024 22:13:08	Present	
20	Dipak Patil	05/20/2024 22:13:13	Present	
21	Sandeep Ingawale	05/20/2024 22:14:00	Absent	
22	Anand Khule	05/20/2024 22:14:30	Present	
23	Anand Khule	05/20/2024 22:20:58	Absent	
24	Nikhil Rotti	05/20/2024 22:21:02	Absent	
25	Dipak Patil	05/20/2024 22:21:05	Absent	

Sheet1

Fig. output data sheet

CONCLUSION —

A facial reorganization-based attendance system is made for deployment in school, collages, industrial location and educational institutes. The system includes complete hardware development in the physical layer, cloud analytics in the Google sheets. System is vulnerable to data loss. The student does not have a real time information on his attendance status, nor does he have access to attendance record but at the other hand employee access attendance record. A complete system is proposed along with its merits and demerits. In the future we hope to improve the reliability of the system by improving the accuracy of face reorganization. We would also like to enable geolocation So that a person can register their presence using their mobile device. We are also trying to detect faeces in a much larger area of coverage or view than existing technology. Also, we are working on Application.

REFRANCE —

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