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Face Recognition Based Attendance System with Student Monitoring Using RFID Technology

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Abstract: *In an every institute, maintaining the attendance of a student in the classroom will play a major role. If we take manually it requires a lot of time. There are several automatic methods are available in this aspect they are biometric attendance, RFID attendance, Iris recognition and so on. All these methods also take a lot of time, because students have to make a queue to scan the student identity cards for marking the attendance. This paper describes one of the effective algorithms for face recognition that automatically marks the attendance without human involvement. This system consists of four phases those are face database, detection, and face recognition and marking attendance. In this paper, we are using a local binary pattern algorithm for face detection and face recognition. Local binary pattern as name suggests its works on local features that uses LBP operator which summarizes the local special structure of a face image. This paper also helps to track or monitor the student within the campus and also monitor faculties work, all these can be achieved with the help of RFID technology and also the information about internal marks can be sent to a registered number through SMS using GSM module.*

Keywords: *LBP, RFID, GSM, LCD, ARM7, PC*

I. INTRODUCTION

Now a days, attendance will be maintained in the institutes for checking the students' performance. Some colleges or schools are taking the attendance manually by calling a name or by using the old paper or file based approach. But in these methods students have to make a line for marking an attendance it wastes a lot of time. Many biometric systems are available but using these method students has to make line to touch their thumb or finger on the device. This process compares the biometric feature of a person with previously stored template captured at the time of enrolment. Our system uses the face recognition methodology for the automatic attendance of students in the classroom atmosphere without human involvement. Face recognition is a fundamental part of biometrics. Facial features are extracted through algorithms and some modifications are done to improve the existing algorithm models. In this paper, we have used a local binary pattern algorithm for face recognition. LBP is one of most efficient method for face texture descriptor, which is extracts the local features of face. The LBP has a high recognition rate compare to other algorithms. In this paper we have used Mat lab Simulink for recognition and verification of face stored in the database. The hardware used in this method is ARM7 which is of 32bit microcontroller. The microcontroller is controls the operation of entire systems. Power supply provides a power to the microcontroller. Basically GSM stands for global system mobile telecommunication which is operates in 900 MHz to 1800 MHz. Here we are using RFID technology for tracking or monitoring the student inside the college.

II. PROPOSED METHODOLOGY

In the starting stage, the image of all the students is captured at once by a webcam connected to a laptop and sends it to the image enhancement module for further processing. In the image enhancement module the image will be converted into a grayscale image, images are enhanced so that matching can be performed easily. For every individual students database will be created and that will be stored in PC. Once face is detected, the System initiates detection process. Detected face images are cropped.

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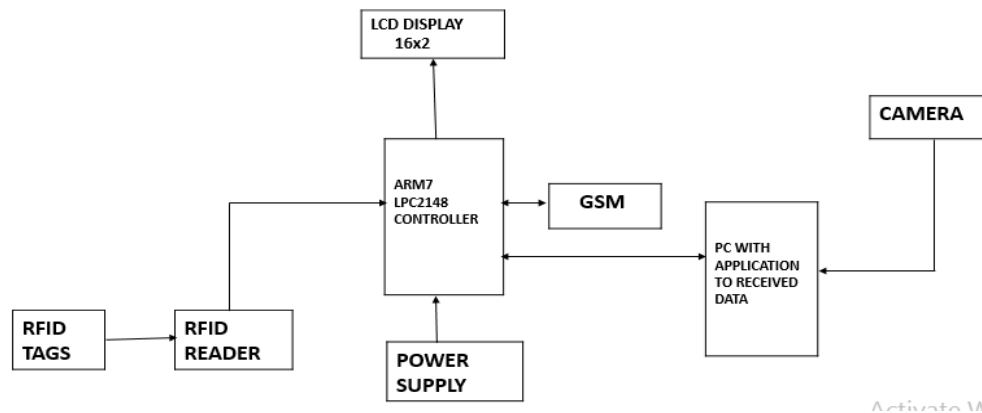


Figure 1: Block diagram

In the Face recognition process the detected images are compare it with database which contains collection of face images and extracted features at the time of enrolment process. If the face image is matched with stored image then the face is recognized. LCD is initialized and GSM searching for a signal once it got the signal it is initialized. Students' faces are recognized one by one with stored face database using local binary pattern method and attendance will be marked automatically. Face detection process separates the facial area from the rest of the background image. Feature extraction is done for distinguishing faces of different students. Feature extraction is helpful in face detection and recognition. The attendance status will be updated through microcontroller and that will be displayed on LCD. RFID basically defined as radio frequency identification. It uses a radio waves to identification of an object. RFID tags are the one which is used for identification of an object. RFID reader will gather the information from the RFID tags. RFID reader is incorporated within the campus, if the student is pass through that reader it will identify the student then, the information about the student location will be displayed on LCD. A message will be sent to absentees through SMS and also does the information of internal marks through SMS using GSM module.

III. LOCAL BINARY PATTERN

Local Binary Pattern is the most effective texture descriptor method among the existing method in this aspect. There are several existing methods for feature extraction. But the most useful method for extracting features from (preprocessed) face images is local binary pattern for face recognition. The LBP approach was introduced by Ojala et al in 1996. With the help of local binary pattern it is possible to extract the texture features from the face. The extracted features will contain a binary pattern to define the surrounding of pixels in the regions. The obtained features are combined into a one single feature called histogram, which forms the image representation. According to several studies [1,2,3] face recognition using the LBP method provides very good results, both in terms of speed and discrimination performance. Because of the way the texture and shape of images is described, the method seems to be quite robust against face images with different facial expressions, different lightening conditions, image rotation and aging of persons.

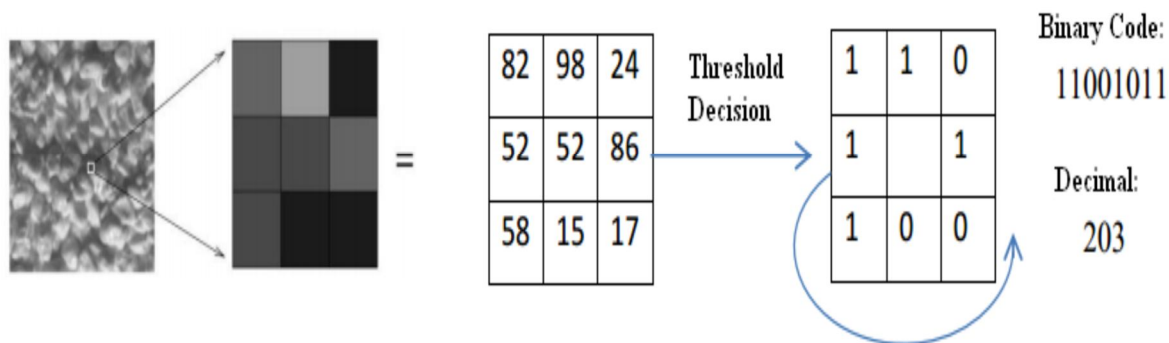


Figure 2: Operational principle of LBP

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The above figure shows the operational principle of LBP. The image will be divided into several blocks, each blocks will have a different intensities levels. In figure2 the image will be divided with 8 neighbors' of a pixel. Center pixel value will be used as a threshold to neighbors' pixels. If the neighbor pixel is greater than or equal to the threshold value then one is assigned to that pixel. If the value is less than the threshold value zero is assigned to that pixel, binary pattern is created that will be converted into decimal value. In this paper we mainly used feature called SURF features it is kind of robust features. Histogram will be calculated for each pixels based on the edge direction occurrence. The surf features will detects the different edges directions. At the time of registration of each faces HOG features will be calculated and that will be saved, HOG defines as histogram of orientations gradients this features will requires at the stage of face recognition because it will compare the query image and test image or it finds the similarity in two images. Once values are matched the face will be recognized. In this paper, we have used a new method for face recognition which gives both shape and texture information to represents the face images. The LBP operator is a powerful texture descriptor. In terms of accuracy and computational complexity ist shows the positive results. It can be seen as a unifying way of the traditionally divergent statistical and structural models of texture analysis classifications [4][5]. By combining these micro patterns, a global description of the face image is obtained.

A. Working of LBP algorithm

- 1) *Step1:* Face image will be captured by camera.
- 2) *Step2:* The captured image will be divided into several blocks.
- 3) *Step3:* For each block histogram will be calculated.
- 4) *Step4:* The gained features from the regions are concatenated into a single feature histogram, which forms a demonstration of the image.

IV. RFID TECHNOLOGY

Radio-frequency identification (RFID) is the wireless technology which is used as reader. Basically this technology uses of electromagnetic fields for transferring of data. For the identification and tracking purpose tags are attached to objects. The information will be stored in tags. The tags are energies by electromagnetic induction from magnetic fields produced near the reader. The primary purpose of an RFID system in this application area is to detect the presence and absence of the student data to be transmitted wirelessly by mobile device, called a tag, which is read by an RFID reader and processed according to the programmed instructions on the personal computer (PC). The ease with which RFID can be integrated into current operations depends on the openness and flexibility of the technology infrastructure especially the PC that will be used to collect and collate RFID data. The proposed system provides solution to lecture attendance problem through coordinated hardware and software design handshaking data communications between RFID tag and RFID reader serially interfaced to the digital computer system.[6]In RFID technology, it consist of RFID reader and RFID tags. There are two types of RFID tags 1.Active tags 2.passive tags. Active tag requires an external battery but a passive tag does not require an external battery.

A. How RFID Works

- 1) *Step1:* The reader will broadcast the signal through an antenna.\
- 2) *Step2:* The signal will be received by the tag and it gets charged.
- 3) *Step3:* The reader will receive the identifying response from the charged tag.
- 4) *Step4:* The data will be read by an antenna and it sends to the reader.
- 5) *Step5:* After receiving the data from an antenna the reader will sends the information to the PC for further processing.
- 6) *Step6:* Computer will send the processed signal that has to stored on the RFID tags.

V. RESULT

A. Database Creation

Students' database will be created. Database is nothing but a collection of pieces of information or set of images.

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Figure 3: Database Creation

B. Face Detection And Cropping

Once face is captured, the system starts face detection process. Detected face images are cropped.

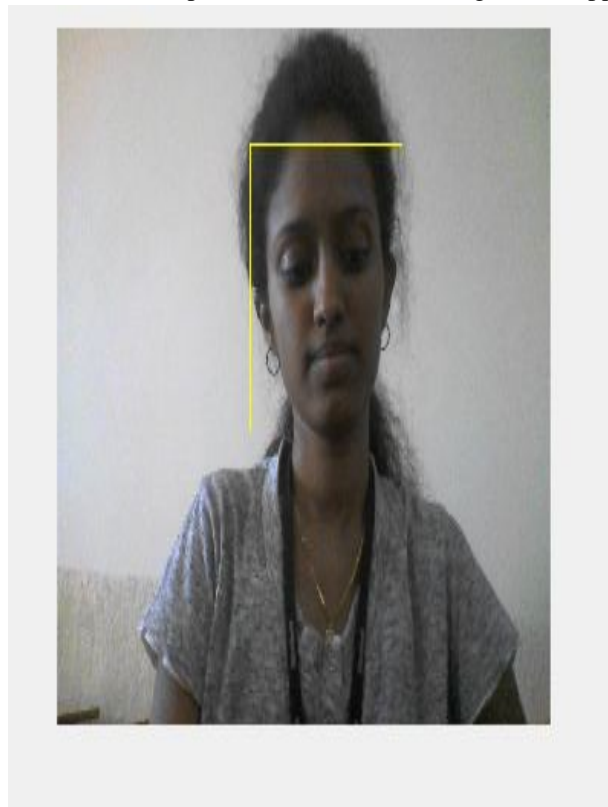


Figure 4: Cropping of an image

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C. Face Recognition

If the detected face image is matched with stored image then the face is recognized.

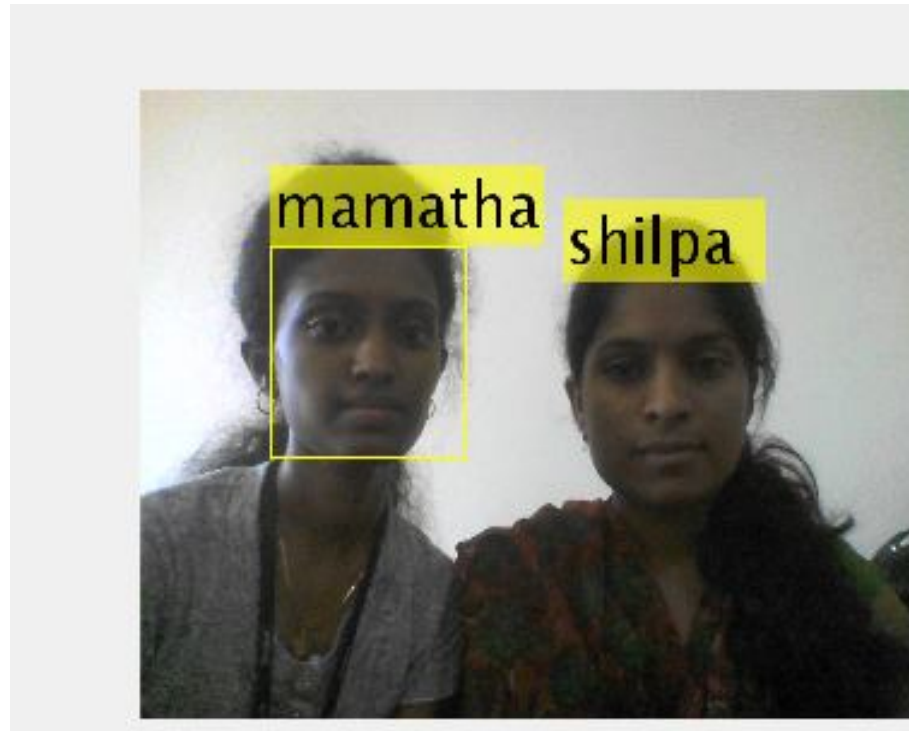


Figure 5: Recognized image

D. Updating in Excel sheet

The attendance of the student which has been recognized and verified using database is updated in excel sheet.

A	B
VarName1	VarName2
Cell	Cell
mamatha	P
shilpa	A
Person3	A
Person4	A
Person5	A
Person6	A

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Figure 6: Excel sheet

VI. CONCLUSION

In this paper, we used face recognition based approach for marking an attendance this will reduces a manual effort. This s highly securing process, proxy will be avoided. We obtain the results that we can reduce a lot of time. In this paper, it will also help to monitor the student in the campus very easily by using RFID technology. The main purpose of this paper is to discover a way to certify safety of students and also controlling the disobedience of the students. As per our research we found out that this process is suitable for the purpose of tracing the students in college campus. Every movement of the student can be arbitrated and hence action can be taken.

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