Automated Class Attendance Management System Using Face Recognition

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***Abstract*—**In this paper we propose an advance attendance system, Which is based on face recognition that is automatically detect the student face when he entered in a classroom and marks the attendance by recognizing face. The overall system architecture and algorithm used in project is described in this paper. When compared to traditional attendance marking this system saves the time and also helps to monitor the students. The framework depends on computer system. The face capturing device is computer system or Raspberry Pi system which detects the face of student when he enters in a classroom ,the data recognized by computer system or Raspberry Pi is stored o fire-base or CLOUD database,

Those data used by android application to display the attendance and perform all other task of our project .the input provided to the system is image and the output of the system is attendance which is displayed on application. the system camera will catch the picture at that point pass it to the computer system or Raspberry Pi which is modified to deal with the face acknowledgment by actualizing the open cv. On the off chance that the understudy's info picture matches with the prepared dataset picture the model entryway will open utilizing Servo Motor, at that point the participation results will be put away in the CLOUD database. The database is associated with Attendance Management System (AMS) web server, which makes the participation results reachable to any

online associated Application.

***Keywords---attendance recording, remote data entry, data acquisition system,open cv,* HOG, SVM, face recognition algorithm,computer system or Raspberry Pi**

I. INTRODUCTION

Most of the universities around the world apply the attendance system to capture students' punctuality. However, the current paper/manual attendance system has many challenges. Passing an attendance sheet from one student to the other to sign takes time as well as causes distraction. Checking the performance of students and maintaining the attendance is a tedious process for institute. Each institute has adopted their own method of taking attendance. Due to such problem, some lecturers delay the attendance till the end of the class, yet some students might be in a hurry to leave the class immediately, hence they might miss signing the attendance sheet. Several very popular automatic attendance systems currently in use are RFID, IRIS, FINGERPRINT etc. However, making queue is essential in these cases thus requires more time and it is intrusive in nature. Any damage to RFID card 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 also 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. Furthermore, there are some students who never come to the class but sign attendance by proxy. In some cases, lecturers call by names one by one to mark the attendance but this method also consume lots of time. Yet another problem is some students come to class late especially the morning classes. 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.

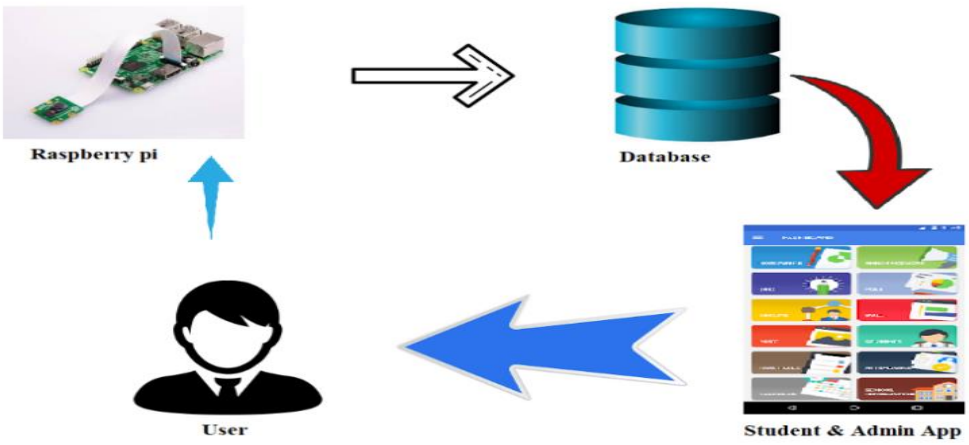

Fig.1.1 System Architecture

II. LITERATURE SURVEY

Authors proposed a method to automate the attendance system by integrating the face recognition technology using Eigen face database and Principal Component Analysis (PCA) algorithm with MATLAB GUI. The architecture of the system first, captures the student image, pre-process it, applied Eigen face generated database then test the captured face image with Eigen face image. This system can produce more accurate results than the manual attendance sheet.

Automated Attendance Systems based on face recognition techniques thus proved to be time saving and secure This paper also proposes the techniques to be used in order to handle the threats in spoofing The automated systems like IRIS , FINGERPRINT , RFID provide better percentage of accuracy but have some limitations like intrusive nature and time inefficient. First step in automatic face recognition is face detection. In 2001, Paul Viola and Michael Jones proposed a real time object detection with very high image processing rate The local binary pattern technique efficiently provides the image texture features. In this paper , the authors developed and implemented a classroom attendance system using radio frequency identification (RFID) and face verification techniques. The system recognizes students by using the RFID card and for more confirmation of the student's identity, face recognition technique has been added using Fast Adaptive Neural Network Classifier (FANNC). The classifier was trained and tested to identify human face images. Every student needs to take seven dissimilar head poses images in order for the classifier to identify students' images. The Discrete Wavelet transform DWT is well known to be a highly flexible and efficient method when it comes to decomposition of a signal. Thus, it decomposes the image into its wavelet coefficients and scaling function. . Discrete Cosine Transform DCT take cares of de-correlation, energy compaction of the dedicated image. Facial training image was the set of trained student images which were used to check the identity of the input student's image. The facial system tested on six distinct images of students and it achieved accuracy up to 93% for the front face.

III. METHODOLOGY

This is a paradigmatic scheme for real time face detection and recognition. The system consists of a camera, installed in the classroom capturing the video frames followed by the detection of multiple faces. These faces are cropped and converted to grayscale causing reduction in the number of bits to be processed. These faces are then compared with the database faces and displays the result and marks the attendance. A user interface for the Android Application is included so the lecturer can check the attendance results from any Android mobile connected to the Internet. The facial recognition is done by implementing open cv. By facing the camera, the face image is captured. The first processing step is to detect and crop the region of interest ROI which is the human face. It can be done by applying the Haar Feature-based Cascade algorithm. After that, the image features are extracted using open cv algorithm compares the extracted features with the trained datasets. Finally, the attendance results are stored in CLOUD database

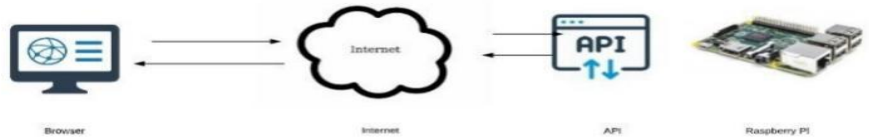

fig .3.1 Connection between web server and web client

3.1 FACE DATABASE CREATION

Pictures of all students are captured in different angles with variety of gestures i.e. each student has 8 to 10 pictures angled at different positions. The RGB images are cropped and converted into grayscale and resized to 112*92 pixels in order to reduce the computational time. Folder named 'Database' containing the subfolders, each subfolder contains multiple faces of single person and the corresponding name is given to the subfolder.

3.2 ALGORITHM

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For recognizing images there are different algorithms are uses that are as follows,open cv algorithm,KNN algorithm and HOG algorithm etc. Open cv3 makes prediction across 3 different scales. The detection layer is used make detection at feature maps of three different sizes, having **strides 32, 16, 8** respectively.

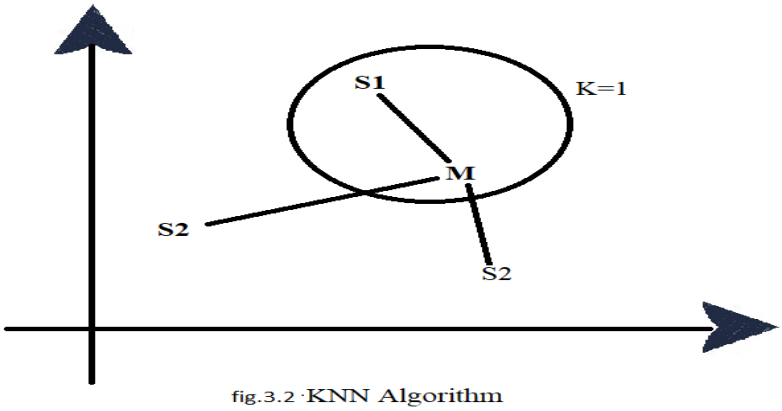

fig.3.2 ·KNN Algorithm

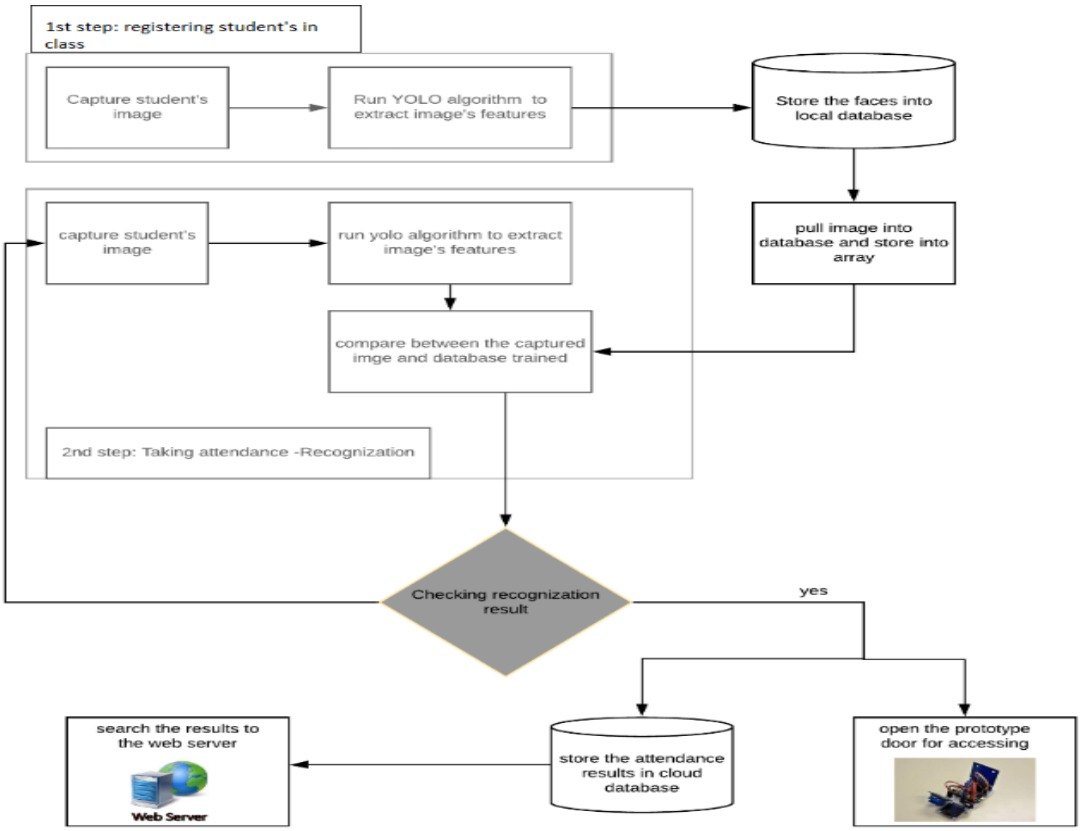

Fig.3.1 System Flowchart

3.3 HOG FEATURES

Object detection is accomplished using histogram of oriented gradients(HOG) .which is a feature descriptor widely used in computer vision. It is based on counting the occurrences of gradient orientation in localized portions of an image This method has similarity with edge orientation histogram, scale invariant feature transform descriptor, shape contexts.

3.4 SVM Classifier

The major process in object recognition using histogram of oriented Gradient descriptors is to feed the descriptors into some recognition system based on supervised learning. The Support Vector Machine (SVM) classifier is a binary classifier where optimal hyper plane is used as decision function. The decisions can be made by SVM classifier regarding the presence of an object such as human, once trained on images containing some particular object.

3.5. Comparison / Recognition

Extracted binary features of 'Test' faces are compared with the extracted binary features of 'Database' faces, the face having the maximum amount of correlation is recognized as matched face and corresponding name of the face is extracted from the database using the classifier.

3.6. Attendance

After extracting the name of the matched face corresponding attendance is marked in the work sheet named as attendance mat.

3.7 FACE RECOGNITION

Facial recognition is a biometric software application capable of uniquely identifying or verifying a person by comparing and analyzing patterns based on the student's faces.

VI. RESULTS AND DISCUSSION

For face recognition implementation, three programs were developed using Python. The first one to gather selfies by capturing frames of student's face from a video record, while the second one is to train these selfies and store the min a classifier which later on it is used to recognize the students' face. The final program was used to recognize the input face, which as explained before taking the input face and comparing it with the trained data using the classifier. Gathering selfies was made by taking a video record while taking this video the face 'Region of Interest' was deducted, cropped, encoded then stored in a text file as strings, each string line represents a face image of the student

V. SYSTEM LIMITATIONS

The system is uses Local Binary Patterns algorithm to recognize faces, there are some limitations here. OPEN CV algorithm has light sensitivity. Since it deals with the value of each pixel in the original image, these pixels change their values with different lighting. The pixel value increases when the light is on while it decreases when the light is off.

Figure Changing in OPEN CVs confidence due to the change of lighting shows a good confidence distance between the trained and the input face with 38.25 since it was recognized with the same spotting light. the confidence of input face is far from the trained face with 75.83 because the object changed his place to a darker background and the light was facing his face. The final one did not detect the face due to a very luminous background. This problem can be avoided easily, due to the fact that the system designed to be fixed on the classroom door.

V.CONCLUSION

The aim of this research paper is to develop an automated attendance system to be used in educational institutions, which can produce more accurate results than the manual attendance sheet. The system is based on Raspberry Pi as the hardware. The system is programmed using both Python for face recognition system and java programming for application to visible the attendance . Moreover, The attendance is stored in CLOUD Database and with internet connection provided, the results are accessed from user Application. Each lecturer has log-in for the application to access his/her attendance sheets. Raspberry Pi is chosen for its small size and affordable price. The small and light size is important because the whole product with the camera is supposed to be fixed on a classroom enterance.

This application provides many features like homework,notification,calendar,time-table etc. this feature are not available in normal attendance system and reduce time & Staff-efforts .

VII . ACKNOWLEDGMENT

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VII. FUTURE IMPROVEMENTS

For the future work, there are some promises to improve and enhance the performance of the system. First, replacing RASPBERRY PI 3 MODEL B with ODROID-XU4 Portable Computer. This Computer has Cortex-A7 Octa core CPUs and 2Gbyte LPDDR 3 RAM which is more advanced than Raspberry Pi 3 hardware. Since the face recognition algorithms are heavy, the performance can be improved rapidly using ODROID-XU4. Second, enhancing the Attendance Management System website by generating automated warning letters for the students who do not attend their classe

V. REFERENCES

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