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AI BASED MONITORING AND ASSISTANCE

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ABSTRACT

AI Based Monitoring and Assistance is an AI based system whose main objective is to automate the attendance system using facial recognition technology i.e., developing a system to present an automated way to keep track of attendance which would reduce the present pen and paper based manual method of marking attendance. Replacing the traditional method, this system will save time, reduce the amount of work the teacher has to do and will replace the stationary material with a computer based system. After marking of attendance a data is generated by this system which would further used by this system to monitor or understand the working pattern of students and classify them on a particular level and provide required assistance to improve their performance.

The system is developed using Python, OpenCV and SQLite database. The proposed system uses Local Binary Patterns Histogram algorithm for facial recognition. The attendance is maintain in a excel sheet which is updated automatically. This system provide required assistance to students by sending a messages using REST API.

Keywords: **Face detection and recognition, Local Binary patterns Histogram, SQLite, Feature extraction.**

I. INTRODUCTION

Attendance of every student are being maintained by school, college and university. Empirical evidences have shown that there is a significant correlation between students' attendance and their academic performances. There was also a claim stated that the student who have poor attendance records will generally link poor retention. Therefore, faculty has to maintain proper record for the attendance. The manual attendance record system is not efficient and requires more time to arrange record and to calculate the average attendance of each student. By traditional system students has to sign the sheets then it will upload online for future analysis this method is time consuming and inaccurate as some students often sign for their absent collogue. This method also makes the difficult to track the presence of individual students in large classroom. Hence there is a requirement of a system that will solve the problem of student record arrangement and student average attendance calculation. One alternative is to make student attendance system automatic is provided by facial recognition.

Objective

1. Detection of unique face image amidst the other natural components such as walls, backgrounds etc.
2. Effective recognition of unique faces in a crowd (individual recognition in crowd).
3. Automated update in the database without human intervention and generate an excel sheet of marking attendance.
4. Based on data available in database analyse the performance of students and messaging students and their parents automatically if required.

Details of this system are described in the remainder of this paper. The paper is organized as follows: Section (II) covers Methodology; in section (III) System Architecture; in section (IV) Literature Survey; in section (V) Algorithm; in section (VI) Result Analysis; in section (VII) Conclusion; in section (VIII) Future Scope.

II. METHODOLOGY

First the system capture the image of whole classroom by a camera. Then algorithm recognizes each faces in a captured image to a particular student and mark the attendance of recognize students automatically in database. At last to cross verify, an excel sheet is generated by the system. So anyone can verify the marked attendance is correct or not. If any issues then again trigger the application for whole process.
The face recognition approach comprises of these basic step:

- Create a dataset that consist the faces of all students. Usually 30-40 faces of each students are stored in dataset for more accuracy.
- Train each images of a dataset, by their identity so that system can identify each images to a particular student.
- And finally the algorithm recognizes the faces in a captured images.

Based on attendance, assistance is provided to the student and their corresponding parents if required in a real time. The system uses Matplotlib to plot some graphs based on attendance and marks obtained by students. By analysing these graphs it will helpful for student to improve their performance.

III. SYSTEM ARCHITECTURE

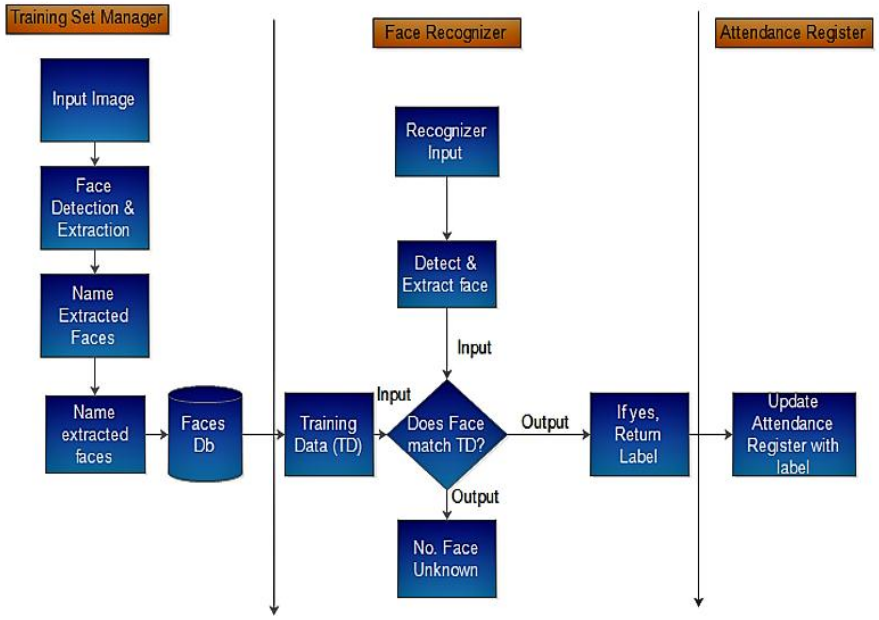


FIG 1. System Model

Image Acquisition: - Images can be acquired by facial-scan technology from camera that captures images of better quality and resolution.

Pre-processing:- First Image is cropped from acquired image. Then cropped images are resized to some pixels for face recognition. These resized images are converted from RGB to Gray level.
Database (DB):- It stores the pre-processed images for further processing and results.

Template Matching: - It compares match templates against enrolment templates. In identifying a single individual from a large database, facial scan is not as effective as iris scan. After large-scale facial-scan identification searches, numbers of matches are returned.

Face Recognition: - For face recognition or detection it compares selected facial components from the image and a face database, it identifies or verifies a person in image.

Face Database Generation: - Original face database consists of images of all students having 5 images per student. With change in intensity of light and various facial expressions, the original database images are acquired at various interval of time

IV. LITERATURE SURVEY

In [1] the author proposed that different types of face detection for detecting faces in different pose .Detecting face in different pattern based on techniques. Basic pattern for detecting face is nose, eyes, hair, ears and some time it based on tone of skin. Face detection is detecting face based on location of face and presences of face in images .Different types of detecting the face techniques they are Ada-Boost Algorithm for Face Detection, Viola Jones Face Detection Algorithm, SMQT Features and SNOW Classifier Method, Local Binary Pattern (LBP). Each have advantages and disadvantages discussed in that paper.

In [10] this paper describes to obtain an automatic attendance system implemented with raspberry pi camera module and MATLAB R2014a version. Two types of methods are used for feature extraction. Local Binary Pattern (LBP) and Histogram of Oriented Gradients (HOG) which are used for recognition of students face from the stored database for marking the attendance. Support vector machine (SVM) classifier is used for comparing stored features in the database with extracted features from the captured image.

In [7] the author proposed an explanation about Local Binary Patterns Histogram for facial recognition and showing the method step by step.

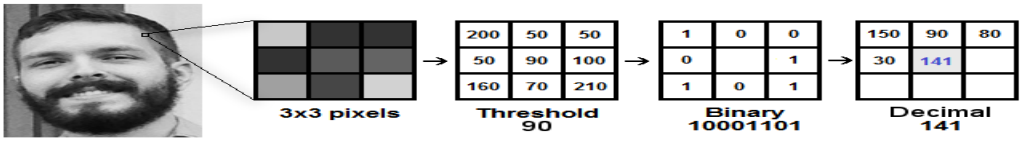
In [11] authors describe the Raspberry Pi module that used for face detection & recognition. The camera will be connected to the Raspberry Pi module. The student's attendance will be sent to their parents using GSM technology. The System performs managing students with Open CV and raspberry pi module that is interfaced with fingerprint device.

V. ALGORITHM

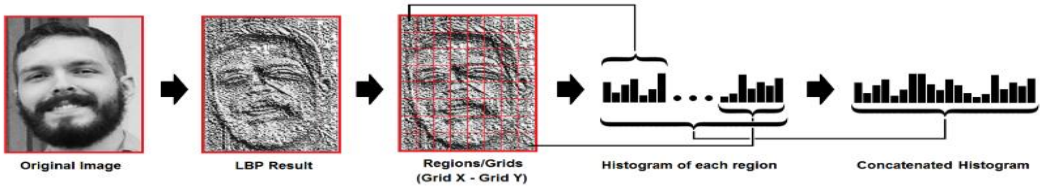
Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighbourhood of each pixel and considers the result as a binary number. It was first described in 1994 (LBP) and has since been found to be a powerful feature for texture classification. It has further been determined that when LBP is combined with histograms of oriented gradients (HOG) descriptor, it improves the detection performance considerably on some datasets. Using the LBP combined with histograms we can represent the face images with a simple data vector.

Training the Algorithm: First, we need to train the algorithm. To do so, we need to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of the person) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person must have the same ID. With the training set already constructed, let's see the LBPH computational steps.

Applying the LBP operation: The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters **radius** and **neighbours**. The image below shows the procedure:



Extracting the Histograms: Now, using the image generated in the last step, we can use the **Grid X** and **Grid Y** parameters to divide the image into multiple grids, as can be seen in the following image:



Based on the image above, we can extract the histogram of each region as follows:
As we have an image in grayscale, each histogram (from each grid) will contain only 256 positions (0~255) representing the occurrences of each pixel intensity.
Then, we need to concatenate each histogram to create a new and bigger histogram. Supposing we have 8x8 grids, we will have 8x8x256=16.384 positions in the final histogram. The final histogram represents the characteristics of the image original image.

Performing the face recognition:
In this step, the algorithm is already trained. Each histogram created is used to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image.
So to find the image that matches the input image we just need to compare two histograms and return the image with the closest histogram.
We can use various approaches to compare the histograms (calculate the distance between two histograms), for example: **Euclidean distance**, **chi-square**, **absolute value**, etc. In this example, we can use the Euclidean distance (which is quite known) based on the following formula:

$$D = \sqrt{\sum_{i=1}^{n}(hist1_i - hist2_i)^2}$$

So the algorithm output is the ID from the image with the closest histogram.

VII. RESULT ANALYSIS

First of all we need to register the person into the database. To do so, we need to give name and his/her registered ID to store.

Fig 2. User Interface

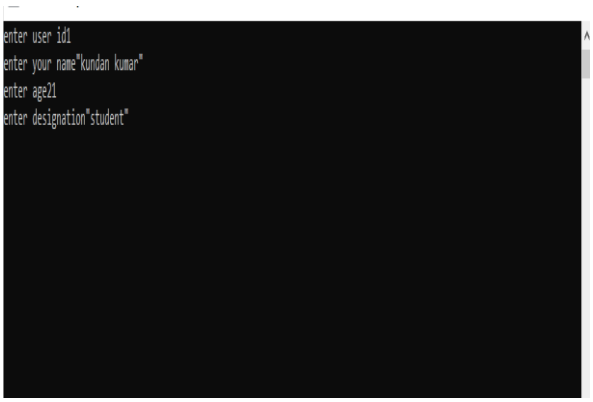


Fig 3. Registration

Now to get the pictures of the persons from the webcam or any other cams available like we used Logitech webcam here. Select the cam from which we need to take the image and start the camera. The camera is plotted in the axes and we can capture and save the images in the folder created automatically with the registered ID we have entered. After that we will train our dataset.

Fig 4. Input Image

Fig 5. Training of Image dataset

After this the data is stored in the database. Now let us capture a picture from the webcam and see the results. Now let us click on the "Mark Attendance" and the camera starts and takes the image to give the results checking from the saved database.

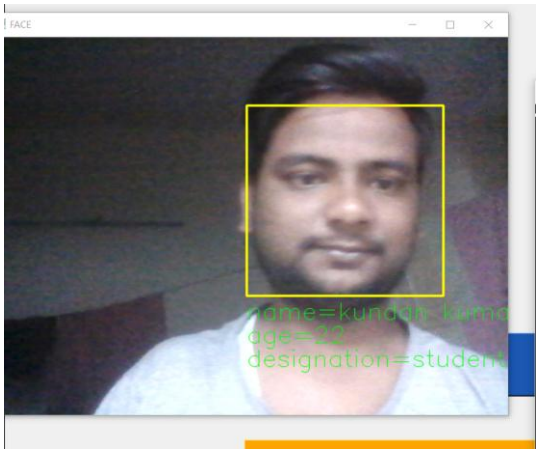


Fig 6. Attendance Marking

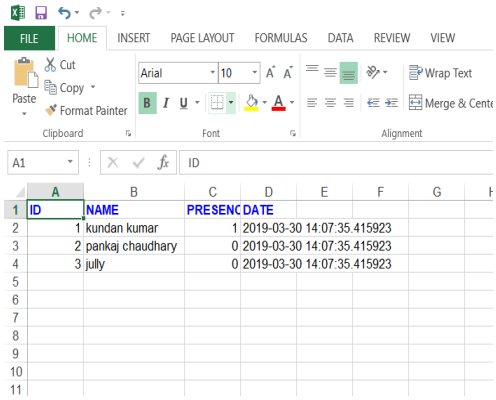


Fig 7. Attendance Sheet

After marking of attendance a notification in the form of SMS is send to the student and their corresponding parent if the student is absent. To check the performance of student click on performance button. And also a required assistance can be send to student by click on assistance button.

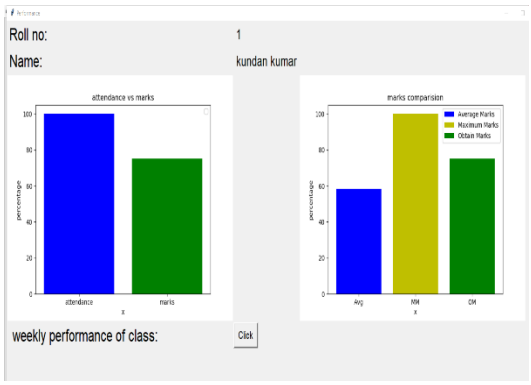


Fig 8. Performance graphs

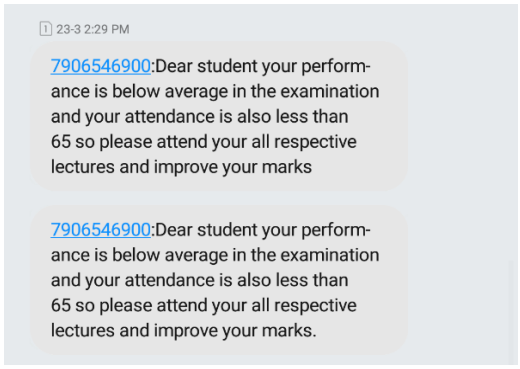


Fig. 9. Assistance

VI. CONCLUSION

The System, AI based monitoring and assistance will be able to replace the traditional method of Attendance management system and it will work nicely. Which takes a lot of time and is hard to Maintain. This system will be able to correlate the attendance and academic performance of a Particular student and assist them by sending appropriate messages in order to improve their Performance. This System demonstrates the use of image processing techniques in class room. This system cannot only merely help in the attendance system, but also improve the goodwill of an institution.

VII. FUTURE SCOPE

The system we have developed has successfully able to accomplish the task of marking the Attendance in the classroom automatically and the output is obtained in an excel sheet as desired in real-time. However, in order to develop a dedicated system which can be implemented in an Educational institution, a very efficient algorithm which is insensitive to the lighting conditions of the classroom has to be developed. Also a camera of the optimum resolution has to utilize in the System.

REFERENCES

[1] A Study of Various Face Detection Methods , Ms.Varsha Gupta1 , Mr. Dipesh Sharma2,ijarcce vol.3 https://www.ijarcce.com/upload/2014/may/IJARCCE7G%2 0%20a%20varsha%20A%20Study%20of%20Various%20F ace.pdf

[2] Aziza Ahmedi, Dr Suvarna Nandyal." An Automatic Attendance System using Image Processing. "The International Journal Of Engineering And Science (IJES) || Volume || 4 || Issue || 11 || Pages || PP - 01-08|| 2015 ||ISSN (e): 2319 1813 ISSN (p): 2319 1805

[3] Samuel Lukas, Aditya Rama Mitra, Ririn Ikana Desanti, Dion Krisnadi "Student Attendance System in Classroom Using Face Recognition Technique."

[4] Dr. Nita Thakare, Meghna Srivastava, Nidhi Kumari, Neha Kumari , Darleen Kaur, Rinku Singh ."Face Detection and Recognition for Automatic Attendance System." International Journal of Computer Science and Mobile Computing, Vol.5 Issue.4

[5] Shireesha Chintalapati, M. V. Raghunadh, "Automated attendance management system using face recognition algorithms." (ICCIC), 2013 IEEE International Conference, DOI: 10.1109/ICCIC.2013.6724266.

[6] Mangesh Owandkar." Attendance Monitoring System using Face Recognition. "International Research Journal of Engineering and Technology (IRJET), www.irjet.net .Volume: 04 Issue: 05 | May -2017

[7] Face Recognition: Understanding LBPH Algorithm by Kelvin Salton do Prado

https://towardsdatascience.com/face-recognition-how-lbph-works-90ec258c3d6b

[8] Abhishek Jha," Class Room Attendance System Using Facial Recognition System. "The International Journal of Mathematics, Science, Technology and Management (ISSN: 2319-8125) Vol. 2 Issue 3

[9] E.Varadharajan, R.Dharani, S.Jeevitha, B.Kavinmathi, S.Hemalatha," AUTOMATIC ATTENDANCE MANAGEMENT SYSTEM USING FACE DETECTION", ieeexplore.ieee.org/document/7916753/

[10] Preeti Mehta, Dr. Pankaj Tomar, "An Efficient Attendance Management System based on Face Recognition using Matlab and Raspberry Pi 2", May 2016 International Journal of Engineering Technology Science and Research (IJETSR) ISSN 2394 – 3386 Volume 3, Issue 5

[11] G.Lakshmi Priya1, M.Pandimadevi 1, G.Ramu Priya1, P.Ramya, "Implementation of Attendance Management System using SMART-FR", November 2014 International Journal of Advanced Research in Computer and Communication Engineering ISSN (Online) : 2278-1021 ISSN (Print) : 2319-5940 Vol. 3, Issue 11.

[12] V. Shehu and A. Dika, "Using Real Time Computer Algorithms in Automatic Attendance Management Systems." IEEE, pp. 397 – 402, Jun. 2010. [8] Prof. P.K Biswas, Digital Image Processing [9] M. A. Turk and A. P. Pentland, "Face Recognition Using Eigenfaces"in Proc. IEEE Conference on Computer Vision and Pattern Recognition, pp. 586–591. 1991

[13] W. Zhao, R. Chellappa, P. J. Phillips, and A. Rosenfeld, "Face recognition: A literature survey," ACM Computing Surveys, 2003, vol. 35, no. 4, pp. 399-458

[14] Bhumika G. Bhatt, Zankhana H. Shah "Face Feature Extraction Techniques: A Survey", National Conference on Recent Trends in Engineering & Technology, 13-14 May 2011.

[15] Adam Schmidt, Andrzej Kasinski, "The Performance of the Haar Cascade Classifiers Applied to the Face and Eyes Detection", Computer Recognition Systems 2