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Autonomous Attendance System Using Facial Recognition with User Friendly GUI

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ABSTRACT

One of the routine processes which is common in every educational institution is marking attendance for students. People use different ways to mark attendance for students like calling their name aloud and receiving their voice output to mark the attendance. And it is time consuming process and there may be chance for mistakes. There are many ways to make this process into automation like Fingerprint based approach, RFID, Iris and facial detection and recognition. In this work, we will see about one of best and effective approach to solve this problem using machine learning process of facial detection and recognition. Initially the pictures of students will be collected and trained under different lighting conditions and nominal accuracy can be achieved. Then the model will be tested with trained datasets and this process continues until the method works well in real environment(classroom).

Keywords : Attendance, Automation, Fingerprint, RFID, Facial detection, accuracy, dataset, classroom

I. INTRODUCTION

Attendance plays a major role in tracking progress of a person in an institution, organisation, and other working area. Conventionally Manually the process is carried out using human inspection. The Human Inspection is time consuming and often results in mistakes and prone to proxies. Alternatively, technologies have been included in the attendance process. RFID is a technique which uses electromagnetic waves to transfer unique ID to post attendance in checkpoints. QR codes and Bar codes have also been used in certain organisation Biometrics Like Fingerprints were also used for the attendance in some organisation. But these processes are time consuming, and Fingerprint based approach fails as it

is contact based one which should be avoided in such a pandemic scenario. So, there is a need for an alternative solution which is less time consuming and eliminate intentional and unintentional errors while marking attendance process.

Face Detection and Face Recognition process using Image processing can be used to implement an advance attendance system using AI Algorithm which eliminates the above-mentioned barriers.

The Subsequent sections in this paper address the literature survey and detailed implementation of the proposed model and finally results, conclusion and future scope of the project.

II. Literature Survey

A. Face Recognition based Approach for Attendance Management:

B.

Face-based Attendance is a fast and accurate method of taking attendance in the classroom that can replace the old manual methods. This method requires only camera and a computer. Installing the system in the classroom does not require any specialised hardware. To improve the system's performance, some algorithms that can recognise faces in veil must be used.[1]

B. Haar Cascade Classifier :

Haarcascade is an effective object detection method mostly used for Face Detection [2]. This technique gives 15 times efficient result than earlier methods proposed for face recognition with minimal computation and higher accuracy. It uses. It can be used in real-time application and this detection module can be run at 15 frame per seconds.

C. Face recognition using LBPH :

Local Binary Pattern Histogram is one of the easiest face recognition algorithms which can give great results with grayscale image under controlled environment. It includes feature extraction by using LBPH and finding Euclidean distance classifier. This is available in OpenCV library in python and gives better results in controlled environment[3]

III. Methodology

The Autonomous Attendance system has three main phases as follows:

i) Face Detection: Face detection and localization is done using Haarcascade classifier algorithm. Through these faces in the given image is extracted.

ii) Feature Extraction: Features are extracted from the detected image using Local Binary Pattern Histogram.

iii) Face Recognition: From the extracted features the distance between the test image and the image in Model is calculated and hence the face id is recognised.

iv) Attendance Update: Based on the matched ID the attendance is marked in the excel Sheet.

Block Diagram

As shown in fig 1 the video is divided into frames and later face is extracted from it after pre- processing. The detected face is given as input for face recognition from which the Id of the detected face is obtained based on the obtained Id the attendance is updated in the excel Sheet.

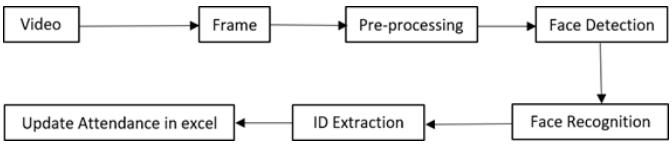

Fig.1: Block Diagram.

Flow Chart

Fig 2 represents the flowchart for the proposed model for Autonomous attendance system.

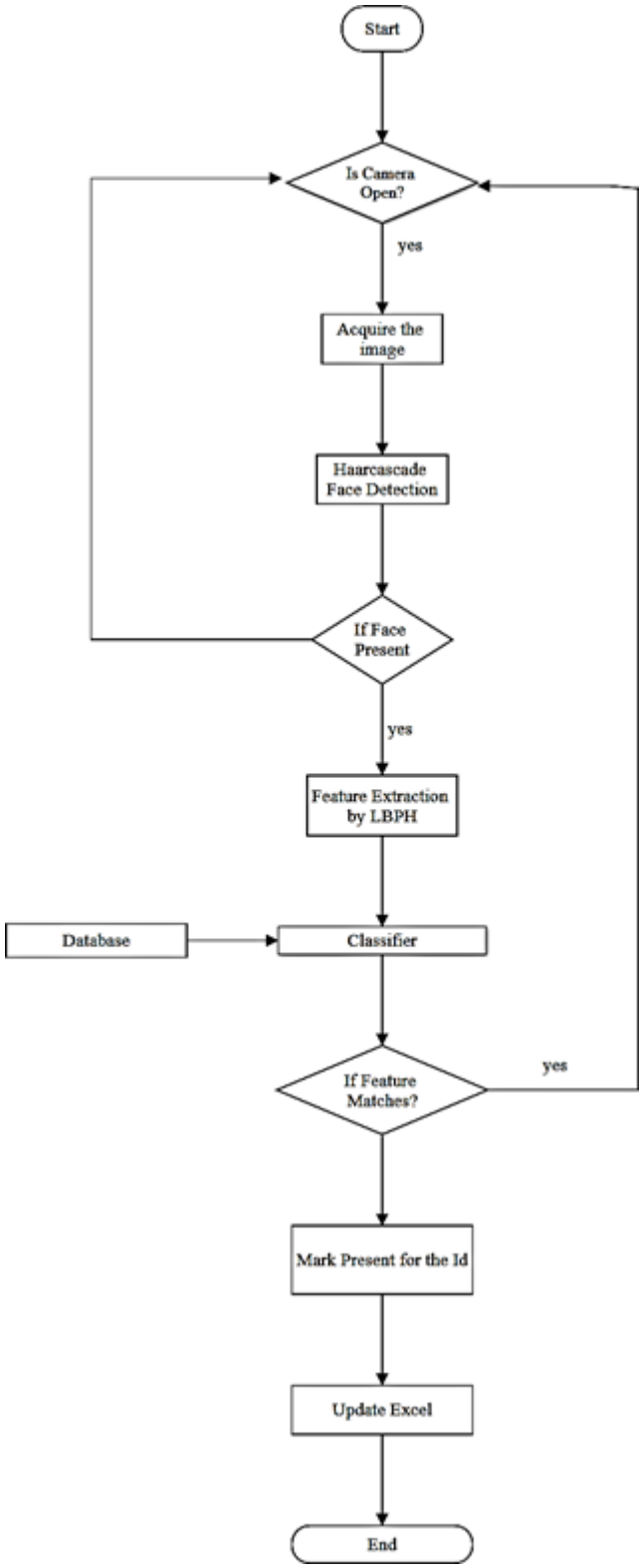

Fig.2: Flowchart for the proposed Model

Creating Dataset

The dataset is created using the camera module available in the computer or external webcam. The face image is obtained from the video frame using Haarcascade classifier. We collect 20 images from the camera within 20 seconds and store it as dataset which is later used for the model Training process.

Face Detection

Face Detection is done with the help of haarcascade classifier. At first the image is pre- processed with following steps.

i) Resizing frame

ii) Converting into grayscale

Later the pre-processed image is fed into haarcascade classifier in which the face is detected and localised. The classifier gives the location of faces, point x, y of the start of a face along with width and height as a array for each faces detected in the frame.

Face Recognition

The face detected using Haarcascade is later used for extracting features using Local Binary Pattern Histogram. Face Recognition process requires two steps.

i) Training the Algorithm: the algorithm is needed to be trained before using. The face image dataset acquired earlier can be used for this process. For training image along with ID is required to give an output for the image we fed for recognition.

ii) Applying LBP Operator: The LBPH feature extraction requires the following Step:

i. Divide Image into cells with fixed kernel size.

ii. For each kernels the centre value is taken as reference and compared with the remaining pixels.

iii. If the pixel value is greater than the reference value, assign '1'. Otherwise assign '0'. This results in a binary number of 8 digits which is later converted into decimal number.

iv. The histogram is computed for the new image create.

iii) Classification: The extracted feature is later fed to the classifier where the distance is calculated for the histogram of the test image is calculated. The shorter the distance gives the higher the match for the specific ID. Mostly Euclidean Distance formula given follow:

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

Attendance Update in Excel

The ID Obtained from the classifier is used for marking the attendance. The ID is later used for getting the roll number or employee Id from the pickle file saved earlier. The id detected for the faces available in the image is marked as present whereas the rest of the persons were marked as absent. The attendance is obtained with time stamp and store in excel sheet using Openpyxl library. The Excel sheet can be used for retrieving the attendance for later use.

Graphical User Interface

The Attendance system is designed using a graphical User Interface created using Qt designer and PyQt5. This enables easy control by any persons using it. Fig 3 represents the Opening GUI which has Different Options like Create Dataset, Train Model and Mark Attendance. Fig 4 represents the create dataset GUI which has two input fields to enter name and id. Fig 5 is the Mark Attendance GUI.

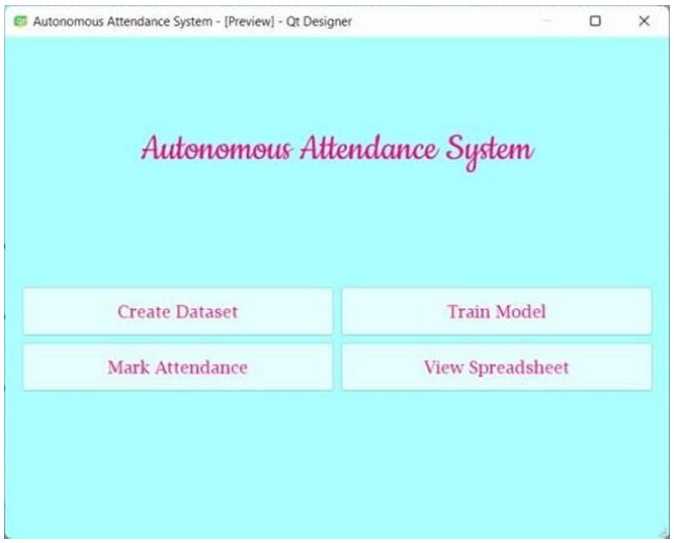

Fig.3: Main GUI

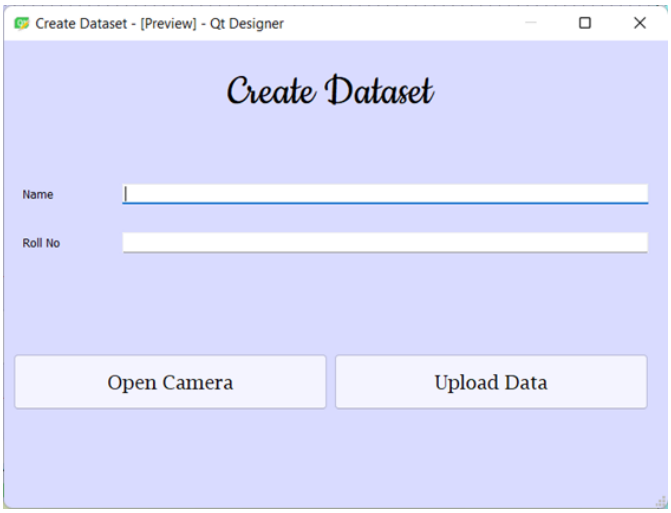

Fig.4: Create dataset GUI

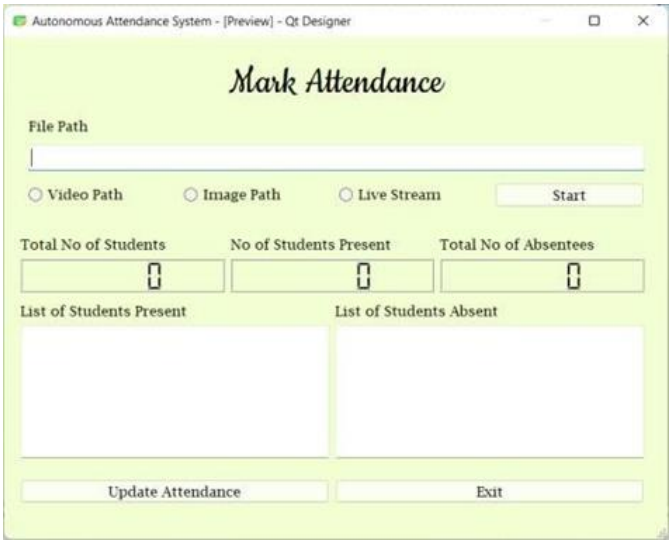

Fig.5: Mark Attendance GUI

IV. Result

Comparing other attendance systems, the face detection and recognition system is quite simpler and efficient one. We created a graphical user interface (GUI) to manage the entire system, as shown above. We extract the detected image and pre-process it with Histogram equations before storing it in the database after face registration with the name and Reg no. Finally, the attendance is marked and stored in an Excel sheet after the face is detected.

V. Conclusion and Future Works

The autonomous facial attendance system using facial has its own advantage in many over other techniques as it is consistent, robust, and accurate. Yet the proposed model has its own limitations like fails in more crowded scenario, low lighting condition. The future work is to improve the limitation in low lighting, huge crowd by using Artificial Neural Network. The GUI can be replaced with a Web App which enables to Take attendance from anywhere in this world.

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