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Automated Attendance System Using Image Processing and IOT

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ABSTRACT: Attendance System in day-to-day places is a time-consuming process. A small mistake done in the manual attendance system can lead to various issues which relies on the attendance report. Maintaining the attendance record has also became a hectic process. This manual attendance system can be digitized, and the digital data can be stored in cloud so that it be accessed anywhere, anytime by the respective authorities in charge. Computers are used as the major component to store and compute facial data of individuals. Such components drastically reduce the time for the attendance process. Also, these digital data can be synced with cloud.The detection of human face from images plays a vital role in Computer vision. The various computational and mathematical models, for classifying face including Dominant Rotated Local Binary Pattern (DRLBP) and Scale Invariant Feature transform (SIFT) have been proposed yields better performance. This paper proposes a novel method of classifying the human face using Haar. This is done by primarily processing the face image at first and then extracting the face features. Then the detection of human faces is done using Haar. Using Simple Mail Transfer Protocol, the processed data is stored in cloud so that it becomes accessible anywhere and anytime.

KEYWORDS:Time efficient System; Haar Cascades; Adaboost algorithm; Mail Transfer Protocol; Digital Sync

I. INTRODUCTION

Facial Recognition System can identify and verify an individual from an image or a frame from a video footage. There are various methods by which Face recognition can be implemented. Most generally they work by comparing the extracted facial data from the video footage with the local datasets available for comparison. These local datasets contain the facial data of various individuals. It is also described as the Biometric Artificial Intelligence based application that can uniquely identify a person from the facial patterns recorded.

The identification of the objects in an image probably start with image processing techniques such as noise removal, followed by the (low-level feature) extraction to locate lines, regions and possibly area with certain textures. Such detailing of features can be done using precompiled libraries. For such detailing, Haar Cascade library is used. With the help of these libraries, the facial data are digitized and stored in the local or cloud database for future comparison. These denotes the trainsets.

Using the camera footage, the facial data are extracted and compared with the trainsets. If the facial data captured coincides with any of the face data in trainsets, then the attendance of the respective individual is marked. The data is stored in local database and is sent through mail.

II. RELATED WORK

In [1] represents a efficient facial image representation based on local binary pattern (LBP) texture features. The LBP operator is one of the best performing texture descriptors and it has been widely used in various applications. It has proven to be highly discriminative (i.e) make distinctions with accuracy and its key advantages, namely, its invariance to monotonic gray-level changes and computational efficiency, make it suitable for demanding image analysis tasks The faces can be seen as a composition of micropatterns which can be well described by using this LBP operator. The [5] shows an intermediatesystem, using a boosting algorithm to train a classifier which is capable ofprocessing images rapidly while having high detection rates. The main ideain the building of the detector is a learning algorithm based on boosting: AdaBoost. AdaBoost is simply termed as Adaptive Boosting.It combines multiple classifiers to increase the accuracy of classifiers. AdaBoost is an iterative ensemble method. AdaBoost classifier builds a strong classifier by combining multiple poorly performing classifiers so that you will get high accuracy strong classifier. The basic concept behind AdaBoost is to set the weights of classifiers and training the data sample in each iteration such that it ensures the accurate predictions of unusual observations.The [3] “Identity Authentication" generally involves two stages: the first is Face Detection and Recognition, where a photo is searched to find any face in it. Next, an image processing algorithm is applied to clean up the facial image for easier recognition.

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The second stage is Face Matching, where the detected face is compared to an image retrieved from the SCE database using a national ID.Identity authentication determines if the person is who they say they are. Authentication relies on additional data that is difficult to produce, except by that specific person. A matching algorithm is applied to verify the person for both matching. The image of the voter captured using a webcam is used as the input to the face detection algorithm. The image must be normalized before entering into Gabor filters. Input image is resized to 128×128.The [2] shows that the face is composed of a set of small facial regions. The spatial feature interdependence matrix (SFIM) determines the local region to represent face appearance. The image is projected onto a unidirectional connected graph which explicitly encodes feature independence-based relations for all pair of local regions. A careful handling of the utilization of the feature interdependences regarding all local region pair is yielded. While measuring feature interdependence strength, a distance-aware weighing method is used, this is facilitated by kernel function. The difficulties addressed in the SFIM are confined to varying illuminations, changing facial expressions and moderate changes in face pose.

III. PROPOSED METHODOLOGY

A. *Environment Preparation:*

A Computer with the following hardware specifications is used:

- Operating System: Microsoft Windows 10 64-bit Home Edition
- Processor: Intel Core i3-3120M dual-core processor (2.5Ghz, 3MB L3 cache)
- Graphics Card: Intel HD4000
- System Memory: 4GB DDR3
- Webcam with 2.4MP quality or above
- 2.4Ghz Network Band 1MBps network connectivity

The following applications and supporting libraries must be installed on the computer for neutral engine to process:

- Anaconda and its supporting environments
- Python
- Visual Studio C++
- Haar Cascade library
- Mail transfer Protocols and supporting libraries
- OpenCV

Anaconda is used for creating an environment capable of handling neural engine for face detection and recognition from the trainsets. Python is used as the scripting language. Visual studio C++ is used for the compilation of dynamic libraries are currently available in C++ scripting language. The output of the compilation is an object file that can used within a python scripting language. OpenCV is highly optimized library that focus on real time applications and can create cross platform links. Haar cascade libraries contains the face detection patterns precompiled and can be used to interface into several applications. The Mail Transfer protocol is used for syncing the data to cloud.

B. *Description of the Proposed System:*

The proposed system can be broadly divided into two processing stages as 'Creation of Trainsets' and 'Detection and Digital Sync'. Creation of trainsets involves storing face patterns of individuals whose face needs to be detected in future. The trainsets are stored in digital format for further reference. Detection and digital sync process involve correlating the face pattern obtained from the footage with the trainsets. The recognized pattern ids are synced with local database and the attendance mark is mailed.

- Creation of Trainsets:

  Creation of the trainsets is based on the Haar Wavelet Technique t analyze pixels in the image into squares by function. Haar cascades uses the **Adaboost** learning algorithm. Face detection traces out the face locations and sizes of human faces in digital images by edge, line, and center-surround features. The XML training data used is 'haarcascasde_frontalface_default.xml' For uniformity in trainset creation, each individual face features are extracted from 30 image frames separated from a video footage.

$$F_T(x) = \sum_{t=1}^{T} f_t(x)$$

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The above equation denotes the Adaboost learning algorithm. From the above equation $f_t(x)$ denotes the sample images taken for creating the trainsets. Here 't' ranges from 1 to 30 since we take 30 frames for cropping faces. Each cropped face denotes a weaker learner which develops into stronger learner upon averaging of additional face samples. $F_T(x)$ denotes the stronger face pattern recorded and integrated into trainsets.

- Detection and Digital Sync:

The Haar cascade Frontal face detection is used to crop a face from a video footage and is compared with trainsets. If the correlation between the trained face pattern and the obtained face patterns is found to be high, then the respective attendance mark is generated and stored digitally on a local database. The results are also mailed so that it can be synced with cloud to have access anytime over internet.

IV. RESULTS

The first two figures show the set of databases (i.e.) a set of images of two different persons that are captured using a camera. These are commonly referred as trained sets. Using these trained sets, our objective of automated attendance can be obtained. The accuracy can be increased by increasing the amount of trained sets of each person. The third figure shows the name of the person whose face is already trained. The fourth image shows the name of the person and the attendance will marked as present with the date and time of the arrival of that person in front of the camera. The final image shows the document in which the name of the person with the date and time. This is how an automated attendance can be marked using a camera and a controller. The attendance is sent through mail to the respective people.

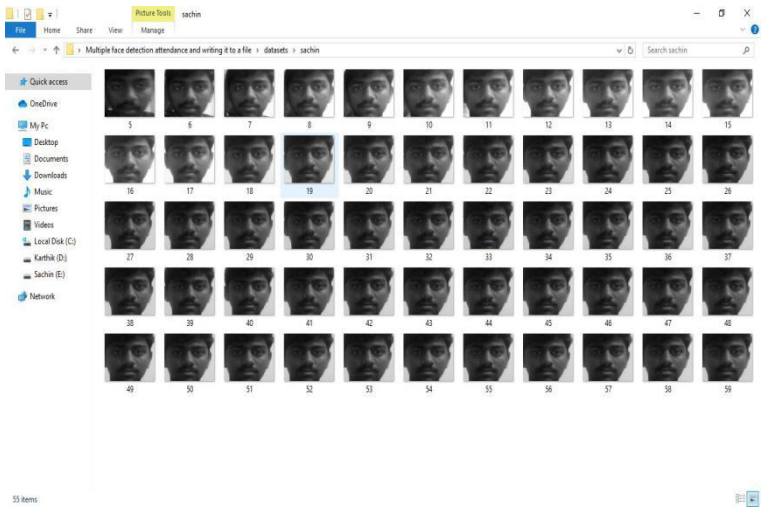

Fig 1. Trainset of person X.

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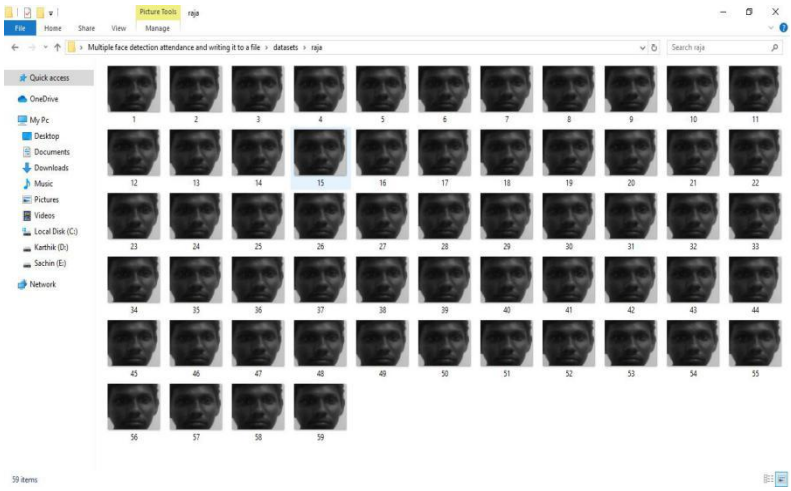

Fig 2. Trainset of person Y.

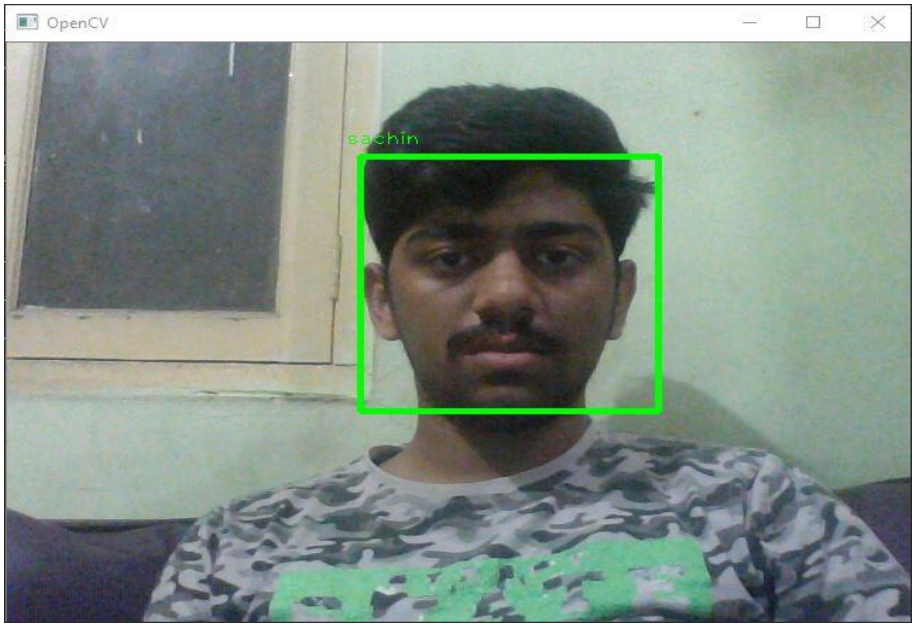

Fig 3. Detection of person X.

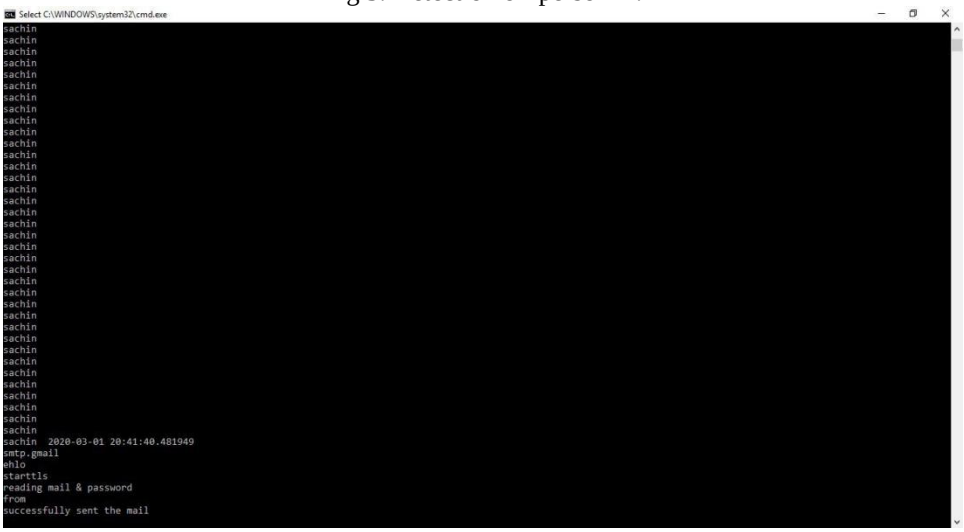

Fig 4. Attendance of person X.

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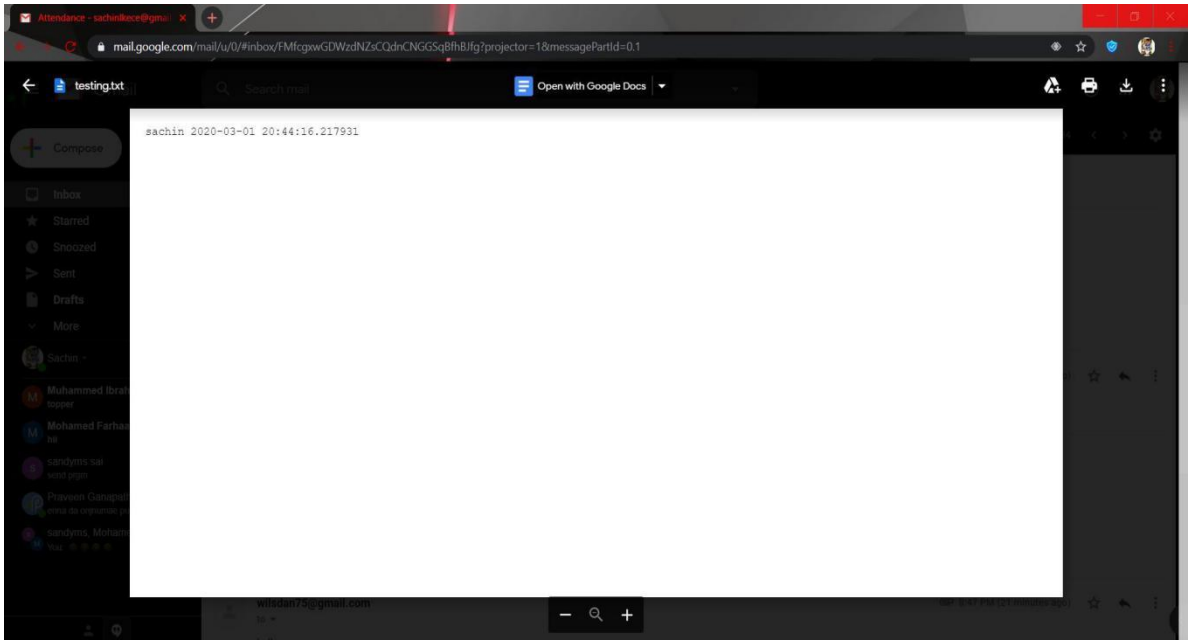

Fig 5. Text document of the attendance mailed to respective people.

V. CONCLUSION AND FUTURE WORK

The above results show that the attendance marking process can be simplified and be made time efficient system. This system can be implemented in schools, colleges, and industries. This system can also be made portable with various limitations. Portable computations can be performed using microcontroller boards. Such portable systems can be implemented in places with low population.

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