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Human Face Recognition for Attendance System

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ABSTRACT
The uniqueness or individuality of an individual face is the representation of one's identity. In this project face of an individual is used for the purpose of attendance making automatically. Attendance of the student is very important for every college, university, and school. Conventional methodology for taking attendance is by calling the name or roll number of the student and the attendance is recorded. Time consumption for this purpose is an important point of concern. Assume that the duration for one subject is around 60 minutes or 1 hour & to record attendance takes 5 to 10 minutes. For every tutor, this is a consumption of time. To stay away from these losses, an automatic process is used in this project which is based on image processing. In this project face detection and face recognition are used. Face detection is used to locate the position of the face region and face recognition is used for marking the understudy's attendance. The database of all the students in the class is stored and when the face of the individual student matches with one of the faces stored in the database then the attendance is recorded.

Keyword: Open Cv Algorithm, Digital Image Processing, Face Detection.

I. INTRODUCTION

Traditional student attendance marking techniques is often facing a lot of trouble. The face recognition student attendance system emphasizes its simplicity by eliminating classical student attendance marking techniques such as calling student names or checking respective identification cards. There are not only disturb the teaching process but also cause a distraction for students during exam sessions. Apart from calling names, an attendance sheet is passed around the classroom during the lecture sessions. The lecture class especially the class with a large number of students might find it difficult to have the attendance sheet being passed around the class. Thus, a face recognition attendance system is proposed in order to replace the manual signing of the presence of students which is burdensome and causes students to get distracted in order to sign for their attendance. Furthermore, the face recognition-based automated student attendance system is able to overcome the problem of fraudulent approach and lecturers do not have to count the number of students several times to ensure the presence of the students.

1.1 About Open CV Algorithm:

We used OpenCV 3 dependency for python 3. OpenCV is a library where there are lots of image processing functions are available. This is a very useful library for image processing. Even one can get the expected outcome without writing a single code. The library is cross-platform and free for use under the open-source BSD license. Cascade detectors: detection of face, eye, car plates.

1.2 About Dataset:

The Dataset is all about student credentials, likewise, the roll number, branch, name, and along with the trained students face patterns, jawline, Eyebrow, retina, and some other features related to the face recognition. In this Dataset only trained students are available, if you give you a trained student dataset then it will mark the attendance based on the feature. We have to train our model using the student dataset before we are testing it.

1.3 Student Attendance System:

Arun Katara et al. (2017) mentioned the disadvantages of the RFID (Radio Frequency Identification) card system, fingerprint system, and iris recognition system. The RFID card system is implemented due to its simplicity. However, the user tends to help their friends to check in as long

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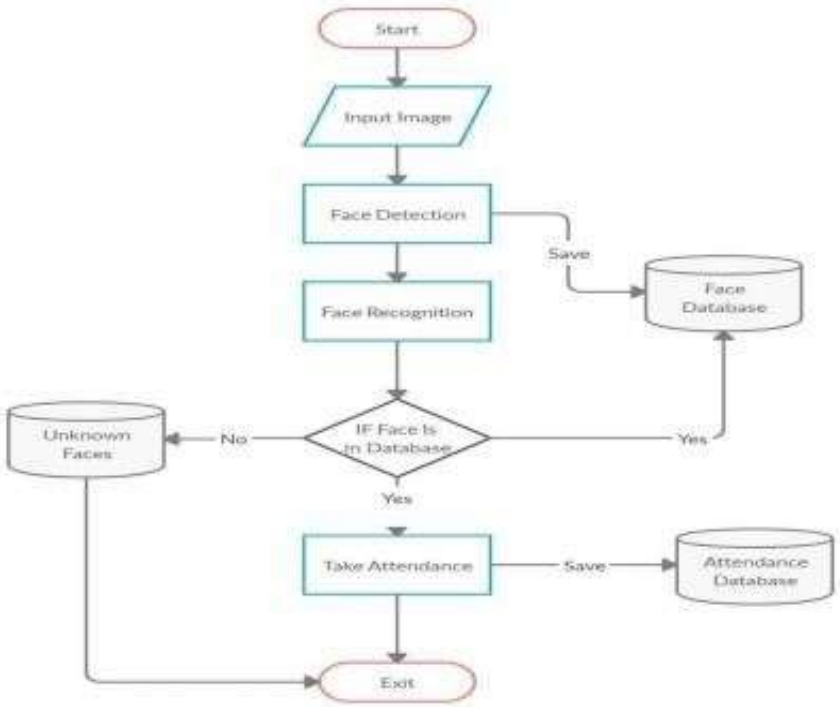
as they have their friend's ID card. The fingerprint system is indeed effective but not efficient because it takes time for the verification process so the user has to line up and perform the verification one by one. However, for face recognition, the human face is always exposed and contains less information compared to the iris. Iris recognition system which contains more detail might invade the privacy of the user. Voice recognition is available, but it is less accurate compared to other methods. Hence, a face recognition system is suggested to be implemented in the student attendance system

1.4 System Flow Diagram



II. LITERATURE SURVEY

Authors in Paper [3] is proposed to handle well-aligned images captured under controlled situations, since the traditional face recognition algorithm performed poorly on real-world images, a new method was adapted to real-world conditions - this method consists of performing a novel alignment process followed by classification using sparse representation techniques.

Authors in paper [2] proposed Image compression is a relatively recent technique based on the representation of an image by a contractive transform, on the space of images, for which the fixed point is close to the original image. Their aim was to discover which techniques are the most efficient and best. They concluded that the first one is face detection and tracking sub-system based on adaptive skin detector, condensation filter with parallel computing particles, and Haar-like classifier. And a simple and fast motion predictor is also proposed for face tracking.

Authors in paper [5] proposed an expression-invariant 3D face recognition approach was presented. This allows to the construction of expression-invariant representations of faces using the bending-invariant canonical forms approach. They have demonstrated a prototype system based on the proposed algorithm and compared its performance to classical face recognition methods. They also state that the numerical methods employed by our approach do not require the facial surface explicitly.

Authors in paper [12] Student Attendance System is essential in all learning institutes for checking the performance of students. In this project, they have proposed propose
the plan and utilization of face detection and recognition framework to consequently recognize students going to an address in a classroom and stamp their attendance by perceiving their faces. They wanted to implement this strategy to reduce

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the hardness in tracking the attendance of individual students in a huge classroom environment.

Authors in paper [16] is to present an automated system for human face recognition in a real-time background for an organization to mark the attendance of their employees or student. They state that automated attendance using real-time face recognition is a real-world solution that comes with day to day activities of handling employees or students. Their work carried out describes an automated attendance system using video surveillance. The proposed algorithm is automatic and efficient in intelligent surveillance applications. In this project, video surveillance was used to detect the object movement thereby the captured image undergoes face detection and recognition process and then searches the student database and enters the attendance if it is valid in the list.

III. EXISTING APPROACH

Current systems at present, attendance, marking involves manual attendance on the paper sheet by professors and teachers. Manual systems put pressure on people to be correct in all details of their work at all times, the problem being that people aren't perfect, however, each of us wishes we were. More manpower is required. It is difficult to maintain a database or register in manual systems. This process is quite hectic and time-consuming.

IV. PROPOSED APPROACH

It will mark the attendance of the students via face Id. It will detect the faces via wireless camera (IP camera)/webcam and then recognize the faces. After recognition, it will mark the attendance of the recognized student and update the attendance record. The students will also receive an email on the low attendance rate. The admin will be able to print these record details afterward.

V. DETAILED APPROACH

To help the lecturers, improve and organize the process of tracking and managing student attendance. Reduce manual process errors by providing an automated and reliable attendance system. Provides a valuable attentive service for both teachers and students. Increase privacy and security which, the student cannot present him or his friend while they are not. Reduce time loss as time is a very valuable resource.

VI. SYSTEM METHODOLOGY

1.5 Digital Image Processing

Digital Image Processing is the processing of images that are digital in nature by a digital computer [2]. Digital image processing techniques are motivated by three major applications mainly, the improvement of pictorial information for human perception. Image processing for autonomous machine application Efficient storage and transmission.

1.6 Image Representation in a Digital Computer:

(,)= (,)× (,)- (2.0) Where, r (x, y) is the reflectivity of the surface of the corresponding image point. i (x,y) represents the intensity of the incident light. A digital image f(x, y) is discretized both in spatial coordinates by grids and in brightness by quantization[3]. Effectively, the image can be represented as a matrix whose row, column indices specify a point in the image and the element value identifies a gray level value at that point. These elements are referred to as pixels or pels. Typically following image processing applications, the image size which is used is ×, elements, × pels, or × pixels. Quantization of these matrix pixels is done at 8 bits for black and white images and 24 bits for colored images (because of the three color planes Red, Green, and Blue each at 8 bits) [4].

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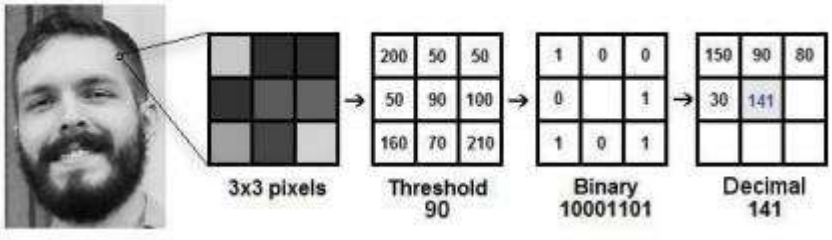


1.7 Steps in Digital Image Processing:

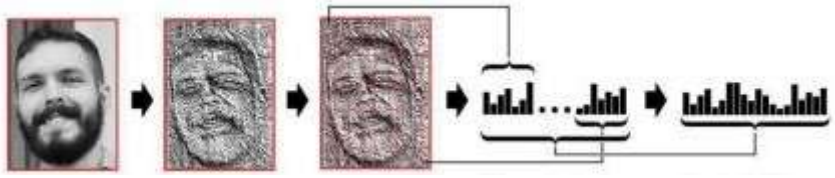
Image Acquisition - An imaging sensor and the capability to digitize the signal produced by the sensor.

. Preprocessing– Enhances the image quality, filtering, contrast enhancement, etc.

- Segmentation – Partitions an input image into constituent parts of objects.
- Description/feature Selection – extracts the description of image objects suitable for further computer processing.
- Recognition and Interpretation – Assigning a label to the object based on the

information provided by its descriptor.

Knowledge Base – This helps for efficient processing as well as inter-module co-operation.



VII. DESIGN REQUIREMENTS:

We used some tools to build the HFR system. Without the help of this tool, it would not be possible to make it done. Here we will discuss the most important one.

1.8 Software Implementation:

OpenCV: We used OpenCV 3 dependency for python 3. OpenCV is a library where there are lots of image processing functions are available. This is a very useful library for image processing. Even one can get the expected outcome without writing a single code.

The library is cross-platform and free for use under the open-source BSD license. Examples of some supported functions are given below:

- Derivation: Gradient/laplacian computing, contours delimitation
- Hough transforms: lines, segments, circles, and geometrical shapes detection
- Histograms: computing, equalization, and object localization with a back-projection algorithm
- Segmentation: thresholding, distance transform, foreground/background detection, watershed segmentation
- Filtering: linear and nonlinear filters,

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morphological operations • Cascade detectors: detection of face, eye, car plates

- Interest points: detection and matching
- Video processing: optical flow, background subtraction, camshaft (object tracking)
- Photography: panoramas realization, high definition imaging (HDR), image in painting. So it was very important to install OpenCV.

1.9 Hardware Implementation:

1. Raspberry Pi 3:

1.4GHz 64-bit quad-core processor, dual-band wireless LAN, Bluetooth 4.2/BLE, faster Ethernet, and Power-over-Ethernet support (with separate PoE HAT)

Specification: The Raspberry Pi 3 Model B+ is the final revision in the Raspberry Pi 3 range.

- Broadcom BCM2837B0, Cortex-A53 (ARMv8) 64-bit SoC @ 1.4GHz
- 1GB LPDDR2 SDRAM
- 2.4GHz and 5GHz IEEE 802.11.b/g/n/ac wireless LAN, Bluetooth 4.2, BLE
- Gigabit Ethernet over USB 2.0 (maximum throughput 300 Mbps)
- Extended 40-pin GPIO header
- Full-size HDMI
- 4 USB 2.0 ports
- CSI camera port for connecting a Raspberry Pi camera
- DSI display port for connecting a Raspberry Pi touchscreen display
- 4-pole stereo output and composite video port
- Micro SD port for loading your operating system and storing data
- 5V/2.5A DC power input Power-over-Ethernet (PoE) support (requires separate PoE HAT)

7.3 Webcam:

ELP HD 8Megapixel USB CMOS board camera module adopts Sensor Sony (1/3.2") IMX179 is nice to use in Linux equipment, or that equipment which comes with Windows, Linux, Android system, etc.

7.4 Specification:

- 1/3.2 inch Sony IMX179 USB webcam
- 8-megapixel high-resolution Mjpeg USB camera
- UVC USB camera, Support Windows, Linux, Mac with UVC, also for android system.
- Compatible with raspberry pi, Ubuntu, Opencv, Amcap, and many other USB web camera software and hardware.
- Webcam USB with 2.8mm lens
- 38×38/32x32mm mini micro USB board camera.

USB webcam, well used in many machines, ATM machine, medical machine, automatic vending machine, industry machine's camera module Parameters are changeable (Brightness, Contrast, Saturation, White Balance, Gamma, Definition, Exposure.

7.5 Power-Source

We use Mi 10000 mAH Power Bank for our power sources. And it is based on the requirements power source can change.

Experimental Result:

The step of the process of the experiment are given below:

Face Detection: Start capturing images through a web camera of the client-side:

VIII. RESULTS & CONCLUSION

Pre-process the captured image and extract the face image calculate the eigenvalue of the captured face image and compared it with eigenvalues of existing faces in the database. If the eigenvalue does not match with existing ones, save the new face image information to the face database (XML file). If the eigenvalue is matched with the existing one, then the recognition step will be done**.** Using the PCA algorithm the following steps would be followed for face recognition. Find the face information of matched face images from the database. update the log table with corresponding face image and system time that makes the completion of attendance for individual students.

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8.1 Sample output:

This section presents the results of the experiment conducted to capture the face into a greyscale image of 50x50 pixels. The faculties are supposed to register with the respective course codes along with their email-id in the faculty registration form provided. This is important because the list of absentees will be ultimately mailed to the respective faculties. In every session, the respective faculty must enter their course code. Then after submitting the course code, the camera will start automatically.

Test data	Expected Result	Observed Result	Pass/ Fail
OpenCAM_CB()	Connects with the installed camera and starts playing.	Camera started.	pass
LoadHaar Classifier()	Loads the HaarClassifier Cascade files for frontal face	Gets ready for Extraction.	Pass
ExtractFace()	Initiates the Paul-Viola Face extracting Frame work.	Face extracted	Pass
Learn()	Start the PCA	Updates the	Pass
Face Recognition Attendance System			
	Algorithm	facedata. xml	
Recognize()	It compares the input face with the saved faces.	Nearest face	Pass

Conclusion

This system aims to build an effective class attendance system using face recognition techniques. The proposed system will be able to mark the attendance via face Id. It will detect faces via webcam and then recognize the faces. After recognition, it will mark the attendance of the recognized student and update the attendance record. We have implemented our model using Trained Dataset and finally, we came up with an attendance marking system, if you give a student id out of the trained dataset, it will fail to access. We came up with accuracy for our trained model dataset.

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