Report On

Smart Attendance System

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Submitted To:

Supta Richard Philip

Senior Lecturer, City University

Department of CSE

Submitted By:

ID: 142362004 Name: Abidur Rahman

ID: 153402316 Name: Saimun Islam

ID: 153402323 Name: Kamrul Hasan

ID: 153402354 Name: MD. Hafijul Islam

Abstract

The most arduous task in any organization is attendance marking. In this paper we proposed an automated attendance management system which tackles the predicament of recognition of faces in biometric systems subject to different real time scenarios such as illumination, rotation and scaling. This model incorporates a camera that captures input image, an algorithm to detect a face from the input image, encode it and recognize the face and mark the attendance in a spreadsheet and convert it into PDF file. The system camera of an android phone captures the image and sends it to the server where faces are recognized from the database and attendance is calculated on basis of it.

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CHAPTER- 01

1.0 Introduction

Face recognition is a biometric technique which involves determining if the image of the face of any given person matches any of the face images stored in a database. This problem is hard to solve automatically due to the changes that various factors, such as facial expression, aging and even lighting, can cause on the image. Among the different biometric techniques facial recognition may not be the most reliable but it has several advantages over the others. t is widely used in various areas such as security and access control, forensic medicine, police controls and in attendance management system.

1.1:Problem Statement

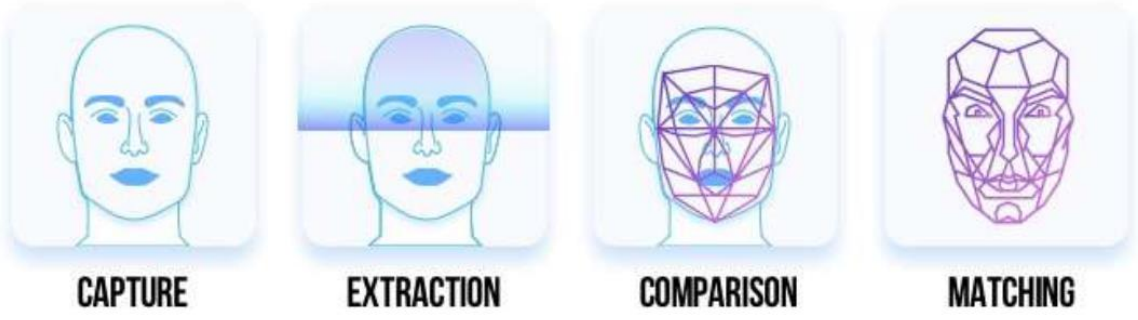
The various techniques for marking attendance are:

- Signature based System
- Fingerprint based System
- Iris Recognition
- RFID based System
- Face Recognition

Amongst the above techniques, Face Recognition is natural, easy to use and does not require aid from the test subject. It is a series of several related problems which are solved step by step:

- To capture a picture and discern all the faces in it.
- Concentrate on one face at a time and understand that even if a face is turned in a strange direction or in bad lighting, it is still the same person.
- Determine various unique features of the face that can help in distinguishing it from the face of any other person. These characteristics could be the size eyes, nose, length of face, skin colour , etc.
- Compare these distinctive features of that face to all the faces of people we already know to find out the person's name.

Our brain, as a human is made to do all of this automatically and instantaneously. Computers are incapable of this kind of high-level generalization, so we need to teach or program each step of face recognition separately. Face recognition systems fall into two categories: verification and identification. Face verification is a match that compares a face image against a template face images, whose identity is being claimed. On the contrary, face identification is a problem that compares a query face image.



1.2 Objective

The prime objectives of research are:

- To discover, verify and test new and important facts.
- To analyses an event or process or phenomenon to identify the cause and effect relationship.
- To develop new scientific tools, concepts and theories to understand scientific and nonscientific Problems.
- To find solutions to scientific, non-scientific and social problems.

1.3 Proposed Solution

To overcome the problems in the existing attendance system we shall develop a Biometric based attendance system over simple attendance system. There are many solutions to automate the attendance management system like thumb based system, simple computerized attendance system, Iris scanner, but all these systems have limitations overwork and security point of view. Our proposed system shall be a "Face Recognition Attendance System" which uses the basic idea of image processing which is used in many security applications like banks, airports, Intelligence agencies etc.

Proposed System Components

Following are the main components of the proposed system

- Student Registration
- Face Detection
- Face Recognition
    - Feature Extraction
    - Feature Classification
- Attendance management system.
    - Automated Attendance marking
    - Manual Attendance marking
    - Attendance details of users.
    - Email notification for absentees

Proposed System Outcome

- It will mark 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 admin will be able to print these record details afterward.
- The students will also receive an email on low attendance rate.

Chapter-02: Background Study

2.1 Related Work-1:

Face detection using LBP was proposed by Jo Chang-yeon. His paper describes how the LBP works and how it is used for face recognizing. The outcome of his paper was that LBP is simpler than haar-like features and faster to discriminate between faces and non faces.Face detection and recognition for automatic attendance system was proposed by Dr. Nita Thakare, MeghnaShrivastava,NidhiKumari, NehaKumari, Darleen Kaur, Rinku Singh which aims at the efficiency of the system. Automated Attendance Management System using Face Recognition was proposed byMrunmayeeShirodkar, Varun Sinha, UrviJain, BhushanNemade. Their paper describes the real time automatic attendance system. Their developed algorithm in taking attendance is achieving 83.2% efficiency.

2.2 Related Work-2:

As a result of the active progress in software technologies, there are now many different types of computerized monitoring and attendance systems applied in companies. These systems mostly differ in the core technology they use. The authors' previous work introduced one solution for developing the RFID based type of attendance system. Employees' entrances and exits records are gathered using cards and RFID reader devices which send data via GPRS to the remote server, where it is, then, stored in the database. This data could be accessed by a web application for authenticated users. Similar RFID based systems are proposed by Sharma et al. in . Sultana et al. in proposed a location based attendance tracking system using an Android for extracting the GPS data. Rao et al. in presented an attendance system using biometrics authentications. They used a common minutiae and a pattern based matching for fingerprint verification in order to accurately distinguish the identity of the people whose attendance was logging. Soewito et al. in [5] used a smartphone. They integrated both the location and individual attributes in order to accurately track attendances. Their system uses fingerprint or voice recognition. Within the application, the user sends the GPS coordinates, date and time along with a fingerprint or voice to the server. Minutiae and texture feature matching algorithms are applied for fingerprint recognition. A voice recognition algorithm uses spectrogram or voiceprint which is converted from the electronic signal to a voice that matches the template voices stored in the database. The tested system achieved the accuracy of 95%. Kadry et al. in the paper presented the attendance wireless system that is based on iris recognition[1]. The system uses an eye scan sensor and Daugman's algorithm for the iris recognition. Patil et al. in applied face recognition for classroom attendance. They used Eigenface for the recognition, but the overall accuracy of the system was not mentioned in the paper. Similar approach using Eigenface for the face recognition based attendance tracking system was proposed in . They achieved overall recognition accuracy of 85% for unveil faces. Tharanga et al. in used Principle Component Analysis (PCA) method for the face recognition for their attendance system, achieving the accuracy of 68%. Due to the rapid progress in deep learning, the accuracy of face recognition is drastically improved by the usage of deep CNNs. Schroff et al. in presented the revolutionary system – FaceNet which depends on the Deep Neural Network (DNN) for the face recognition task. The proposed method achieved astonishing results

on the Labeled Faces in the Wild (LFW) dataset, 99.63% accuracy. Motivated by these results, the authors of this paper decided to use an alternated version of this approach as part of a model for the deep learning based face recognition attendance system[1].

CHAPTER-03:METHODOLOGY

3.1 Prepare Data

The whole method of developing the deep learning based attendance system is explained in detail in this section. The developing procedure is divided into several important stages, including obtaining the training dataset and augmentation, preparing images and training DNNs and last but not least, integration into the existing system in order to test the proposed method[1].

A) Creating the database:

A database of all the students will be created using python and opencv. It is a onetime process so that we will have a real time database to train our system and to match the captured faces. For creating a person's database,the person has to sit in front of the camera around 80cms away from the camera with light on the opposite side of the face. The camera must be at level of the face of the person. When the coderuns, the person has to give 8 poses with different expressions so that a database of different types of photo gets made. The poses can be looking sideways, up down or any direction in which face is visible. The expressions to be recorded can be happy, sad, bored, yawning etc. Also the faces detected from the captured images will be added to the database so that the database is updated continuously. Once the database is done we are ready with our implementation part

B) Image Capturing

mages are captured using a module that is a digital camera whose link is integrated to the application that is developed using the proposed idea. After an image is captured, using web services transfers the image on server for processing. Together with the image, the web service accepts the course code. Using this course code, the LMS is aware of which students are enrolled in that class and do face matching only for those students. The camera continuously takes pictures on a given interval (by default each five minutes), until all faces detected are successfully identified or until the system is told to stop. This means that in some cases, e.g., when a face cannot be successfully identified, the camera keeps taking pictures until the class finishes[2].

C) Pre-processing

While changing over a RGB picture to grayscale, we need to take the RGB values for every pixel and make as yield a solitary esteem mirroring the shine of that pixel. One such approach is to take the normal of the commitment from each channel: (R+B+C)/3. Be that as it may, since the apparent splendor is frequently ruled by the green segment, an alternate, more "human-situated", strategy is to take a weighted normal, e.g.: 0.3R + 0.59G + 0.11B. An alternate approach is to give the weights access our averaging be reliant on the genuine picture that we need to change over, i.e., be versatile. A (fairly) straightforward go up against this is to frame the weights so that the subsequent picture has pixels that have the most difference, since pixel change is connected to the differentiation of the picture. In the applet over, the "ideal projection" figures how we ought to join the RGB diverts in the chose picture to make a grayscale picture thathas the most change. [For the all the more actually propelled; we discover the weights by taking the important eigenvector of the specimen covarianceframework of the RGB channels.Picture improvement strategies have been broadly utilized as a part of numerous utilizations of picture preparing

where the subjective nature of pictures is vital for human translation. Complexity is an essential calculate any subjective assessment of picture quality. Differentiation is made by the distinction in luminance reflected from two nearby surfaces. At the end of the day, complexity is the distinction in visual properties that makes a protest recognizable from different articles and the foundation. In visual discernment, differentiation is controlled by the distinction in the shading and shine of the protest with different articles. Our visual framework is more delicate to differentiate than supreme luminance; in this manner, we can see the world comparatively paying little mind to the impressive changes in light conditions. Numerous calculations for achieving contrast upgrade have been produced and connected to issues in picture preparing. In this address we will discuss differentiate upgrade. Straight and non-direct change capacities, for example, picture negatives, logarithmic changes, control law changes, and piecewise straight changes will be talked about. Histogram process and histogram of four fundamental dim level attributes will be presented.Separating is a strategy for adjusting or upgrading a picture. For instance, you can channel a picture to underscore certain components or evacuate different elements. Picture handling operations executed with separating incorporate smoothing, honing, and edge upgrade.Sifting is aneighborhood operation,in which the estimation of any given pixel in the yield picture is dictated by applying some calculation to the estimations of the pixels in the area of the relating input pixel. A pixel's neighborhood is some arrangement of pixels, characterized by their areas with respect to that pixel. (SeeNeighborhood or Block Processing: An Overviewfor a general discourse of neighborhood operations.)Linear filteringis separating in which the estimation of a yield pixel is a direct mix of the estimations of the pixels in the information pixel's neighborhood[3].

D) Face Detection

Because ofprocessor intensive job of the face detection algorithm, this tool is server based. Detecting a face is in essence an object detection task, where the object of interest in this case is the face. However, many factors can interfere with the face detectionalgorithms, factors such as face pose, scale, position, rotation, light, image colors etc. The same problems arise when one wants to identify (recognize) a face, with addition to some other obstacles which is discussed shortly.The process of detecting faces from still pictures containing multiple faces can be separated in few steps. There are plenty face detection algorithms which can effectively detect a face (or any other specific object) in a picture. In the system presented here, most students face the camera frontally hence we chose to use the HAAR classifier for face detection. This classifier is implemented on Intel’s Open CV library.The classifier works by training a model using positive face images and negative face images. A positive image is an image that contains the desired object to be detected, in our case this object is a face. A negative image is an image that does not contain the desired object. After the model is trained, it is able to identify face features, which is later,stored on a XML file.A problem faced during this process was the large number of false-positives: objects mistakenly detected as faces. This was not such a big issue for us, since a false-positive does not result in a positive identificationduring the recognition phase. Because of this, we lowered the detection threshold, so all faces could be detected. After a face has been detected, the rectangle enclosing this face is cropped and processed later by the face recognition module. This rectangle represents a single face, and after being cropped as an image is transferred on server. Each file transferred is renamed to have a unique ID[2].

E) Face Recognition

Recognizing a face means to identify that particular face from a list of faces on a database. Our university, upon enrollment takes pictures from every student, and those images are stored in a database. Same as in face detection, there are many existing algorithms used to identify a face. Our system implements a server based module, programmed in Python (Pyfaces -http://pyfaces.blogspot.com/) which takes benefit of eigenfaces to identify a face. This algorithm has many drawbacks: it depends on scale, pose and the color of the compared images. However the algorithm is very fast, and can compare only to images, thus we do notNEED to have multiple images of a person to train our system.Since our system is setup to capture only frontal images the pose of the face in not an issue. When a face is captured during the face detection phase, it is converted into gray scale. The same conversion is applied to faces on our student image database. We also do background subtraction on our images so other objects do not interfere during the process. Another issue is that faces are subject of change during time (facial hair, eyeglasses etc). Whenever we successfully identify a face, a copy of that face is stored in the database of faces for that student. Together with the image we store the time and date when this image was taken. This way even if a student gradually changes his appearance (e.g., grows a beard) the system is still capable to identify him, since it has multiple images of the same person. On each consequent scan for a student, the recognition module starts comparing images from this database, sorted by date in descending order. This approach was chosen since the latest image of a student on our database is most likely to be more similar to the current captured image. Of course, a drastic change on a student's look causes the system to not identify that particular student. To solve this issue, we have included a module, which lists all unidentified faces and the teacher is able to manually connect a captured face with a student from the list. This image is also stored on our database, as an updated picture of this particular student. This manual recognition process is performed only once. In a subsequent scan, this student is identified automatically by our system. To speed up the face recognition process we only compare images captured in a classroom, with the database of students enrolled for that course only. This ensures that we process only a small subset of images available on our central data base.

F) Attendance Marker

If a face from the particular date folder is matched with the database, then the particular student will be marked present. Following the same procedure, we will have list of all students who were present in the class. Rest of the class students will be marked absent.

3.2 Evaluate Data

3.3 Improve Results

3.4 Present Result

CHAPTER-04: EVALUATION

- An image capture system with embedded computing can extract information from images without need for an external processing unit, and interface devices used to make results available to other devices. The choosing of an Embedded platform is very unique and easy to implement.
- the designed system is fast enough to run the image capturing, recognition algorithm, and the data stream can flow smoothly between the camera.
- embedded image capturing system is smaller, lighter and with lower power consumption, so it is more convenient than the PC-based face recognition system.
- Because of the open source code, it is freer to do software development on Python. Experimental results show that its an effective method of using OpenCV to actualize embedded image capturing system.
- Face detection and recognition system is more cheap, simple, accurate and non intrusive process as compare to other biometrics.

CHAPTER-5: CONCLUSION

Nowadays, various attendance and monitoring tools are used in practice in industry. Regardless the fact that these solutions are mostly automatic, they are still prone to errors. In this paper, a new deep learning based face recognition attendance system is proposed. The entire procedure of developing a face recognition component by combining state-of-the-art methods and advances in deep learning is described. It is determined that with the smaller number of face images along with the proposed method of augmentation high accuracy can be achieved, 95.02% in overall. These results are enabling further research for the purpose of obtaining even higher accuracy on smaller datasets, which is crucial for making this solution production-ready. The future work could involve exploring new augmentation processes and exploiting newly gathered images in runtime for automatic retraining of the embedding CNN. One of the unexplored areas of this research is the analysis of additional solutions for classifying face embedding vectors. Developing a specialized classifying solution for this task could potentially lead to achieving higher accuracy on a smaller dataset. This deep learning based solution does not depend on GPU in runtime. Thus, it could be applicable in many other systems as a main or a side component that could run on a cheaper and low-capacity hardware, even as a general-purpose Internet of things (IoT) device. An automatic attendance management system is a necessary tool for any LMS. Most of the existing systems are time consuming and require for a semi manual work from the teacher or students. This approach aims to solve the issues by integrating face recognition in the process. Even though this system still lacks the ability to identify each student present on class, there is still much more room for improvement. Since we implement a modular approach we can improvedifferent modules until we reach anacceptable detection and identification rate. Another issue that has to be taken in consideration in the future is a method to ensure users privacy. Whenever an image is stored on our servers, it must be impossible for a person to use that image[2].

Refference:

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