

FACE RECOGNITION BASED ATTENDENCE SYSTEM USING DEEP LEARNING APPROACH

K.E.Eswari MCA., M.Phil., M.E.*, A.Mohanasundaram

(Associate professor, Department of MCA, Nandha Engineering College(Autonomous), Erode, Tamilnadu, India

Email: eswarisaravanan2001@gmail.com)

** (Final MCA, Department of MCA, Nandha Engineering College(Autonomous), Erode, Tamilnadu, India

Email: mohansundaram1523@gmail.com)

Abstract:

Attendance is a very important a part of daily classroom ascertainment for the teacher for his or her smooth running of sophistication. At the start and ending of the category, usually teacher check the attendance, but the manual attendance system may ends up in appear that an educator may miss someone or some students may answer multiple times. Now a days, Machine Learning has been highly explored for computer vision applications. So, we use the concept of machine learning in Face – recognition for automatic attendance systems. during this project, we perform the face recognition and face detection algorithms, to produce the pc systems the power of finding and recognizing human faces fast and precisely in images or videos in order that the systems can employed in giving attendance.

Keywords — Machine Learning, face recognition, assessment, face detection algorithm, LBPH,HAAR

I. INTRODUCTION

Generally, within the classroom the attendance was taken by the teachers manually at the start and ending of the category. the matter with this approach is that it requires a while to require and also the manual process will have chances to form mistakes in most of the cases. to beat that problem, RFID (Radio Frequency Identification) was introduced within the past years. But those also are having the fail proof of attendance system. So, we are introducing the concept of Face Recognition Based Attendance system, the most objective the proposed system is to allot attendance to the scholars using face recognition-based algorithms to realize fail proof attendance system.

Face detection is employed for several applications for the identification of human faces in digital images or video. it's defined as specific case of object-class detection; where it's wont to find the locations and sizes of all objects in a picture that belong to a given class. The technology is will be able to predict frontal or near-frontal faces during a photo, no matter orientation, lighting conditions or complexion. Face Recognition could be a kind of biometric software that maps an individual's face expression mathematically and stores the info as a faceprint. The software consists of Deep Learning algorithms to check a live capture or digital image to the stored face print so as to verify an individual's identity.

Face Recognition using Python

Faces are manufactured from thousands of fine lines and features that has got to be matched. The face recognition using Python is employed to interrupt the task of identifying the face into thousands of smaller, bite-sized tasks, each of which is simple to face Recognition Python is that the latest technology in Machine Learning techniques. OpenCV utilizes Machine Learning algorithms to look for faces within an image.

Facial Recognition using Python Libraries

An easy thanks to detect faces using Python is by using the OpenCV package which is written in C/C++, OpenCV now provides bindings for Python. It uses machine learning algorithms to go looking for faces within an image. Faces are very complicated, product of thousands of small patterns and features that has to be matched. The face recognition algorithms break the task of identifying the face into thousands of smaller, bite-sized tasks, each of which is simple to unravel, referred to as classifiers.

A face may have 5000 or more classifiers, all of which must match for a face to be detected. Since there are a minimum of 5,000 or more tests per block, you may have lots of calculations to try to to, which makes it a difficult process. to resolve this, OpenCV uses cascades. The OpenCV cascade segments the matter of detecting faces into multiple stages. It performs a close test for every block. The algorithm may be performed on around 30 to 50 of those stages or cascades, and it'll only detect a face if all stages pass. The cascades are a bunch of XML files that contain OpenCV data wont to detect objects.

II.LITERATURE REVIEW

Traditionally attendance was taken manually which is extremely time consuming and infrequently results in human error. Additionally, there are many uncertainties towards the sources of the attendance records which after all, most of the attendance records don't seem to be retrieved from the particular situation. The old method that uses paper sheets for taking student's attendance can now not be used. supported the research, there are many solutions that are available to resolve this

issue. in line with research journal "Attendance System Using NFC Technology with Embedded Camera on Mobile Device" (Bhise, Khichi, Korde,Lokare, 2015). The attendance system is improved by using Near Field. Communication (NFC) technology and mobile application. in keeping with the research paper, each student is given a NFC tag that contains a unique ID during their enrolment into the school each class will then be taken by touching or moving these tags on the lecturer transportable. The embedded camera on the phone will then capture the student's face to send all the info to the school server to try and do validation and verification. The advantages of this method are where the NFC is easy to use, and also the speed of connection establishment is incredibly high. It indeed accelerates the attendance taking process lots. However, this method couldn't automatically spot the violation when the NFC tag isn't personally tagged by the first owner. except that, the convenience of the system which uses the mobile phone because the NFC reader was actually an inconvenience to the lecturer. Imagine if the lecturer had forgotten to bring their mobile phones to figure, what would be the backup procedure for the attendance to be recorded? Moreover, most of the lecturer won't likely to prefer their personal smart phones to be employed in this manner thanks to privacy matter. Hence, unique information about the student like biometrics or face recognition, which is guanine for a student, should be utilized in replacement of the NFC tag. This will ensure attendance to be taken originally by the particular student.

The second research journals "Face Recognition Based Attendance Marking System" (Senthamil Selvi, Chitrakala, Antony Jenitha, 2014) relies on the identification of facerecognition to resolve the previous attendance system's issues. this method utilizes camera to capture the worker images to try and do face recognition. The captured image is compared one by one with the face database to go looking for the worker's face where attendance are going to be marked when

a result's found within the face database. The main advantage this system is where attendance is marked on the server which is very secure where nobody can mark the attendance of other. Moreover, during this proposed system, the face detection algorithm is improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are invested within the accuracy of the face detection algorithm, This system requires a standalone computer which is able to need a relentless power supply that produces it not portable. this sort of system is merely suitable for marking staff's attendance as they only have to report their presence once each day, unlike students which require reporting their attendance at every class on a selected day, it'll be inconvenient if the attendance marking system is not portable. Thus, to unravel this issue, the full attendance management system may be developed on an embedded design in order that it are often work similarly with just batteries that produces it portable.

The third research journal "Fingerprint Based Attendance System Using Microcontroller and LabView" (Kumar Yadav, Singh, Pujari, Mishra, 2015) proposed an answer of using fingerprint to mark the attendance. this technique is using 2 microcontrollers to scope with the fingerprint recognition process. Firstly, the fingerprint pattern are obtained through a fingerprint sensor, then the information are transmitted to microcontroller 1. Next microcontroller 1 will pass the data to microcontroller to do the checking with the database that resides in it. After finding a student's match, the small print are sent to the PC through serial communication to be displayed. This design is sweet because it accelerates development while maintaining design flexibility and simplifies testing. But again, this method is attached to a PC which make it not portable. Other than that, the database information cannot be accessible easily. Meaning that, for the oldsters whom have an interest in knowing their child's attendance cannot easily or conveniently access the knowledge. Therefore, to

supply accessibility of the student's information to the legitimate concerned party, the knowledge are often uploaded to an online server for straightforward access. While the authentication for the suitable access is enforced through a login screen.

According to the forth research journal "RFID based Student Attendance System" (Hussain, Dugar, Deka, Hannan, 2014), the proposed solution is nearly kind of like the primary research journal where RFID technology is employed to enhance the older attendance system. during this system, a tag and a reader is again used as a technique of tracking the attendance of the scholars. The difference between the primary journals with this {can be} where attendance's information can be accessed through an online portal. It provides more convenient for information retrieval. 8 BCS (HONS) Computer Engineering Faculty of knowledge and Communication Technology (Perak Campus), UTAR Again, this technique is imperfect within the sense that, firstly, it's not portable, because the RFID reader can only work when it's connected to a PC. Secondly, the RFID tag isn't a genuine information which will uniquely identify a student, thus, leading to the inaccuracy of the collected attendance information. RS232 is employed to attach that device to the pc and save the recorded attendance from the database. This RFID based attendance system may bring about to the problem of fraudulent access. Unauthorized person may have an opportunity to create use of authorized ID card and enter into the organization.

Fingerprint based Attendance System contains a portable fingerprint device which may be passed between the scholars then they need to place their finger on the sensor during the lecture time without the instructor's involvement. the matter with this approach is that passing of the device during the lecture time may distract the main target and concentration of the scholars. Iris is another branch of biometric which will be used for Attendance

Systems. during this system authors have proposed Daugmans algorithm-based Iris recognition system. this technique uses iris recognition management system that does capturing the image of iris recognition so extraction, storing and matching. But the problem occurs to get the transmission lines within the places where the topography isn't good. during this the authors have proposed a system supported real time face recognition which is reliable, secure and fast which needs improvement indifferent lighting conditions. Face detection may be a basic technology of human-computer interaction. It can get the information from the faces in pictures or videos. Face recognition technology analyses the face images to extract the face expression, and so identify specific targets. the event of machine learning technology tries to further improve the accuracy of face recognition. The face recognition problem is formulated as an issue in difference space, which models dissimilarities between two facial images. in several space they formulate face recognition as a two class problem. The cases are: (i)Dissimilarities between faces of the identical person, and (ii) Dissimilarities between faces of various people. By modifying the interpretation of the decision surface generated a similarity metric between faces, that's learned from samples of differences between faces. The SVM-based algorithm is compared with a principal component analysis (PCA) based algorithm on a difficult set of images from the FERET database. Performance was measured for both verification and identification scenarios. The identification performance for SVM is 77-78% versus 54% for PCA. For verification, the equal error rate is 7% for SVM and 13% for PCA.

III.METHODOLOGY

PROPOSED WORK

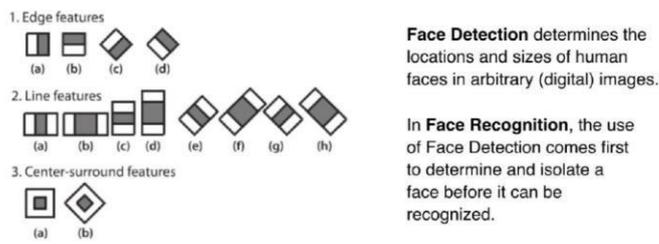
The proposed system face recognition-based attendance system are often divided into five main modules. The modules and their functions are defined as follows.

Image Capture : The camera is fixed at a distance from the doorway to capture the frontal image of the scholars.And remaining process goes for face detection.

Face Detection : A proper and efficient face detection algorithm always increases the performance of face recognition systems. Various algorithms are proposed for face detection like face knowledge based methods, feature invariant methods, machine learning based methods. during this project, I implemented a system for locating faces in digital images. These are in JPEG format only. Before we continue, we must differentiate between face recognition and face detection. they're not the identical, but one depends on the opposite. during this case face recognition needs face detection for creating an identification to "recognize" a face. i'll onlycover face detection. Face detection uses classifiers, which are algorithms that detects what's either a face(1) or not a face(0) in an image. Classifiers are trained to detect faces using thousands to uncountable images so as to urge more accuracy.

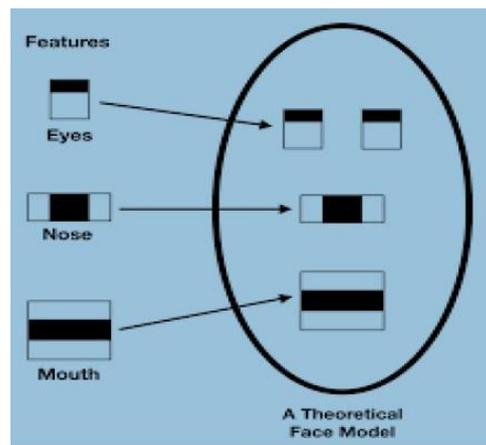
OpenCV uses two kinds of classifiers, LBP (Local Binary Pattern) and Haar Cascades

Understanding Haar Cascades:A Haar Cascade is predicated on "Haar Wavelets" which defines as: A sequence of rescaled "square-shaped" functions which together form a wavelet family or basis.It is supported the Haar Wavelet technique to research pixels within the image into squares by function. This uses machine learning techniques to induce a high degree of accuracy from what's called "training data". This uses "integral image" concepts to compute the "features" detected. Haar Cascades use the Ada boost learning algorithm which selects a little number of important features from an outsized set to provide an efficient results of classifiers.



Feature Extraction

Haar Cascades use machine learning techniques in which a function is trained from a lot of positive and negative images. This process in the algorithm is feature extraction.



Pre-Processing

The detected face is extracted, subjected to pre-processing. This pre-processing stage involves With the histogram equalization of the extracted face image and is resized to 100x100. Histogram Equalization is that the commonest technique in Histogram Normalization. This improves the contrast of the image because it stretches the ranges of the intensities in a picture by making it more perfect.

Database Development

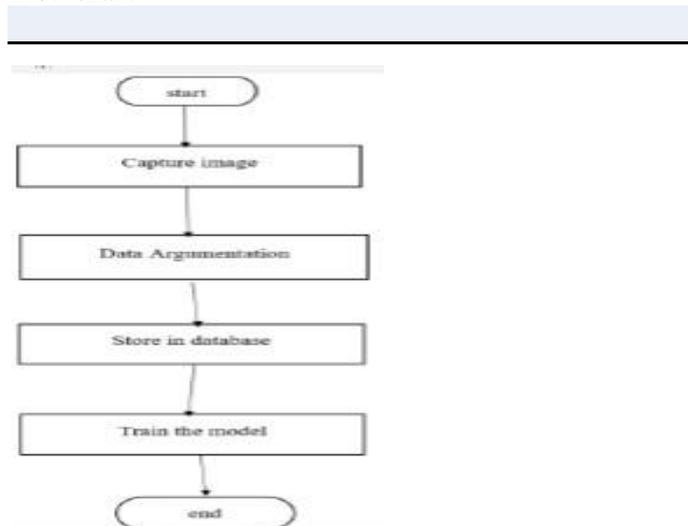
In this Biometric based system collection of each individual is required. This database development phase consists of image capture of each individual student and extracting the Biometric feature for each individual, in our proposed system it's face, and after it's enhanced using pre-processing techniques and to be stored within the database. Post -Processing In the proposed system , after recognizing the all faces of the

scholars, the names of people are updated into an excel sheet is made by exporting mechanism present within the database. The database also has the flexibility to come up with monthly and weekly reports of scholars attendance. These generated records may be viewed by the college and students .this ensures that student whose Faces don't seem to be recognized correctly by the system have the possibility to send missive of invitation to admin. And Thus, giving the power to the right the system and make it more stable and accurate.

Proposed Algorithm

1. Capture the student’s image through camera.
2. Detect each and each individual face by apply face detection algorithm.
3. Extract the ROI(Region Of Interest) in rectangular bounding box.
4. Converting to grey scale, apply histogram equalization and resize to 100x 100 i.e. apply pre-processing.
5. If image captured then
 Store in database
 Else
 Apply LBPH (for feature extraction)
 Apply SVM(for classification)
 End if
6. Post-processing

Flow chart



Data augmentation encompasses a good range of techniques accustomed generate “new” training samples from the initial ones by applying random jitters and perturbations (but at the identical time ensuring that the category labels of the info don't seem to be changed).

- Scaling
- Rotation (at finer angles)
- Flipping Adding Salt and Pepper noise
- Lighting condition

Scaling: Having differently scaled object of interest within the images is that the most significant aspect of image diversity. When your network is in hands of real users, the article within the image may be tiny or large. Also, sometimes, object can cover the complete image and yet won't be present totally in image (i.e. cropped at edges of object).

Translation: we might like our network to acknowledge the article present in any a part of the image. Also, the thing may be present partially within the corner or edges of the image. For this reason, we shift the article to varied parts of the image. this might also end in addition of a background

Rotation (at 90 degrees): The network needs to recognize the thing present in any orientation. Assuming the image is square, rotating the image at 90 degrees won't add any background signal within the image.

Rotation (at finer angles): Depending upon the necessity, there may be a necessity to orient the item at minute angles. However problem with this approach is, it'll add background signal. If the background in image is of a set colour (say white or black), the newly added background can blend with the image. However, if the newly added background colour doesn't blend, the network may consider it on be a feature and learn unnecessary features.

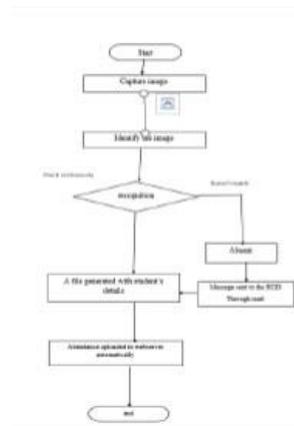
Flipping: This scenario is more important for network to get rid of biasness of assuming certain features of the article is on the market in just a selected side. Consider the case shown in image

example. You don't want network to find out that tilt of banana happens only in right side as observed within the base image. Also notice that flipping produces different set of images from rotation at multiple of 90 degrees. My additional question is has anyone done some study on what's the utmost number of classes it gives good performance.

Adding Salt and Pepper noise: Salt and Pepper noise refers to addition of white and black dots within the image. Though this might seem unnecessary, it's important to recollect that a general user who is taking image to feed into your network might not be an expert photographer. His camera can produce blurry images with many white and black dots.

Lighting condition: this can be a really important style of diversity needed within the image dataset not just for the network to be told properly the article of interest but also to simulate the sensible scenario of images being taken by the user. The lighting condition of the pictures are varied by adding Gaussian noise within the image.

Perspective transform: In perspective transform, we try and project image from a unique point of view. For this, the position of object should be known prior to. Merely calculating perspective transform without knowing the position of the article can cause degradation of the dataset. Hence, this kind of augmentation needs to be performed selectively. the best advantage with this augmentation is that it can emphasize on parts of object in image which the network must learn.



Local Binary Patterns Histogram(LBPH)

Step-by-step algorithm:

Parameters: the LBPH uses 4 parameters: • Radius: the radius is employed to make the circular local binary pattern and represents the radius round the central pixel. it's usually set to 1. • Neighbours: the quantity of sample points to make the circular local binary pattern. confine mind: the more sample points you include, the upper the computational cost. It is usually set to eight. • Grid X: the amount of cells within the horizontal direction. the extra cells, the finer the grid, the higher the dimensionality of the resulting feature vector. it's usually set to eight. Grid Y: the quantity of cells within the vertical direction. The more cells, the finer the grid, the upper the dimensionality of the resulting feature vector.

Training the Algorithm: First, we'd like to coach the algorithm. To do so, we'd like to use a dataset with the facial images of the people we wish to acknowledge. we want to also set an ID (it is also variety or the name of the person) for every image, so the algorithm will use this information to acknowledge an input image and provides you an output. Images of the identical person must have the same ID.

Applying the LBP operation: the primary computational step of the LBPH is to make an intermediate image that describes the original image in an exceedingly better way, by highlighting the facial characteristics. To do so, the algorithm uses an idea of a sliding window, supported the parameter's radius and neighbours.

Extracting the Histograms: Now, using the image generated within the last step, we are able to use the Grid X and Grid Y parameters to divide the image into multiple grids. Performing the face recognition: during this step, the algorithm is already trained. Each histogram created is employed to represent each image from the training dataset. So, given an input image, we perform the steps again for this new image and build a histogram which represents the image.

So, to seek out the image that matches the input image we just must compare two histograms and return the image with the closest histogram. we are able to use various approaches to match the histograms (calculate the space between two histograms), for example: Euclidean distance, chi-square, definite quantity, etc. during this example, we are able to use the Euclidean distance (which is sort of known) supported the subsequent formula:

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

So the algorithm output is that the ID from the image with the closest histogram. The algorithm should also return the calculated distance, which may be used as a 'confidence' measurement. we are able to then use a threshold and also the 'confidence' to automatically estimate if the algorithm has correctly recognized the image. we are able to assume that the algorithm has successfully recognized if the confidence is below the brink defined.

CONCLUSION

This system helps to avoid the fail proof of attendance system and this method works because the substitute for the all existingsystems i.e. oftenness Identification and every one other bio-metric systems. It saves the time and energy within the aspect of taking attendance. Automated Attendance Systems supported face recognition techniques thus proved to be time saving and secured. This system may be accustomed identify an unknown person whether he's associated with the organization or not.

FUTURESCOPE

Further extensions will be made, to realize the 000-time detection of specific student within the surveillance premises. Instead of taking images, we will also work with recorded videos. But a while period is maintained to record the photographs, because if

continuous recording is completed then load on database increases. the long run work is to enhance the popularity rate of algorithms when there are unintentional changes during a person like tonsuring head, using scarf and beard. The system developed only recognizes set about to 30 degrees angle variations which has got to be improved further. Gait recognition may be fused with face recognition systems so as to realize better performance of the system.

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