

Automated Virtual Attendance Using Image Recognition Techniques

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Abstract - Attendance being a very important thing nowadays administration normally becomes a good laborious and redundant activity, even pushing itself to correctness. The old and evergreen approach of making roll calls proves itself present or not or be a statute of many limitations and very difficult to call names and maintain the records especially when the ratio of students to faculty is not good. Every organisation has its way of taking availability of students for the attendance of students to confirm highest accuracy and highest precision. Some organisations use a document based approach and others have implemented many digital methods such as biometric fingerprinting techniques, face identification techniques, card swapping techniques, etc.

However, these methods have many issues like students wasting time during attendance of subjects and going to the waiting queue. There are many situations in which people waste time and other issues created when any person loses their ID. Then he will not be able to mark his attendance, even though he is physically present.

Keywords:- Face Recognition, Face Detection, Image Capture, KNN, SVM.

Introduction

1.Objectives-The methodology proposed is designed to apply the features of current face detection algorithms.As the time is passing and research is going on there has been a lot of changes in face recognition algorithms and the other steps that are involved are face detection,feature extraction. Firstly,we need to capture the image for recognition and for that we will use multiple cameras to cover the entire area.The input for the system will be the images that were captured by the camera that we installed .Due to the movement of the students or due to defect in the lens of the camera the quality of the image can be compromised . In order to obtain better efficiency, images can be upgraded using Generative Adversarial Networks.For the face detection first we will

enhance the quality of image and refine it then we pass it to the system.Face recognition is done with the help of face detection and feature extraction. Feature extraction uses the Gabor filters. Face recognition is done using the KNN algorithm, Convolutional neural networks, and SVM algorithm.After the face recognition the system will produce the ID of the students present in the image using the database.so with the help of that Id the attendance will be marked for that particular lecture .

Scope

Every classroom has a huge number of attendees or students nowadays, which in turn makes the routine attendance a laborious and tedious task. The application of this technology and product will result in comparatively lesser time taken and human efforts involved.

This will also ensure the safe storage of an organisation's data as it intends to store the new entry made in a relational database, and they don't have any third party controlling their data.

With this, they can customise their search filters or security methods as the project is being built from scratch and nothing is prebuilt. The organisation or administration is given maximum authority over the database and deciding which predefined factors will allow or deny an individual's attendance.

Motivation

The process of automated attendance is generally implemented with the application of various biometrics tools and methods.Face recognition can improve the system of automated attendance system. It is the most productive way of taking attendance due to its

property of being less time-consuming and involvement of third-party. A lot of research is going on to improve the face recognition algorithms.

As the mobile phone technology is improving and the security level of the fields are also growing, there is a rapid growth in this arena. It is a method of labelling a known face. As humans remember the face of the known people so we are trying to make the computers to remember the face of the owner and users.

There are lots of applications of face recognition such as surveillance, social media. So that we can connect the known people and we can use surveillance for the security purpose.

Review Of Face Detection

[2] In this review paper major focus is on Generic Object Detection which is basically a technique of locating or pointing out specific instances of image in a large or predefined categories of natural wide variety of images. Given an image, this method of generic object detection searches for occurrences or specimens of images in a vast multitude and presents the detected pixels which match or show similarity to the predefined categories of images. With taking the basic CNN architecture in focus, this paper states that in the process of object detection if the technique opted is black-box regression method then the procedure is called to be Generic Object Detection whereas if the technique is local contrast segmentation then it is salient object detection. It also features various methods involved in Generic Object Detection such as multi scale adoption, multi feature fusion/boosting forest, traditional object detection pipeline, and various other methods evaluating object and image detection that have regression or classification problems in opting a unified approach for all the samples combined.

[3] In this paper, the TensorFlow library is used, which is an open-source library. With the use of TensorFlow, an experiment is conducted on the dataset of images to classify the image as Male or Female, based on their body features

extracted. Using lots of training data and a good learning model is considered for finding good CAD problem solutions. Use of transfer learning is applicable for good accuracy and good efficiency of the image classification. In this paper, the Haar Cascade algorithm is used for detecting faces, and the advantage of this is the algorithm that improves the model accuracy by 91.69% and is able to detect faces up to 15 degrees with a maximum distance of 200 cm using a camera.

[4] This paper initially states the classical and traditional methodologies and techniques developed and subsequently discusses the relation between and difference between the old ways and the deep learning ways in object detection. This clarifies the ideas of model designing and the limitations of deep learning ways. It gives the idea of a common object detection model which is based on deep learning. This paper checks more challenges of object detection which is based on deep learning, and gives some solutions for reference. This is the innovation of deep learning theories and computer hardware upgradation, the performance of object detection by using deep learning will be very fast and accurate. Spatially, the development of application of current system in deep learning will promise prospect for object detection which is based on deep learning.

[10] In face biometric two main different representations are Grey level intensity and Gabor feature (fusion problem in face recognition). In these methods face image pixel coordinates to high dimension and classification carried out in low dimension. It helps to reduce false accept rate but additional cost of sensors. Gray-level intensity used for detecting eyes and other features and we scale the image to 64 pixels. Use (Principal Components Analysis) PCA, (Linear Discriminant Analysis) LDA PCA used for grey level intensity and reduce the dimension of original face LDA used for classifying the data in required manner to create the classes in the

database. FERET face database is used to train the images dataset.

[11]According to this paper, as the e-learning platforms are increasing, the need for the online student authentication is also increasing so they are creating a model that can authenticate the student so basically they are only recognizing one face at a time.They are considering the face contour and the adaboost algo with convolutional neural network for the real time face detection and recognition.We will be using the PCA and eigenface for the feature extraction and matching the faces.With the help of these algorithms they have improved their accuracy to 98% but as our project we have to detect multiple faces in one go so we have to modify some of the algo and we have used a multiple camera system for capturing the images.we can also go with the template matching algo according to this paper but this will only work for the static face.If the noise goes high or the resolution goes down then we can also consider the geometric algo for the result and accuracy.

[12]The combination of the viola jones algorithm and PCA is a fast algorithm and gives the high accuracy of the result.The drawbacks of these algorithms are that they have high computation time with the data increase and high dimensions . Viola Jones Algorithm is a fast face detection technique, but it has some false positive values for images with occluded faces, so future work is to try to reduce the false positives. Future work is also to increase the accuracy of face detection and recognition.

[13]According to this paper we will consider video in place of the image and video surveillance are used in day to day life. We can see them around us daily like in marketplaces , colleges, hospitals etc.We are also thinking of this approach as our future scope so that we can also expand to this level.We will be using the Gabor feature and eigenface for the face feature extraction and matching the results.PCA will help the eigenface for the face recognition and

feature extraction from the image and that will make our process too fast and computation time will be low and energy consumption will be low. In this paper, the Haar Cascade algorithm is used for detecting faces, and the advantage of this is the algorithm that improves the model accuracy by 91.69% and is able to detect faces up to 15 degrees with a maximum distance of 200 cm using a camera.

Review Of Face Recognition

[1]Here they implemented the convolution neural network (Deep learning algorithm) to analyse, categorise food images. A Convolutional Neural Network (CNN) is a Deep Learning algorithm which requires input in the form of a visual, i.e., image or picture and processes the input to assign priorities and rank accordingly (based on learnable weights and biases) to various aspects or elements in the image(input feeded) and be able to differentiate among other samples.the future scope targets to focus on improving the efficiency and performance by reducing the fissure between training and test set. Here the model constructed divided the considered dataset into three parts namely: training set, validation set (both of these were used during the later development of the model), and evaluation set, i.e., test set.

[5]In order to complete this experiment, a huge amount of data was required so that accurate results can be drawn. Experiment was to detect text and numbers from the registered licence plate. The model requires training data to be derived from the set of characters from the licence plate and manual image capturing of the licence plate. The sample data formed has its limitations due to restrictions of characters obtained from licence plate detection. Therefore in order to enrich the dataset, characters are added to the training sample set through manual addition This review paper highlights the importance of machine learning

and its application in the arena of image recognition and object identification. In order to authenticate the conclusions and results various established algorithms and techniques such as licence plate recognition, pattern detection were researched and their inferences were considered.

[8] Apart from PCA, many other algorithms are available like cascade classifiers and FFW. But in this paper, the author is using PCA only with the use of the Eigenface approach. Biometric technology is a combination of many other recognition technologies for example hand geometry, fingerprint, etc. The cascade classified method detects human faces very fast and in a good way. For the recognition process light and angle factors are very influential at the beginning. The Eigenface approach is very efficient for the recognition of the Human face. Eigenvalues and Eigenvectors are being used for the reconstruction of faces which produces good images. If the images are clear and are not blurred then these images will be good in the recognition process.

[9] Face recognition depends upon Misalignment, Pose variation, Illumination variation, Expression. By using Deep learning we are able to apply Multi-Layer Perceptron means extra linear layer added in the network. Deep learning is a complex function that applies a self hidden layer for accurate answer. We use 2 main libraries that are OpenCV and Matlab. But OpenCV is much faster than Matlab approx 30 times faster but matlab environment is more simple and user friendly that provides various functions and algos and no memory allocation and leakage issues. OpenCV is much faster, efficient, and uses less resources. Tensorflow is a very important library that is used to classify the input data according to their database. Camera->video/image->CNN Classifier->Comparison->Recognition. The classifier trained the recognition.

Accuracy = $\frac{(TN+TP)}{Total} * 100\%$. Distance less than 60CM. Lighting Condition. Accuracy

of face recognition based on image/video. Real time image resolution is better than a real time video. Apply CNN. By real time video accuracy achieved 86.7% and by image 91.7%.

[15] If face detection used as a biometrics in this research we read about different approaches to face detection and implement it on MATLAB software in the same keywords like Face Detection, Face Recognition, Biometrics, Face Identification. It has two main tasks: verification and identification. It means 1:N problem comparing face image from all database images depends upon light condition and angle of view. The three main approaches of face recognition: Feature based approach (nose, eyes etc.), Holistic approach (complete face as an input), Hybrid approach (Combination of above approach). To detect face grey-scale intensity distribution is needed. The clear divisions of the bright intensity invariant area by the dark intensity invariant regions. It is divided into two strategies: a) Face recognition using geometrical features (face vectors, pixel intensity), b) Face recognition using template matching (work like face or non-face, matrix of pixels compare with stored images. Automated Virtual Attendance Using Image Recognition Techniques. According to this paper we will take the grey scale measure and for every part of the face there will be different results like for the forehead and nose it will be bright and high intensity. We will use both the template and geometrical for better results and accuracy because they both combined will take care of direct match and features match geometrical will take care when noise is too high in the image and template will direct match it.

[6] The aim of the paper is to recognize a robust and reliable face detection system. Face Recognition has many real-world applications for example in user authentication for access control and improving surveillance systems. The Purpose of this paper is to develop a new FIQ (face image quality) assessment whose objective is to realise this in the next generation

of facial recognition systems. Varying illumination, misalignment and blurriness are some of the major factors degrading Face recognition performances between test and training images. A new FIQ assessor has been introduced in this paper which is flexible and efficient to the recognition system with the condition of the test face image.

Multiple face detection

[7]The major problem in face recognition comes in the accuracy and in the long process of the final result. If there is only one person then, in that case, the system will have no problem, but when it comes to recognizing more than one person, it becomes tough for the system. In this paper, the author presents a hybrid method of Haar Cascades and EigenFace to detect multiple faces. It uses the Methodology which includes three steps. First is preprocessing then comes feature extraction and the final step is the recognition process. In this paper, the Haar Cascade algorithm is used for detecting faces, and the advantage of this is Overview Diagram:

the algorithm that improves the model accuracy by 91.69% and is able to detect faces up to 15 degrees with a maximum distance of 200 cm using a camera.

Proposed Idea

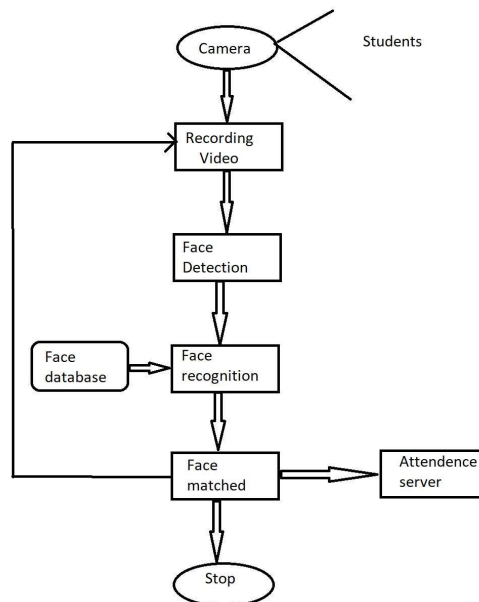
We are trying to build a model that can take the attendance of students sitting in an auditorium.

So for the implementation we will use some machine learning algorithms like Haar Cascades and EigenFace to detect multiple faces.

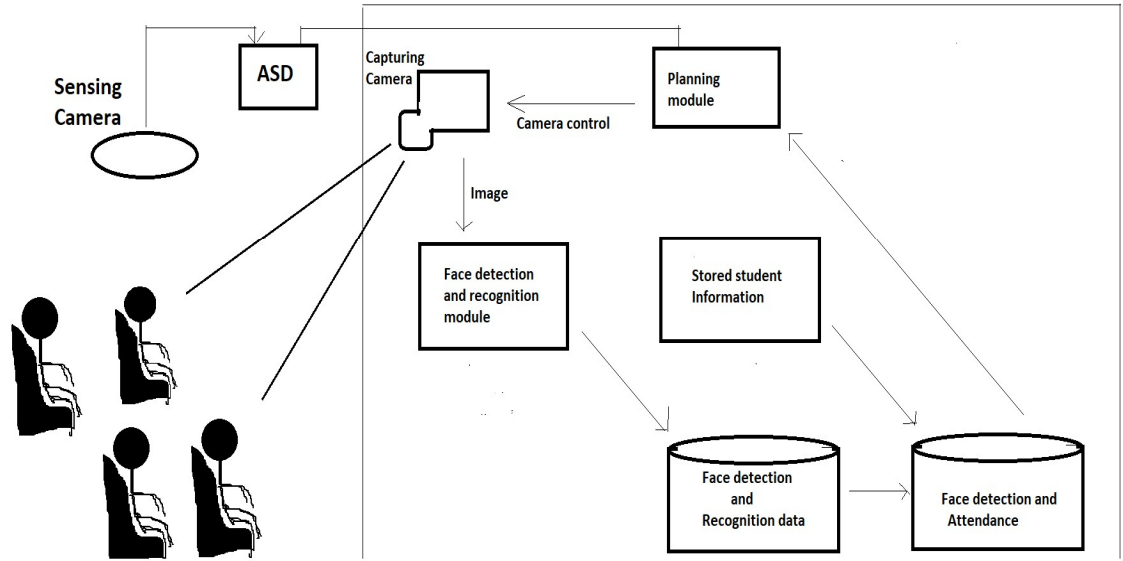
We will use a database of attendance and for that we will use a non-structural database management system like Mongo-DB.

For the development of the front end of the application we will be using React.js.

For the improvement of the accuracy of the model we will provide the training data set to the model of all students. We will click photos of every student and capture the features using the PCA algorithm.



Architectural Design



Conclusion

The thorough research conducted displays the time, hardware deployed and human effort involved can be conserved if automation is done efficiently. Research performed on different open-source search platforms for analysing various algorithms and pre-defined techniques provides us with necessary insights required for subsequently deciding the final documentation and procedure. We scrutinised

various research papers, journal papers and articles to come across image processing, face recognition and feature extraction techniques and algorithms such as Support Vector Machine, HaaR Cascade algorithm, Linear Discriminant Analysis, Principal Component Analysis.