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College Attendance System Using Face Recognition

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COLLEGE ATTENDANCE SYSTEM USING FACE RECOGNITION

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Abstract— ***We know how much time we waste in talking student's attendance manually, so for that we have to have an efficient system to manage our time. In our system we will install a camera in front of the classroom which will detect the faces and capture the image of the student face and then match with the faces present in the database and mark the present student as present. The whole world is suffering from Covid-19 and it is high time we must give heed to social distancing. Having a safe distance with others has become a necessity nowadays. Times like this can be problematic if you have a manual attendance system, also keep you at a safe distance from them as you can work remotely and still see who all are coming and going. However, usual methods of going to university can present a variety of problems. Offices or workplaces or even just public places where the entry and exit times of employees or a person are strictly noted down will have a ready-made automated system to record the entry and exit time of each person for a given time. It won't even need the person to stop and click a photo, the software's are advanced enough to record the data from a continuous reel and also Cost-effective. This paper will introduce an automatic system where the attendance of the student is marked as present by his/her presence in the class with the help of the face detection and face recognition in the database.***

Keywords— Face detection, haar Classifier, Face Recognition

I. INTRODUCTION

Attendance at a university course plays a very important part for the knowledge purpose. Usually, attendance is marked by calling out the name or the roll no if the student is present then he/she will be marked as Present or otherwise marked as absent. But along this method there are problems involved in it. Students signing a signature of a close friend of theirs also takes a long time. To address these issues, we have come across a more efficient way to deal with such situations. With the help of this paper we will try to explain the project which will automatically take the record of the student present in the class and mark them present and other Students as absent. And all these details will be stored in the database of the university. We will be using Face detection and face recognition techniques to make this whole process automatic. Biometrics system suggestions basically include an application that the teacher will use during the lecture. This will eventually disrupt the classroom if the teacher allows late students to enter the classroom so as by using biometrics, it will take longer as students need to form a line to use the device. Face recognition systems are one of the best ways to solve this problem. Using facial detection, there will be no loss of knowledge as the attendance will be taken while the students studying in the class are unnoticed and will not be disturb and will be able to learn more without any interruption information provided by the teacher. As the attendance will be automatically generated so one has not to maintain a record of every lecture taken by the student. The information generated for this report will be correct and no error will be made. This will also cut out the chance of redundancy and the opportunities for students to copy papers have been eliminated. Using the traditional method, teachers are human and they can make errors while taking attendance and when this happens, the data may be affected when reporting.

The word attendance means "the act of being in a place" as for the students it is important to attend the class and make sure to present at the time of attendance taking place otherwise he/she will be missing their name and there will be confusion as mark absent. As commonly, attendance 1 takes place on a paper which is circulated by the teacher where students have to write their details and sign. Also this method saves a little time for the teacher but the student gets distracted for the lecture or they can miss to write their name on the page. Also there is another method where 23 teachers call student's names and they have to respond aloud to mark their name on the register. Both of these methods are very old now and take a long time to get complete. It is time consuming, especially when students need to respond to their teacher's call. Attendance documents can be very difficult to maintain and if lost there will be a lot of problems. Using the traditional method, teachers are human and they can make errors while taking attendance and when this happens, the data may be affected when reporting.

For image processing photos can be taken from various sources. Some of the examples are internet satellites, air

crafts or cameras and other sensor devices. The images taken from any of these sources are known as Raw Images. To enhance these images we use Image Processing. In Image Processing we produce the features or parameters as per the image input as its output this is the whole process. Image Processing includes many fields and areas. These areas and fields do textile, remote sensing, and medical thinking. Basically it's a three step process. The first step is to import the digital photography or optical scanner. The next step we have to analyze and manipulate the image and the final step is to the results. We have two types of image processing. The first type is analog image, Analog image editing is when the image is altered through an electric medium and processing and he television image, which adjusts the size and height of the video signal, darkening and a change in the brightness of the displayed image the and other is digital image processing, unlike an analog signal, a digital image is processed in a two-dimensional image using a digital computer and the limited number of bits that actually is a real number array represents a digital image.

II. LITERATURE REVIEW

Face detection is a computer technology that determines the location and size of a human face in an arbitrary (digital) image. The facial features are detected and any other objects like trees, buildings and bodies etc. are ignored from the digital image. It can be regarded as a specific 'case of object-class detection, where the task is finding the location and sizes of all objects in an image that belong to a given class. Face detection, can be regarded as a more general 'case of face localization. In face localization, the task is to find the locations and sizes of a known number of faces (usually one). Basically, there are two types of approaches to detect facial parts in the given image i.e. feature base and image base approach. Feature based approach tries to extract features of the image and match it against the knowledge of the face features. The image base approach tries to get the best match between training and testing image.

III. PROBLEM FORMULATION

Face recognition technology a general statement of face recognition problem can be formulated as follows. Given still or video images of a scene, identify or verify one or more persons in the scene using a stored database of faces Available collateral information such as race, age, gender. facial expression and speech may be used in narrowing the search (enhancing recognition). The solution of the problem involves segmentation of faces (face detection) from cluttered scenes, feature extraction from the face region. recognition or verification In identification problems, the input to the system is an unknown face, and the system reports back the decided identity from a database of known individuals, whereas in verification problems. the system needs to conform or reject the claimed identity of the input face Various applications of FRT range from static, controlled format photographs to uncontrolled video images, posing a wide range of different technical challenges and requiring an equally wide range of techniques from image processing understanding and pattern recognition One can broadly classify the challenges and techniques into two groups, static and dynamic/video matching Even among these groups, significant differences exist, depending on the specific application. The differences are in terms of image quality, amount of background clutter (posing challenges to segmentation algorithms). the availability of a well-defined matching criterion, and the nature, type and amount of input from a user A rich repository of research literature exists after 35 years of research Particularly the last five-year experiences the most active research activities and rapid advances for a up to date critical survey of still and video-based face recognition Research.

IV. METHODOLGY

FEATURE BASED APPROACH

Active Shape Model Active shape models focus on complex non rigid features like actual physical and higher-level appearance of features Means that Active Shape Models (ASMs) are aimed at automatically locating landmark points that define the shape of any statistically modelled Department of ECE Page 5 object in an image. When facial features such as the eyes, lips, nose, mouth and eyebrows. The training stage of an ASM involves the building of a statistical facial model from a training set containing images with manually annotated landmarks. ASMs is classified into three groups i.e. snake, PDM, Deformable templates Snakes: The first type uses a generic active contour called snakes, first introduced by Kass et al. in 1987 Snakes are used to identify head boundaries [8,9,10,11,12]. In order to achieve the task, a snake is first initialized at the proximity around a head boundary. It then locks onto nearby edges and subsequently assumes the shape of the head. The evolution of a snake is achieved by minimizing an energy function, Esnake (analogy with physical systems), denoted as Esnake = Einternal + EExternal Where internal and EExternal are internal and external energy functions. Internal energy is the part that depends on the intrinsic properties of the snake and defines its natural evolution.

LOW LEVEL ANALYSIS

Based on low level visual features like color, intensity, edges, motion etc. Skin Color Base Color is avital feature of human faces. Using skin-color as a feature for tracking a face has several advantages. Color processing is much faster than processing other facial features. Under certain lighting conditions, 3 color is orientation invariant. This property makes motion estimation much easier because only a translation model is needed for motion estimation. Tracking human faces using color as a feature has several problems like the color representation of a face obtained by a camera is influenced by many factors (ambient light, object movement, etc.). In the implementation of the algorithms there are three main steps viz.

(1) Classify the skin region in the color space,

(2) Apply threshold to mask the skin region and

(3) Draw bounding box to extract the face.

MOTION BASE

When use of video sequence is available, motion information can be used to locate moving objects. Moving Silhouettes like face and body parts can be extracted by simply thresholding accumulated frame differences. This system utilizes hierarchical Face location consisting of three levels. Higher two levels based on mosaic images at different resolutions. In the lower level, an edge detection method is proposed. Moreover this algorithm gives a fine response in a complex background. Edge Base: Face detection based on edges was introduced by Sakai et al. This work was based on analyzing line drawings of the faces from photographs, aiming to locate facial features. Then later Craw et al. Proposed a hierarchical framework based on Sakai et al. work to trace a human head outline. Then remarkable works were carried out by many researchers in this specific area. Method suggested by Anila and Devarajan was very simple and fast. They proposed framework which consist three steps i.e. Initially the images are enhanced by applying a median filter for noise removal and histogram equalization for contrast adjustment. In the second step the edge image is constructed from the enhanced image by applying a sobel operator. Then a novel edge tracking algorithm is applied to extract the sub windows from the enhanced image based on edges.

CONSTELLATION METHOD

All methods discussed so far are able to track faces but still some issues like locating faces of various poses in complex backgrounds is truly difficult. To reduce this difficulty investigators form a group of facial features in face-like constellations using more robust modelling approaches such as statistical analysis. Various types of face constellations have been proposed by Burl et al. . They establish use of statistical shape theory on the features detected from a multiscale Gaussian derivative filter. Huang et al. also apply a Gaussian filter for pre-processing in a framework based on image feature analysis. Image Base Approach.

NEURAL NETWORK

Neural networks gaining much more attention in many pattern recognition problems, such as OCR, object recognition, and autonomous robot driving. Since face detection can be treated as a two-class pattern recognition problem, various neural network algorithms have been proposed. The advantage of using neural networks for face detection is the feasibility of training a system to capture the complex class conditional density of face patterns. However, one demerit is that the network architecture has to be extensively tuned (number of layers, number of nodes, learning rates, etc.) to get exceptional performance. In the early days most hierarchical neural networks was proposed by Agui et al. The first stage has two parallel subnetworks in which the inputs are filtered intensity values from an original. The inputs to the second stage network consist of the outputs from the sub networks and extracted feature values. An output at the second stage shows the presence of a face in the input region.

LINEAR SUBSPACE METHOD

Eigenfaces Method: An early example of employing eigenvectors in face recognition was done by Kohonen in which a simple neural network is demonstrated to perform face recognition for aligned and normalized face images. Kirby and Sirovich suggested that faces can be linearly encoded using a modest number of basis images. The idea was arguably proposed by Pearson in 1901 and then by HOTELLING in 1933. Given a collection of n by m pixel training. Images represented as a vector of size m X n, basis vectors spanning an optimal subspace are determined such that the mean square error between the projection of the training images onto this subspace and the original Images is minimized. They call the set of optimal basis vectors Eigen pictures since these are simply the eigenvectors of the covariance matrix computed from the vectorized face images in the training set.

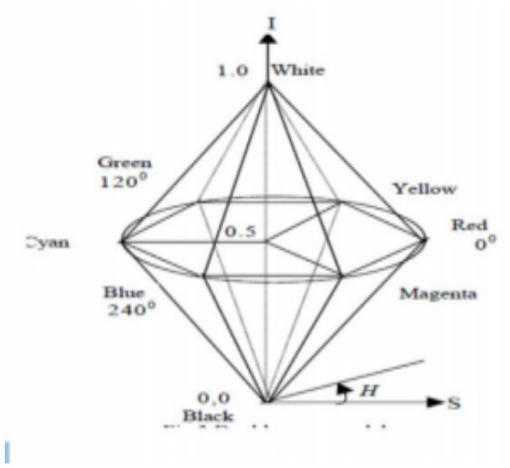

Fig.2. LINEAR SUBSPACE

STATISTICAL APPROACH

Support Vector Machine (SVM): SVMs were first introduced by Osuna et al. for face detection. SVMs work as a new paradigm to train polynomial function, neural networks, or radial basis function (RBF) classifiers. SVMs work on an induction principle, called structural risk minimization, which targets to minimize an upper bound on the expected generalization error. An SVM classifier is a linear classifier where the separating hyperplane is chosen to minimize the expected classification error of the unseen test patterns. In Osuna Et al. developed an efficient method to train an SVM for large scale problems, and applied it to face detection. Based on two test sets of 10,000,000 test patterns of 19 X 19 pixels, their system has slightly lower error rates and runs

approximately 30 times faster than the system by Sung and Poggio.

V. ADVANTAGES OF FACE RECOGNITION BASED ATTENDANCE SYSTEM

1. Automated time tracking system
   Offices or workplaces or even just public places where the entry and exit times of employees or a person are strictly noted down will have a ready-made automated system to record the entry and exit time of each person for a given time. It won't even need the person to stop and click a photo, the software's are advanced enough to record the data from a continuous reel also.

2. Cost-effective
   Since the whole process will be done by a computer, it means the total attendance registration and calculation will be automated and done by the system itself, therefore, saving us the money which would have been otherwise spent on the labor cost to do that.

3. Increased security
   Face recognition-based attendance systems won't just calculate attendance but also note down the entry and exits of visitors in the place. At times when there is a situation where the identity and time of entry and exit of a specific person need to be noted, this system would become handy as it will easily show you when he/she came in and what the places he/she went to at a very precise level.

4. Time saving
   The whole world is suffering from COVID-19 and it is high time we must give heed to social distancing. Having a safe distance with others has become a necessity nowadays. Times like this can be problematic if you have manual attendance system, also keep you at a safe distance from them as you can work remotely and still see who all are coming and going.

5. Easy to manage
   Since the artificial intelligence-based attendance system is fully automated, managing the records and keeping a track of day to day activities will become easier.

VI. ARCHITECTURE DIAGRAM FOR FACIAL RECOGNITION ATTENDANCE SYSTEM

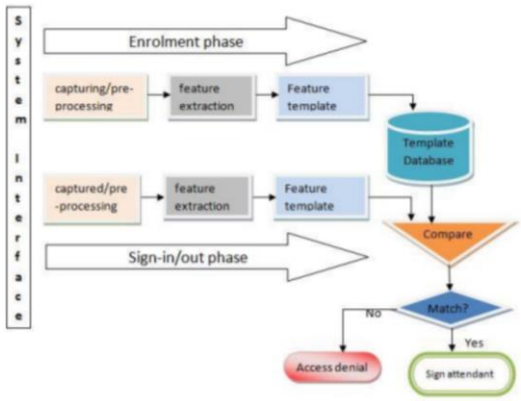

Fig.3. Architecture Diagram for Facial Recognition

VII. ATTENDANCE DATABASE

After doing all the checks and clearing all the phases, students will be marked as present as the student id will be saved along with the date. Our objective in developing this system is to present an automatic type to mark attendance using face detection and recognition techniques which would reduce the time taken and also make the attendance system of schools and universities very efficient rather than using that old black and white process.

S. No	Name of the Student	Present/Absent
1	Naman Kumar	Present
2	Akash Vishwakarma	Present
3	Prakhar Chaubey	Absent
4	Sagar Gupta	Present
5	Aman Saxena	Present

VIII.RESULT

As the project is an easy task, all already identified students will be marked according to their attendance which will be presented. After reviewing the program, the project finds that under a controlled environment, the project shows promising results. Some of the regulated areas include:

- In the background. For facial recognition to be effective, the background needs to be structured. It's hard to see the face behind the change.
- Proper Light also plays an important role in facial recognition. A well-lit area gives more exact results.
- Any change on the face. Other changes in the facial area can lead to inconsistencies in the student's facial recognition process.

For example, people with a novel and spectacle are difficult to identify if they are not wearing it.

Therefore, in order to improve we have to pay attention and to address these issues because it will increase the accuracy of the system.

IX. CONCLUSION

There we came across an automatic system that will help the students and teachers in the process of attendance talking and makes it much more efficient, less time consuming and more accurate. This project has already acquired all the features that will make this project reliable and usable to take on student visits. Using this system, the person will not waste their class time or lose attention as compared to the old method. The program also assists the management team by automatically saving student mobility. Also we have to give proper attention to be corrected. For example some of them are background light which should be good in order to recognize problems like changes in the student's face as well as natural lighting where they should have enough light to be seen to work. We hope that this study will satisfy the expectations of the automated system in a participatory process as we know our old method of taking attendance has many flaws which need to be corrected. After a face test, the results showed that the program was well-functioning and had a high level of recognition.

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