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MULTIPLE FACE DETECTIONATTENDANCE SYSTEM USING MACHINE LEARNING

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Abstract:

This paper is about the biometric attendance management. The automatic attendance management will replace the manual method, which takes a lot of time consuming and difficult to maintain. There are many biometric processes, in that face recognition is the best method. In this paper we are going to describe the attendance without human interference. In this method the camera is fixed in the classroom and it will capture the image, the faces are detected and then it is recognized with the database and finally the attendance is marked. There are various methods for comparing the faces. We are using NN methods for finding similarpatches in images, we can exploit various properties of images to develop veryefficient implementations of Ball Tree algorithm.

Keywords: *-Face Detection, Face Recognition, Ball Tree.*

1. INTRODUCTION

Image Processing is a type of processing a signal for which the requirements are photograph, an image. There are two types of Image processing Analog and digital processing. Analogue image processing is an image processing technique which can be used for hard copies such as photographs and Printouts. Now a days Student or attendance plays a significant role in many college, universities and schools. Automated attendance system will excerpt the image when person comes in the classroom and will accordingly mark the attendance. On the other hand, manual attendance system will verify and manage each and every record of student in paper which requires more time and effort of the faculty or staff and also chances of proxies are also more in manual attendance [1] [2]. This system will be efficient and more user friendly as it can be run on devices which everyone has now a day. This study is the first attempt to provide an automated attendance system that identifies students using face recognition technology through an image or video stream for recording attendance in any classroom environment or and estimating the efficiency accordingly. Through constantly detecting of facial info, this method will resolve less efficiency of technologies which already exist, and advance the accurateness of recognition of faces [8][6].

We studied and planned a technique or way that mark the presence or attendance using face recognition constructed on non-stop surveillance.

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In this proposed method or paper, our aim and purpose is to gain the images or video of the students face, their position and attendance which are beneficial info in the lecture or classroom environment.

2. RELATED WORK

2.1. Using Principal Component Analysis

NirmalyaKar et al. proposed Student's Attendance System [3] which will integrate with the face recognition technology using Personal Component Analysis (PCA) algorithm. PCA method has been widely used in applications such as face recognition and image compression. PCA is a common technique for finding patterns in data, and expressing the data as eigenvector to highlight the similarities and differences between different data [6]. The following steps summarize the PCA process.

Let D is Training dataset, { D_1, D_2, D_3, …D_m}

$$Avg = {}^{1}/_{m} \sum_{i=1}^{m} D_i$$

Each element in the training data set differs from Avg by the vector Yi=Di-Avg. The covariance matrix Cov is obtained as:

$$Cov = {}^{1}/_{m} \sum_{i=1}^{m} Y_i Y_i^T$$

Choose M' significant eigenvectors of Cov as E_K's, and compute the weight vectors W_{ik}

$$W_{ik} = E_k^T (D_i - Avg), \ \forall i, k$$

2.2 Using LDA

Kamran Etemad and Rama Chellappa [11] the face recognition technology using Most of traditional linear discriminate analysis (LDA)-based methods, by defining all instances of the same person's face as being in one class and the faces of different subjects as being in different classes for all subjects in the training set, we establish a framework for performing a cluster separation analysis in the feature space. Also, having labeled all instances in the training set and having defined all the classes, we compute the within- and between-class scatter matrices as follows:

$$S_w^v = \sum_{i=1}^{L} . Pr(C_i) \sum_{i} \text{i}$$

$$S_b^v = \sum_{i=1}^{L} . Pr(C_i)(\mu - \mu_i)(\mu - \mu_i)^T$$

Here S_w is the within-class scatter matrix showing the average scatter (i of the sample vectors (V) of different classes C_i around their respective mean, vectors μ_i :

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The other biometric method available using RFID [4][5] and eye ball detection. In this method eyeball sensor is used. It senses the blinking rate of eye ball and it also senses the location of iris. In this method first the eye ball or iris of each individual is stored in the database [9]. Usually the eye ball is not same for all persons. It has some difference. The obtained image of eye ball is then compared with the eye ball in the database. If it is same then the attendance is marked. But practically it is not possible. We define some problems in existing methods.

1. Takes lot of time to process the output using existing methods.
2. Capturing the datasets like eyeball is practically not possible.
3. Using hardware manual efforts will be there.

3. OUR SYSTEM

These disadvantages are overcome with the help of automated attendance management which does not consume time and the data is not lost until we erase the data. This method is most efficient in these days. In face detection the face of images are marked with the help of rectangle. The face detected after background subtraction is accurate as compared to the face detected from an image which is not background subtracted. The detected face is then cropped. Finally all the face of individuals are detected and cropped from the image. Each cropped image is taken for the comparison of images in database and finally the attendance is marked. We enhanced this system by using KNN algorithm using Ball Tree.

The first type of metric tree that we will look at is ball trees [3]. In their original form, each node's points are assigned to the closest center of the node's two children. The children are chosen to have maximum distance between them, typically using the following construction at each level of the tree. First, the centroid of the points is located, and the point with the greatest distance from this centroid is chosen as the center of the first child. Then, the second child's center is chosen to be the point farthest from the first one. The resulting division of points can be understood as finding the hyper plane that bisects the line connecting the two centers, and perpendicular to it.

Algorithm 1. K-NN using Ball Tree

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```
function construct_balltree is
    input:
      D, an array of data points
    output:
      B, the root of a constructed ball tree
   if a single point remains then
      create a leaf B containing the single point in D
      return B
   else
      let c be the dimension of greatest spread
      let p be the central point selected considering c
      let L,R be the sets of points lying to the left and right of the median along dimension c
      create B with two children:
        B.pivot = p
        B.child1 = construct_balltree(L),
        B.child2 = construct_balltree(R),
        let B.radius be maximum distance from p among children
      return B
   end if
end function
```

4. IMPLEMENTATION

Face detection

The image after background subtraction is used for face detection. In face detection the face of images are marked with the help of rectangle or circle. The face detected afterBackground subtraction is accurate as compared to the face detected from an image which is not background subtracted

Face recognition

Face recognition is used to identify the detected faces. There are many methods available for face detection. But the eigen value method is the more suitable method. This method is more suitable because of its speed. Hence here we are going to eigen value method to recognize the faces

System Architecture

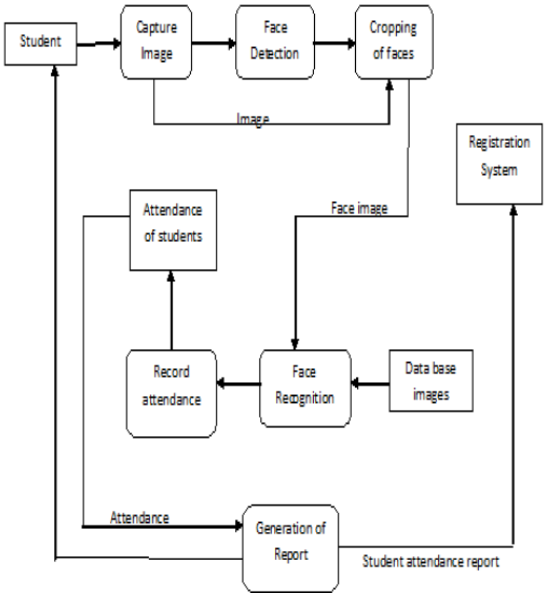

Figure.1 Block Diagram of Proposed System

4.1. Methods Used

face_recognition.load_image_file ():

For loading the image

face_recognition.face_encodings ():

For extract the face features

face_recognition.compare_faces ():

For finding matches faces

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def train(train_dir, model_save_path=None, n_neighbors=None, knn_algo='ball_tree', verbose=False)

Taking algorithm of ball_tree

5. EVALUATION RESULTS

We have implemented the proposed system in Python. We develop our proposed system in Pycharm, it's a desktop application using Python, PyQT5 and Mysql database. We need to create an interface for desktop application inPyQT5. We store required data in Mysql. We Use windows Operating System with i5 processor, 2.20 GHz, and 8 GB Ram.

Evaluation 1:

Comparing our results with our Knn approach with Different Face Orientations and check the results of face detection rate and face recognition Rate. In Table 1 we can see the result analysis of Face Orientations Vs Algorithm results.

Face Orientations	Detection Rate	Recognition Rate
0^0 (Frontal face)	98.7%	95%
18^0	80.0%	78%
54^0	59.2%	58%
72^0	0.00%	0.00%
90^0	0.00%	0.00%

Table 1.Face Orientations Vs Algorithm results.

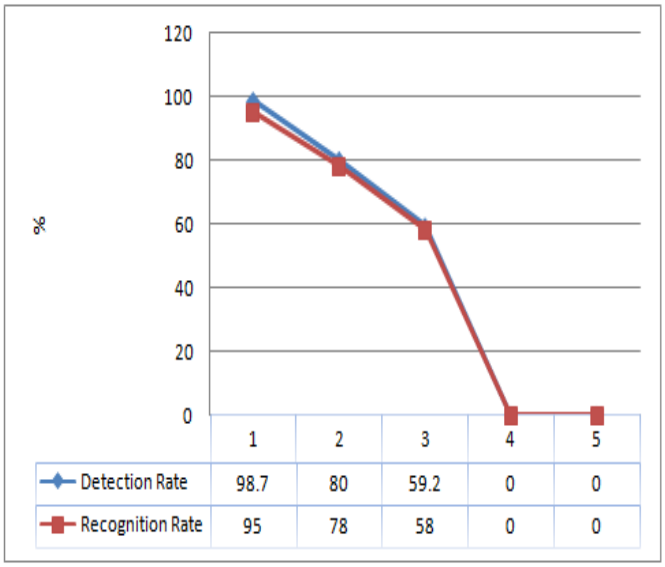

Fig: 2. Face Orientations Vs Results

Evaluation 2:

Comparing our results with our Knn approach with related algorithms with 0^0 Face Orientationsand comparing the results of face detection rate and face recognition Rate. In Table 2 we can see the result analysis of KNN vs LDA vs PCA.

Algorithm	Face Orientations	Detection Rate	Recognition Rate
KNN	0^0 (Frontal face)	98.7%	95%
PCA	0^0 (Frontal face)	85.0%	82%
LDA	0^0 (Frontal	79.0%	74%

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	face)		

Table 2: KNN vs. LDA vs. PCA.

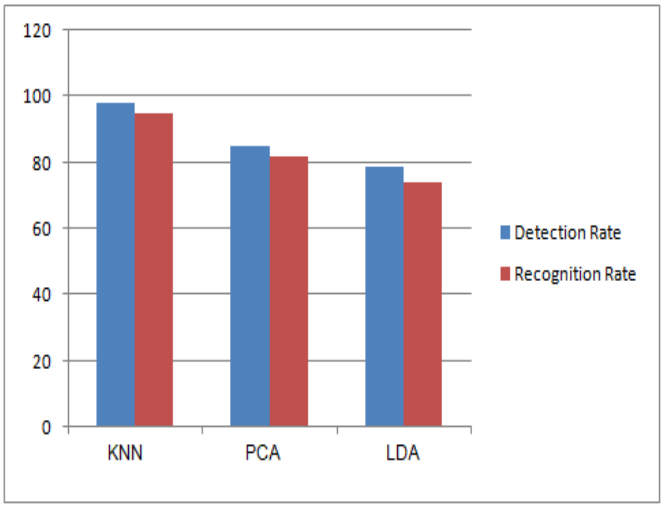

Fig: 3. Algorithm Results

6. EXPERIMENTAL RESULTS

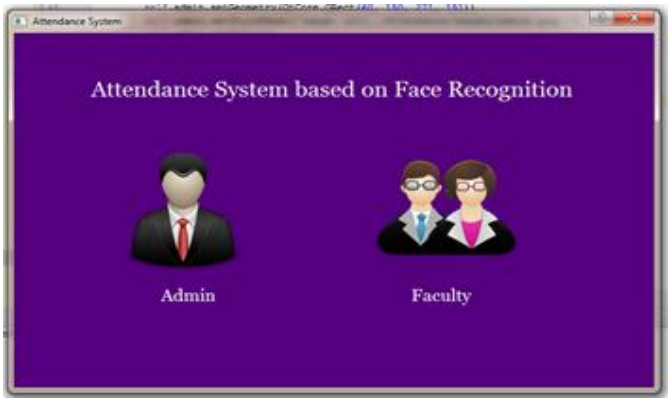

Fig:-4 Main Screen of the Application

Fig:-5Admin options

Fig 6. Results

7. CONCLUSION

This system has been proposed for maintainingthe attendance record. The main motive behinddeveloping this system is to eliminate all thedrawbacks which were associated with manualAttendance system.Using this method we can replace all the old methods. Efficient and automatic attendance management is introduced in paper. This method requires only simple hardware for installation. The management of attendance in

this method is simpler and the attendance is taken more accurately. One difficult task in this system is face recognition. We proposed face recognition using KNN using Ball Tree.

8. REFERENCES

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