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Facial Recognition based Attendance System with LBPH

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Abstract – *In this paper, we will propose a system that takes the attendance of the students for the class. The proposed takes the participation of the student using facial identification technique. This participation is recorded by a high quality camera which is installed as a part of classroom and continuously capturing the images of the students, detects their faces , contrast Distinguished appearances and mark the attendance. This paper first demonstrates the related works in the field of participation and face acknowledgements. This will also represent the structure of system and work flow. Finally the experiments are implemented and it shows the advancement of performance of the system.*

Key Words: **Python, Django, Machine Learning, LBPH, Facial Recognition, Biometrics.**

1. INTRODUCTION

Face recognition is an important application of Image processing owing to its use in many fields. Identification of individuals in an organization for the purpose of attendance is one such application of face recognition. Maintenance and monitoring of attendance records plays a vital role in the analysis of performance of any organization. The purpose of developing attendance management system is to computerize the traditional way of taking attendance. Automated Attendance Management System performs the daily activities of attendance marking and analysis with reduced human intervention. There are many other ways of computerizing the attendance process using other biometric techniques as mentioned below:

1. Signature based System
2. Fingerprint based System
3. Iris Recognition
4. RFID based System
5. Face Recognition

Among all the above techniques the facial recognition technique is unique, efficient, accurate and affordable system. There are many different sub problems in the system which is mentioned step-by-step below.

1. Capture a picture and detect all the faces from it.
2. Focus on a single face and understand it even it turned into the different direction or bad lighting, still it is a same person.
3. Note the unique characteristics of the face which will help to distinguish it from all other images. The Characteristics can be the nose, depth of eyes, dimensions of face, color of skin etc.

The human brain is capable of recognizing the faces very quickly. The computers can also be implemented to recognize the uniqueness of the faces, so we need to program or make the computer to learn that how to differentiate the faces by their unique characters. The Facial recognition can be divided into two categories as mentioned below:

1. Verification
2. Identification

Verification is a method of matching of one on one i.e. match or no match. The method can be used for locking and unlocking systems, mobiles etc.

Identification is a method of identifying a person from a set of people i.e. one on N people.

2. LITERATRE SURVEY

There are many ways to deal with differences between the images and the variations in the environment of the images and these approaches were implemented to detect the objects. These systems may also be used in the systems that detect the characteristics of the face. These methods use gray-level information to extract the face and its characteristics. The main reason of using the gray-scale representation instead of using the colored image is that it simplifies the algorithm, reduces the complexity, implementation time and computational time. The colored image may provide excessive and more information which is unnecessary and it will also increase the computational time and results the low performance of the system. These proposed systems assumed the shape of the objects or illumination conditions. These assumptions were made for the generic object recognitions so there for these are not sufficient for face recognition systems.

The second approach is an Edge map of an image which is useful object representation feature which is irrespective of the environmental changes. This approach may be used for facial recognition and also having similar accuracy as the gray-scale approach. Edge map approach is having an advantage of feature based approach, such as invariance to illumination (i.e. darkness or brightness), low storage structure. It amalgamates the facial information (i.e. dimensions of face) with structural information by grouping

the face Edge map to line segments. After reducing the Edge map, a polygonal line fitting process is applied to generate the Edge map face.

There is another approach of handling the variations of environmental conditions in an image is by creating several models of several images. These images will be captured of a same person but in the different environmental conditions. These conditions may be brightness, color, distance and etc. These images captured may be used as several independent models or may be used as a combined model to recognize the faces. Same kind of approach is used in this system where 30-40 images will be captured of a same student and these images will be captured in all the environmental conditions.

3. PROBLEM DEFINATION

Recognizing faces in computer vision is a challenging problem. The illumination problem, the pose problem, scale variability, low quality image acquisition, partially occluded faces are some examples of the issues to deal with. Thus face recognition algorithms must exhibit robustness to variations in the above parameters. The existing techniques do not perform well in cases of different illumination, background or rotation. Thus there is a need to address the above mentioned disadvantages. The project aims to design and implement a system which is less sensitive to Illumination, is rotation invariant, scale invariant and robust enough to be implemented in practical applications.

4. PROBLEM SOLUTION

The method proposed in this paper is to mark the attendance using facial recognition technology. As shown in figure-1 the system records video feeds from camera and detect the faces in image format. The detected faces will be compared with student database and mark the attendance in the Excel File. Using these Excel sheets we can generate a graph which shows the overall attendance of whole class/Individual student.

The project has two main phases

1. Development of Facial Recognition Technology
2. Development of Attendance System

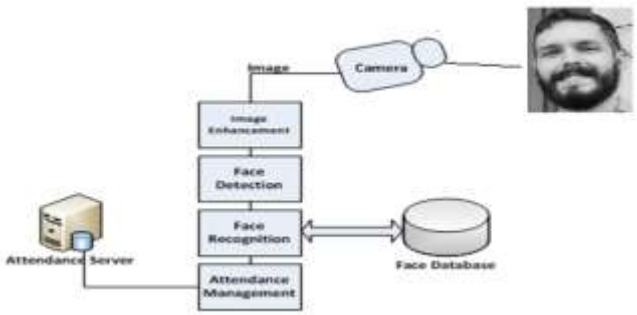

Fig 1

The Facial Recognition Technique can be achieved by using following four image processing steps:

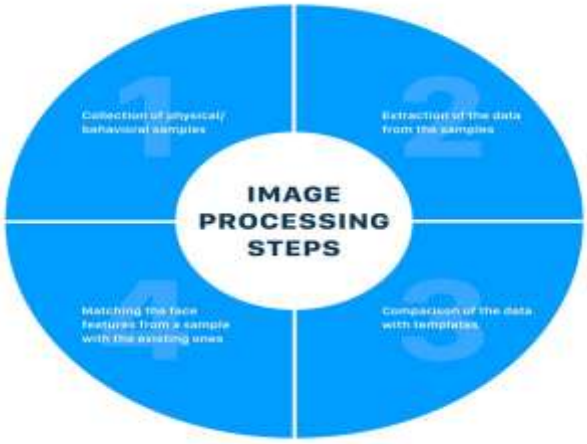

Fig 2

4.1 Collection of Physical/Behavioral Samples

It involves the collection of a sample using the video equipment. This samples that was collected could be an image/footage during the registration/enrollment of the student.

4.2 Extraction of Data from Samples

Unique data is extracted from the sample and a template is created. There are different types of face recognition algorithms such Eigenfaces, Local Binary Pattern Histograms (LBPH), Fisherfaces, Scale Invariant Feature Transform (SIFT), Speed Up Robust Features (SUFR). In this project we are using LBPH Algorithm because it is one of the easier face recognition algorithm and everyone can understand it without any difficulties.

4.2.1 Local Binary Pattern Histogram (LBPH)

It was first described in 1994 (LBP) and has since been found to be a powerful feature for texture classification. It has further been determined that when LBP is combined with histograms of oriented gradients (HOG) descriptor, it improves the detection performance considerably on some datasets. Using the LBP combined with histograms we can represent the face images with a simple data vector. As LBP is a visual descriptor it can also be used for face recognition tasks, as can be seen in the following step-by-step explanation.

1. Parameters: the LBPH uses 4 parameters:

> **Radius**: It is the circular binary pattern that represents the radius around central pixel. That may be 0 or 1.

Neighbors: It is the total number of sample points which is used to build the circular binary pattern. If the number of sample points increases, the computational cost also increases. So it is usually set to 8.

Grid X: It is the total number cells in a horizontal direction. If the number of cells increases the grid will be better, the dimensionality of a resulting vector will also increases. It is also usually set to 8.

Grid Y: It is the total number of cells in a vertical direction. If the number of cells increases the grid will be better, the dimensionality of a resulting vector will also increases. It is also usually set to 8.

2. Training the Algorithm: To train the algorithm we need to get all the facial images of all the students we want to recognize. With that we also need a unique identification number or a name for each image, so that we can use these identification numbers to recognize a new image. All images of the same student should have same identification number.

3. Applying the Algorithm: There are several computational steps of LBPH algorithm to create an intermediate image. The intermediate image will describe the original image in a better format by highlighting several characteristics. To get the characters of face the algorithm uses a concept called sliding window, based on the parameters, radius and neighbors.

The below fig 3 shows this procedure

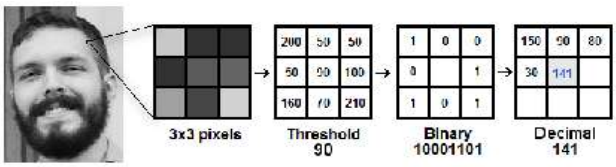

Fig 3

To understand the above image, let's break the procedure into a several steps.

a. Consider we have an image in grayscale.

b. We divide the image into 3x3 pixels to get a part of it.

c. It can also be represented as a 3x3 matrix each pixel containing the intensity that lies between 0-255.

d. The central value will be considered as a threshold value.

e. By considering this threshold value we can set a new binary value for each neighbor. If the neighbor's value is equal or more than the threshold value the will set the binary value to 1 else it will be set to 0.

f. Now the new matrix will be a binary matrix except the threshold value. Now we will concentrate on each binary value by its position in the matrix line by line. For example considering the above image the binary number will be 10001101. It is not necessary to approach line by line. Some authors may use clockwise or anti-clockwise approach but at the end the result will be same.

g. Now we will convert this binary number into a decimal number (i.e. 141 is the decimal value for 10001101). Then we set this decimal value to the central value that is actually a pixel of the image.

h. At the end of this procedure we will have a new image that will define better characteristics of it.

4. Extracting the Histograms: Now using this new image, we can use the parameters Grid X and Grid Y to divide the image into a several grids as it is shown in the below figure Fig 4.

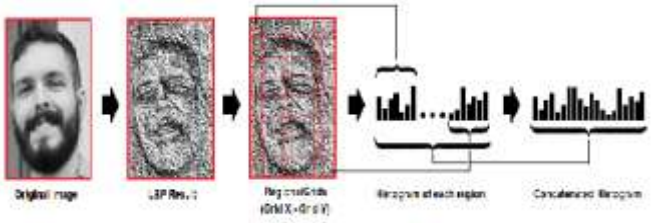

Fig 4

Now we can extract the histogram of each image by following steps.

a. Now each histogram of each grid will contain only 256 positions (i.e. 0-255) that will represent the occurrences of each pixel's intensity.

b. Now we will create a new histogram which will be the bigger histogram. Consider we have 8x8 grids then we will have 8x8x256 i.e. 16,384 positions. This is the final histogram that will represent the characteristics of an original image.

4.3 Comparison of Data from Templates

Now we have created the histogram for each image. Now these histograms are used to represent each image of training dataset. Now we will give a new input image and we will follow the steps again to create a new histogram for this input image.

- Now we will compare this histogram of new image with all the histograms of the dataset images.

- We have many different approaches to compare the histograms (i.e. to compare the difference between two histograms), For example Absolute value, Chi-square value or etc.

4.4 Match the Face Features from samples with the existing ones

Now it implicates making a final decision that whether or not the template corresponds with the entry which is already in the database.

5. EXPERIMENTAL SCREENSHOTS

Fig: Capturing the Images

This system is implemented in a django framework, in this framework we have an authentication process for a faculty. After the authentication process the faculty need to register the new student with the name and the student unique ID. In this registration process the faculty will capture the images of the student as shown in the above figure.

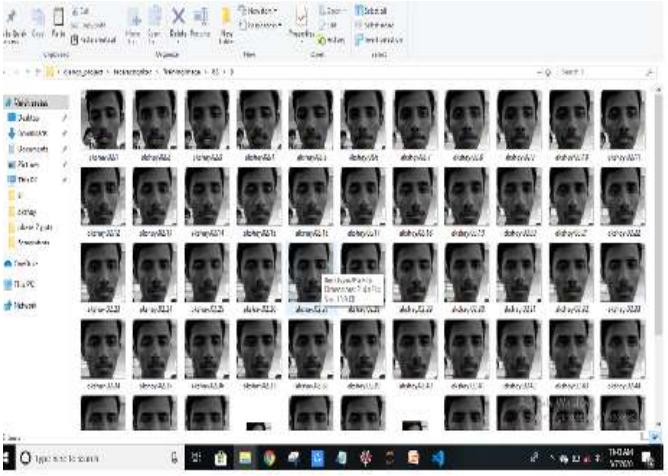

Fig: Captured Images Database

After capturing the images it will be stored in the Training Images folder as shown in the above figure. 35 images will be captured for one student. NOTE: If the number of images increases the processing time will but it will also enhances the accuracy of the system.

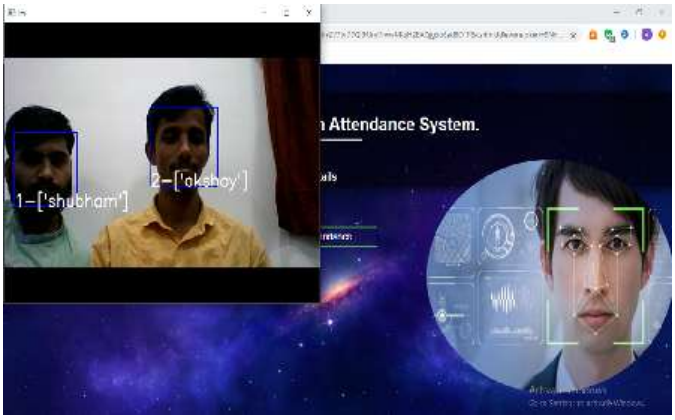

Fig: Detecting Multiple Faces

The system is also having the capability to recognize the multiple faces in a single as shown in the above image.

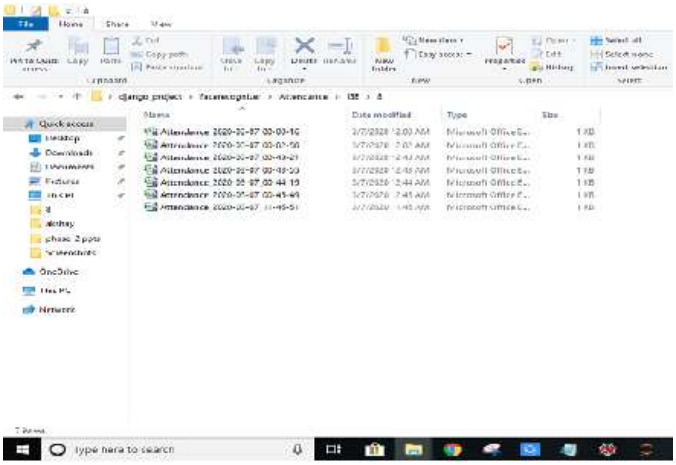

Fig: Excel Sheet of Attendance

After recognizing the faces it will generate an Excel file each time recording the faces as shown in the above image.

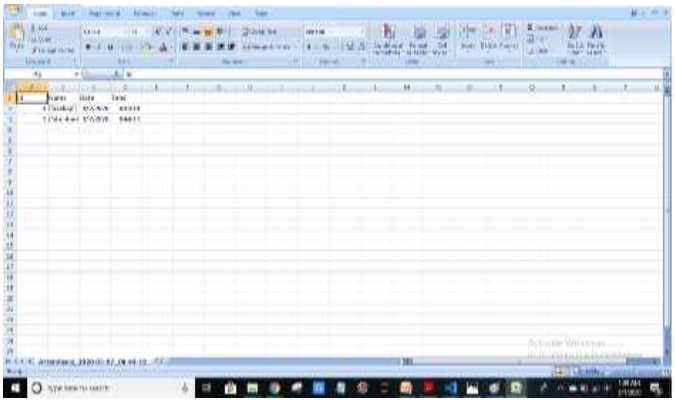

Fig: Attendance List

As additional information the system will also note the date and time of attendance. This additional information is used for future references.

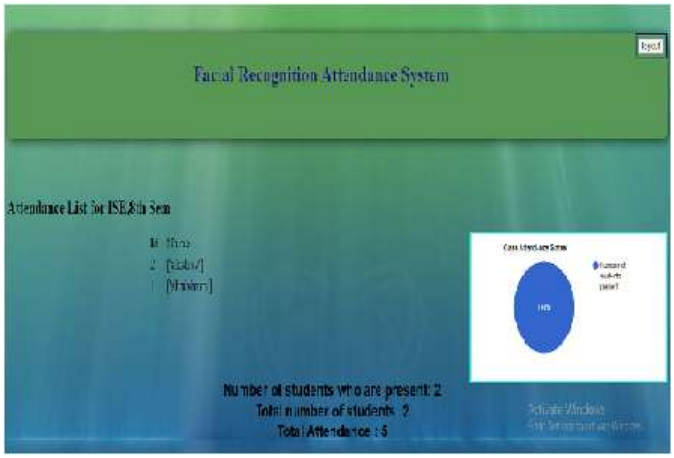

Fig: Overall report of the attendance

And at the end we will generate the report of the class the in a graphical representation as shown in the above image. This graph shown that how many students and present and how many are absent for class. We can also generate the individual student's report.

6. CONCLUSION

The purpose of implementing this system is to reduce the man power and to increase the class duration. This system is shows the better usage of the algorithm and exhibits the robust towards recognition of the users with accuracy. The result shows the capacity of the system to cope with the change in posing and projection of faces and the distance. From face recognition with machine learning , it has been determined that during face detection, the problem of change in environment is solved as the original image is turned into a HOG representation that captures the major features of the image regardless of image brightness. In the face recognition method, local facial landmarks are considered for further processing. After which faces are encoded which generates 128 measurements of the captured face and the optimal face recognition is done by finding the person's name from the encoding. The result is then used to generate an excel sheet. The facial recognition attendance system will enforces the classes to be digitalized and can also be implemented In IOT application also.

REFERENCES

[1] W. Zhao, R. Chellappa, P. J. Phillips, and A. Rosenfeld, "Face recognition: A literature survey," ACM Computing Surveys, 2003, vol. 35, no. 4, pp. 399-458.

[2] Herbert Bay, Andreas Ess, Tinne Tuytelaars, and Luc Van Gool. Surf: Speeded up robust features. Computer Vision and Image Understanding (CVIU), 110(3):346–359.

[3] H.K.Ekenel and R.Stiefelhagen, Analysis of local appearance based face recognition: Effects of feature selection and feature normalization. In CVPR Biometrics Workshop, New York, USA, 2006

[4] IJCSI International Journal of Computer Science Issues, Vol. 9, Issue 4, No 1, July 2012 ISSN (Online): 1694-0814

[5] IRJET International Research Journal of Engineering and Technology, Vol. 5, Issue 6, June 2018 e-ISSN(Online): 2395-0056

[6] IJIRSET International Journal of Innovative Research In Science, Engineering and Technology, Vol. 3, Issue 4,April 2014 ISSN:2319-8753.

[7] T. Kanade, Computer Recognition of Human Faces.

Basel and Stuttgart: Birkhauser Verlag 1997.

[8] Open source computer version library. (Online)

Available:http://www.scholarpedia.org/article/Local_Binary_Patterns

[9] Open source computer vision library.[Online]

Available: https://opencv.org/

[10] Grundland M, Dodgson N (2007) Decolorize: Fast, contrast enhancing, color to grayscale conversion.

Pattern Recognition 40: 2891-2896.