Vatte Sangameshwar, 2021, 9:3
ISSN (Online): 2348-4098
ISSN (Print): 2395-4752

Attendance System Using Real Time Face Recognition

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Abstract- Face is the representation of one's identity. Hence, we have proposed an automated student attendance system based on face recognition. Face recognition system is very useful in life applications especially in security control systems. The airport protection system uses face recognition to identify suspects and CISF (Central Industrial Security Force) uses face recognition for criminal investigations. In our proposed approach, firstly, video framing is performed by activating the camera through a user- friendly interface. The face ROI is detected and segmented from the video frame by using Viola-Jones algorithm. In the pre-processing stage, scaling of the size of images is performed if necessary, in order to prevent loss of information. The median filtering is applied to remove noise followed by conversion of color images to grayscale images. After that, contrast-limited adaptive histogram equalization (CLAHE) is implemented on images to enhance the contrast of images. In face recognition stage, enhanced local binary pattern (LBP) and principal component analysis (PCA) is applied correspondingly in order to extract the features from facial images. In our proposed approach, the enhanced local binary pattern outperforms the original LBP by reducing the illumination effect and increasing the recognition rate. Next, the features extracted from the test images are compared with the features extracted from the training images. The facial images are then classified and recognized based on the best result obtained from the combination of algorithm, enhanced LBP and PCA. Finally, the attendance of the recognized student will be marked and saved in the excel file. The student who is not registered will also be able to register on the spot and notification will be given if students sign in more than once. The average accuracy of recognition is 100 % for good quality images, 94.12 % of low-quality images and 95.76 % for Yale face database when two images per person are trained.

Keywords:- Face Recognition, image processing, object detection.

I. INTRODUCTION

Computer vision tasks include methods for acquiring, processing, analyzing and understanding digital images, and extraction of high-dimensional data from the real world. The main objective of this project is to develop face recognition based automated student attendance System.

In order to achieve better performance, the test images and training images of this proposed approach are limited to frontal and upright facial images that consist of a single face only. The test images and training images have to be captured by using the same device to ensure no quality difference. In addition, the students have to register in the database to be recognized. The enrolment can

be done on the spot through the user-friendly interface.

Real-time computer vision can be performed using open source computer vision (OpenCV) programming library. OpenCV has vast application areas such as facial recognition system, human-computer interaction, object identification, mobile robotics, motion tracking, augmented reality.

If we see the post covid world, Then it will be completely different from pre-covid world. In post covid world, we will give more focus on automation of everything, that is without physically touching anything, will work done or not?

If work will be done automatically then it will be more beneficial for containing this virus. Then we thought about attendance of students in class which is takes by teacher and those student answered yes teacher by sounding their mouth, And we know that WHO recently said that covid19 will infect people via airborne also.

II. LITERATURE SURVEY

Facial recognition is a way of recognizing a human face through technology. A facial recognition system uses biometrics to map facial features from a photograph or video. It compares the information with a database of known faces to find a match. Facial recognition can help verify personal identity, but it also raises privacy issues.

The facial recognition market is expected to grow to $7.7 billion in 2022 from $4 billion in 2017. That's because facial recognition has all kinds of commercial applications. It can be used for everything from surveillance to marketing.

Automated facial recognition was pioneered in the 1960s."Woody Bledsoe, Helen Chan Wolf", and Charles Bisson worked on using the computer to recognize human faces. Their early facial recognition project was dubbed "man-machine" because the coordinates of the facial features in a photograph had to be established by a human before they could be used by the computer for recognition. On a graphics tablet a human had to pinpoint the coordinates of facial features such as the pupil centers, the inside and outside corner of eyes, and the windows peak in the hairline.

The coordinates were used to calculate 20 distances, including the width of the mouth and of the eyes. A human could process about 40 pictures an hour in this manner and so build a database of the computed distances. A computer would then automatically compare the distances for each photograph, calculate the difference between the distances and return the closed records as a possible match.

In 1970, Takeo Kanade publicly demonstrated a face matching system that located anatomical features such as the chin and calculated the distance ratio between facial features without human intervention. Later tests revealed that the system could not always reliably identify facial features. Nonetheless, interest in the subject grew and in 1977 Kanade published the first detailed book on facial recognition technology.

III. DESIGN AND IMPLEMENTATION

Face recognition takes a photo from a video or a digital camera as input and outputs the diagnosed photo subject matter.

Facial features may additionally consist of regions inside the face, variations within the face structure, face cuts and angles which have been formatted and styled.Face extraction includes grabbing of the capabilities from camera. Face detection includes the elimination of the background and focusing on the foreground eliminating some other elements apart from the face vicinity.

But the device nevertheless pertains some drawbacks because it cannot come across the head be counted which can be a gift because of overlapping of faces or mistaken recognition of faces having similar facial functions.Find faces - regardless of whether the errand of perceiving individuals in photos, or video acknowledgment, or whatever else.

Face positioning - pics aren't regularly located on which an individual stand straightforwardly before the focus, often the face grows to become, we are facing the challenge of situating it as though the picture become taken legitimately. Defining outstanding facial capabilities- this development can be referred to as a full face acknowledgment step, it examinations the photograph and gets certainly one of a type automated estimations of the face.

Identification of a person - we assessment a got information and the information efficiently accessible to us, if the statistics are similar. we will show the call of the character, if now not, in like way we've now not recognised at this point to us character.

This will analyse in element each one of the means to manufacture a face acknowledgment framework and comparison their execution and the help of various libraries, simply as the velocity of crafted by way of every section in various libraries of Computer vision.

1. Training Data Base:

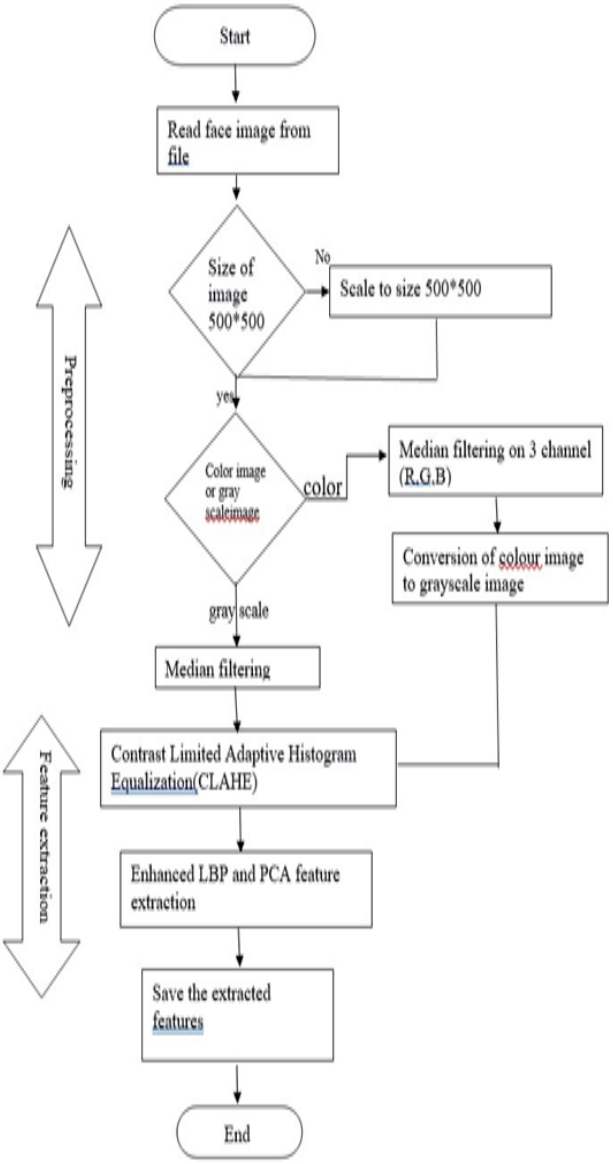

Fig 1. Flow of the Proposed Approach (Training Part).

2. Recognition:

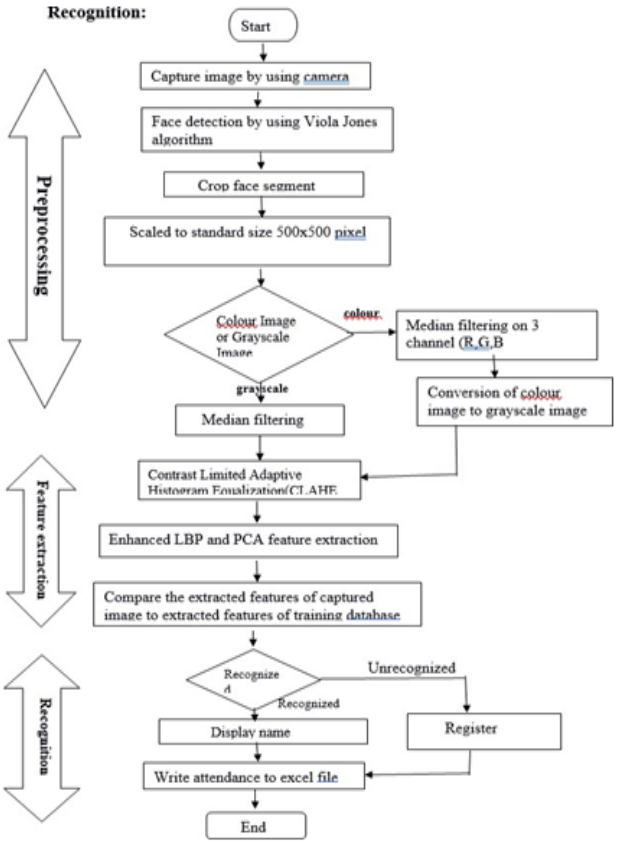

Fig 2. Flow chart of Face Recognition.

IV. MATHEMATICAL MODEL

1. Viola Jones method for face recognition:

Haar Like Feature values were derived from the difference in the number of dark area pixel values by the number of bright area pixels:

$$F(HAAR) = \sum Fwhite - \sum Fblack$$

F(Haar) was the total feature value, ∑ Fwhite was the feature value on the brightest area and ∑ Fblack was the feature value on the dark area. Haar features are composed of either two or three rectangles. Face candidates are scanned and searched for Haar features of the current stage.

The weight and size of each feature and the features themselves are generated using a machine learning algorithm from AdaBoost.Integral image was a technique for calculating the feature value quickly by changing the value of each pixel into a new image representation, as shown in Figure 1 below,

Fig 3. Integral image.

1. Integral image(x,y).
And Based on Figure 2, integral image in (x,y) (ii(xy)) could be find used the formula:

$$ii(x,y) = \sum x' \le x, y \le y i(x', y')$$

where ii (x, y) was the integral image at location x, y and i (x ', y') was the pixel value at the original image location.

The calculation of the value of a feature could be done quickly by computing the integral image value at four points as shown in Figure 2.

If the integral value of image of point 1 was A, point 2 was A + B, point 3 was A + C, and at the point 4 was A + B + C + D, then the number of pixels in region D could be known by 4 + 1 (2+3).

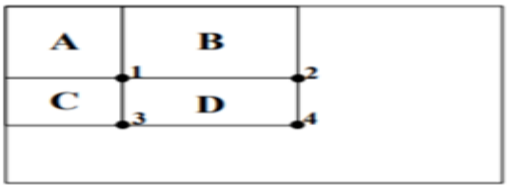

Fig 4. Score Count.

2. The figure Score Count.
The Adaboost learning algorithm, used to improve classification performance with simple learning to combine many weak classifier into one powerful classifier. Weak classifier was a correct answer with a less accurate truth level. A weak classifier was stated below:

$$h_j(x) = \begin{cases} 1, & if\ p_j f_j < p_j \theta_j\ (x) \\ 0, & other \end{cases}$$

Where $h()$ was a weak classification, is parity to j, was threshold to j and x is sub image dimension such as 24 x 24.
The steps to get a strong classifier were expressed in an algorithm as follows, giving figure as example (), … () = 0 the positive example and = 1 for negative example.

V. RESULTS AND ANALYSIS

In this proposed approach, face recognition student attendance system with user Real time images. A few buttons are designed in the interface, each provides specific function, for example, start button is to initialize the camera and to perform face recognition automatically according to the face detected, register button allows enrolment or registrations of students and update button is to train the latest images that have been registered in the database.

Lastly, browse button and recognize button is to browse facial images from selected database and recognized the selected image to test the functionality of the system respectively. In this part, enhanced LBP with radius two is chosen and used as proposed algorithm. The analysis of choosing the radius size will be further explained in the discussion.

This proposed approach provides a method to perform face recognition for student attendance system, which is based on the texture based features of facial images. Face recognition is the identification of an individual by comparing his/her real-time captured image with stored images in database of that person. Thus, training set has to be chosen based on the latest appearance of an individual other than taking important factor for instance illumination into consideration.

The proposed approach is being trained and tested on different datasets. Yale face database which consists of one hundred and sixty-five images of fifteen individuals with multiple conditions is implemented. However, this database consists of only grayscale images. Hence, our own database with color images which is further categorized into high quality set and the low quality set, as images are different in their quality: some images are blurred while some are clearer. The statistics of each data set have been discussed in the earlier chapter.

Viola-Jones object detection framework is applied in this approach to detect and localize the face given a facial image or provided a video frame. From the detected face, an algorithm that can extract the important features to perform face recognition is designed.

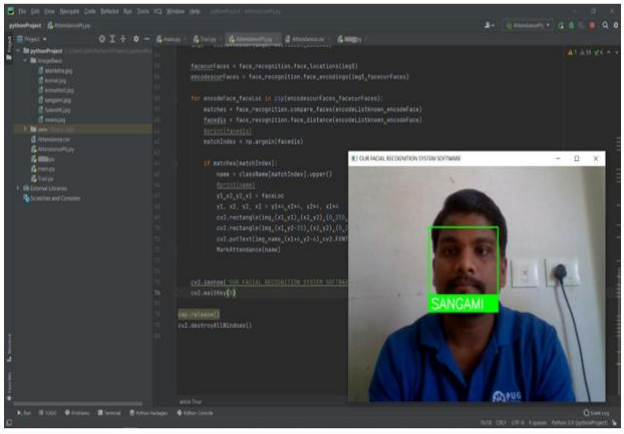

Fig 5. Output With Code.

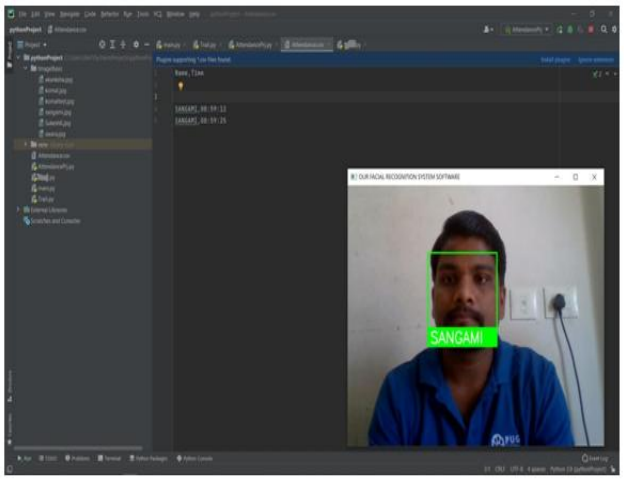

Fig 6. Expected Output With Attendance.

VI. APPLICATIONS

- Human computer interaction
- Virtual reality
- Information security
- Automated identity verification

VII. CONCLUSION

In this approach, a face recognition based automated student attendance system is thoroughly described. The proposed approach provides a method to identify the individuals by comparing their input image obtained from recording video frame with respect to train image. This proposed approach able to detect and localize face from an input facial image, which is obtained from the recording video frame. Besides, it provides a method in pre-processing stage to enhance the image contrast and reduce the illumination effect. Extraction of features from the facial image is performed by applying both LBP and PCA. The algorithm designed to combine LBP and PCA able to stabilize the system by giving consistent results. The accuracy of this proposed approach is 100 % for high-quality images, 92.31 % for low-quality images and 95.76 % of Yale face database when two images per person are trained.

As a conclusion for analysis, the extraction of facial feature could be challenging especially in different lighting. In pre-processing stage, Contrast Limited Adaptive Histogram Equalization (CLAHE) able to reduce the illumination effect. CLAHE perform better compared to histogram equalization in terms of contrast improvement. Enhanced LBP with larger radius size specifically, radius size two, perform better compared to original LBP operator, with less affected by illumination and more consistent compared to other radius sizes.

Face recognition systems are currently associated with many top technological companies and industries making the work of face recognition easier.

This Application speed up the process of taking attendance by university instructors would save lecturing time and hence enhance the educational process. It would save the students time and teachers effort of taking attendance. Teacher just have to capture image and train model and make attendance again by click image.

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