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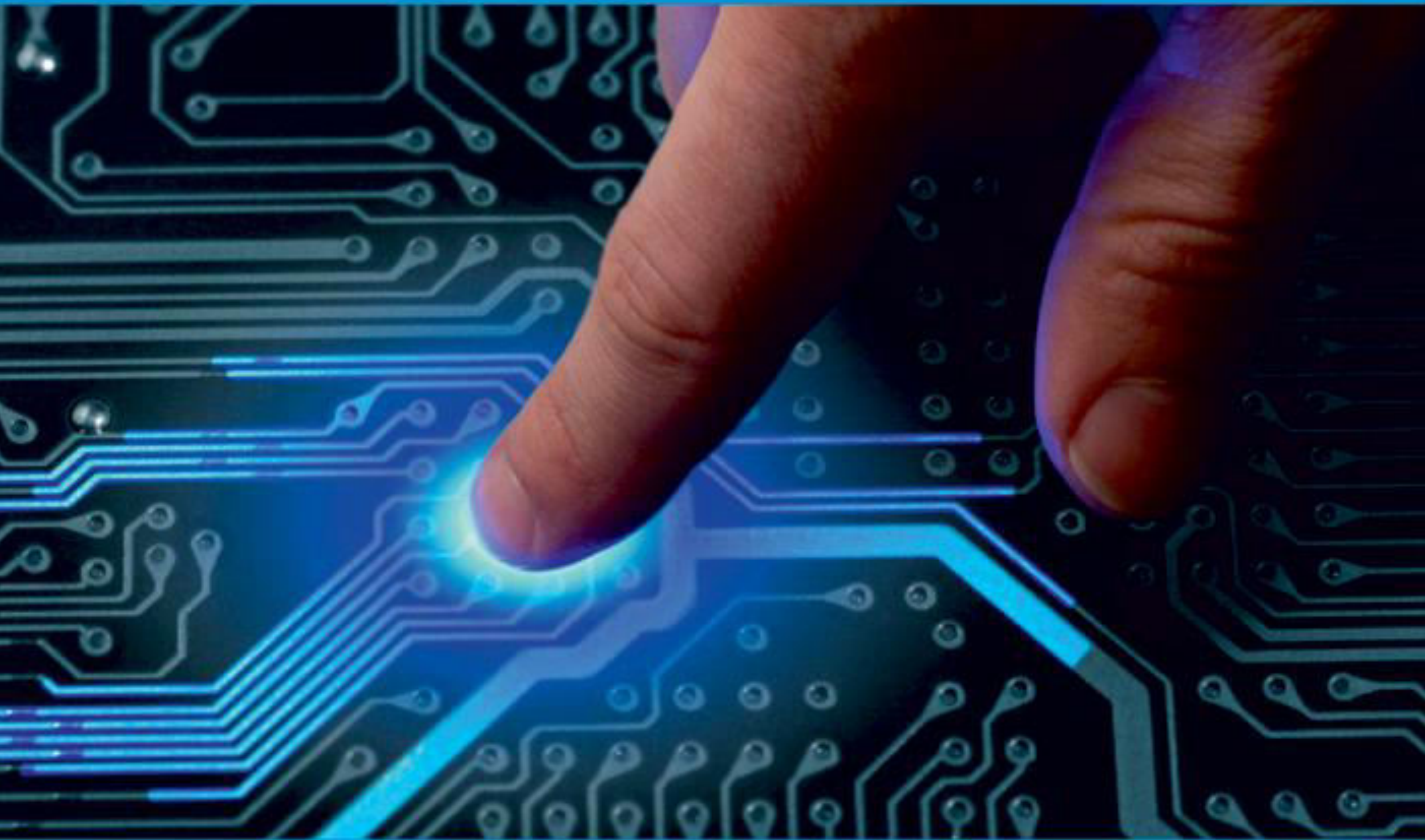

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Real Time Face Attendance System Using Deep Learning

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ABSTRACT: Our proposed approach is a facial recognition-based automatic attendance system using deep learning. First, video framing is performed by launching the camera through a user-friendly interface. Face ROIs are detected using the Viola-Jones algorithm and segmented from the video frames. If necessary, images are scaled in preprocessing to avoid information loss. Performs a color to grayscale image conversion after applying median filtering to remove noise. Contrast-Limited Adaptive Histogram Equalization (CLAHE) is then implemented on the image to improve the contrast of the image. In the face recognition phase, extended local binary pattern (LBP) and principal component analysis (PCA) are applied appropriately to extract features from face images. In the proposed approach, the enhanced local binary pattern outperforms the original LBP by reducing lighting effects and increasing the recognition rate. The features extracted from the test images are then compared with the features extracted from the training images. Face images are classified and recognized based on the best results obtained from the algorithm, his improved LBP and PCA combination. Finally, the recognized student presence is recorded and saved in an Excel file. Even preschoolers can register on the spot, and if they register more than once, they will receive a notification. When training two images per person, the average recognition accuracy is 100% for high quality images, 94.12% for low quality images, and 95.76% for the Yale Face Database. The proposed model has features such as black-and-white image detection, blurry image detection, timely registration, and a new user interface.

KEYWORDS: Deep Learning, Viola-Jones algorithm, CLAHE, Local Binary pattern, Principal component analysis, Greyscalling, Face Recognition.

I. INTRODUCTION

The main goal of this project is to develop a facial recognition-based automatic attendance system for students. To achieve better performance, test and training images for this proposed approach are restricted to frontal and upright face images consisting of only a single face. Test and training images should be captured using the same device to ensure there is no difference in quality. Additionally, students must be enrolled in the database to be recognized. You can register onsite through a user-friendly interface.

Face recognition is crucial in daily life in order to identify family, friends or someone to identify human faces. method in which identification of an individual is performed by comparing real-time For instance, airport protection systems and FBI use face recognition for implement face recognition to allow the users to tag their friends in the photo for users to use face recognition to get access to their online account (Reichert, C., 2017). Apple allows the users to unlock their mobile phone, iPhone X by using face recognition The work on face recognition began in 1960. Since then, many studies on facial recognition have been continuously conducted up to the present.

Real-time face presence system is a face recognition problem for participating using face recognition technology based on Viola Jones algorithm and other information technology. These features, extracted from facial images that reflect the student's identity, should be consistent with respect to background, lighting, posture, and facial expression changes. High accuracy and fast computation time are its rating points for performance.

The goal of this project is to develop a facial recognition-based automatic attendance system for students. The expected outcomes for completing the task are:

- Detect face segments from video frames.
- Extract useful features from detected faces.
- Recognize detected faces by classifying features.
- Records the existence of the identified student.

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II. LITERATURE SURVEY

Arun Katara et al. (2017) mentioned shortcomings of radio frequency identification (RFID) card systems, fingerprint systems and iris recognition systems. The RFID card system is implemented due to its simplicity. However, users tend to help their friends check in as long as they have their girlfriend's ID. Fingerprint systems are certainly effective, but they are not efficient because the verification process takes time. However, in facial recognition, the human face is always exposed and contains less information compared to the iris. An iris recognition system that contains details may violate the user's privacy. Speech recognition is available, but less accurate than other methods. Therefore, it is proposed to implement a facial recognition system in the student attendance system. An effective and efficient paradigm is needed to process the massive amounts of data generated by the Internet of Things (IoT). Deep learning and edge computing are emerging technologies used to efficiently process massive amounts of data with high accuracy. Facial recognition is considered one of the most reliable solutions. For face recognition, scale-invariant feature transforms (SIFT) and accelerated robust features (SURF) have typically been used in the research community. In this paper, we propose a convolutional neural network (CNN)-based face detection and recognition algorithm that outperforms traditional techniques. The system can recognize about 35 faces and recognizes 30 faces out of 40 student frames. The proposed has been system achieved 97.9% accuracy on test data. Additionally, the data generated by the smart classroom is calculated and transmitted via her IoT-based architecture with edge computing. Comparative performance studies show that our architecture is above average in terms of data latency and real-time response.

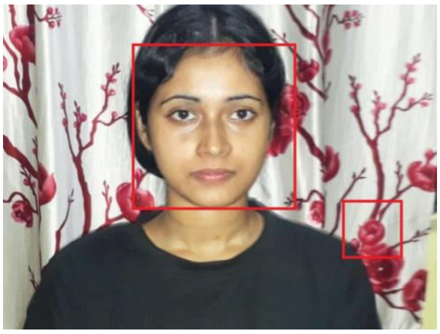
Akshara Jadabet Al. (2017) and P. Arun Mozhi Devan et al. (2017) proposed a Viola-Jones face recognition algorithm for a student attendance system. They found that his Viola-Jones algorithms for methods such as facial shape-based methods, feature-invariant methods, and machine-learning-based methods are not only fast and robust, but also provide high detection rates and are suitable for various I concluded that it performs better in lighting. conditions. Rahul V Patil and S B Bangar (2017) also agreed that the Viola-Jones algorithm performed better in different lighting conditions. Further, a publication by Mrunmayee Shirodkar et al. (2015) they state that the Viola-Jones algorithm can solve lighting problems as well as scaling and rotation. Furthermore, Naveed Khan Balcoh (2012) found that the Viola-Jones algorithm is the most efficient among all algorithms such as AdaBoost algorithm, FloatBoost algorithm, Neural Networks, S-AdaBoost algorithm, Support Vector Machines (SVM), Bayes classifier, etc.Varsha Gupta and Dipesh Sharma (2014), in addition to Viola, used local binary patterns (LBP), the AdaBoost algorithm, local successive mean quantized transform (SMQT) functions, sparse network of winnow (SNOW) classification methods, and neural network-based I studied the face recognition method of - Jones - Algorithm. They came to the conclusion that the Viola-Jones algorithm has the best speed and accuracy of all the methods. Other methods. B. Local binary patterns and SMQT features are easy to compute and can solve lighting problems, but their overall performance is inferior to Viola-Jones face detection algorithm.

III. METHODOLOGY

A. *Description of the Proposed Algorithm:*

P. Viola introduced Viola-Jones algorithm, M. J. Jones (2001) is the most popular algorithm to localize the face segment from static images or video frame. Basically the concept of Viola-Jones algorithm consists of four parts. The first part is known as Haar feature, second part is where integral image is created, followed by implementation of Adaboost on the third part and lastly cascading process. Features are performed as a window function mapping onto the image. A single result with values representing each feature can be computed by subtracting the white square sum from the black square sum (Mekha Joseph et al., 2016). The value of integrating an image in a specific location is the sum of pixels on the left and the top of In order to illustrate clearly, the value of the integral image at location 1 is the sum of the pixels in rectangle A. The values of integral image at the rest of the locations are summation of A and C, (A C), and at location 4 is summation of all the regions, (A B C D) .

However, false positives could occur and it had to be manually removed based on human vision. Figure 1 shows an example of false face detection.



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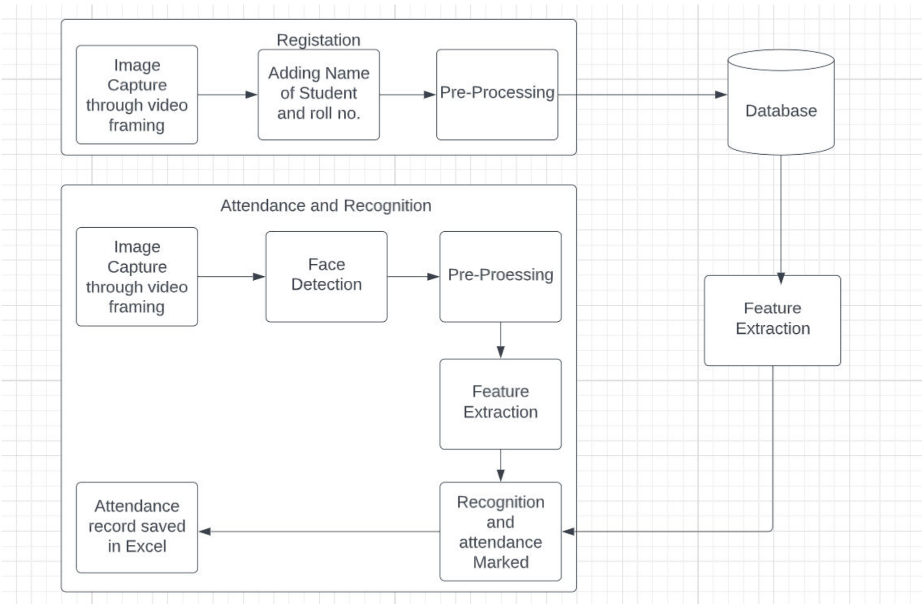
B. *System Architecture:*

The system works in the following way: When the user opens the application he has two options. First is to register if the user is a new user, second is to mark attendance. If the user is a new user, he has to click on the registration button and add his details like student name and roll number. After that with video framing 110 images will be captured and

saved in the database with the student's name and roll no. for further attendance. Secondly, the user has the option to mark attendance. For that, he simply needs to click on mark attendance. Camera will be opened and the face will be detected and recognised with the help of video framing. And the attendance will be marked in the CSV file. Once the face is recognised, a green box will be generated on the face with the name of the student below the green box.This is how the student knows that his face is recognised correctly. If there comes any problem in detection of the student, the student can simply click on the register and add his student details and update his face images there.

This approach implements a facial recognition based student attendance system . The methodology flow begins with image acquisition by using a simple and convenient interface, followed by preprocessing of the captured face images, feature extraction from the face images, subjective selection, and finally Classification is done. face images to be recognized. Both LBP and PCA feature extraction methods are examined in detail, computed in this proposed approach, and compared. This approach boosts LBP and reduces the lighting effect. Algorithms for combining improved LBP and PCA are also designed for subjective choice to increase accuracy.



C. *Input Images*

Our own database should be used to design a real-time facial recognition system for students, but we also used the database provided by previous researchers to design the system more effectively and efficiently. used and for evaluation purposes.

. There are 11 images per person. Each image of an individual is in a different state, conditions include center light, glasses, happy, left light, no glasses, normal, right light, sad, sleepy, surprised, wink. These different variations provided by the database ensure that the system can operate consistently in different situations and conditions.

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Figure.2 shows samples of high quality input images.

Figure.3 shows a sample of low quality input images.

C. *Face Detection*

1.*Pre-Processing*

Pre-processing: This stage consists of 3 main steps:

a) Face Detection: Viola–Jones face detection algorithm is used for Face detection.
b)Resizing: Once face is detected, it is resized to a fixed resolution of 92 *112 pixel resolution
c)Contrast Enhancement: For better recognition accuracy, we have used Min-Max Linear Contrast Stretch Enhancement Technique.

System performance gets improved in Preprocessing. It plays an essential role in improving the accuracy of face recognition. Scaling is one of the important preprocessing steps for manipulating image size. Shrinking an image speeds up processing by reducing system computation as the number of pixels decreases. Image dimensions and pixels contain spatial information. Gonzalez, R.C., and Woods (2008) stated that spatial information is a measure of the smallest

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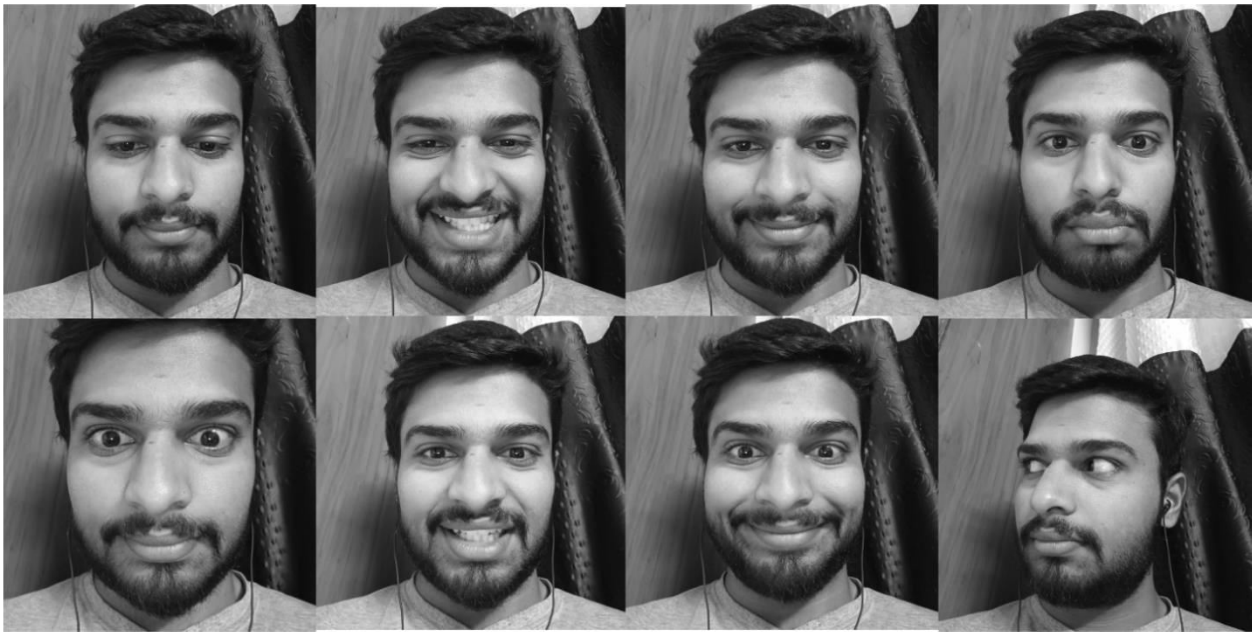
discernible detail in an image. Therefore, spatial information must be carefully manipulated to avoid image distortion to prevent checkerboard effects. The size should be the same for all images for normalization and standardization. Subhi Singh et al. (2015), he proposed PCA (principal component analysis) to extract features from facial images. The image he scaled to 120x120 pixels, as the length and width of the image should be the same.
Figure.4 shows quality of images Significantly decreasing from Left to Right.

In addition to image scaling, color images are usually converted to grayscale images for preprocessing. Grayscale images are believed to be less sensitive to lighting conditions and require less computation time. A grayscale image is an 8-bit image in which pixels range from 0 to 255, and a color image is a 24-bit image in which pixels can have values from 16 77 7216. Therefore, color images require more storage and computing power than grayscale images. (Canaan and Cottrell, 2012). If the computation does not require a color image, it is considered noise. Also, preprocessing is important to improve image contrast. In the writings of Pratiksha M. Patel (2016), he stated that histogram equalization is one of his preprocessing methods to improve image contrast. It ensures uniform intensity distribution across the intensity level axis and can also reduce uneven lighting effects. Figure.5 shows facial images converted to grayscale.



2. *Scaling of image*

Image scaling is one of the most common tasks in image processing. The size of images should be manipulated carefully to avoid loss of spatial information. Therefore, in this proposed approach, the test and training images are normalized to a size of 250 × 250 pixels.

3. *Median Filter*

Median filtering is a robust noise reduction method. It is widely used in various applications due to its capability to remove unwanted noise as well as retaining useful detail in images. Since the colour images captured by using a camera are RGB images, median filtering is done on three different channels of the image. Figure.6 shows the image before and after noise removal by median filtering in three channels. If the input image is a grayscale image, then the median filtering can be performed directly without separating the channels.

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4. *Conversion to Grayscale Image*

Camera captures color images, however the proposed contrast improvement method CLAHE can only be performed on grayscale images. After improving the contrast, the illumination effect of the images able to be reduced. LBP extracts the grayscale features from the contrast improved images as 8 bit texture descriptors. Figure.7 shows conversion of image into Grayscale.

5. *Contrast Limited Adaptive Histogram Equalization*

Histogram equalization or histogram stretching is a technique for improving image contrast. The contrast improvement is usually performed on the grayscale images. Image contrast is improved by stretching the range of its pixel intensity values to span over the desired range of values, between 0 and 255 in grayscale. The reason that Contrast Limited Adaptive Histogram Equalization (CLAHE) is used instead of histogram equalization is because histogram equalization. Figure.9 shows contrast improvement.

6. *Feature Extraction*

Different facial images imply changes in structural or geometric information. In order to perform face recognition, these features have to be extracted from the facial images and classified appropriately. In this project, enhanced LBP and PCA are used for face recognition. On the other hand, PCA extracts the global grayscale features which means feature extraction is performed on the whole image.

7. *Working Principle of Proposed LBP*

The original LBP operator consists of a 3 × 3 filter size of 9 pixels. Instead of circular pattern looks more rectangular. 9 pixels that are adjacent to each other means that all details are taken as sampling points. PCA accuracy is calculated to compare and improved LBP. $Xp = Xc + Rcos(\theta/P), Yp = Yc + Rsin(\theta/P)$

8. *Feature Classification*

The chi-square statistic is used as the LBP dissimilarity measure to determine the shortest distance between training and test images. On the other hand, the Euclidean distance is used to compute the shortest distance between the training image and the test image after PCA feature extraction. Both classifiers, the chi-square statistic and the Euclidean distance, determine the closest or most likely training image to the face recognition test images.

9. *Subjective Selection Algorithm and Face Recognition*

The system is based on Deep learning. Deep learning is a machine learning technique that teaches computers to do what humans take for granted: learn by example. Deep learning is the key technology behind self-driving cars, allowing them to recognize stop signs and distinguish between pedestrians and light poles. The feature classification performed in the previous part gives the closest result, but it's not absolute. To increase accuracy and reduce his detection rate, an algorithm to combine enhanced LBP and PCA was developed in this proposed approach. This proposed approach yields the top five results from improved LBP and PCA.

IV. RESULTS AND DISCUSSIONS

In this proposed approach, a student attendance system is designed with facial recognition and a user-friendly interface with MATLAB GUI (Graphic User Interface). Finally, the browse button and the recognize button are used to browse facial images from the database of choice, and the recognizes selected images to test the capabilities of each system. This proposed approach provides a method to perform face recognition for the student attendance system,

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which is based on the texture based features of facial images. 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 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.

The proposed approach is trained and tested on various datasets. A Yale face database consisting of 165 images from 15 with multiple medical conditions is implemented. However, this database consists only of grayscale images. Therefore, our own database of color images is further divided into a high quality set and a low quality set due to the different quality of the images. Some images are blurry, some are sharper. The Viola-Jones object detection framework is applied to this approach to detect and locate faces when provided with facial images or video frames. Algorithms are developed that can extract features important for face recognition from the detected faces.Several preprocessing steps are performed on the input face image before features are extracted. Median filtering is used because it preserves image edges while removing image noise. Face images are scaled to the appropriate size for normalization and converted to grayscale if not grayscale. This is because the CLAHE and LBP operators work on grayscale images.

One of the common obstacles to face recognition performance is uneven lighting conditions. Therefore, many alternatives are implemented in this proposed approach to reduce uneven lighting conditions. Before feature extraction occurs, preprocessing is performed on the cropped face image (ROI) to reduce lighting issues. We use our own database and the Yale University face database for comparison. The results in the table show that CLAHE outperforms histogram equalization. From our own database image, the left side of the original image appears darker than the right side. However, histogram equalization does not effectively improve contrast and darkens the left side of the image. In contrast to histogram equalization, CLAHE appears to improve contrast across face images more evenly. This helps reduce uneven lighting. In the Yale Face Database, CLAHE prevents some areas from appearing washed out and reduces excessive noise amplification. Also, CLAHE shows clearer edges and contours compared to histogram equalization. Also, looking at the histograms, for CLAHE the pixels are well spread across the intensity scale axis from 0 to 255, whereas for histogram equalization the pixels only extend from 0 to about 200 across the intensity scale axis. . Therefore, we can say that CLAHE improves image contrast evenly over the entire image compared to histogram equalization based on the results obtained.

V. Conclusion and Future Work

This approach details an automated student attendance system based on facial recognition. The proposed approach provides a way to identify a person by comparing input images obtained from video frame recordings with train images. This proposed approach is able to recognize and localize faces from input facial images obtained from recorded video frames. It also provides a way to improve image contrast and reduce lighting effects during the preprocessing stage. Feature extraction from face images is performed using both LBP and PCA. Algorithms that combine LBP and PCA can stabilize the system by providing consistent results. The accuracy of this proposed approach is 100% on high-quality images, 92.31% on low-quality images, and 95.76% on the Yale face database when training two images per person..

References

1. Margaret Routh. (2012). What is a face recognition? - Definition by WhatIs.com. Available [online]: http://whatis.techtarget.com/definition/facial-recognition [accessed March 25, 2018].
2. Solon, O. (2017). Face recognition database used by FBI out of control, House committee hears [online] Guardian. Get it from: https://www theguardian.com/technology/2017/mar/27/us-facial-recognition-database-fbi-drivers-licenses-passports [accessed March 25, 2018].
3. Robert Silk. (2017). Biometrics: Facial recognition technology is coming to airports near you: Travel Weekly. Available [online]: http://www.travelweekly.com/Travel-News/Airline-News/Biometrics-Facial-recognition-tech- coming-airport-near-you [accessed 25 March 2018].
4. Sidney Hussel. (2018). News Facebook's new facial recognition feature: What we know (and don't know). Available [online]: https://gizmodo.com/facebooks-new-face-recognition-features-what-we-do-an-1823359911 [accessed 25 March 2018].
5. Ashley Duvall (2012). Facial Recognition Software - A History of Forensic Psychology. Available [online]:

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http://forensicpsych.umwblogs.org/research/criminal-justice/face-recognition-software/ [accessed 12 April 2018].

6. Jesse Davis West. (2017). History of Facial Recognition - Facial Recognition Software. Available [online] at: https://www.facefirst.com/blog/brief-history-of-face-recognition-software/ [accessed March 25, 2018].
7. Reichert, C. (2017). Intel Demonstrates His 5G Facial Recognition Payment Technology | Intel ZD Net. [Online] ZDNet. Available at:
http://www.zdnet.com/article/intel-demos-5g-facial-recognition-payment-technology/ [Accessed 25. 2018]。

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