Automated Attendance System Using LBPH- BasedFace Recognition

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ABSTRACT

This technology uses biometric data to analyze and identify individuals based on their facial features, creating a unique "faceprint" that can be compared against a database of known faces. Automated attendance management systems are integral to various domains, facilitating streamlined tracking of attendance records while minimizing manual intervention. Initially, the system captures images or video streams of individuals entering the premises using cameras strategically placed at entry points. These images are then processed to extract facial features and generate unique face templates for individual. The extension for this implementation is, it maps more than two personsat a time. Individual student Images, labelled with H. T. No. The image captured with more than two students iscompared with data base of the students if the student gets absent it need to mark the absent, if the student presents his/ her H.T. No should mark as Present. In the proposed system, we use the Haar cascade classifier to determine the presence or absence of faces and LBPH (Local binary pattern histogram) algorithm for face recognition.

Keywords: Haarcascade classifier, LBPH (local binary pattern histogram) Algorithm.

1. INTRODUCTION

Facial recognition technology has become increasingly prevalent in our society, with applications ranging from unlocking our smartphones to security surveillance in public spaces. This technology works by analyzing unique facial features of individuals, such as the distance between the eyes, the shape of the nose, and thecontour of the jawline, to identify and verify their identity.

While facial recognition systems offer many potential benefits, such as enhancing security and convenience, they also raise concerns aboutprivacy, surveillance, and potential misuse. Debates continue about the ethical and legal implications of widespread facial recognition deployment, prompting discussions around regulation, accountability, and the protection ofindividual rights.

The impact of facial recognition technology has been far-reaching, with applications in law enforcement, security, retail, and social media. On the positive side, facial recognition has enabled law enforcement agencies to quickly identify suspects and locate missing persons, leading to numerous successful investigations. In the retail sector, facial recognition technology has been used to enhance customer service by providing personalized recommendations and improving security in stores.

In the rapidly evolving landscape of technology, facial recognition systems stand at the forefront, representing a profound intersection of artificial intelligence, computer vision, and biometric identification. These systems have garnered significant attention for their potential to revolutionize security, streamline processes, and personalize experiences. Yet, they also evoke complex discussions surrounding privacy, ethics, and societal implications. This comprehensive exploration delves into the multifaceted nature of facial recognition systems, examining their mechanisms, applications, challenges, and broader societal impact.

2. METHODOLOGY:

2.1 Local Binary Pattern Histogram (LBPH):

LBPH, a widely utilized method in image processing, serves a robust technique for texture analysis and feature extraction. Its applications span various domains, including face recognition, texture classification, and object detection. By adeptly capturing local patterns within images, LBPH effectively describes texture, demonstrating resilience to lighting variations and other distortions. Its versatility renders it indispensable across both academic research and industrial contexts.

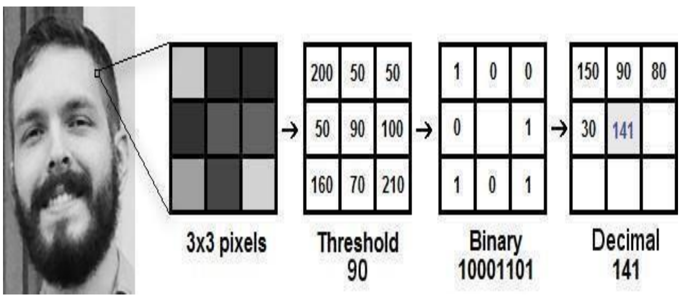

Fig 2.1.1 Face Recognition using lbph Algorithm

- Consider an image with the dimensions of the N x M as shown in fig 2.1.1
- Afterwards, dividing the image into portions of equal height and width produces a uniform n x m for each portion.

- For every region, we use LBP operator. The Local Binary operator is defined in window of 3x3.

$$LBP(x_c, y_c) = \sum_{p=0}^{P-1} 2^p s(i_p - i_c)$$

In this equation, the LBP value is determined by accumulating contributions from neighbouring pixels surrounding the central pixel.

Now, Here P indicates the total number of neighboring pixels contemplated.

S is the scaling factor which will be used to weigh the contributions of each pixel.

ip – This is the intensity of the neighboring pixel at position.

ic – This is the intensity of the centered pixel.

2^p encodes the outcome for comparison between the intensity of the neighboring pixel and the central pixel.

$$s(x) = \begin{cases} 1, & x \geq 0 \\ 0, & x < 0 \end{cases}$$

The Local Binary Pattern (LBP) calculates a binary code for each pixel by comparing its neighbors' pixel values to that of the central pixel, followed by converting this code into a decimal value, indicative of the pixel's LBP value. The resultant histogram of these LBP values, observed across either an image or a region of interest, frequently acts as a feature descriptor essential for tasks such as texture analysis or pattern recognition.

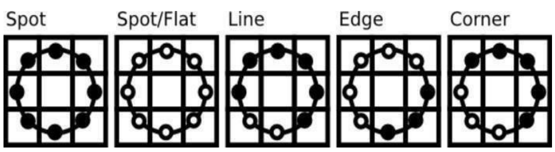

Fig 2.1.2 Circularly Symmetric neighbor sets

2.2 HaarCascade Classifier:

HaarCascade is a ML algorithm used to pick out objects in an images, regardless of their scale incomputer vision, particularly for object detection. These algorithms utilize Haar-like features to identify objects within images by analysing variations in pixel intensities. A cascade of classifiers is employed to efficiently discard regions of the image that are unlikely to contain the object being detected, thereby accelerating the detection process.

This method has proven effective for various applications, including face detection,pedestrian detection, and more.

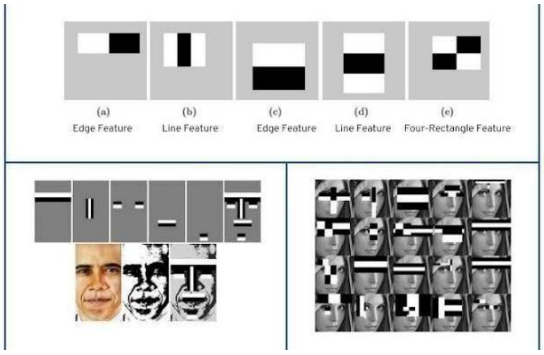

Fig 2.2.1 HaarCascade Classifier

3. PROPOSED METHOD

Our proposed method researches for taking the attendance system for the students more than one at a time in the image will be implemented. The imagecaptured with more than two students is compared with data base of the students if the student gets absent it need to mark the absent, if the student presents his/ her H.T. No should mark as Present.The process shown in fig 3.1

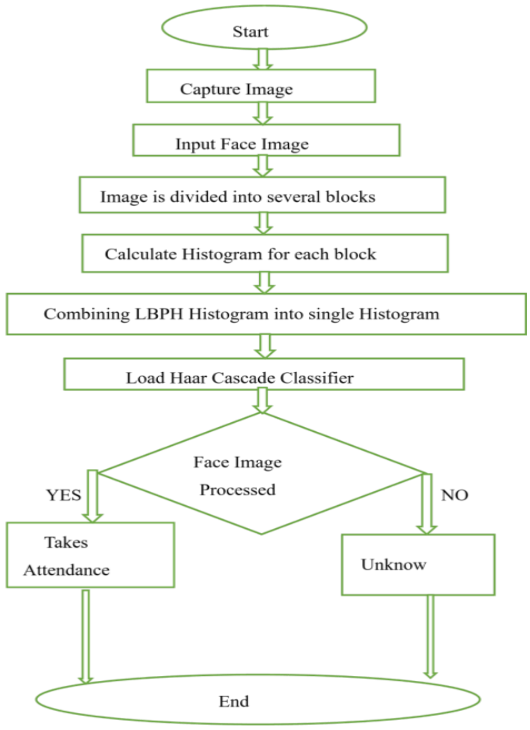

Fig 3.1 System Flow Chart

Steps as followed:

Step 1: from the fig 3.1, this step displays the front viewof the GUI.

Step 2: In this step, the image of the student captured.

Step 3: In this step the captured images are taken as theinput images.

Step 4: In this step, the images are divided into several blocks.

Step 5: In this step, the histogram of each block will be calculated.

Step 6: In this step, the calculated histograms are combined into single histogram.

Step 7: In this step, Haar cascade classifier is loaded, which is ML algorithm used to identify facial features within the segmented blocks. This classifier is trained to recognize patterns corresponding to eyes, nose, and mouth, crucial for accurate facial recognition.

Step 8: In this step, the face images were processed, which means feature extraction and normalization techniques to the detected facial regions within each block. These processes involve extracting relevant facial features such as key points, edges, and textures, while also standardizing the representation of each face image to ensure consistency and comparability across different samples.

Step 9: In this step, if the face is detected it takes attendance and marks attendance on excelsheet with name, id, and time and excel sheet was saved with date. If the face was not detected, it displays unknown.

4. RESULTS:

1. This front view is obtained by using GUI as shown in

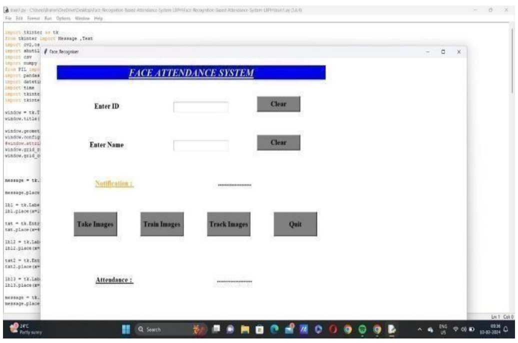

Fig 4.1

2. This window appears for capturing the image of student

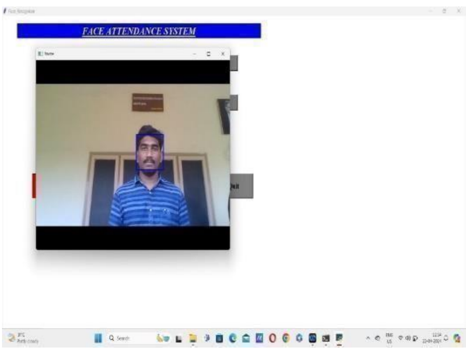

Fig 4.2

3. This window shows the trained images of the captured images the image folder.

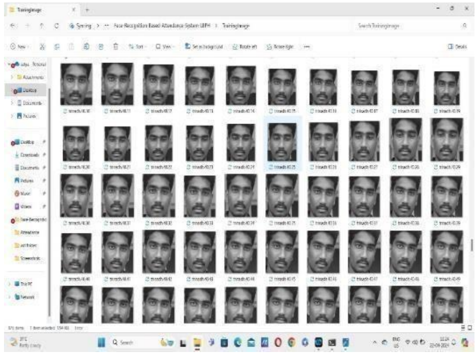

Fig 4.3

4. Notifications of saved images were show in this window as below fig 4.4

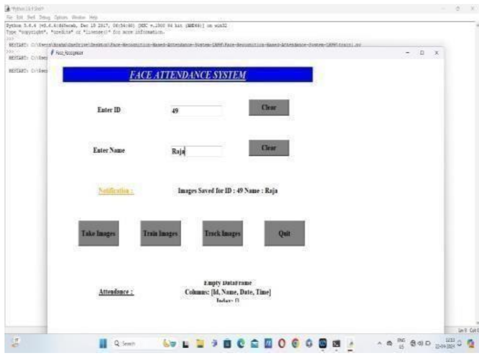

Fig 4.4

5. By clicking on Train image button, the image will be trained and displays the notification as Imagetrained. Thesaved and detected images were trained.

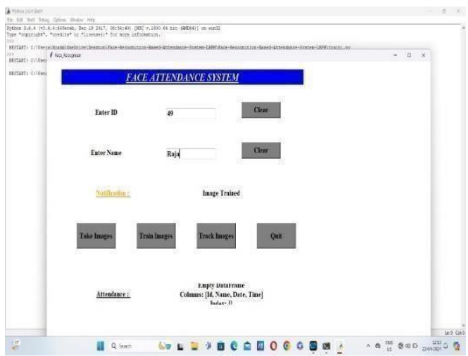

Fig 4.5

. 6.By clicking on the track image button, it scans the faces and matches them against a pre-trained database. Upon recognizing a face, it retrieves the associated name and ID information. The above window shows how the project spontaneously detects and track the attendance of particular person.

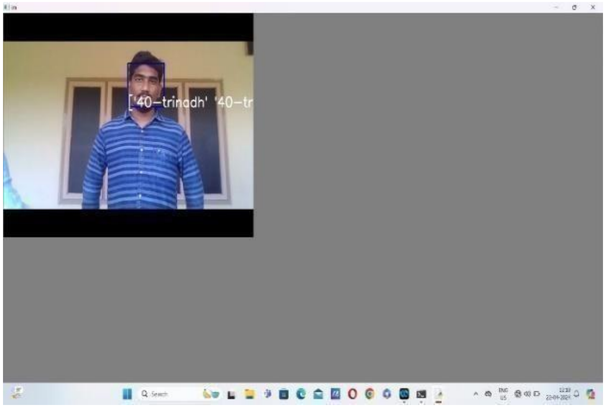

Fig 4.6

.1 7.After the images were tracked, by clicking on quit shown on window marks attendance in excel sheet saved with the date which was shown in fig 4.7

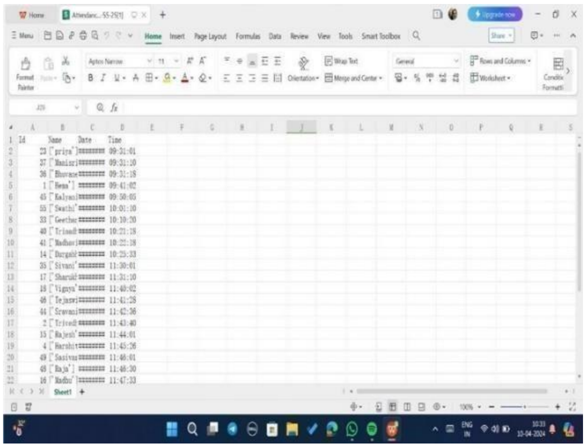

Fig 4.7

.2 8.Face detection of two members were shown in the image asbelow fig 4.8.

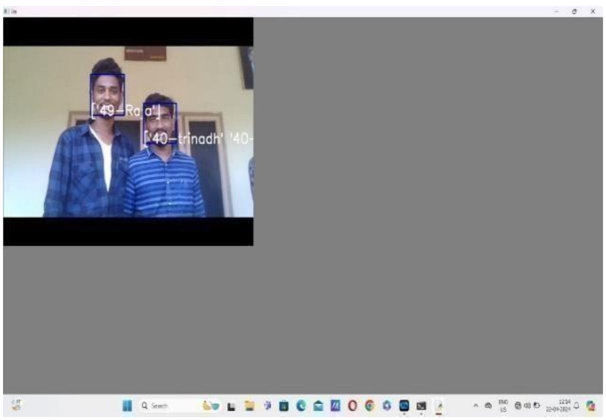

Fig 4.8

9.The untrained image was recognised as unknown in theabove image since it was untrained as shown in fig 4.9

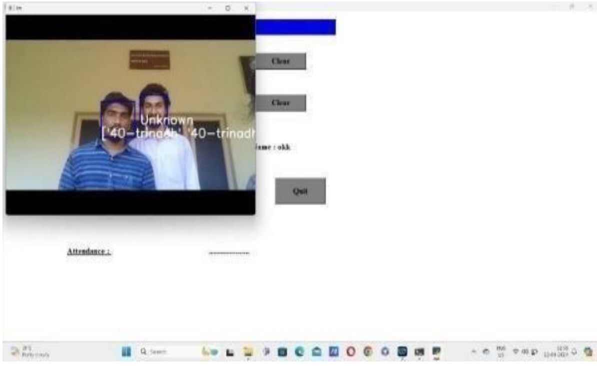

Fig 4.9

CONCLUSION:

This project focusses on marking the attendance through automated attendance management system by capturing the images and converting into blocks, comparing them with the database if the imagesmatch with data in date base it marks whether the student is absent or present. Traditional attendance marking technique does not disturb students but also teaching process The system helps in getting more accuracy. This research is developed to reduce the human intervention for marking the attendance in educational institutes. In this system, the attendance is marked for 2 or 3 students at a time which is time consuming that too regardless of any human efforts,which is the main extent in this system.

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