Automated Attendance Tracker

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Abstract: **From the most basic attendance systems to the most important security systems, tracking systems are in high demand nowadays. With the rapid advancement of AI and computer vision. These tracking systems have improved in accuracy and precision, leading in increased stability and durability. The suggested project is based on the detection, recognition, and tracking of images and videos. The appearance of the face with the help of the Camera and Open CV formula, facial recognition is enforced. The system will recognize a specific student's face and automatically save the response in information. The system also has the capability of retrieving a list of pupils who are absent on a specific day. The varied data is recorded with the help of a camera that is linked as part of the front of the classroom, which is capable of continuously filming pupils, detecting faces in images, distinguishing appearances with information, and recording attendance. This work begins with a review of related studies in the subject of participation administration as well as facial recognition. Our framework structure and plan are presented at that time. Finally, the experiments were implemented, demonstrating the advancement of the attendance system's performance. With the help of OpenCV, this work is used to find the face.**

Keywords: **Face recognition, Open-source Computer Vision, Multi cascade convolution neural networks.**

1. Introduction

Customary techniques are as yet being followed to mark participation in numerous schools and universities which is an additional tedious errand. The most well-known regular techniques being drilled in routine way of life are, the understudy should sign the participation sheet physically, which is passed around the homeroom while the speaker is giving the address, in some cases this specific methodology could without a doubt permit the understudies to cheat about their participation, where an understudy present in the class may sign for a genuinely missing understudy. Phenomenally, this participation sheet could undoubtedly be either lost or lost with/without the speakers' information. Another stricter traditional strategy which is all the more usually utilized practically speaking is the roll call framework, where the understudy should reply to his/her roll call made by the instructor, in some cases this technique additionally permits the understudy to cheat about their participation by noting the roll call as present for a not understudy accessible in the class which

is again a tedious assignment. These manual techniques for a taking understudies' participation have been demonstrated to be a troublesome and tedious interaction.

2. Literature Survey

V. Kurniawan et.al [1]and [6] executed participation structure using Eigen face calculation for face acknowledgment. The participation framework is developed using Android and web advancements with topographical situating extraction feature and biometric advancement is explained in [2] the face acknowledgment. Despite that, Euclidean distance is used for figure the distance between input picture and the preparation picture. The framework explained in [3] has been authorized in 3 fundamental advances.

The essential advance is face identification and extraction. The picture is caught by abuse camera which is taken as information. The front facing face is caught by abuse the OpenCV Haar Cascade procedure [4]. When the face is identified, it's anything but's a dark scale picture of 50x50 pixels. The subsequent advance is to search out and train face film. The framework must be instated by taking care of it a lot of preparing film of appearances. The framework in [5] has been implemented in 3 essential advances. The essential advance is face recognition and extraction. The picture is caught by misuse camera which is taken as information. The front facing face is caught by mis-treatment the Open CV Haar Cascade technique.

When the face is distinguished, it's anything but's a dark scale picture of 50x50 pixels [7]. The subsequent advance is to search out and train face film. The framework must be instated by taking care of it a lot of preparing film of countenances. The third step is that face acknowledgment part and recognizable proof. All through this progression the front facing face that will be perceived, test face, which is then separated from the particular picture. On the off chance that it's coordinated with implies that the understudy going to is enlisted with time. However, no current models of Raspberry Pi incorporate Wi-Fi organizing equipment ready, it's feasible to highlight wire-less.

P. Wagh et.al [8] assessed different face acknowledgment framework for study hall participation using Viola Jones for face discovery reason and Eigen Face for face acknowledgment

[9]. For the face acknowledgment the idea of assurance of district of fascinated is used and the countenances are affirmed individually using the Eigen Face technique. They have determined examination of particular face acknowledgment calculations inside the paper. The makers have discovered the course of action for light force issue and head pose issue for which they have used the light invariant head pose issue for which they have used the light invariant calculation.

3. Proposed System

Image capture, Face Detection, and Face Recognition are the three main aspects of the proposed attendance system. The system's operation is depicted as follows

1. *Image procurement:* A web cam is used to capture images of students. Multiple photographs of a single student will be taken from various angles and gestures. Pre-processing is applied to these photos. Cropping the photos yields the Region of Interest (ROI), which will be used in the recognition procedure. The cropped photos are then resized to a specific pixel point. Following that, these photos will be transformed from RGB to grayscale [10]. The photographs will subsequently be saved in a folder with the names of the students.
2. *Face Detection:* This technique separates the face area from the rest of the image. When Face extraction is also used, the faces are kept in the information and detected.
3. *Face Recognition:* After that, the retain image is compared to the face image. The face is recognized when the face image matches the stored image.
4. *Attendance Updating:* This system will have a high-definition camera mounted outside the classroom for the purpose of registering attendance. By scanning their faces in that camera, students will gain entry to the classroom. Both cameras will be equipped with facial identification and recognition algorithms, which will examine the faces and record their presence.

4. Implementation

The face recognition is generally passively excluded from any particular activity or involvement of the user, given that facial images are often purchased from a camera at a distance. For security and monitoring needs this can be extremely valuable. Face could be a sophisticated multidimensional structure which requires intelligent computer recognition tools.

A. OpenCV

OpenCV (Open-source Computer Vision) is a computer vision library that was founded by Intel in 1999. This platform-to-platform library is largely specialized in the processing of images in real time and also part of the proprietary realisations of the newest computer vision techniques. OpenCV is provided with C, C++, Python and Android packages and programming connectivity. OpenCV is an open-source Python library, used as an artificial intelligence computer vision, machine learning, facial recognition etc. In OpenCV, the CV is an abbreviation for the vision of a computer that is defined as a field to interpret the content of computers Photographs and films are of digital

imagery. The goal of computer vision is to comprehend the content of images. It extracts the description from the images, which may be an object, a text description, a three-dimensional model, or something else. Human eyes provide lots of information based on what they see. Machines are facilitated with seeing everything, convert the vision into numbers and store in the memory. Here the question arises how computer convert images into numbers. So the answer is that the pixel value is used to convert images into numbers. A pixel is the smallest unit of a digital image or graphics that can be displayed and represented on a digital display device.
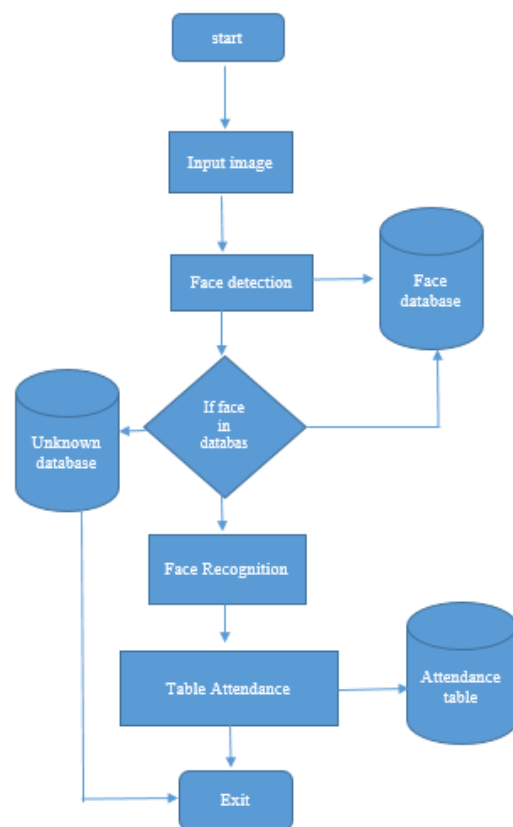

Fig. 1. Block diagram of attendance system

B. MTCNN

A Multi cascade convolution neural network (MTCNN) is a type of multilayer neural network that has one or more convolutional layer followed by one or more fully connected layers, similar to a conventional multilayer neural network. The MTCNN was conceived in the 1960s, including concepts such as local perception, sharing parameters, and sampling in space and time. For simple elements of visual animals, along with an angle and an arc in a picture, local perception can find certain local qualities of the data [4]. It's a type of effective improving an organization 's effectiveness that's recently gotten a lot of attention. MTCNNs have the advantage of being easier to train and having a far smaller number of parameters than fully connected networks with the same number of hidden units. The convolution layer and pool layer are generally used in conjunction with the convolution neural network design [12]. The pooling layer's favorite pastime is to muddle the characteristics of a certain spot. Because some location features

aren't necessary, it's only necessary to get the other features and the relative position. Max pooling and mean pooling are two operations in the pooling layer. Mean pooling determines the average neighborhood within a certain number of feature points.

5. Methodology

HAAR-Cascade Detection in OpenCV: Both the trainer and the detector are provided by OpenCV. Using OpenCV, we can train a classifier for any object, such as vehicles, planes, and buildings. The cascade image classifier has two primary states. The first is training, and the second is detection. OpenCV includes two OpenCV haar training and OpenCV train cascade apps for training cascade classifiers. The classifier is saved in a distinct file format in these two applications. A set of samples is required for training. There are two different kinds of samples:

1) Negative example: It's about images that aren't objects.

2) Positive samples: It's an image containing detectable items that's related.

1. *Choosing the Parameters:* The four parameters accepted by the LBPH (Local Binary Histogram Patterns) are: Radius: The radius surrounding the Centre pixel is represented by this value. Normally, it is set to 1. It is employed in the construction of the circular local binary pattern.
Neighbors: The total number of sample points required to create the circular binary pattern.
Grid X: The number of horizontally aligned cells. The larger the dimensionality of the generated feature vector, the more cells and finer the grid represents.
Grid Y: The number of vertically aligned cells. The larger the dimensionality of the generated feature vector, the more cells and finer the grid represents.

2. Algorithm Training: The algorithm must first be trained. It necessitates a dataset including the facial photographs of the person to be recognized [8]. Each photograph should have a unique ID (which could be a number or the person's name). The programmed then utilizes this data to detect an input image and provide you with the result. The ID of an image of a specific individual must be the same.

3. By using LBP operation: As shown in figure 2, the LBP calculation is utilized to build an intermediate image that highlights the facial characteristic and characterizes the actual image in a certain way. In the idea of a sliding window, the parameters radius and neighbors are employed.
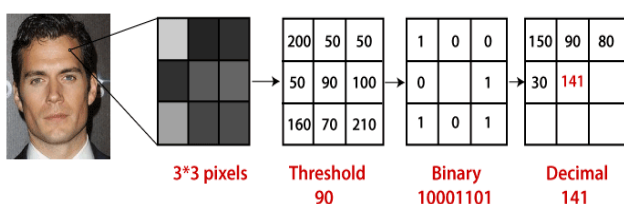

Fig. 2. LBPH Operations

4. *Getting the Histograms out of the Image:* As shown in figure 3 The image is formed in the last phase, and we may divide it into various grids using the Grid X and Grid Y parameters. Take the following image:
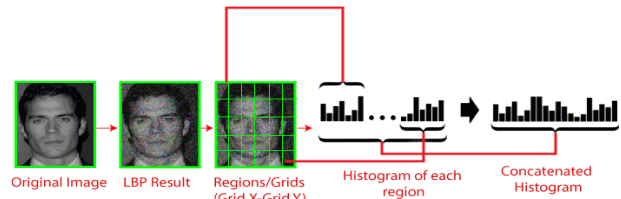

Fig. 3. Getting histograms out of image

A grayscale image, each histogram (from each grid) will only include 256 positions reflecting the occurrence of each pixel intensity. By concatenating each histogram, a new, larger histogram is required.

5. *Face recognition:* At this point, the algorithm has been well-trained. Each image from the training dataset is represented by the extracted histogram. As for the new look, to repeat the processes and make a fresh histogram. It only has to match two histograms and return the image with the closest histogram to identify the image that matches the given image.

Different methods for comparing histograms (calculating the distance between two histograms) exist, such as Euclidean distance, chi-square, absolute value, and so on. The Euclidean distance can be calculated using the following formula [11]:

$$D = \sqrt{\sum_{i=1}^{n}(\text{hist }1_i - \text{hist}2_i)^2} \tag{1}$$

Image with the closest histogram, the algorithm will return ID as an output. In addition, the method should return the calculated distance, which can be referred to as a confidence measurement. If the confidence value is less than the threshold, the algorithm has correctly detected the face. Face detection and identification have been discussed. For face detection, the haar-like cascade method is used. Face recognition algorithms vary; however, the Local binary patterns method is a simple and widely used one. It usually concentrates on the image's local aspects. Multitask Cascaded Convolutional Neural Networks is the algorithm used by the model (MTCNN). Local Binary Pattern Histogram is the face recognizer employed in this system.

6. Result and Analysis

A. Dataset Creation

In figure 4, a webcam is used to capture images of students. Multiple photographs of a single student will be taken from various angles and gestures.
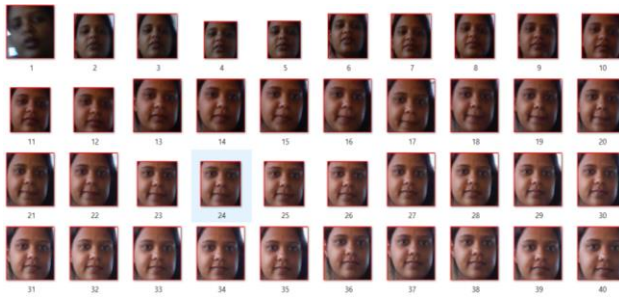
A

Fig. 4. Dataset

B. Face Detection

Fig. 5. Face detection

As shown in figure 5 the number of faces discovered by executing the OpenCV python code using Harr pre trained model which help to detect only human faces.
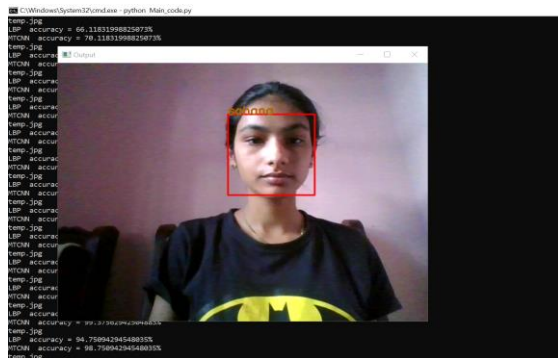
C. Face Recognition

Fig. 6. Face recognition

In figure 6, it is shown that Trained the dataset and recognized with dataset of previously captured faces and faces are reorganized with their name using MTCNN algorithm.

7. Conclusion

The automated attendance system was created with the goal of lowering the number of errors that occur in traditional attendance systems. The goal is to automate and create a system that will benefit an organization like an institute. In the office, the most efficient and precise technique of attendance that can replace the old manual methods. This technology is secure, dependable, and readily available. At order to implement the system in the office, no specialist hardware is required. It can be made with a camera and a computer. Users have incorporated an attendance system for a lecture or laboratory in this system, which allows the lecturer or teaching assistant to track student attendance. It helps you save time and effort. OpenCV is used to implement the entire system. The use of facial recognition techniques for the purpose of student attendance is demonstrated in this attendance system. The detection and recognition phase of the experiment is shown in the results. This approach can recognize numerous faces and is simple to implement in a classroom setting. The discovered faces are then cross-checked against a face database.

References

[1] V. Kurniawan et.al, "Executed participation structure using Eigen face calculation for face acknowledgment."

[2] Guoshing Huang and Jiahong Su, "A real-time face detection and tracking," 2008 International Conference on Audio, Language and Image Processing, 2008, pp. 173-179.

[3] Karnalim, Oscar, et al. "Face-face at classroom environment: Dataset and exploration." 2018 Eighth International Conference on Image Processing Theory, Tools and Applications (IPTA). IEEE, 2018.

[4] P. Wagh et.al., "Assessed different face acknowledgment framework for study hall participation using Viola Jones for face discovery reason and Eigen Face for face acknowledgment."

[5] Y. Duan, J. Lu, J. Feng, and J. Zhou, "Context-aware local binary feature learning for face recognition," IEEE Trans. Pattern Anal. Mach. Intell., vol. 40, no. 5, pp. 1139-1153, May 2018.

[6] X. Zhu, H. Liu, Z. Lei, H. Shi, F. Yang, D. Yi, et al., "Large-scale bisample learning on ID versus spot face recognition," Int. J. Comput. Vis., vol. 127, no. 6, pp. 684-700, Jun. 2019.

[7] G. Roshan Tharanga, S. M. S. C. Samarakoon, T. A. P. Karunarathne, K. L. P. M. Liyanage, M. P. A. W. Gamage, D. Perera. "Smart Attendance Using Real Time Face Recognition (SMART - FR) ", SAITM Research Symposium on Engineering Advancements, pp. 41-43, (SAITM – RSEA2013).

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

[9] Liu, F. and Zhang, F., "Parallax-tolerant Image Stitching," Computer Vision and Pattern Recognition, IEEE, pp. 3662-3669, 2014.

[10] E. Varadharajan, R. Dharani, S. Jeevitha, B. Kavinmathi, and S. Hemalatha, "Automatic attendance management system utilizing face detection," 2016 Online International Conference on Green Engineering and Technologies (ICGET).

[11] V. Shehu and A. Dika, "Using real-time computer vision algorithms in automatic attendance management systems," Proceedings of the ITI 2010, 32nd International Conference on Information Technology Interfaces, Cavtat, 2010, pp. 397-402.