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AN ANALYTICAL STUDY ON AN AUTOMATED ATTENDANCE SYSTEM THAT UTILIZED A CLOSED-CIRCUIT TELEVISION CAMERA AND THE LBPH AND HAAR CASCADE ALGORITHMS

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ABSTRACT
A significant development in the security industry is the ability to recognise faces, particularly when CCTV (Closed-Circuit Television) cameras are being utilised to monitor security. Due to the requirement to safeguard sensitive data and their lack of accuracy, manual attendance systems continue to present several difficulties even after considerable breakthroughs in the field of computer vision. On the other hand, face recognition technologies have substantially advanced and are currently utilised for simple attendance tracking in schools and universities. After the camera has taken pictures of the students, the system's graphical user interface displays their unique ID numbers. Face detection has been implemented using the face_recognition, LBPH, and Haar Cascade techniques.

Keywords: Face recognition, Face detection, Haar Cascade, LBPH technique, Attendance monitoring, face_recognition.

1. INTRODUCTION
Technology today strives to convey a significant degree of knowledge-based technical innovation. At the beginning and end of each lesson in the past, teachers would manually take attendance in the classroom. The problem with that strategy is that taking attendance manually requires some time and nearly always leaves space for error. Recently, RFID (Radio Frequency Identification) was created to address that problem. But those also have an unbreakable attendance system. We'll now talk about the concept of a face-based student attendance system. The main objective of the suggested system is to allocate attendance to students using algorithms based on face recognition to develop a foolproof attendance system.
Face detection is frequently used for face identification in digital photos and movies. According to the definition, it is a specific case of object-class detection in which all objects in an image that belong to a certain class are identified and measured. The technique can forecast frontal or near-frontal faces in a photograph regardless of orientation, lighting, or skin tone.
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Powerful and simple to learn, Python is a programming language. Its object-oriented programming methodology is straightforward but effective, and it has a good high-level data structure. Python is the best language for scripting and quick application development in a number of fields on most platforms because of its elegant syntax, dynamic typing, and nature of being an interpreted language. foundation. With additional functions and data types developed in C or C++ (or other

languages callable from C), the Python interpreter is easily extendable. Python is a good choice as an add-on language for flexible software.

Open CV - Python

Python is a general-purpose programme invented by GUIDO VAN ROSSUM that has quickly gained popularity mostly because of its clarity and readable code. It enables programmers to communicate their ideas in less code while maintaining readability. Python is sluggish compared to languages like C and C++. But another crucial aspect of Python is its simplicity in C++ extensions. This feature makes it easier for us to build computationally complex C and C++ code and wrap it in python so that we can use it as a module in python. We benefit from this in two ways. First, our code runs just as quickly as the original C, C++ implementation. The Numpy support also makes it simple. A highly optimised library for numerical operations is called Numpy. It offers syntax similar to MATLAB. All OpenCV array Numpy arrays are transformed into and out of structures. Therefore, you can expand your arsenal of weapons by combining whatever Numpy can do with OpenCV.The primary picture processing and simpler computer vision methods are aided by OpenCV[4]. Additionally, this can be used with some other libraries that support Numpy, such as SciPY and Matplotlib. As a result, OpenCV-python is an appropriate tool for developing solutions to computer vision issues.

Face recognition

The easiest face recognition library in the world lets you recognize and work with faces from Python or the command line. based on the most advanced deep learning face recognition technology from dlib. With respect to the Labeled Faces in the Wild benchmark, the model has an accuracy rate of 99.38%[6].

The excel sheets are used to mark the attendance for the students with the time that they are present and on which date the attendance was taken.

SYSTEM ARCHITECTURE

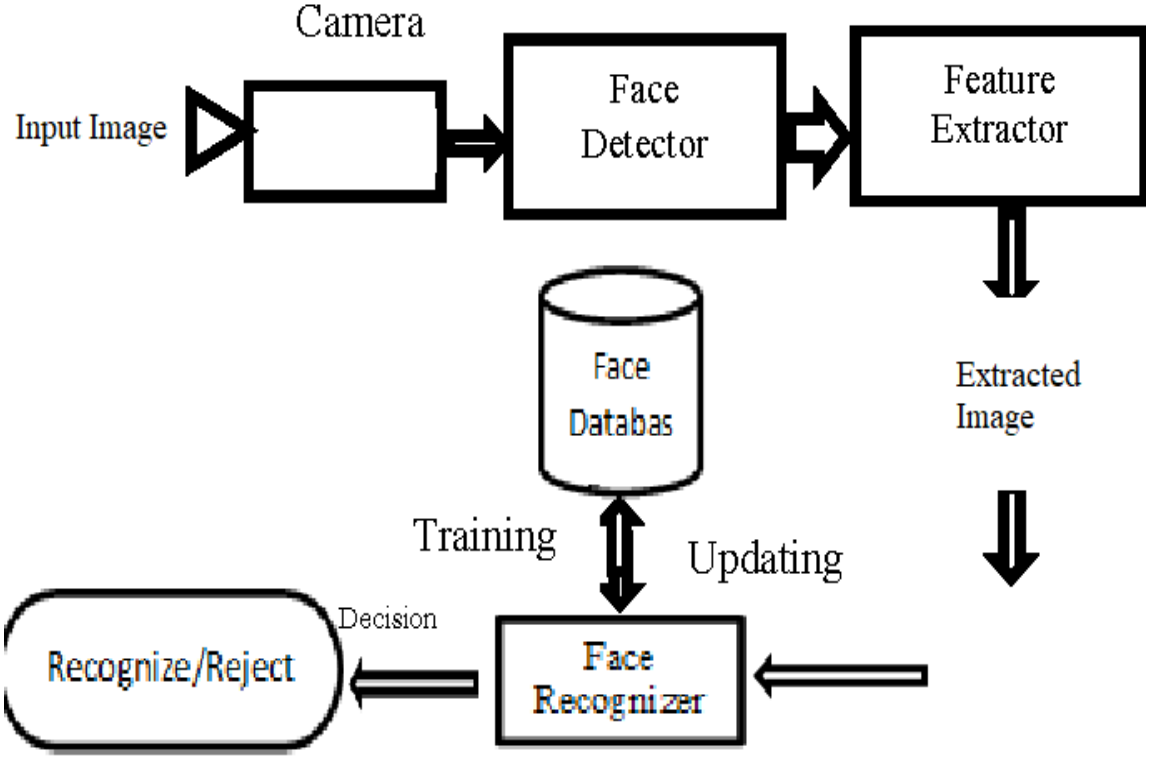


Fig.1. System architecture

Creating the database

A database of all the pupils will be created using Python and OpenCV. Because it is a one-time process, we will have a real-time database to train our system on and to match the captured faces. To create their database, the subject must sit in front of the camera at a distance of around 80 cm, with a light on the face's opposite side. The subject's face must be level with the camera. The person running the code must supply 8 poses with different expressions in order to build a database of various types of photographs. Poses can display the face in any way that makes it visible, such as up, down, or sideways.

Capturing the image

To record every student in the class, a high-definition camera will be mounted above the board in the classroom. Depending on the user's preference, the camera can be operated manually or through programming. The image will be taken and then sent to the system for additional processing.

Face detection and segmentation using Haar cascades

Once the system receives the input image, it will process it and use the OpenCV haar cascade feature to detect all of the faces that are present. The image will then be divided into segments for each of the faces present and kept in a file for that specific date.

Face recognition using LBP

We will run the face recognition code after all the faces have been divided into various faces. The local binary pattern algorithm will be used to compare each face from the specific date folder with the database. For increased effectiveness, the picture will be added to the database if a similar face is discovered.

Attendance marker

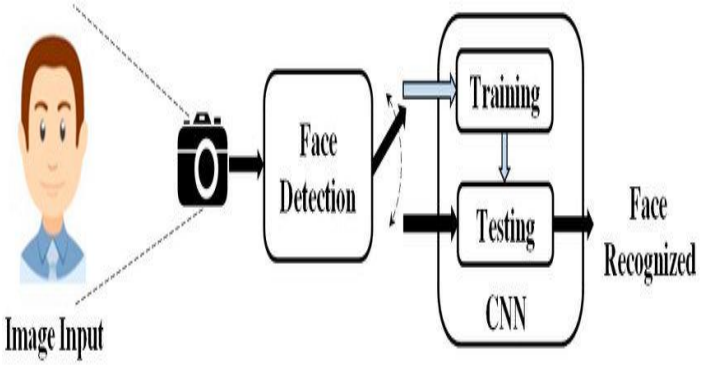
The student will be marked present if a face from the specific date folder matches one in the database. We will have a list of every student who attended the class after the same process. The remainder of the class will be marked absent.

2. PROPOSED MODEL

With no longer requiring manual recording of attendance, the proposed system will reduce paperwork. The new system will also cut down on the overall amount of time needed to record attendance. To ensure the accuracy of the attendance data, the new system will collect individual attendance using facial recognition.

We suggest a technique to get around the shortcomings of the current approaches. The suggested application is unobtrusive because it automates a system that takes attendance without the students being aware of it and does so in a real classroom setting.

Fig.2. Proposed model



The proposed system consists of the following steps[1] :

1. Creating Database
2. Input image
3. Face detection
4. Face recognition

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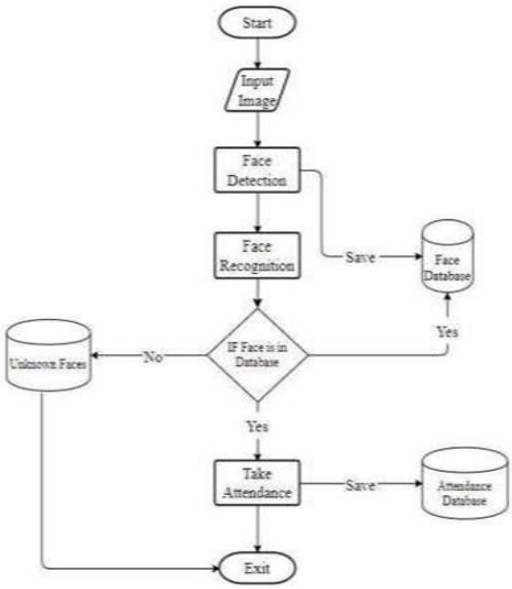
5. Attendance marking

Fig.3. Flow chart of proposed system



The unlabeled or unknown faces will not be considered while the system takes attendance, while the known face's attendance will be marked into the excel sheet with the time at which the student entered the classroom. The excel sheet consists of the name or roll number and time of attendance for each student.

The following methods are used in proposed system:

HAAR-Cascade detection in OpenCV

OpenCV offers both the trainer and the detector. Using OpenCV, we can train the classifier to recognize any object, including cars, aeroplane, and buildings[2]. Image subtraction morphological process is used in Haar cascades [5]. The cascade image classifier has two main states:

1.Training

2.Detection

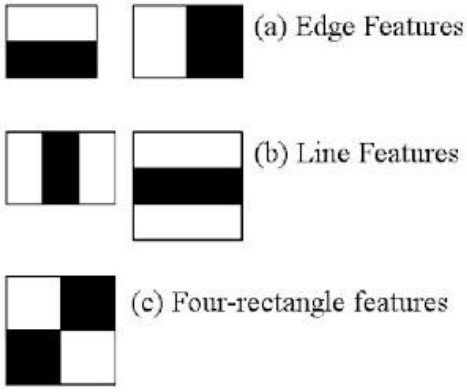
OpenCV offers the opencv_traincascade and opencv_haartraining applications for training cascade classifiers. The classifier is kept in two different file formats by these two programmes. For training, there are two types of samples:

• Negative sample

• Positive sample

Images without objects are related to the negative sample. A connected image with objects can be considered a positive sample[8]. The collection of positive samples is constructed using the opencv_createsamples function, however a set of negative samples must be manually prepared.

Fig.4. HAAR-Cascade Classifier



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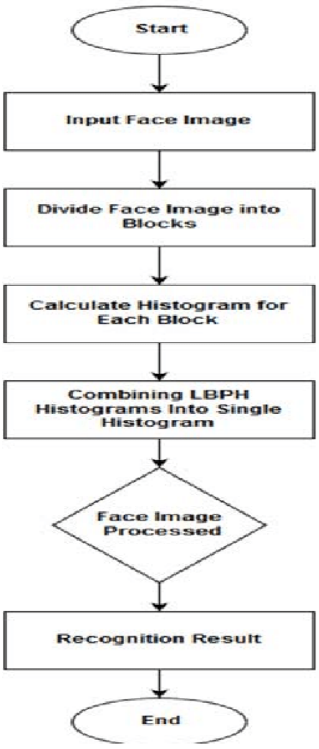
LBPH Algorithm

Local Binary Pattern (LBP) is a simple but effective texture user that marks the image's pixels according to how close they are to one another and interprets the results as binary numbers[7].

Fig.5. LBPH Algorithm



3. RESUTS

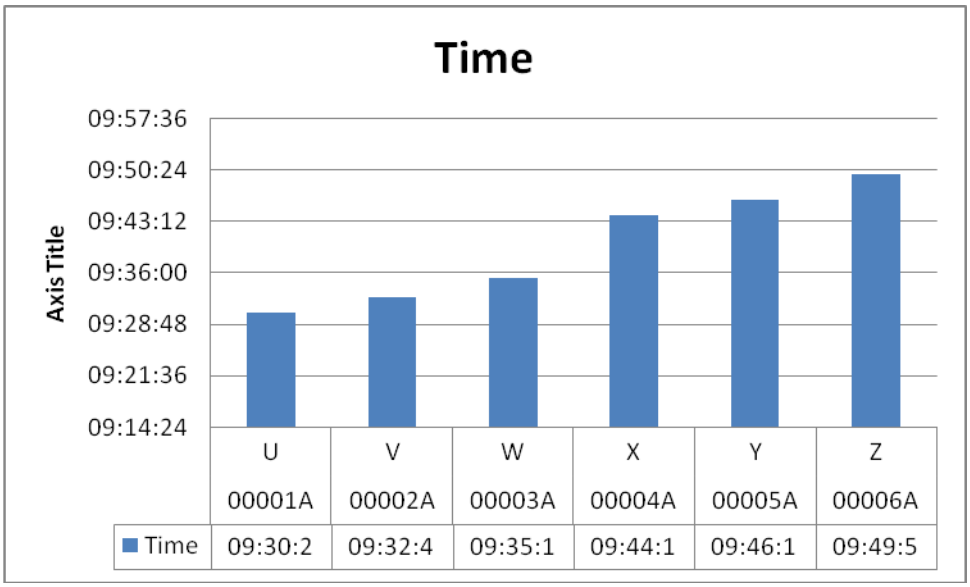


Figure.6. Attendance with student roll number, Name with time

CONCLUSION

In essence, this framework aims to improve the performance of the framework in all contexts, including associations, organisations, associations, and schools. Manual or traditional work will be reduced by recording live photos from the camera and utilising various face localization and face recognition algorithms. In our approach, the dataset is created by developing an interface. Using

Haar Cascade, the photos were processed. It will accurately be able to tell apart faces from non-appearances once preparation is finished.

The participation sheet is updated with the proper time and date when storing images and scheduling related photos. Each understudy's itinerary is simple for staff to monitor as it is stored for the upcoming season.A student management system has many advantages for a company, college, or university. There is no documentation necessary with the suggested system. The act of supervising can be done anywhere in the world. This project specifically reduces the amount of labour that needs to be performed by individuals. The college is processing this application, maintaining data security and preventing information leaks. The pupils greatly benefit from receiving updates on their attendance and internal evaluations.

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