FACE RECOGNITION ATTENDANCE SYSTEM USING HOG ALGORITHM

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ABSTRACT
Face recognition is the effective technique in this real world application. Human face recognition is useful for the verification purposes mainly in the student attendance system. Attendance system employs high definition monitoring, face biostatistics, and other computer technologies. The development of this system contributes to the digital transformation of the traditional method of recording attendance by calling names and keeping handwritten records. Today's methods of taking attendance are time-consuming processes. Manual recording allows for simple changes to attendance data. Both current biometric methods and traditional attendance methods are vulnerable to proxies. This article addresses each of these concerns. Following face recognition, attendance is maintained in excel format. The system is tested under a variety of conditions, including changing lighting, head movements, and pupil distance from the cameras. After extensive testing, the total complexity and accuracy are determined. The proposed technique has proven to be a dependable and effective tool for taking attendance in a classroom without the use of human labour or time-consuming procedures. The developed technology is inexpensive and requires minimal installation. By using this technique we can easily take the attendance and maintain the attendance.

Keywords: HOG Algorithm, CNN, SVM, Face Detection, Face Recognition, OpenCV, Machine Learning.

INTRODUCTION
Face Recognition is a system that uses digital masking to recognise or confirm a person's face in an image or video. There are numerous methods for recognising faces. Face recognition uses biometrics to map facial traits from an image or video. Facial recognition technology can be used to confirm a person's identity based solely on their appearance. In today's digital world, face recognition is extremely useful. Especially in places where attendance must be verified. Some regions may now use technology to confirm attendance. Face recognition can thus expedite the process of recording and validating the person, which is extremely useful for attendance verification. Face recognition is the very important and actively reaching technologies in this ML, with different outcomes. This is very helpful in the real world. It can be used in any work place. In this there are many approaches to take the attendance. This face recognition removes issues in work places.
A facial recognition system is the ideal solution to these problems. The attendance is generated automatically by the system, so the lecturer does not have to worry about keeping track of every student's attendance records for future reports. Because there are no longer any opportunities for students to falsify documents, the data generated for the report will be accurate and free of errors. The process of taking the attendance gives the better and accurate results.

LITERATURE REVIEW
Student attendance system by face recognition, maintain the records of attendance is compulsory in all the institutions for checking the regularity of the student. Each institute has its own method of taking attendance. Some are taking attendance manually using the pen and paper approach. Some of

 DOI: 10.36893.DRSR.2023.V13I0.0255-0261

them are upgraded to new technologies like biometric techniques.[3]. The following describe a few of the approaches discussed in the literature.
The author, Xiang-Yu Li [2], proposed using HOG features and PCA algorithms to recognise faces. We obtain similarity between the taken image and the database image by applying the recognition algorithm to cropped faces images. The PAC algorithm is used for face detection and recognition in this paper.
Arun Katara [4], the author, demonstrated face recognition of different people or students. Attendances are uploaded to a database using face detection and recognition of students or workers. This manual work is being reduced by humans, and an automatic attendance system based on faces is being implemented.
The authors of Adam Schmidt, Andrzej Kasinski [10] considered a system based on real-time face recognition that is fast and requires image improvisation in various lighting environments.

HOG AlGORITHM

Histogram of oriented gradients algorithm steps

Step1: Pre processing

In this pre process step the captured Image can be cropped and resized. The image in the ratio of 1:2. For Example, they can be 150 X 300, 1000 X 2000 but not 102 X 208.
Figure1 shows a large image of 720 X 475. We have a selected image of size 100 X 200 this is the size of the image we cropped. After cropped out of an image the image can be resized to 64 X 128. The resized image is now ready for calculating the HOG descriptor. This is how pre processing is done in step1.

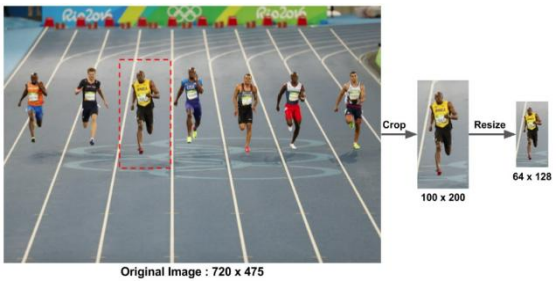

Figure 1 (source): Pre processing

Step2: Calculate the Gradients

To calculate the HOG descriptor, we want to calculate the horizontal and vertical gradients, after that we want to calculate the histogram of gradients.

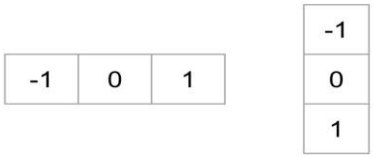

Figure 2: Horizontal & vertical gradients

The figure3 shows the gradients

Figure3: Gradients

Left: Absolute value of x-gradient.

 DOI: 10.36893.DRSR.2023.V13I0.0255-0261

Centre: Absolute value of Y-gradient.
Right: Magnitude of gradient.

Step 3: Calculate Histogram of Gradients

The Figure 4 is divided into 1:2 ratio that means 8x8 cells and a histogram of gradients. An 8×8 image patch contains 8x8x3 = 192 pixel values. The gradient of this patch contains 2 values (magnitude and direction) per pixel which adds up to 8x8x2 = 128 numbers.

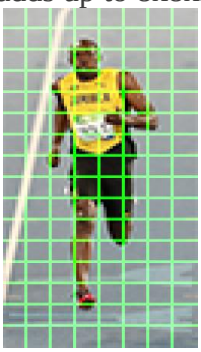

Figure 4 8 x 8 cells of HOG

The histogram is a vector (or an array) corresponding to angles 0, 20, 40, 60, 80, ….160.
For each and every 8x8 cell in the image and the calculated gradients.

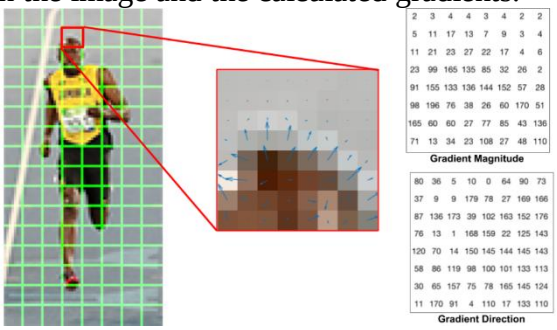

Figure 5: centre: gradients represented using arrows. Right: gradients represented as numbers.

After calculating the gradients the 8x8 cells are added up to create the 9-bin histogram.
Below figure6 represents, y -axis is 0 degrees. The histogram has a lot of weight near 0 and 180 degrees, the gradients are pointing either down or up.

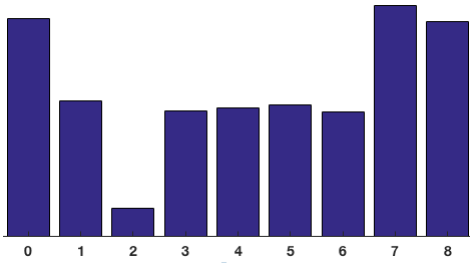

Figure 6 : Histogram

Visualizing Histogram of Oriented gradients:

The HOG descriptor of the image visualized histograms in the 8x8 cells.

DOI: 10.36893.DRSR.2023.V13I0.0255-0261

Figure 7 :Visualization of HOG

PROPOSED SYSTEM

Architecture Diagram:

The following Figure8 illustrates the proposed attendance management system.

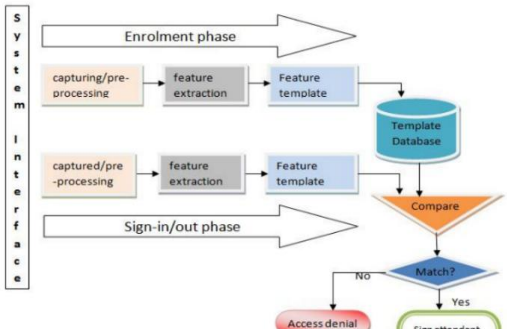

Figure 8: Architecture

Step1: Finding Images

Face detection is an excellent camera tool. Since the camera can automatically recognise faces, it can ensure that every face is in focus before taking the photo.

Figure2 shows that, each individual point on the face are examined.

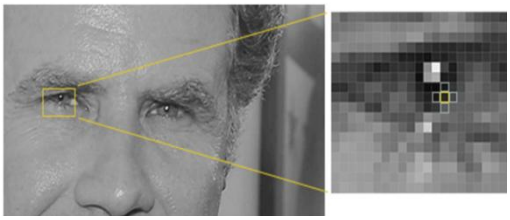

Figure 9 (source): Examining individual points on the face

To identify faces HOG image, In figure3 illustrates that only the main part of face from the HOG pattern will be extracted and drawn from a large collection of training faces.

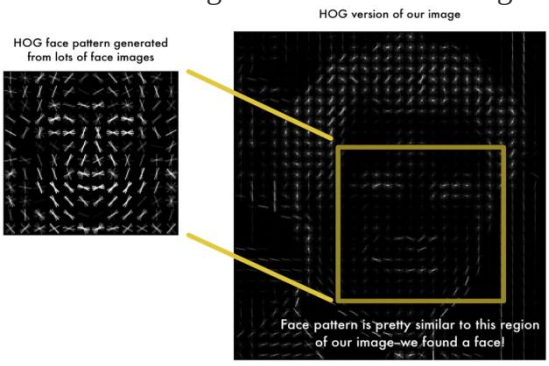

Figure 10 (source): Image detection using HOG

Step 2: Projecting faces

Each of the images will be altered to ensure that the eyes and lips are always in the sample area in order to make up for this. compare faces in the subsequent steps.

In figure 4 Identifying 68 different areas on each face, also referred to as landmarks, and is the basic strategy. The landmarks are taken around our face. For each and every person the 68 landmarks are created. The person face is trained by using landmarks.

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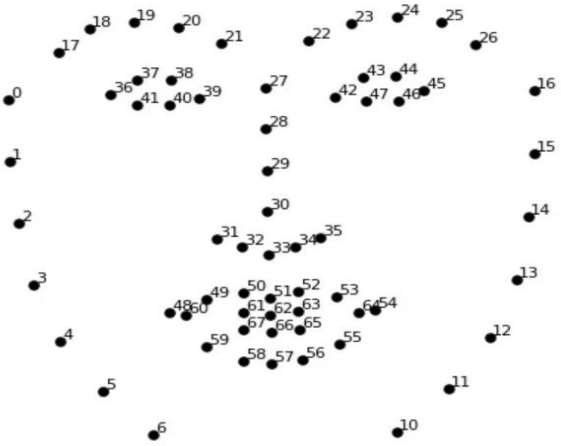


Figure 11 (source): Landmarks on face

The process of training the image shows in figure5:

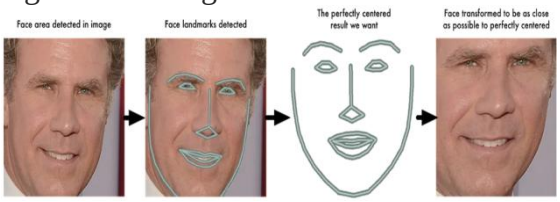


Figure 12 (source): Training the face

Step 3: Encoding faces

Here, a person's photograph will be used to create a 128-encoding. After that, an encoding from a test image of a different person is created and repeat the same for a second image. The results will be compared to make minor adjustments to the neural network. Convolutional Neural Network is referred to as CNN.

Face photos are run through their pre-trained network to obtain each face's 128 metrics that shows in the figure6. The dimensions the test image are as follows:

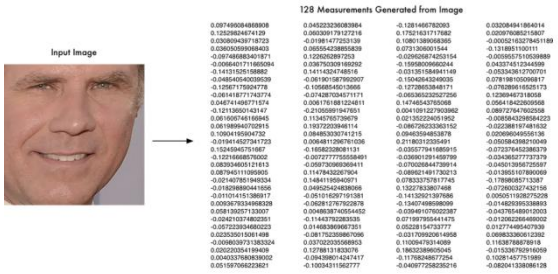


Figure 13 (source): Metrics of face

Step4: Finding the person's name from the encoding

The process's final step is the one that is actually the simplest. The system will check the entered person face measurements and database stored face measurements. If the person face matches with the database faces it will mark the person attendance otherwise it will not record the attendance.

RESULTS:

Webcam: Figure7 shows the webcam. It will open the webcam after executing the application.

 DOI: 10.36893.DRSR.2023.V13I0.0255-0261

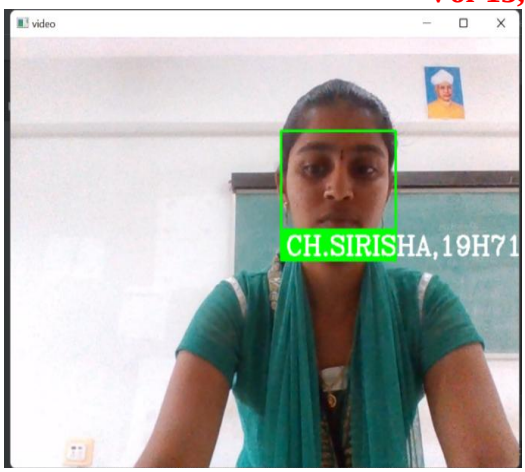
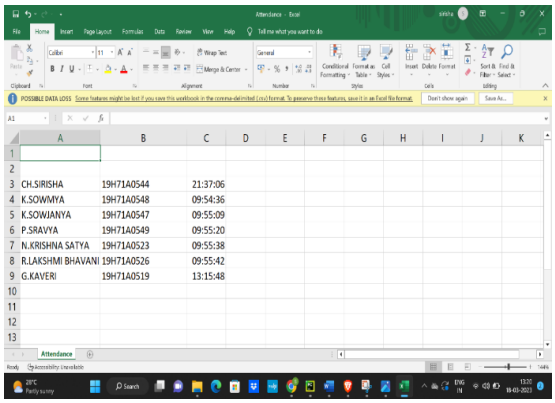


Figure 14: Webcam

Excel sheet: Figure8 shows attendance records in Excel format.



	A	B	C
3	CH.SIRISHA	19H71A0544	21:37:06
4	K.SOWMYA	19H71A0548	09:54:36
5	K.SOWJANYA	19H71A0547	09:55:09
6	P.SRAVYA	19H71A0549	09:55:20
7	N.KRISHNA SATYA	19H71A0523	09:55:38
8	R.LAKSHMI BHAVANI	19H71A0526	09:55:42
9	G.KAVERI	19H71A0519	13:15:48

Figure 15: Excel Sheet showing the attendance

CONCLUSION:

The goal of this technology is to create a powerful face recognition-based class attendance system. The proposed system will be able to record attendance by using roll number, name and entered time of the student. It will detect and identifies the faces using a webcam. The attendance record will be updated on student's attendance.

The suggested method can identify faces and record attendance with more precision and accuracy while requiring less computational effort. The system also has less physical and financial influence. The employment of the HOG and CNN algorithms has been fruitful. It can be observed that the system's accuracy changes depending on other circumstances, such as lightning, yet 99.20% is achieved. It can be noticed that the suggested approach is more effective than any other system that makes use of various algorithms, such as KNN and SVM.

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 DOI: 10.36893.DRSR.2023.V13I0.0255-0261