Attendance Management System, Using Facial Recognition

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Abstract-:

Face acknowledgment is among the most useful picture-handling applications and plays a crucial part in the specialized field. Acknowledgment of the human face is a functioning issue for verification purposes explicitly concerning the participation of understudies. Participation framework utilizing face acknowledgment is a method of perceiving understudies by utilizing face biostatistics in light of the superior quality observing and other PC innovations. The improvement of this framework is meant to achieve digitization of the conventional arrangement of gauging participation by calling names and keeping up with pen-paper records. Present procedures for gauging participation are monotonous and tedious. Participation records can be without any problem controlled by manual recording. The conventional course of making participation and present biometric frameworks are helpless against intermediaries. This paper is consequently proposed to tackle this large number of issues. The proposed framework makes the utilization of Har classifiers, KNN, CNN, SVM, Generative antagonistic organizations, and Gabor channels. After face acknowledgment participation reports will be created and put away in successful design. The framework is tried under different circumstances like enlightenment, head developments, the variety of distance between the understudy , what's more, cameras. After fiery testing by and large intricacy and exactness are determined. The Proposed framework ended up being a productive and vigorous gadget for gauging participation in a homeroom with practically no time utilization and manual work. The framework created is cost-productive and needs less establishment.

Keywords – KNN, SVM, VIOLA-JONES, HAAR classifiers, CNN.

I. INTRODUCTION

Participation being an extremely important side of an organization may regularly turn into a challenging, excessive movement, driving itself to errors. The customary methodology of settling on roll decisions impresses by a legal time limit as it is undeniably challenging to call names and keep up with its record particularly when the proportion of understudies is high. Each association has its approach to going to lengths for the Participation of understudies. A few associations use report situated Approach and others have executed these computerized strategies, for example, biometric fingerprinting methods and card trading procedures. be that as it may, these strategies end up being a legal time limit as it subjects understudies to stand by in a tedious line if the understudy neglects to bring his id card, he can not get participation. developing advancements have made numerous enhancements in the impacting scene.

The arrangement of insightful participation is by and large executed with biometrics help. Acknowledgment of face is one of the Biometric approaches to working on this framework. Face acknowledgment ended up being a useful strategy for gauging participation. The regularizing face acknowledgment strategies and philosophies neglect to handle difficulties like scaling, present, brightening, varieties, pivot, and impediments. The structure proposed is intended to settle the downsides of current frameworks. there has been a ton of progression in face acknowledgment however the fundamental advances are face discovery, highlight extraction, and face acknowledgment. A recently created improved picture will be passed to the framework for face discovery. a cycle of face identification is joined by highlight extraction and face acknowledgment these interaction utilizes Gabor channels. face acknowledgment is finished utilizing the K-closest neighbor calculation, Convolutional brain organizations, and SVM calculation with their relative investigations. post-finish of face acknowledgment, the framework creates the name and ID number of the understudies who are available and distinguished in the picture. then, at that point, participation is set apart before the understudy names in the successful design with a separate date and subject of a talk in an organization. It requires not many equipment assets subsequently it is a framework that welcomes expenses.

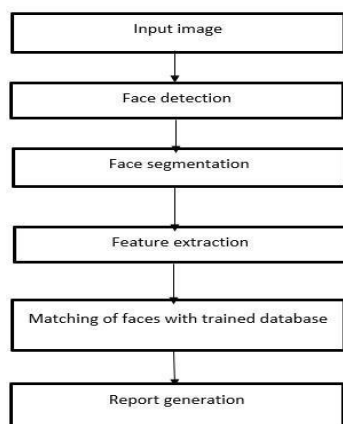The above statement can be illustrated in Figure 1 below

Figure 1 Operating process of the attendance system

II. LITERATURE REVIEW

The essential point of this paper is to concentrate on the various methodologies given by creators and to foster a continuous participation framework that defeats the inadequacies of past strategies and gives the best arrangement.

In [1] Yohie Kawaguchi et.al proposed a framework in light of persistent perception and utilizing face acknowledgment. The creator gave a framework for a functioning understudy identifying technique (ASD) having two cameras put on the wall in which one is a detecting camera which is utilized for assessing seats inside the class and the other is a catching camera which is utilized for face identification. They have proposed a shooting plan in which one seat is assessed from the seating region got by ASD and afterward guides the catching camera to the seat and catches a picture. The presence of understudies is assessed utilizing foundation deduction and entombs outline deduction. The creator has tackled the direct aggregate task issue to give the correspondence of understudies and seats.

The paper proposed by [2] presented a robotized framework given convolutional brain organizations. The creator has utilized the GSM module to send the produced participation report to an approved individual. The creator proposes the altered convolutional brain network by adding two standardization tasks to two of the layers. This activity gives the clump standardization speed increase of the organization. The face acknowledgment framework is planned to utilize the Filter calculation. This

framework will gauge participation utilizing MATLAB. The picture will be caught and coordinated with the information base and the SMS is shipped to the approved number. significant advances acted in this methodology for creating the elements are scale-space outrageous recognition, key point confinement, direction task, and key point descriptor. When the face is perceived by the framework Drove on the Arduino board will begin squinting.

In [3] creator examined [6] a two-stage mixture face recognition plot that utilizes the likelihood-based Facial covering Prefiltering (PFMPF)and the pixel-based various leveled Element Promotion supporting (PBHFA) strategy. This approach is expected to take care of the issue in Har overflow. The creator proposed a framework with two stages, the preparing stage, and the testing stage. In the preparation stage, they introduced two primary advances initially face identification in which they utilized the Viola-Jones calculation. the second step which is highlight extraction in the wake of identifying faces from a video highlight is separated utilizing the PCA calculation. in the testing stage, the informational collection is divided into two sections named preparing the dataset and testing the dataset.

In [4] the author used the convolutional neural network (CNN) to obtain low dimensional features as the pre-processed images are too high dimensional for a classifier to take it as input directly. For face detection, they used the Viola and Jones algorithm and then used a correlation tracker to track faces from frame to frame. In this paper, the author has worked on several parameters like pose estimation, sharpness, resolution, and brightness. The head position is determined using a three-angle roll, yaw, and pitch. The approach includes a final score calculation named face quality assessment by assigning weights to each of the normalized parameters.

In [5] the creator introduced the framework which utilized the Eigenfaces approach for face acknowledgment. They performed face location followed by trimming of countenances and then, at that point, dealt with foundation deduction for greyscale pictures and paired pictures. The creator has utilized the Eigenface technique because of its straightforwardness, speed, and learning capacity.

In [6] Savitha et al proposed a framework that utilizations skin recognition strategy for face identification. after the skin is distinguished skin pixels are taken and the other pixels in pictures will be made dark. Then these skin pixels will be utilized for face location creators have utilized two information bases, the main data set is for putting away faces of understudies and the subsequent data set is for putting away information of understudies.

III. PROPOSED SYSTEM

A. Architecture

The proposed framework is exceptionally basic, easy, and sensible with clear activities. It embraces an information base of understudy's countenances and their subtleties like name, enrolment number, and course. at least two cameras relying upon the need and size of the homeroom are to be obliged on the roof of the study hall covering the whole region. these cameras will catch pictures a few times during a talk. this will expand the proficiency of the framework since, supposing that the camera won't cover a few understudies then different cameras will catch their countenances. there are various articulations and postures conceivable that an understudy can perform. if at a specific occurrence, the framework neglects to recognize faces because of troublesome postures then the framework can distinguish those countenances on one more occasion of picture obtaining. When the picture securing is done when the educator sets off the framework by making a tick on the beginning button from there on the framework will go through face identification. after the appearances are distinguished in a picture taken by all cameras in all given cases the identified countenances will be contrasted and put away pictures of the understudies in the data set. When the face is matched then the present is set apart before it compares the enrolment number and name in the succeeding design. however there are various cameras and numerous examples, and there is a plausible of repetitive countenances. teamed up results will be produced by barring repetitive countenances of a similar understudy so that solitary participation is given to that understudy during a talk.

B. Methodology

In developing an intelligent attendance management system, some steps need to be followed to achieve this Successful task.
The steps are definable as follows:

Database creation
Image amelioration
Face detection
Feature extraction
Face recognition
Redundancy removal
Report generation

Database creation

In the first step, the database will be created at the time of enrollment of students. The database will store generic information about students like name, identification number, course, and semester subjects. alongside the image of the student is to be captured by the system for training in the proposed system. This system captures a single image for a student for training purposes. With the aid of all the pictures the student has stored in the database, facial recognition for all of the students attending a lecture. It can be accomplished.

Image amelioration

Because of the developments of an understudy in a homeroom, the picture caught by the camera might get obscured. the picture can be enhanced by utilizing Generative Antagonistic Organizations. GANs are known for their capacity to hold surface data in pictures, make arrangements like the real scope of viewpoints, and look distinguishably persuasive.

$$I_B = k(M) * I_s + N$$

where I_B is a distorted image, $k(M)$ is referred to as unknown blur kernels identified by motion field M. I_s is the sharp latent image, and * symbolizes convolution whereas N denotes an additive noise.

Face detection

For detection of faces 68 landmarks of faces are taken into account. with the help of these landmarks, faces are detected. For face detection, Haar classifiers have been used. It is an approach based on machine learning in which a cascade function is trained from many positive and negative images. This is then used on other images to detect images. These classifiers are simply the subtraction of the sum of pixels under the black area from the sum of pixels under the white area. applying 6000 features on each window frame was found to be difficult. features were grouped into stages which are known as cascades of a classifier.
AdaBoost is used for removing redundant features and for selecting only appropriate features. These features are known as weak classifiers. A weighted combination of weak classifiers is used to detect faces. using the AdaBoost linear combination of weak classifiers is constructed known as a strong classifier.

$$P(Y) = \sum (S_i * p_i(Y))$$

Here, $P(Y)$ is a strong classifier and s_i are corresponding weights to each weak classifier $p_i(Y)$.

Feature extraction

For include extraction, Gabor channels are utilized to lay hang on facial highlights leaned at different points. It is an extremely basic step since it is accepted that a fruitful element extractor chooses a capability that isn't inclined to impediment, lighting, setting, and posture change. 2D Gabor channels are utilized to determine spatial mutilations brought about by position and lighting changes.

$$W(x, y, \theta, \lambda, \varphi, \sigma, \gamma) = e^{\left(-\frac{x^2 + \gamma^2 y^2}{2\sigma^2}\right)} \cos\left(2 \prod \frac{x^2}{\lambda} + \varphi\right)$$

$$x' = x \cos\theta + y \sin\theta$$

$$y' = -x \sin\theta + y \cos\theta$$

here (x, y) defines the situation of a light impulse and μ, ϕ, γ, λ, σ are parameters of the sinusoidal wavelet.

Face recognition

For face acknowledgment, the K-closest neighbor calculation has been utilized, convolutional brain organizations, and a backing vector machine. These three calculations are thought about on the grounds of exactness, heartiness, and time intricacy.

A. K-nearest neighbor algorithm

KNN is called memory-based or languid learning since it just jams the understanding of the preparation models because of how it learns.
The Euclidean distance metric is frequently chosen to Decide the area of data of interest inside KNN. An item is ordered by the Democratic done by most of its neighbors, with the item designated to the most well-known class of its closest neighbors (k Is a positive number). If k = 1, the article is it is allotted to his nearest neighbor's family.

$$d(x.y) = \sqrt{(x_1 - y_1)^2 \dots \dots \dots (x_n - y_n)^2}$$

ᬁ.ᬂᬛ G ᬛᬂ is the Euclidean distance which is by default used by KNN to find the nearest class.

B. Convolutional neural networks

Convolution Neural Networks allow us to derive from images a large variety of features. This concept of extracting the

functionality for face recognition can also be used. CNN uses 68 facial landmarks to generate 128-dimensional encodings which are facial features encoded in RGB format. These encodings are compared to match faces. The strictness of face comparison can be manipulated by tolerance value.

Redundancy removal

As the framework envelops different cameras. there may be plausible of the presence of the essence of a solitary understudy in various pictures. repetitive countenances will be taken out and single countenances will be considered to check single participation for an understudy during a talk.

Report generation

Trailing face recognition reports are generated by marking present in front of the student's name and enrollment number in Excel format during a lecture.

IV. RESULTS

The framework was tried on three unique calculations out of which the KNN calculation ended up being better with the exactness of 99.27 %. The framework was tried under different circumstances which incorporate brightening, head developments, articulations, and the distance of understudies from the camera. The framework confronts the assumptions in any event when the picture contains faces with stubbles and displays and without facial hair and scenes. proposed framework displayed to be eminent to perceive faces having two years of distinction. Being tried in these circumstances KNN ended up being better by accomplishing the general precision of 97 %. at the point when tried on conditions recorded above CNN accomplished the general precision of 95 % and SVM accomplished an exactness of 88 %. seeing the part of time intricacy, CNN presented to have low time intricacy. It was found that SVM has the most elevated time intricacy among these three recorded calculations. The proposed framework is tried on 200 continuous pictures of a homeroom with the greatest strength of 70 understudies. The proposed framework is sufficiently strong to gauge the participation of 70 understudies in a homeroom.
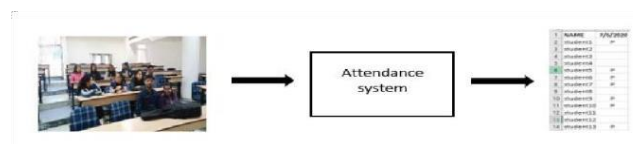The figure below shows the result of our proposed system

Figure 4 Proposed system

V. COMPARISON

In our proposed system Haar cascades are used for face detection and generative adversarial networks for image amelioration and feature extraction Gabor filters were used. For face recognition,

In a classroom head movements at different angles is possible during a lecture. Head movements can be categorized into three

different algorithms were used. These are the respective x-axis, y-axis, and z-axis.

Above listed algorithms were tested with different head movements. The graphs below show the variation in the algorithm's accuracy with a variety of angles.

For Roll and Yaw angles, the negative x-axis shows the head movement in the left direction and the positive x-axis shows the head movement in the right direction.

For the Pitch angle, the negative x-axis shows the head movement in the downward direction and the positive x-axis shows the head movement in the upward direction.

1) Pitch angle variation
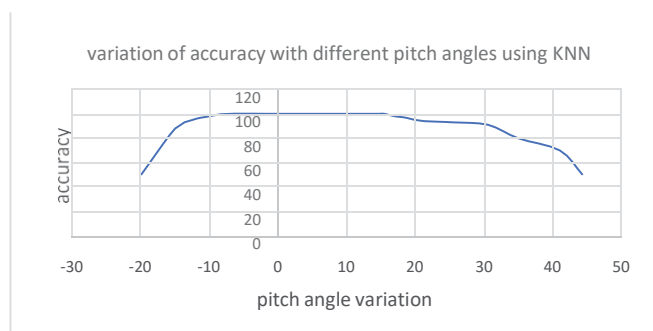
algorithms have been compared on the grounds of time complexity accuracy in various conditions.

Table 1 shows the comparison of algorithms under listed conditions.

Conditions under testing	Accuracy		
	KNN	CNN	SVM
Normal	99.27	95.54	89.15
With age difference (2yrs)	97.90	95.00	86.75
With beard	90.00	90.00	80.00
With different expressions	92.00	90.00	78.00

Table 1 Comparison

A. Head movements

categories measured in angles which are pitch, yaw, and Roll at Graph 1 Variation of accuracy with variation in pitch angle using KNN Graph 3 Variation of accuracy with variation in pitch angle using SVM
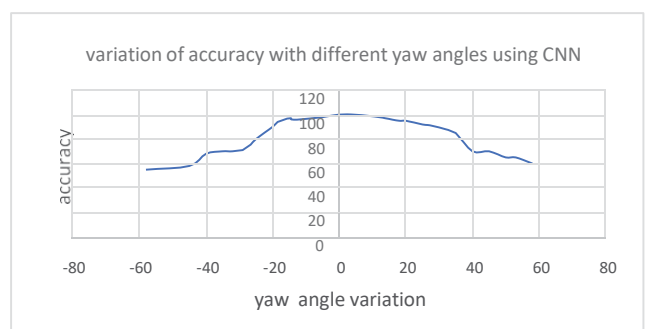
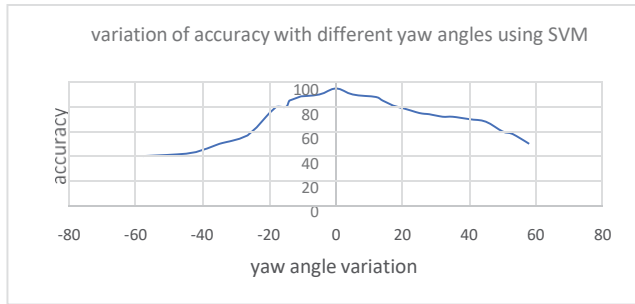*2) Yaw angle variation*
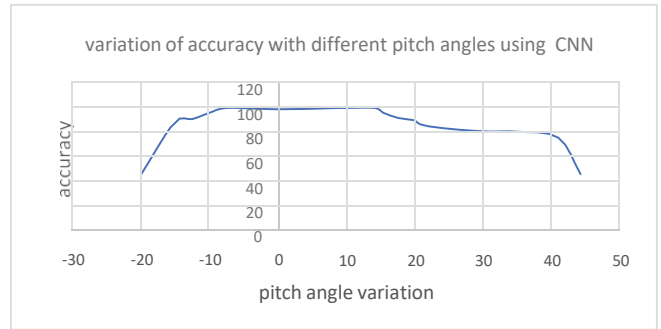
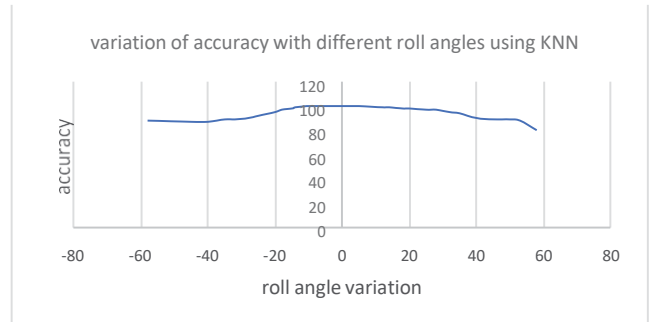Graph 2 Variation of accuracy with variation in pitch angle using CNN
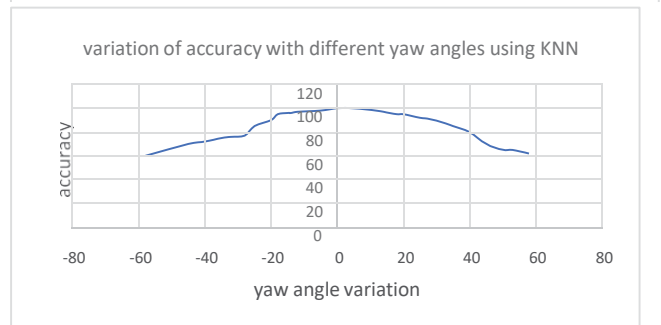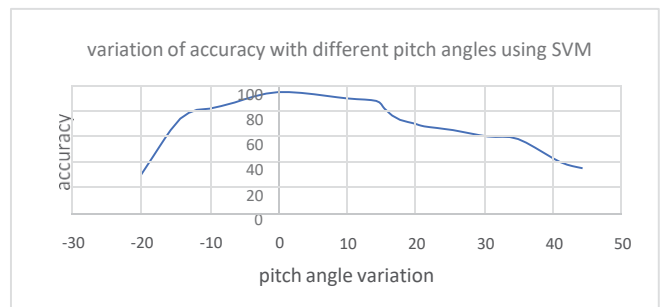
Graph 4 Variation of accuracy with variation in Yaw angle using KNN

Graph 5 Variation of accuracy with variation in Yaw angle using CNN
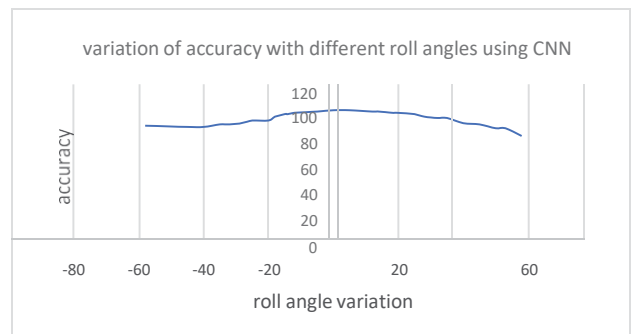
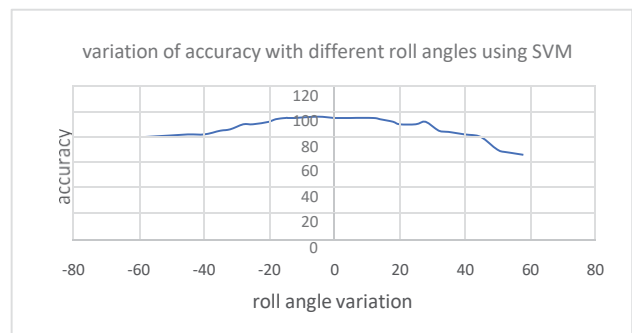Graph 6 Variation of accuracy with variation in yaw angle using SVM

3) Roll angle variation

Graph 7 Variation of accuracy with variation in roll angle using KNN
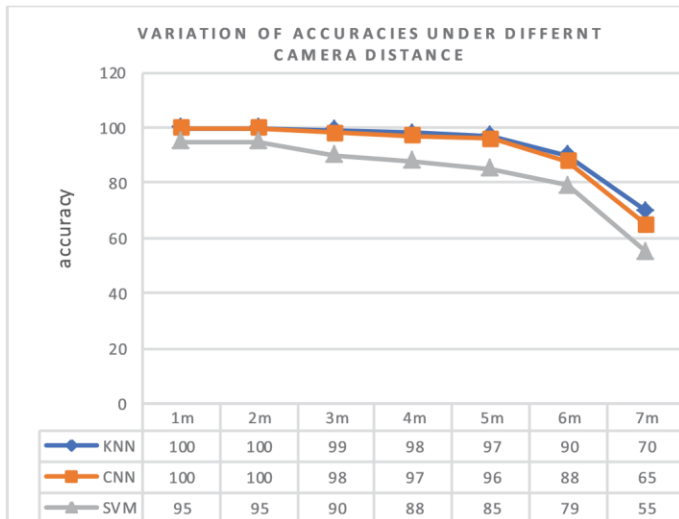

Graph 8 Variation of accuracy with variation in roll angle using CNN

Graph 9 Variation of accuracy with variation in roll angle using SVM

B. Different camera positions

Although cameras are to be fixed at the ceiling of classrooms, there may be a possibility of the varying distance between students and the camera as students can sit at different seats. A system using three different algorithms were tested under the situation of the varying distance between student and cameras. The graph below shows the variation inaccuracy of the abovementioned algorithms.

Graph 10 Variation of accuracy with variation in distance

C. Overall result

Taking into account all the above-mentioned conditions and situations overall accuracy, precision, recall, F1 score, and time complexity of the algorithm are calculated.

The table listed below describes the above statement.

Algorithm	KNN	CNN	SVM
Overall accuracy	99.27	98.54	80.15
Overall time complexity	124 seconds	120 seconds	480 seconds
Precision	0.99	0.98	0.78
Recall	0.98	0.97	0.75
F1 score	0.984	0.974	0.764

Table 2 result

VI. CONCLUSION

The proposed system meets the objective of achieving high precision and less computational complexity. This system is cost-efficient and less manual work is needed. Using Gabor filters accuracy is highly improved. For face recognition, Three algorithms have been used which are K-nearest neighbor, convolutional neural networks, and support vector machine, among these, the KNN algorithm proved to have the highest accuracy of 99.27 %. Convolutional neural networks evinced to

have low computational complexity. The SVM algorithm proved to be less efficient

VII. REFERENCES

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