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Online Classroom Attendance Marking System Using Face Recognition, Python, Computer Vision, and Digital Image Processing

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Abstract: ***The face is the identity of someone. The tactic to appear out this physical feature has seen an exquisite change since the advent of the image processing method. The attendance is taken in every school, college and library. The regular method for attendance is teachers calling student name & marking attendance. Nowadays, AI has been highly explored for computer vision applications[1]. So, we use the concept of neural network in Face – recognition for automatic attendance marking systems. In this project, we perform the face recognition and face detection algorithms, to produce the computer systems the ability to find and recognize human faces fast and precisely in live videos so that the systems can be used in marking attendance.***
Keywords: Face detection, Python, Computer Vision, Attendance marking system, Image processing

I. INTRODUCTION

Attendances of each student are being maintained by every university, school, and college. Teachers should be maintaining, proper records for attendance. An attendance system could even be a system that is used to track the attendance of a particular person and is applied in the industries, universities, schools, and also working places. The manual attendance record system is not efficient and requires more time to arrange the record and to calculate the average attendance of each student. The Regular way of marking attendance has drawbacks. Old conventional methods for student attendance are still used by most universities. As this Regular method is used, many students are given proxy attendance of their friends by signing in their attendance in case they are absent in the institute In general, the attendance system of the student can be maintained in two different forms namely,

A. Attendance By Using Google forms

The regular Student Attendance Management system is a process where a teacher concerned with the particular subject needs to make google forms of quiz and on basis of that they mark the attendance manually. This attendance method may be considered as a time-consuming process, or sometimes it happens for the teacher to miss someone or students may forget to fill google forms.
Friends. So, the problem arises when we think about the traditional process of taking attendance in the classroom. To solve all these issues, we go with the Automatic Attendance System(AAS)[2]. An automated Attendance System (AAS) is a process to automatically estimate the presence or the absence of the student in the classroom by using face recognition technology[5]. It is also possible to recognize whether the student is attending the complete class or not.
Attending the complete class or not. This main web application where student mark their attendance only when class get over by teacher. It also marks for how much time student was present in class. The two common Human Face Recognition techniques are,

- Feature-based-approach
- Brightness-based-approach

The Feature-based approach also known as local face recognition system, used in pointing the key features of the face like eyes, ears, nose, mouth, edges, etc., whereas the brightness-based approach also termed as the global face recognition system, used in recognizing all the parts of the image[3].

II. LITERATURE SURVEY

1) M Rajamanogaran, S Subha , S Baghavathi, Priya Jeevitha Sivasamy proposed a system Contactless Attendance Management System using Artificial Intelligence, Test results improved accuracy of the attendance system and automate faculty attendance system. The main aim of Artificial Intelligence (AI) is to develop technology which makes the machines to mimic the human beings. Learning algorithms work on the basis of AI. In particular, machine learning plays a vital role through which the algorithms can be improvised based on their experience. Neural networks are a set of algorithms which is composed of artificial neurons. These artificial neurons will mimic the biological neurons. Real time problems can be solved using Artificial Neural Networks (ANN)[1].

2) Smitha, Pavithra S Hegde, Afshin proposed a system Face Recognition based Attendance Management System, s, detects the student automatically when he enters the class room and marks the attendance by recognizing him. Typically, students attendance is marked manually which spends a lot of time. Proposed system gives automated attendance of students via NFC and face recognition. Accuracy of attendance will increase[2]. This system useful for automatic attendance and report generation. important document will be send to student as well as parent by the teacher. This system introduced the NFC technology which gives flexibility that is it can be extend with more modules. these tag can be put to use at the university and may replace with student ID card.

3) Heeral Chauhan, Shubham Gokhale, Ekta Chhatbar, Sompurna Mukherjee, Nikhil Jha proposed a system Student attendance management system, The major steps are detecting and recognizing faces[3]. comparison of detected faces can be done by crosschecking with the database of student. The paper proposed by Zhao, W et al. (2003) has listed the difficulties of facial identification. One of the difficulties of facial identification is the identification between known and unknown images. In addition, paper proposed by Pooja G.R et al. (2010) found out that the training process for face recognition student attendance system is slow and time-consuming. In addition[7], the paper proposed by Priyanka Wagh et al. (2015) mentioned that different lighting and head poses are often the problems that could degrade the performance of face recognition based student attendance system.

4) Shireesha Chintalapati, M.V. Raghunadh, "Automated Attendance Management System Based On FacRecognition Algorithms", IEEE International Conference on Computational Intelligence and Computing Research, 2013 Engineering and Technology (IRJET), Volume 4, Issue 1, Jan 2017. Automated Attendance Systems based on face recognition techniques thus proved to be time saving and secured. This system can also be used to identify an unknown person. In real time scenarios PCA outperforms other algorithms with better recognition rate and low false-positive rate[8].

III. PROPOSED SYSTEM

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. Systems design could be seen as the application of systems theory to product development. The proposed automated attendance system can be divided into five main modules. The modules and their functions are defined in this section. The five modules into which the proposed system is divided are:

A. Image Capture

In this module the camera turn on automatically whenever class get over and its capture the image and saved it into temporary file which later goes for face recognition

B. Face Detection

A proper and efficient face detection algorithm always enhances the performance of face recognition systems. Various algorithms are proposed for face detection such as Face geometry based methods, Feature Invariant methods,

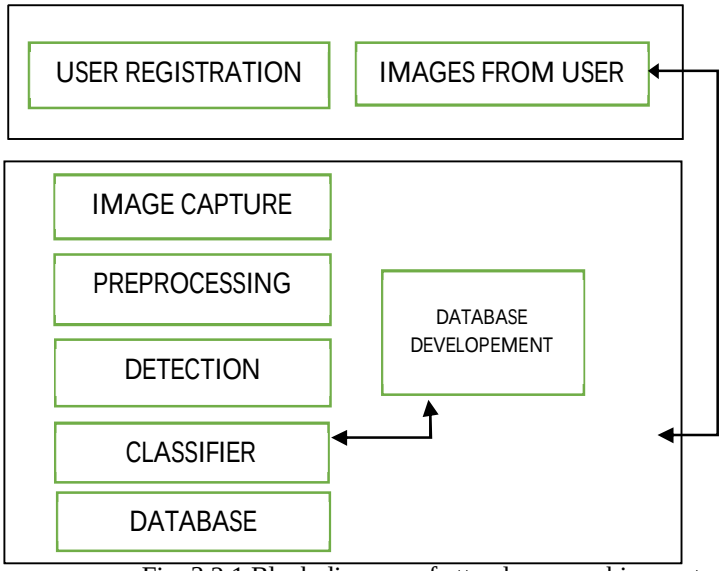

Fig. 3.2.1 Block diagram of attendance marking system

Machine learning based methods. Out of all these methods Viola and Jones proposed a framework which gives a high detection rate and is also fast. Viola-Jones detection algorithm is efficient for real time application as it is fast and robust. [9] Hence we chose Viola-Jones face detection algorithm which makes use of Integral Image . We observed that this algorithm gives better results in different lighting condition.

C. Pre-processing

The detected face is extracted and subjected to pre-processing. This pre-processing step involves with image cropping of the extracted face image and is resized to Histogram Equalization is the most common Histogram Normalization technique. This improves the contrast of the image as it stretches the range of the intensities in an image by making it more clear. In this process of extracting face component features like eyes, nose, mouth etc from image which capture during recognition.

D. Database Development

This process is to store database of user at the time of user registration it store all the data which given by user and three photos which later used for attendance marking. The images are stored with same name as user.at the time of attendance marking the system also capture live image of user and make another database of it. At last after the face detection ,extraction and attendance marking the relevant data get stored and makes excel sheet of attendance.

E. Feature Extraction and Classification

The performance of a Face Recognition system also depends upon the feature extraction and their classification to get the accurate results. Feature extraction is achieved using feature based techniques. We compared the results of different holistic approaches used for feature extraction and classification in real time scenario. This system proposed a light weight face recognition library which mainly used voila Jonas algorithm for detection and extraction. Facial feature extraction is process of extracting face component features like eye, mouth, nose by making face arc on face for face classification.

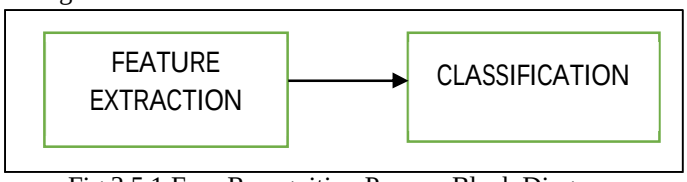

Fig.3.5.1 Face Recognition Process Block Diagram

Face Recognition involves in two stages, feature extraction and classification. The above mentioned feature extractors combined with classifiers are compared in various real world scenarios such as lighting conditions, Unintentional facial feature changes (occluded faces), Expressions.

F. Post-processing

This stage is proposed to save the data after successful attendance marking . so it make a excel sheet to save attendance data in the form of name, data, attend time ,out time and spend time on class and status of presented

A	B	D	E	F	G
STUDENT NAME	ENTER TIME	DATE	OUT TIME	Total spend time	Attendence status
NANDKISHOR-SATPUTE	14:23:34	28 October 2021	14:24:32	00:00:58	ABSENT

Fig. 3.6.1 Excel sheet of attendance

IV. RESULT

A. System Results

Features of the detected facial image have been extracted and are compared with the features present in the database. A sample image of a student is shown in Figure 2. If there is a valid match, attendance will be marked as present and the time of presence will be recorded. From that moment, the in time has been recorded. The same process is used for recording the out time and based on these inputs, the total minutes of the students present inside the class have been calculated.

The first step of online classroom attendance marking system is registration. If student is already registered so they have to login to start attendance marking . the interface of registration stage is shown below in fig. 4.1.1

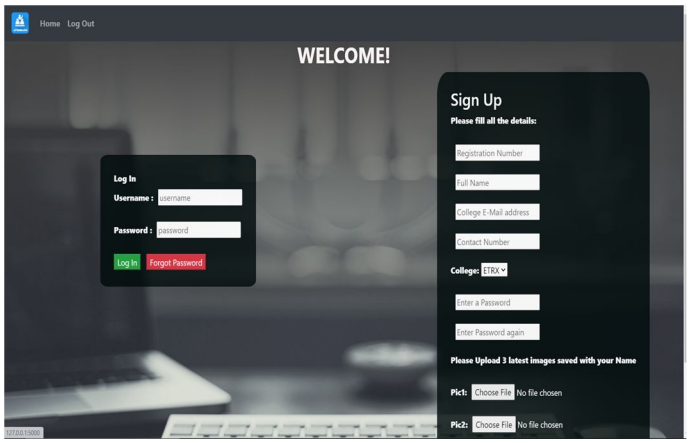

Fig. 4.1.1 Interface of registration stage

At the time of registration system get all details of student and also three soft photo copies of student and store it in folder which later used to mark attendance student is already registered then they just have to login and go to next step. In next step student have to select class. The interface of it shown in fig. number 4.1.2.

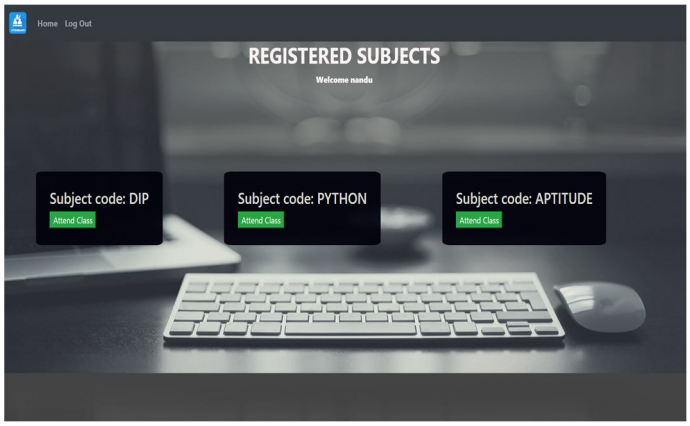

Fig.4.1.2 Interface of subject selection stage

After subject selection has done the student have to add the link of class of that subject. And after adding the link they get the option of join class. After clicking that option class will start atomaticaly. Whenever class get end from teacher side, student will get option of attendance marking . The interface of this is shown in fig number 4.1.3

Fig. 4.1.3 Interface of classroom joining stage

The interface of attendance marking stage shown in fig no. 4.1.4 which get after the class completion. In this stage student just have to click on mark attendance . System turn on camera automatically and start to capture image. Within 10 sec of time slap system click the picture. And student have click q or p to proceed.

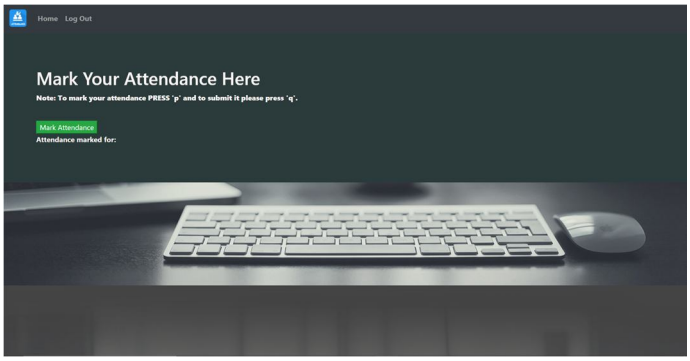

Fig. 4.1.4 Attendance marking interface

After overall process it also blink the name of student whose attendance get marked .The interface of it is shown in fig no. 4.1.5

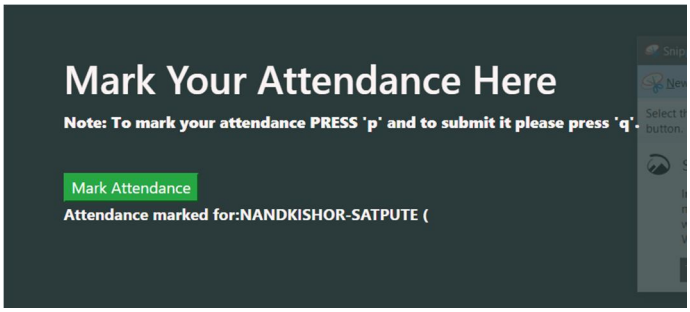

Fig. 4.1.5 Name blinking stage

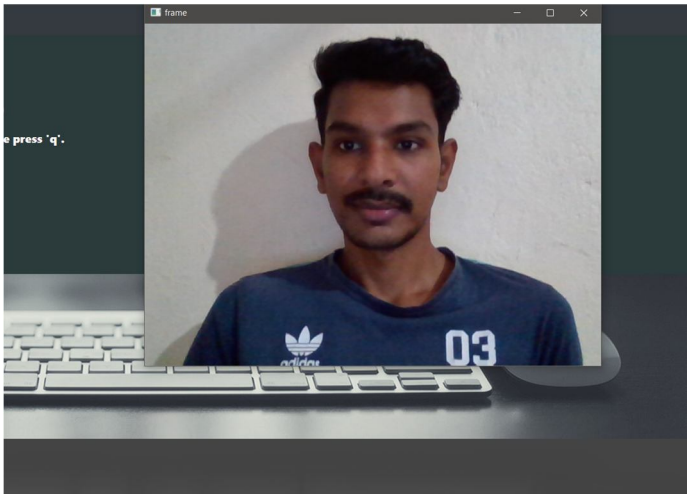

Fig. 4.1.6 Image capturing interface

After capturing process and name blinking process all the data get stored into excel sheet which shown in fig.3.1.6

STUDENT NAME	ENTER TIME	DATE	OUT TIME	Total spend time	Attendence status
NANDKISHOR-SATPUTE	14:23:34	28 October 2021	14:24:32	00:00:58	ABSENT

Fig. 3.1.6 Excel sheet of attendance

V. CONCLUSION

Online attendance marking system is based on face recognition and dlib concept. This project is to get rid of attendance flaws which arises due to traditional methods. The work has been developed as a touch-free system to prevent the students getting affected from contagious diseases, especially COVID'19. The overall attendance for a class can be easily obtained by calculating the starting time and ending time of the students entering the class. A customized attendance report has been generated automatically and thus the system enables the faculty to save time for taking attendance in the class room. In future, this work can be converted into advanced which applicable for all domains. Also, the 3-D images can be incorporated in future for producing better accuracy[10].

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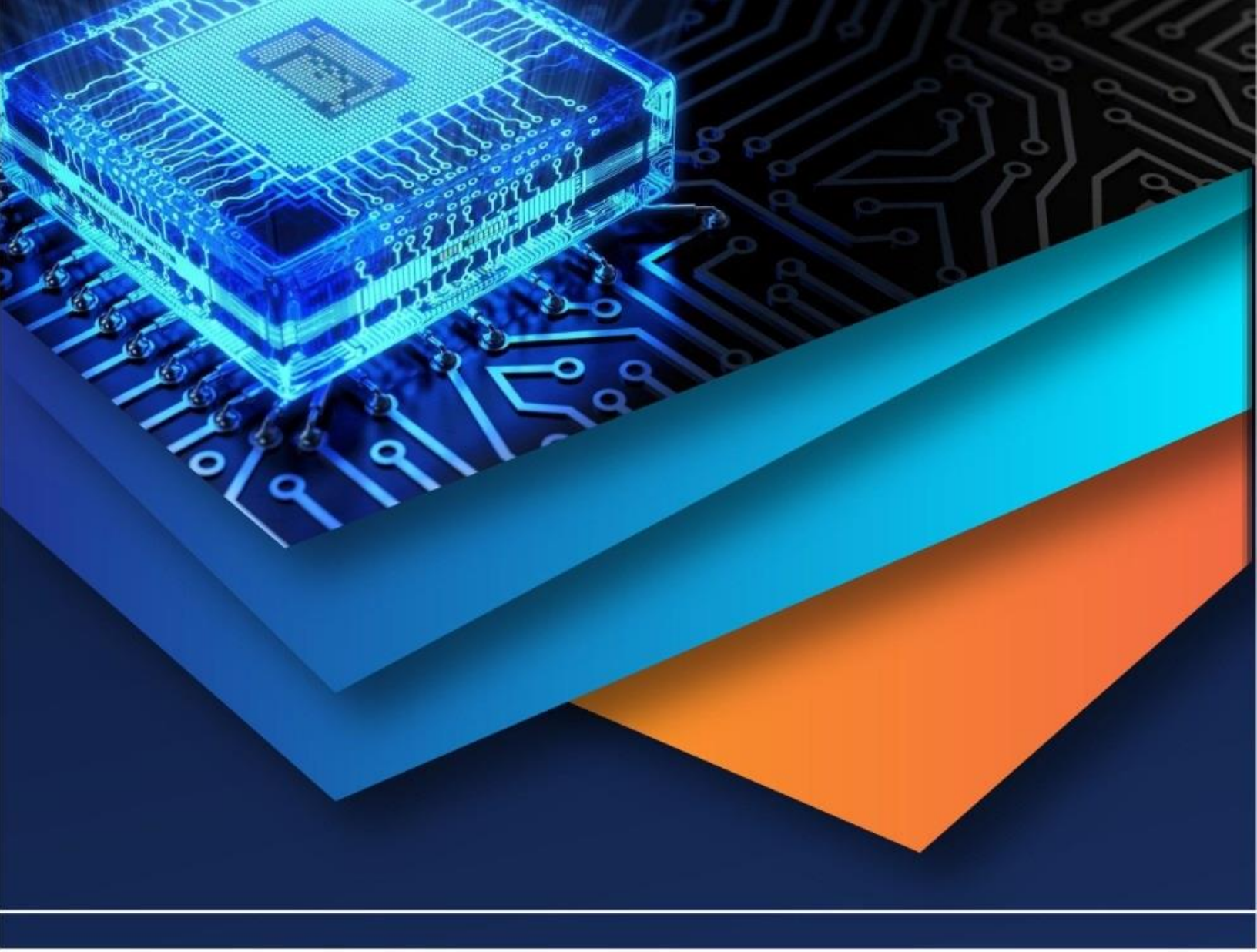

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