FACE RECOGNITION BASED ATTENDANCE MANAGEMENT SYSTEM USING MACHINE LEARNING

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Abstract - *Machine learning algorithms are used in practically every industry in this digital age. One of the most widely utilised biometrics is face recognition. It is frequently utilised due to its contactless and non-invasive technique, despite its low accuracy when compared to iris and fingerprint recognition. Face recognition systems can also be used to track attendance in schools, colleges, and companies. Because the existing manual attendance system is time consuming and difficult to maintain, this system aims to create a class attendance system that uses the concept of face recognition. There's also the possibility of proxy attendance.*

Database generation, face detection, face recognition, and attendance updating are the four aspects of this methodology. The photos of the kids in class are used to generate the database. The Haar-Cascade classifier and the Local Binary Pattern Histogram technique are used to detect and recognise faces. Faces are discovered and recognised from the classroom's live streaming footage. At the end of the session, the attendance will be mailed to the appropriate faculty.

Key words- Face Recognition, Machine Learning, Haar Cascade Classifier, Local Binary Pattern Histogram.

1. INTRODUCTION

The main goal of this project is to create an automated student attendance system based on facial recognition. This proposed approach's test and training images are limited to frontal and upright facial photographs of a single face alone, in order to obtain superior performance. To ensure that there is no quality variation between the test and training photographs, they must be acquired with the same instrument.

1.1 Background

Face recognition is essential in everyday life in order to recognise family, friends, or someone we know. We may not realise that there are multiple phases involved in recognising human faces. After the human visual system has processed the image, we identify the object's shape, size, contour, and texture in order to analyse the data. To recognise the data, it will be compared to other representations of objects or faces that we have in our memory. In fact, creating an automated system that can detect faces as well as a human is a difficult task. However, in order to distinguish diverse faces, we need a huge memory. For example, in universities, where there are many students of various races and genders, it is impossible to remember each individual's face without making mistakes. Face recognition systems make use of computers with nearly infinite memory, fast processing speed, and power to overcome human limitations.

The human face is a one-of-a-kind expression of one's individuality. Face recognition is thus described as a biometric approach for identifying a person by comparing a real-time capture image with photographs saved in that person's database. Face recognition systems have been increasingly popular in recent years due to their ease of use and high performance. For example, airport protection systems and FBI use face recognition for criminal investigations by tracking suspects, missing children and drug activities. Face recognition is a feature that Apple allows consumers to utilise to unlock their iPhone X.

Face recognition research began in 1960. Woody Bledsoe, Helen Chan Wolf, and Charles Bisson devised a system that required the administrator to identify eyes, ears, nose, and mouth from photographs. The distance and ratios between the features and the common reference points are then calculated and compared. The studies are further enhanced by Goldstein, Harmon, and Lesk in 1970 by using other features such as hair color and lip thickness to automate the recognition. Kirby and Sirovich proposed principle component analysis (PCA) to tackle the face recognition problem for the first time in 1988. Many facial recognition studies have been undertaken since then, and they continue to this day.

1.2 Problem Statement

The student attendance marking technique is often facing a lot of difficulty. There are not only disturbing the teaching process but also causes distraction for students during class. Besides calling names, attendance sheet is passed around the classroom during the lectures. As a result, a

face recognition student attendance system is proposed to replace the customary manual signing of students' presence, which is inconvenient and causes pupils to become distracted when signing for their attendance. Furthermore, the automatic student attendance system based on face recognition is capable of overcoming the problem of fraudulent approaches, and lecturers do not need to count the number of students multiple times to ensure that they are present.

There are numerous systems in the literature that are connected to RFID-based Attendance Systems. Students use an RFID tag type ID card that they must place on the card reader to record their attendance in an RFID system. The system is connected to the computer through RS232, which saves the noted attendance from the database. This system could lead to a problem with unauthorised access. Unauthorized individuals may use an authorised ID card to gain access to the organisation. The fingerprint-based Attendance System includes a portable fingerprint device that students can use to place their finger on the sensor during class without the need for the instructor's assistance.The issue with this strategy is that passing the device during lecture time may cause students to lose focus.

One of the most difficult aspects of facial recognition is distinguishing between known and unknown photos. Furthermore, the face recognition student attendance system's training procedure is slow and time-consuming. Furthermore, factors such as variable lighting and head positions can hamper the efficacy of a facial recognition-based student attendance system.

As a result, a real-time functioning student attendance system is required, which means that the identification procedure must be completed within specified time limitations to avoid omission. The retrieved features from facial photos that identify the students' identities must remain consistent as the background, illumination, stance, and expression vary. The performance will be judged based on its accuracy and speed of computation.

2. METHODOLOGY

Machine learning is a sort of data analysis that uses machine intelligence to create analytical models. It's an artificial intelligence area predicated on the idea that computers can learn from data, recognise patterns, and make decisions with little or no human intervention.

2.1 Description of Block Diagram

The system proposed within the basis of face recognition. Fig 2.1 is the proposed block diagram. The image will be captured when the student appears in front of the camera. The input image to improve the quality of image it is converted into grey scale image using color to grey image conversion technique. Then it processes to face detection, which helps to determines captured image with location and sizes of student faces. The image are going to be captured from detected faces using haar cascade classifier. Comparing the faces which have be to recognized with similar faces present in the dataset.

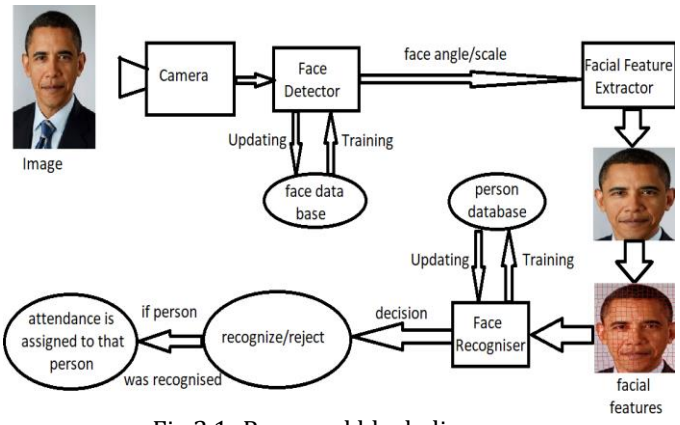

Fig 2.1- Proposed block diagram.

When recognize face by algorithm, it uses the training set to form recognition. Face recognition of an automated method of identifying and verifying a person from the camera.
The particular student will be marked present in attendance when the face is recognized and matched with the dataset. The students whose face is not detected will automatically be marked absent.

2.2 Haar Cascade Classifier

The successful object detection method Haar cascade classifier was proposed by Paul Viola and Michael Jones. This is used in machine learning based approach. Fig2.2 shows the working of haar cascade classifier. The positive and negative pictures are then analysed using a cascade approach. In here, without faces to research the classifier, face detection algorithm will use therein need tons of positive and negative face images.

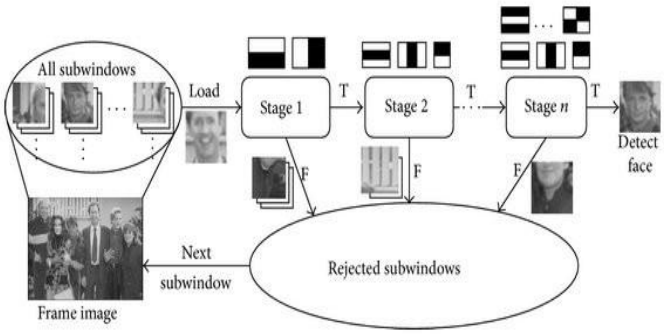

Fig 2.2- Haar Cascade Classifier

2.3 Local Binary Pattern Histogram

For the input image given, this algorithm generates a replacement histogram and compares it with other generated histograms. Fig2.3 shows working of LBPH.

For the histogram faces recognize, a 3X3 window move it one image, at each move of each local part of an image, the center pixel will compared with its neighbor pixels. 1 is denoted the neighbor pixels intensity value is less than or equal to center pixel and 0 is denoted for others. Then, in the 3X3 window, read values 0 or 1 in clockwise sequence to produce a binary pattern, such as 11000011, which is local to a specific part of the image. We will have an inventory of local binary patterns after performing the recognized on whole image.

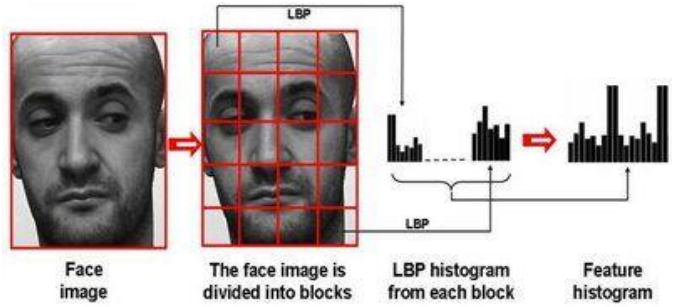

Fig 2.3- Local Binary Histogram

2.4 User Interface

The user interface will be a simple and easy to understand and use system. A rough idea of the user interface is shown in fig2.4. There will be two slides one to register the student's details and one for the teacher to give her subject details. The student will have to feed in his/her personal data such as student name, student roll no and department that he/she is studying in current once the data is filled the images will be taken and tracked.

In the attendance the teacher will have to just feed in the data of the subject she/he is teaching as it corresponds directly to the excel sheet. So the next time the teacher adds her subject name to the attendance the excel sheet will automatically update.

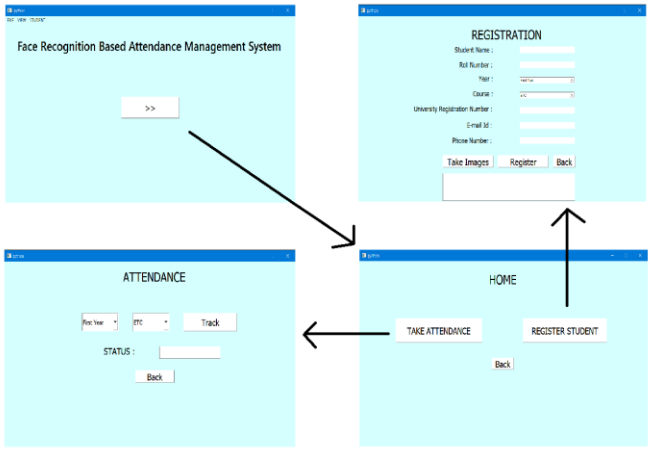

Fig 2.4 – User Interface

3. RESULTS AND DISCUSSION

Learning from the methodology, process description and software requirements we were able to implement and install.

3.1 Registration User Interface

The users can register with the system using a graphical user interface shown in Fig-3.1. Here users will have to feed in required details such as Student name, Student RollNo, University Registration Number and some personal details like email-id and contact number. The year and course have been created using drop down menu the students desired course and current year the student is presently attending will be available. The students are supposed to enter all the required details in the GUI interface manually.

Fig3.1 – System GUI

3.2 Take Images

After clicking on Take Images button, the web cam opens automatically and window as shown in Fig3.2 pops up and starts detecting the faces in the frame. The faces are

detected by a blue color box which outlines the face. Then it automatically starts taking photos until 100 samples are collected. After the collection of 100 samples the window closes and the details are shown in a small window below Take Images as shown in Fig4.1. Click on register button to register the student.

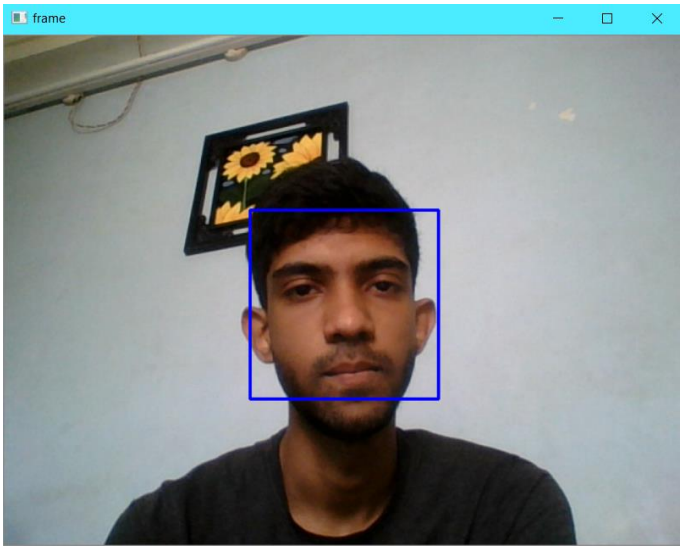

Fig 3.2 – Take Images

3.3 Attendance Tracker

First the student needs to selection he's/her's year and course and click on Track. Once clicked on Track button the window will open and mark student's faces that have been detected.

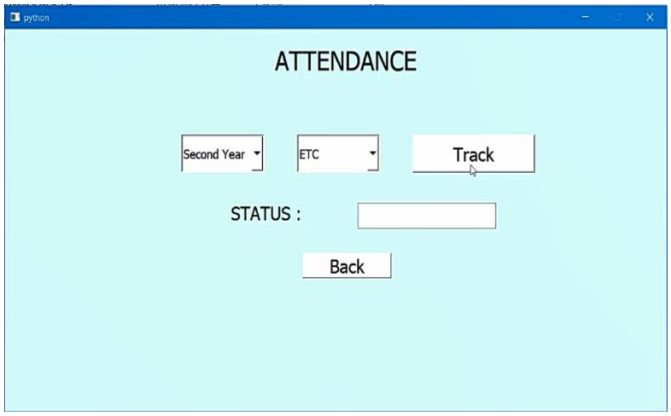

Fig3.3 – Train Images

3.4 Result

The Fig3.4 shows the face recognition window where two registered students are recognized by showing their Roll No. and Name in case they were not registered it would have shown 'unknown'.

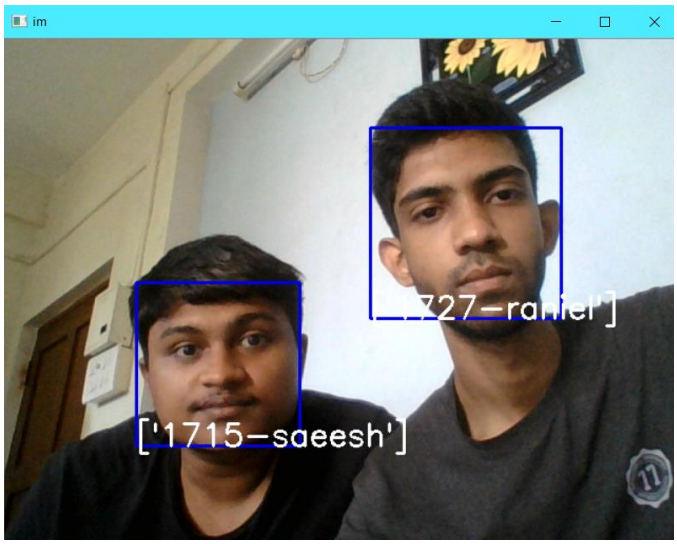

Fig3.4 – Track Images

By pressing CTRL+Q, the window will be closed and attendance will be updated in the excel sheet. Table3.1 shows attendance of students marked for 3 days.

Id	Name	Department	Year	registration	email	phone	22-07-2021	24-07-2021	26-07-2021
27	RANIEL	ETC	Fourth Year	201707842	ranielmonteiro@gmail.com	7083296855	P	P	A
15	SAEESH	ETC	Fourth Year	201707741	saeeshgawas@gmail.com	8668409704	P	P	A
11	ELTON	ETC	Fourth Year	201707737	eltondemenezes@gmail.com	8087647645	A	P	P

Table3.1 – Attendance Excel Sheet

4. CONCLUSION

The project titled 'Face Recognition Based Attendance Management System Using Machine Learning', is an autonomous system designed to provide a more efficient alternative to the traditional method of marking attendance. The system is trained to detect objects in an image or video by using Haar Cascade Classifier. Identification of the person is performed by using Local Binary Pattern Histogram algorithm. A user interface is designed which enables the user to effectively control the system and make the process of marking attendance simple and faster. The interface is user friendly and provides quick access to the features of the designed system.

Our proposed system can be used in educational institutions to keep track of the students. It will help in saving the time taken by the faculty to manually mark attendance. Hence, this time can be utilized by the faculty and the students for more productive activities. It will help in reducing the human errors caused while recording attendance. The proposed system will also help to overcome the problem of proxy attendance.

4.1 Future Scope

A more detailed research is needed on a project as such. The methods used could be combined with others to achieve great results. According to the literature research, various strategies have been used in the past.

For security reasons, a login feature would be implemented on the system. The system will be deployed as a stand-alone system that other schools can use. Data confidentiality is very important. At the start of each school year, the images of new students are taken and stored in the university database. Every student will have the right to know if their faces will be used in a face recognition attendance system. This must adhere to government regulations on ethical issues as well as data protection laws and rights. Students must provide their permission for their photographs to be used for attendance purposes.

There are some other tasks to be completed on this project in order to alert the student by sending an SMS regarding his or her attendance. This is accomplished through the usage of a GSM module. This SMS alert is sent to the student's parent.

Because it is not totally reliable, the system that has been given should only be used for testing purposes.

REFERENCES

[1] Ishan Ratn Pandey, Mayank Raj, Kundan Kumar Sah, Tojo Mathew, M. S. Padmini,"FACE RECOGNITION USING MACHINE LEARNING"-IRJET 2019(www.irjet.net).
[2] Natalya Selitskaya, Stanislaw Sielicki, and Nikolaos Christou," Challenges in Face Recognition Using Machine Learning Algorithms: Case of Makeup and Occlusions"- University of Bedfordshire(https://www.beds.ac.uk/computing).
[3] FINGERPRINT BASED ATTENDANCE MANAGEMENT SYSTEM by L.S. Ezema, C.K.A. Joe-Uzuegbu, J. N. Eneh and I. Amanze.
[4] C. Christy, S. Arivalagan, P. Sudhakar," Human Face Recognition and Identifying Ethnicity Using Machine Learning"-(www.ieee.org).
[5] Nicolas Delbiaggio," A comparison of facial recognition's algorithms"-Haaga-Helia University of Applied Sciences.
Ajimi. S," Implementation of Face Recognition based Attendance System using LBPH"-IJERT 2019(www.ijert.org).
[6] G.Suvarna Kumar, P.V.G.D. Prasad Reddy, M.Srinadh Swamy, Sumit Gupta," Skin based Occlusion Detection and Face Recognition using Machine Learning Techniques"- International Journal of Computer Applications.
[7] V.VINUPRIYA , S.ASWATHY , J.KAYALVIZHI , M.RAKAVI, A.DHARANI," Smart Face Recognition Using Machine Learning"-IRE Journals,CCA 2019.
[8] Sunila Godara," Face Detection & Recognition Using Machine Learning"- International Journal of Electronics Engineering.
[9] Kanchan Singh, Ashok K Sinha," Face Recognition using Extended Kalman Filter based Machine Learning"- International Journal of Computer Applications.
[10] Xuebin Xu, Zhixiao Wang, Xinman Zhang, Wenyao Yan, Wanyu Deng, and Longbin Lu," Human Face Recognition using Multi-Class Projection Extreme Learning Machine"- IEEK Transactions on Smart Processing and Computing.

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