Development of an Automatic & Manual Class Attendance System using Haar Cascade-based Facial Recognition

Mrs. B Rajeswari[1], SK. Hasan Ahammad[2], A. Nikhil Kumar[3], G. Praveen Kumar[4], P. Murali Mahesh[5]

[1]*Associate Professor Department of Information Technology, KKR & KSR Institute Of Technology And Sciences (A), Guntur, India*

[2,3,4,5] *Undergraduate Students, Department of Information Technology, KKR & KSR Institute Of Technology And Sciences (A),Guntur, India*

---***---

Abstract - *Authentication plays a very significant role in controlling systems in computerized communications. The development of this system is aimed to accomplish digitization of the traditional system of taking attendance by calling names and maintaining pen-paper records. Present strategies for taking attendance are tedious and time -consuming. Attendance records can be easily manipulated by manual recording. The traditional process of making attendance and present biometric systems are vulnerable to proxies. This paper is therefore proposed to tackle all these problems. The proposed system makes the use of Haar classifiers. Facial recognition has become a very crucial part of biometric authentication and is used in many applications. This article describes how to integrate facial recognition technology with an open source computer vision algorithm (OpenCV) to develop an attendance monitoring system. The software enables an automatic attendance process along with manual attendance process, allowing faculty and staff to query student data by simply logging into Faculty Login with the appropriate credentials.*

Key Words: **Face Detection**, **OpenCv, Xampp, Automatic Attendance, Manual attendance, Haar Cascade, Face Recognition**

1. INTRODUCTION

Attendance maintenance is a significant function in all the institutions to monitor the performance of the students. Traditional call approach turns out to be a statute of limitations because it is very difficult to call names and maintain your record, especially when the ratio of students is high. Every organization has its own arrangements for student attendance. Some organizations use a document-oriented approach and others have implemented these digital methods such as biometric fingerprint scanning techniques and techniques of card exchange. However, these methods are shown to be statute-barred because they are subject to students waiting in a time-consuming queue. If the student fails to bring his ID, then he will not be able to get attendance. evolving technology has brought many improvements to a changing world.

1.1 Background Study

The system of intelligent attendance is generally implemented with biometrics help. Recognition of face is one of the Biometric ways of improving this system. Face recognition proved to be a productive method for taking attendance. The normative face recognition techniques and methodologies fail to tackle challenges like scaling, pose, illumination, variations ,rotation, and occlusions. The framework proposed is designed to solve the drawbacks of current systems. There has been a lot of advancement in face recognition but the vital steps are face detection, feature extraction, and face recognition. Firstly ,a camera is needed and it has to be installed at the entrance of the classroom from where it covers the entire face of the student or the person entering into the classroom.

1.2 Purpose of Study

The main purpose of this study is manual attendace at any institute is very long as well as time taking process. It is also needed very large amount of paper work in case of large institutes. It takes nearly 20 to 30 mins of time for taking the attendace of every person in the classroom. As coming to RFID system of taking attendace there is a chance of making errors by the students ssuch as using RFID of one person by another person this bring drastic failure in the attendace management by the college management. In Order to avoid such problem A camera based attendace system is proposed by which attendace will be recorded only when the person is physically present in the classroom.

1.3 Elobration of Study

Firstly a camera is fixed at the entrance of the classroom or working hall. when ever a person is moving into the classroom face detection is done by the camera that is fixed at the entrance. Using LBPH Algorithm Face recognition is done and the identified face is matched with the details present in the dataset. when the faces are matched the attendace of the student are marked in the database. When there is a failure in the camera there a module called manual

attendace which a student came mark his/her attendance with the help of enrolment id and name

2. LITERATURE REVIEW

[1]Hao Yang and X Han made a Face recognition Attendance system based on real-time video processing. The attendance system realizes the expected attendance results through face recognition technology with the help of a computer, which fully reflects the feasibility design of the overall algorithm. The students who have completed the attendance sign-in system quickly completed the tasks, got rid of the complicated sign of roll call, and soon realized the sign of operation and function

[2]Samridhi Dev Tushar Patnaik designed Student Attendance System using Face Recognition in there project they used three algorithms for the completion of there project the three algorithms are KNN algorithm CNN And SVM Algorithm CNN algorithm is used due to reduce the computational complexity of the system KNN provided Accuracy for generating the attendance where as SVM algorithm provides the less efficient in capturing the video of the particular person.

[3]Arjun Raj, Mahammed Shoheb et al, Proposed face recognition based smart attendance system in this project they used raspberry pi3 model b module, raspberry pi camera, Servo Motor and database servers. By using Face recognition algorithm they overcame the problems of different head orientations and substantial occlusion. This approach is a two-d recognition problem. Their studies indicates that the automatic technique is highly accurate even if the rejection rate is considerably unknown and therefore potentially appropriate for those applications. In order to determine the gender of this topic and to interpret facial expressions, this project also included recognition the face using an independent analysis.

[4]M Srivastava, Amit kumar, Aditya Dixit, Aman Kumar proposed Real Time Attendance System Using Face Recognition Technique. In which every student's attendance is collected by the system through constant observation at the entry and exit points. The results of our initial experiment performed better in performance assessment than traditional black and white display systems. This system is mainly developed for face recognition from images or video frames. In this project they used Mobile camera to capture the images of the student.

[5]Keerthana Sanath, Meenakshi K, Muktha Rajan, Varshini Balamurugan, M.E.Harikumar introduced the project RFID and Face recognition based smart attendance system the proposed system verified the RFID card and measured the temperature of the employee, and sent a message with the corresponding employee details to the concerned authorities in case of high temperature. If the temperature was normal,

the access time check was carried out. After the successful completion of all the above mentioned procedures, facial recognition was implemented for the given input image of the employee. If the prediction matched the name associated with the RFID tag, entry was granted to the employee. Further, for improving the productivity of the employees.

3. SOFTWARE REQUIREMENT SPECIFICATIONS

3.1 Functional Requirements

A functional requirement specifies how a system or one of its components should function. A function is defined as a collection of inputs, behaviors, and outputs. It also relies on the kind of system that uses the programme, the anticipated users, and the kind of software.

3.1.1 Software Requirements

• Windows 7 or Above

• Pycharm

• Xampp

• OpenCv

• Haar Cascade XML Files

3.1.2 Hardware Requirements

• Processor -i3

• Memory -2GB RAM

• Camera

4. Proposed System Architecture

Architecture

The proposed system is very simple, effortless, and manageable with lucid operations. It embraces a database of student's faces and their details like name, enrolment number. Firstly camera is needed and it has to be installed at the entrance of the classroom from where it covers the entire face of the student or the person entering into the classroom. This camera will capture image of the student. There are numerous expressions and poses possible which a student can perform. if at a particular instance system fails to detect faces due to unfavorable poses then the system can detect those faces at another instance of image acquisition. Once the image acquisition is done. Using LBPH algorithm the face detection of students is done. after the faces are detected in an image taken by all camera will be compared with stored images of the students in the database. Once the face is matched then present is marked For corresponding enrolment number and name in Attendance_bd database in Local Database.
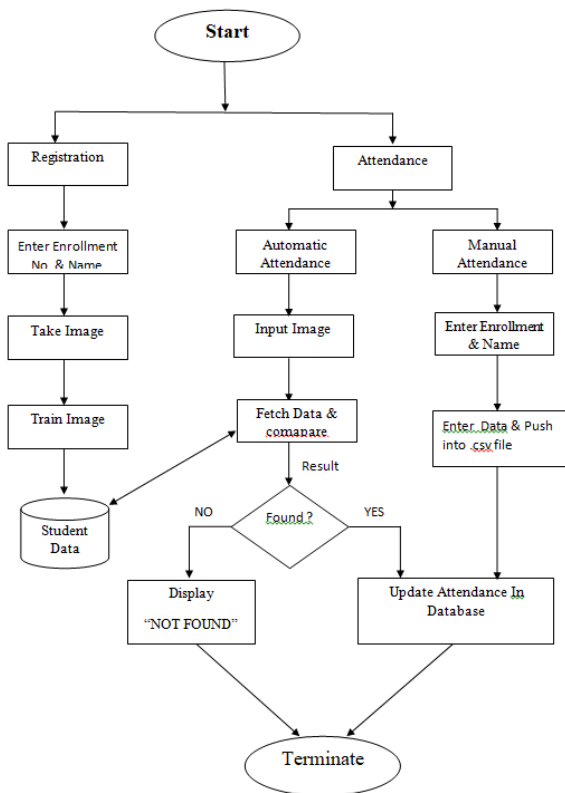
Fig -1: Architecture of proposed system

When a student is not Registered With his/her enrollment id and name there is a another way of marking the attendance of them manually by the corresponding faculty. For making the unregistered students attendance there are two basic requirements such as enrollment number and name of the student. After entering the required details the details must be stored in a .csv file. The attendance is marked for the unregistered students in another database called manually attendance in Local database

Methodology

To develop an intelligent time and attendance management system, certain steps need to be followed to successfully achieve this task. The main task is to take the attendance of student without flaws which is very important. The steps can be determined as follows:

Creation of Dataset:

Initially, the database will be created at the time of student registration. The database will store the student's genetic information such as name, identification number next to the student's picture must be taken by the proposed system For training system. This system captures a single image for a student for training purposes. Using all the photos that students have stored in the database, facial recognition process will be done for all students participating in a class.

The Dataset will be as follows:

Face Recognition:

Face detection algorithms are used to find the features that best describe an image, cropping, shrinking, and often converting existing facial images to grayscale. Facial recognition is a biometric method of identifying an individual by comparing live or digital image data with a recorded record of that individual.

Facial recognition included

- Face verification process
- Face Identification process

Identification of faces of the students will be as follows :
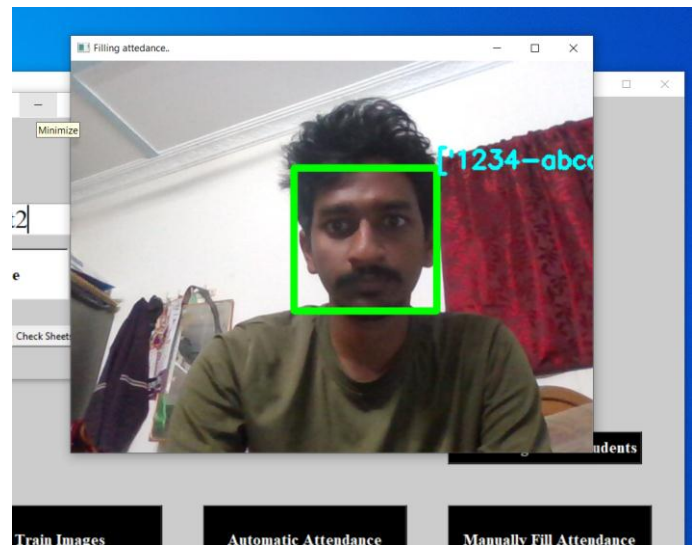
Modules used:

- **OpenCv**
- **Tkinter**
- **Pandas**

- **Pymysql**
- **Pillow**
- **DateTime**

Algorithm of Machine Learning

- ❖ Haar Cascade Classifier

Haar cascade algorithm comprises of many xml files which has distinctive topographies. Different xml files are used for different purposes.

Some of the Xml files of haar cascade algorithm are as given below:

  I. Haarcascade_eye.xml

 II. Haarcascade_eye_tree_eyeglasses.xml

III. haarcascade_frontalface_default.xml

IV. haarcascade_frontalface_alt.xml

 V. haarcascade_fullbody.xml

VI. haarcascade_profileface.xml

Files of Haar cascade used For this paper:

  1. haarcascade_frontalface_default

  2. haarcascade_frontalface_alt

5. Algorithm

1) Step 1: (Take image) The video is captured when the a student enrolls with the name and Enrollment number of that particular student and every new student details are stored in the student table.

2) Step 2: (Update database) 70 images are extracted from the video captured and are stored in the dataset folder in the form of .csv file.

3) Step 3: (Train images) The model is trained by using the images stored in the dataset and with the help of applying LBPH algorithm.

4) Step 4: (LBPH Algorithm) Apply LBPH operator on each matrix and result is obtained as decimal number for each block.

LBPH Operator algorithm:

If (NV>= CV)

{

//put pixel value as 1

}

Else

{

//put the pixel value as 0

}

Here NV = Neighbour Pixel Value

5) CV = Central Pixel Value

Hence a binary number is obtained for each matrixthen it will be converted into decimal and replaced with that particular block.

6) Step 5: (Automatic Attendance Marking) Face of the student is detected from the video by placing camera at entrance of classroom

if image is matched with the images in dataset

// attendance of person is updated with date and time in attendace_db (Database)

Else

// a message will be shown as "unknown "image.

7) step 6: (Manual Attendance Marking) Student provides details such as enrollment id and name

//Attendance will be marked in manually_attendance (Separate database)

6. Result

The actual output will be having different modules such as Take Images, Train Images, Automatic Attendance, Manual attendance, Check sheets. The output screen will be as shown
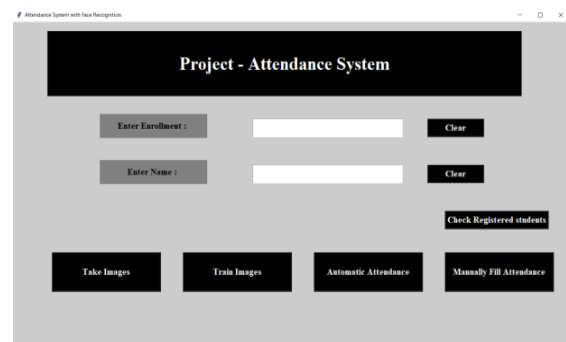

Initially Every student has to Register in the System using their name, enrollment id and Images of different angles To Register One should click on take images module so it starting taking images of a student. About 70 images of students are taken the output screen will be as follows
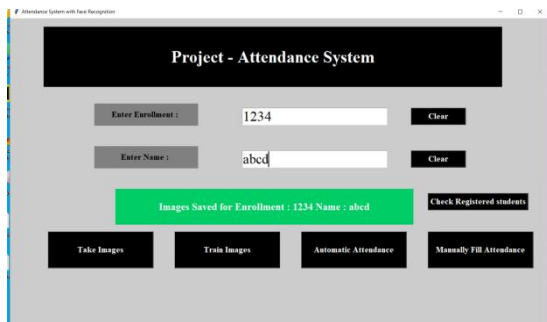
The taken images must be trained in order to compare the images with person is attended for automatic attendance system. The trained images will play a major role for marking the attendance of the student. The trained data is considered as data set. When the images are trained output of the trained images would be as shown as below
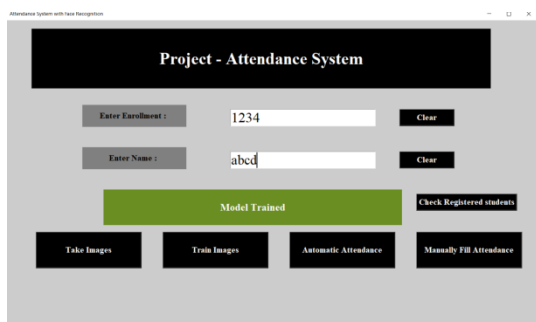
After taking automatic attendance the output will be as follows
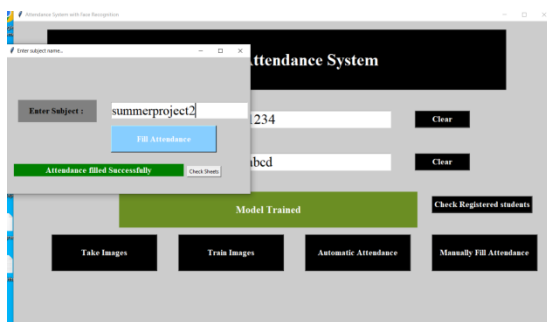
7. CONCLUSIONS

The Face recognition based attendance system can be established as an effective attendance system in any organization. This method overcomes the drawbacks of traditional paper based attendance system as well as RFID tag based attendance where there is a chance of miss using tag of one person by another person. The chances of giving wrong attendance to a student is reduced largely by this proposed method. In this proposed method there are two modes of attendance systems. Firstly automatic attendance which uses the trained dataset of student. where the dataset contains images along with their enrollment numbers. The

second mode is Manual attendance which is used for unregistered students A part from this xampp server is used as local database to store the attendance of student either automatic or manual. There is an option for faculty to login with their credentials in order to check the attendance of the students. This automatic attendance is achieved using LBPH algorithm of Machine Learning

8. REFERENCES

[1] H. Yang and X. Han, "Face Recognition Attendance System Based on Real-Time Video Processing," in IEEE Access, vol. 8, pp. 159143-159150, 2020, doi: 10.1109/ACCESS.2020.3007205.

[2] S. Dev and T. Patnaik, "Student Attendance System using Face Recognition," 2020 International Conference on Smart Electronics and Communication (ICOSEC), 2020, pp. 90-96, doi: 10.1109/ICOSEC49089.2020.9215441.

[3] A. Arjun Raj, M. Shoheb, K. Arvind and K. S. Chethan, "Face Recognition Based Smart Attendance System," 2020 International Conference on Intelligent Engineering and Management (ICIEM), 2020, pp. 354-357, doi: 10.1109/ICIEM48762.2020.9160184.

[4] M. Srivastava, A. Kumar, A. Dixit and A. Kumar, "Real Time Attendance System Using Face Recognition Technique," 2020 International Conference on Power Electronics & IoT Applications in Renewable Energy and its Control (PARC), 2020, pp. 370-373, doi: 10.1109/PARC49193.2020.236628.

[5] K. Sanath, M. K, M. Rajan, V. Balamurugan and M. E. Harikumar, "RFID and Face Recognition based Smart Attendance System," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), 2021, pp. 492-499, doi: 10.1109/ICCMC51019.2021.9418481

[6] K.Preeethi,S. Vodithala, "Automated Smart Attendance System using Face recognition," 2021 5thInternational Confereance on Intelligent computing and control System(ICICCS),2021,pp.1552-1555, doi: 10.1109/ICICCS51141.2021.9432140

[7] R.Hartanto and M.N. Adji," Face recognition for attendance system detection"2018 10th international conference on Information Technology and electrical engineering(ICITEE),2018,pp.376-381,doi:10.1109/ICITEED.2018.8534942