ATTENDANCE USING REAL TIME FACE RECOGNITION

MANEESH CHAUHAN (2020525889)

UMANG SHARMA (2020490277)

ABSTRACT

For a long time now all the teachers and students all across the world have been bothered by the very inconvenient method of taking attendance in the school/universities. Teachers are bothered by this as the traditional procedure of calling each individual's name takes a lot of time and it wastes their precious time of their lectures. Through this system we want to automate this process through the use of facial recognition. It will simplify the process of taking the attendance of each and every lecture in the universities/ schools.

INTRODUCTION

Facial recognition technology has gained significant attention in recent years due to its potential for improving security, convenience, and efficiency in various domains. The education sector is one such domain where attendance tracking is a crucial task for teachers and administrative staff. The traditional methods of attendance tracking are manual and time-consuming, leaving room for errors and the possibility of proxy attendance. To address these challenges, this project proposes a facial recognition attendance system that utilizes Python and OpenCV.

The proposed system has three modules: face store, trainer, and recognize. The face store module captures 30 images of the subject using the camera and saves them in a folder. The trainer module extracts facial features from the images and trains a machine learning model stored in a YAML file. The recognize module recognizes the subject in the camera feed, marks their attendance in an Excel sheet against their name, and announces their name aloud. The system eliminates the need for manual attendance tracking, reduces errors, and saves time for teachers and administrative staff. The user-friendly interface provides easy access to attendance data, enabling schools to make data-driven decisions to improve student performance.

The use of facial recognition technology in this system offers several advantages over traditional attendance tracking methods, including reduced workload, improved accuracy, and enhanced security. Moreover, the implementation of the system using Python and OpenCV makes it highly customizable and flexible, allowing institutions to tailor the system to their specific needs. This project's proposed system provides a promising solution for educational institutions seeking to streamline their attendance management process, improve student performance, and provide a better educational experience.

LITERATURE REVIEW

In paper [1] requirements and conditions for the visitor identification system are outlined and an example system is proposed. Two main subsystems: face detection and face recognition are described. Algorithm for face detection integrates skin-colour, mask analysis, facial features (fast and effective way of eyes localization is presented), reductors, knowledge and template matching. For face recognition a three-stage algorithm is proposed. It utilizes well known methods connected in a sequential mode. To improve accuracy and speed some modifications to original methods were proposed and new one presented. The aim was to build a visitor identification system which would be able to operate in mode with a camera and present results in real-time. The emphasis on speed and accuracy was stressed.

The paper [2] describes a face detection framework that is capable of processing images extremely rapidly while achieving high detection rates. There are three key contributions. The first is the introduction of a new image representation called the “Integral Image” which allows the features used by our detector to be computed very quickly. The second is a simple and efficient classifier which is built using the AdaBoost learning algorithm (Freund and Schapire, 1995) to select a small number of critical visual features from a very large set of potential features. The third contribution is a method for combining classifiers in a “cascade” which allows background regions of the image to be quickly discarded while spending more computation on promising face-like regions. A set of experiments in the domain of face detection is presented. The system yields face detection performance comparable to the best previous systems (Sung and Poggio, 1998; Rowley et al., 1998; Schneiderman and Kanade, 2000; Roth et al., 2000). Implemented on a conventional desktop, face detection proceeds at 15 frames per second.

In recent years considerable progress has been made in the area of face recognition. Through the development of techniques like eigenfaces, computers can now compete favourably with humans in many faces recognition tasks, particularly those in which large databases of faces must be searched. Whilst these methods perform extremely well under constrained conditions, the problem of face recognition under gross variations in expression, view, and lighting remains largely unsolved. This paper details the design of a real-time face recognition system aimed at operating in less constrained environments. The system is capable of single scale recognition with an accuracy of 94% at 2 frames-per- second. A description of the system's performance and the issues and problems faced during its development is given[3].

The paper[4] presents an automated system for human face recognition in a real time background world for a large homemade dataset of persons face. The task is very difficult as the real time background subtraction in an image is still a challenge. Addition to this there is a huge variation in human face image in terms of size, pose and expression. The system proposed collapses most of this variance. To detect real time human face AdaBoost with Haar cascade is used and a simple fast PCA and LDA is used to recognize the faces detected. The matched face is then used to mark attendance in the laboratory, in our case. This biometric system is a real time attendance system based on the human face recognition with a simple and fast algorithm and gaining a high accuracy rate.

The Local Binary Pattern Histogram (LBPH) algorithm is a simple solution on face recognition problem, which can recognize both front face and side face. However, the recognition rate of LBPH algorithm under the conditions of illumination diversification, expression variation and attitude deflection are decreased. To solve this problem, a modified LBPH algorithm based on pixel neighbourhood grab median (MLBPH) is proposed. The Gray value of the pixel is replaced by the median value of its neighbourhood sampling value, and then the feature value is extracted by the sub blocks and the statistical histogram is established to form the MLBPH feature dictionary, which is used to recognize the human face identity compared with test image. Experiments are carried on FERET standard face database and the creation of new face database, and the results show that MLBPH algorithm is superior to LBPH algorithm in recognition rate[5].

PROPOSED METHODOLOGY

The proposed facial recognition attendance system has three modules: face store, trainer, and recognize. The following is a brief overview of each module's functionality:

1. Face Store Module: This module is responsible for capturing 30 images of the subject using the camera and saving them in a folder. The module utilizes OpenCV to open the camera, capture the images, and save them to the disk. The images are then used for the subsequent training of the machine learning model.

2. Trainer Module: This module extracts the facial features from the images captured by the Face Store Module and trains a machine learning model. The module utilizes the OpenCV library to detect the face in the images and extract features such as the eyes, nose, and mouth. The extracted features are then used to train the machine learning model using the Local Binary Patterns Histograms (LBPH) algorithm. The trained model is saved in a YAML file and used for the subsequent recognition of the subject.

3. Recognize Module: This module is responsible for recognizing the subject in the camera feed, marking their attendance in an Excel sheet against their name, and announcing their name aloud. The module utilizes OpenCV to detect the face in the camera feed and extract its features. The features are then compared to the trained machine learning model to identify the subject. Once the subject is recognized, their attendance is marked in an Excel sheet, and their name is announced loud.

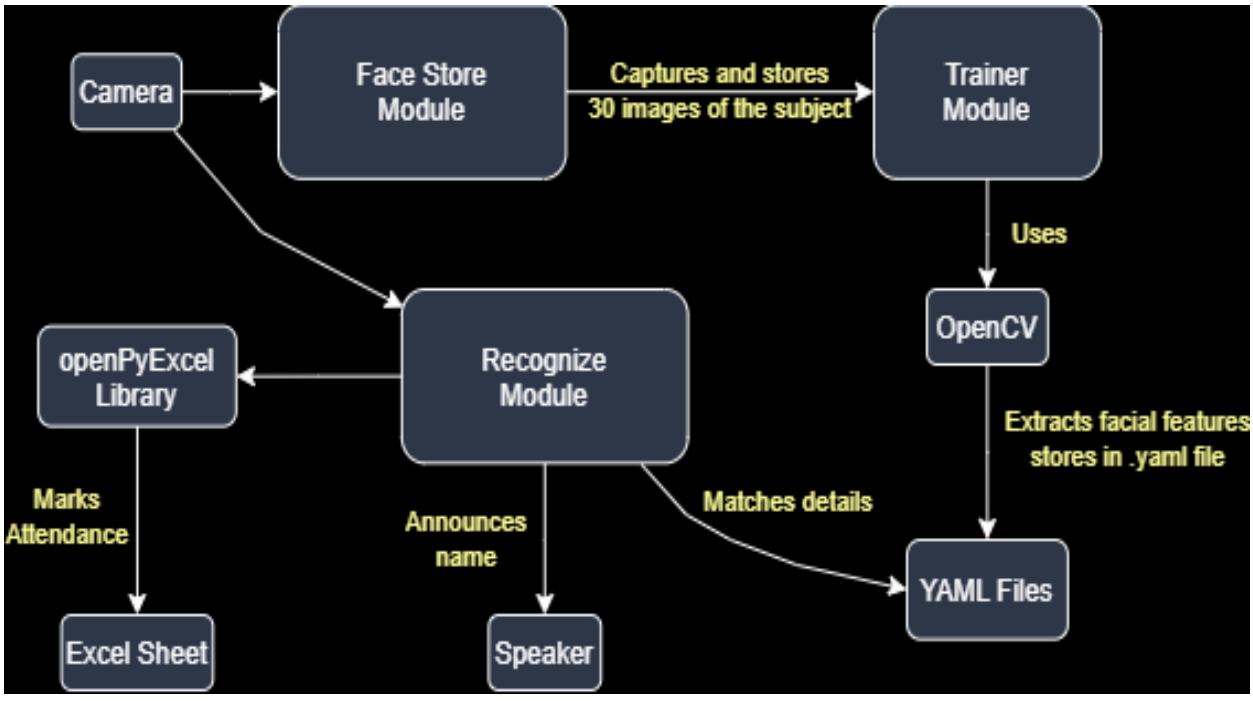

Fig. 1

RESULT

As we can see in Fig. 2, the student's face is correctly recognised by the system and consequently his name is shown on top of his face. Also, his attendance is marked in the excel sheet as well as the name is also announced through the speakers. Beforehand, 30 images of the student were captured by the system and processed for extraction of his face features which were then used to identify him in the camera feed.

Fig. 2

The facial recognition attendance system provides accurate and efficient attendance management for educational institutions. By automating the attendance tracking process, the system can reduce the workload on teachers and administrative staff, allowing them to focus on more critical tasks. Additionally, the system's use of facial recognition technology can eliminate the risk of proxy attendance and reduce errors in manual attendance tracking. The system's user-friendly interface can also make it easier for school administrators to access and analyse attendance data, enabling them to make data-driven decisions to improve student performance.

CONCLUSION AND FUTURE SCOPE

In summary, the facial recognition attendance system created in this project offers an improved and dependable way to keep track of attendance in educational institutions. By utilizing Python, OpenCV, and other relevant technologies, we have constructed a system that is capable of recognizing students' faces and automatically marking their attendance. This system is both speedy and precise, making it an ideal solution for educational institutions seeking to streamline their attendance monitoring process.

The modular design of the system allows for simple customization and scalability, making it suitable for institutions of all sizes. The face store module captures images of students' faces, the trainer module analyses and stores these images in a .yml file, and the recognize module uses these stored features to recognize students in real-time, marking their attendance and speaking their name aloud.

In terms of future development, there are several potential directions that this system could take. One potential area is integrating it with other technologies such as biometric sensors or RFID cards to further enhance accuracy and security. Another possible improvement could be incorporating machine learning algorithms to enhance the system's recognition capabilities over time. Additionally, the system could be expanded to include additional features such as tracking student behaviour or integrating with a student information system.

Apart from educational institutions, this system may have potential applications in various other industries as well, such as the corporate sector for tracking employee attendance or the hospitality industry for monitoring guest activity. The ability of the system to accurately and efficiently track individuals using facial recognition technology has numerous potential use cases beyond the education sector.

In conclusion, the facial recognition attendance system developed in this project provides a robust and innovative solution to attendance tracking challenges. With further refinement and expansion, this technology has the potential to make a significant impact across a wide range of industries and applications, leading to more efficient and streamlined processes for businesses and organizations.

REFERENCES

[1] G. Kucherov and A. Nowosielski, Short communications / WSCG ’2004, The 12th International Conference in Central Europe on Computer Graphics, Visualization and Computer Vision 2004, University of West Bohemia, Plzen, Czech Republic, February 2. - 6., 2004: in co-operation with Eurographics. Plzen: Univ. of West Bohemia, 2004.

[2] P. Viola and M. J. Jones, “Robust Real-Time Face Detection,” Int. J. Comput. Vis., vol. 57, no. 2, pp. 137–154, May 2004, doi: 10.1023/B:VISI.0000013087.49260.fb.

[3] R. Cendrillon and B. Lovell, “Real-time face recognition using eigenfaces,” presented at the Visual Communications and Image Processing 2000, Perth, Australia, May 2000, p. 269. doi: 10.1117/12.386642.

[4] K. S. Kumar, V. B. Semwal, and R. C. Tripathi, “Real time face recognition using adaboost improved fast PCA algorithm,” 2011, doi: 10.48550/ARXIV.1108.1353.

[5] X. Zhao and C. Wei, “A real-time face recognition system based on the improved LBPH algorithm,” in 2017 IEEE 2nd International Conference on Signal and Image Processing (ICSIP), Singapore, Aug. 2017, pp. 72–76. doi: 10.1109/SIPROCESS.2017.8124508.