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Face Recognition based Attendance System with Realtime Database

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ABSTRACT: One of the most successful uses of image analysis, face recognition has recently attracted a lot of attention, especially during the past several years. Our concept suggests a deep learning and artificial intelligence-based automatic facial recognition attendance system for students that uses a real-time database and small cameras. The system automatically recognizes faces, marks students as present or absent using face detection, and highlights the technological difficulties in developing a face recognition system. The system will automatically update all data to the cloud, update the student's database with their attendance information, and send the department head and the guardians of the absent will both receive a message from it. processing for face recognition, including essential elements such face detection, tracking, alignment, and feature extraction, as well as the difficulties in implementing a face recognition system technically. We emphasize the significance of the best existing options at this time. The chapter's conclusion discusses the applications and methods for face recognition that have been chosen as well as their potential applications in fields unrelated to face recognition.

KEYWORDS: Attendance system, Face recognition, OpenCV.

I. INTRODUCTION

In many schools and universities, recording attendance using the traditional technique is a laborious effort. Additionally, the faculty must personally call out each student's name in order to record attendance, which could take up to five minutes for the entire session. This takes a lot of time. There is a potential that a proxy will show up. As a result, several institutions began using a variety of additional methods to track attendance, including Radio Frequency Identification (RFID) [3], iris recognition [4], fingerprint recognition, and others. These technologies, however, operate on a queue, which could take longer and be more obtrusive.

Face recognition has established itself as a key biometric characteristic that is both simple to acquire and unobtrusive. Systems that use face recognition are generally unaware of different facial expressions. Face Verification and face identification are the two categories that make up a recognition system. Face verification uses a 1:1 matching technique to compare a face image to a template face image, whereas face comparison uses a 1:N matching process to compare a query face image [1].

This system's goal is to create an attendance system based on face recognition methods. Here, a person's face will be taken into account while recording attendance. Face recognition is a technology that is becoming more and more common today. In this research, we suggested a system that tracks students' faces in real-time classroom video and records their attendance if the detected face is recognized in the database. Compared to the old ways, the new one will take less time.

II. LITERATURE SURVEY

A remote iris acknowledgement participation plan and execution within the board framework. One of the most reliable methods for confirming an individual's recognizable identity in biometrics is the iris recognition check. This framework-based biometrics and remote technique addresses the issues of laying the relating system and deceiving participation.

Effective Face Recognition Using Adaptive Sparse Representation. Insufficient Representation (or coding) based Classification (SRC) has recently achieved remarkable success in face recognition.

Current System: A common scenario for assessing participation has students sitting in homeroom and the teacher calling out each student's name individually to stamp their involvement. Typically, the participation is marked on paper and with a pen using tangible assets.

An existing issuesystem: Maintaining a massive collection of records is laborious.

- It is tiresome and prone to error.
- It encourages resource waste.

III. PREVIOUS WORK

This was a final-year project completed by students at Kingston University London in 2018. The system will be given an image via a camera or from memory, and it will automatically count the number of faces on it. The system should clip the faces from the image after determining who is in them and store them in memory for image recognition, which will be carried out in the following step. The number of faces found in the image should be automatically counted by the system. The system will be able to match faces from the stored dataset and compare it to the input data from the first step in the recognition phase of the second step. A program for this method, which automatically sorts out the faces, software will be employed. To enable interaction between various jobs as needed, the program will be interactive. The second stage of the system will include training photos on a dataset that will be utilized for recognition because the system consists of two parts.

Use of technology

The most important techniques are Hidden Markov Model with SVD and Viola-Jones for face detection.

- The Viola-Jones algorithm can be implemented using programs like MATLAB, OpenCV, and web browsers (using Adobe Flash).
- MATLAB, C++, and OpenCV libraries currently offer the Hidden Markov Model with SVD implementation for face recognition.

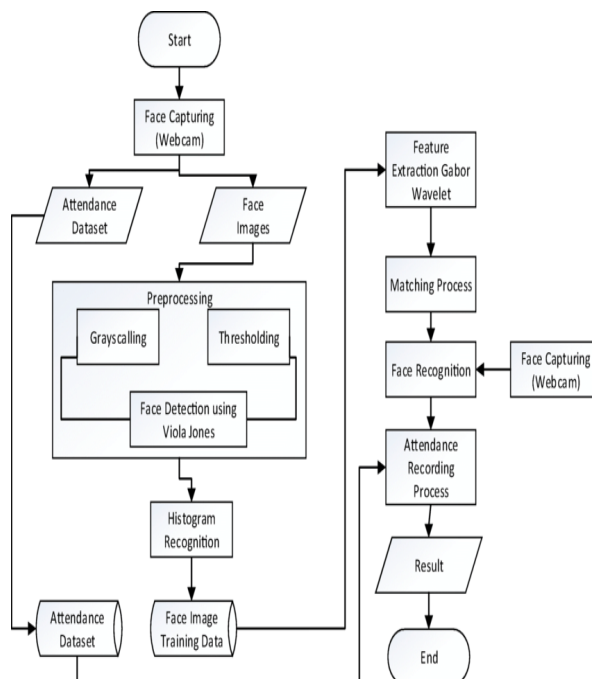


Figure 3.1 System Structure

CURRENT TECHNIQUES

The RFID (radio frequency identification) device's first patent was obtained by Charles Walton, who is most recognized for that accomplishment. Additionally, he was granted a patent for a passive transponder that opens doors without a key. A reader next to the door received a signal from a card with an integrated transponder. The reader unlocked the door when it discovered a valid identity number kept on the RFID tag.

A design for an attendance tracking system was presented in 2006 by Michael Dobson, Douglas Ahlers, and Bernie DiDario. Each possible participant will receive an identity tag with wireless communication capabilities as well as scanners to detect the tags as they enter a certain space.

Development of an Attendance Management System Using Biometrics by O. Shoewu and O.A. Idowu. With the use of a finger print device, attendance is electronically obtained, and the records are kept in a database. The marking of attendance follows student identification.

IV. METHODOLOGY

Each student in the class must register by providing the necessary information before their photographs are taken and included to the dataset. Faces will be recognized from the classroom's live streaming footage during each lesson. The identified faces will be compared to the dataset's image data. If a match is made, the attendance of the relevant student will be recorded. A list of absentees will be mailed to the faculty member in charge of the session at the conclusion of each session. The suggested system's system architecture is provided below

4.1 DATASET CREATION

A webcam is used to take pictures of the students. A single pupil will be captured in numerous pictures from various perspectives and motions. There is pre-processing done to these pictures. To acquire the Region of Interest (ROI), which will be used in the recognition procedure, the photos are cropped. The clipped photos must then be resized to a specific pixel position. Then, these RGB photos will be transformed to grayscale versions. And after that, these pictures will be saved in a folder with the names of the respective students.

FACE DETECTION

Here, faces are detected using OpenCV and the Face recognition software. Before it can be utilized for face identification, the Haar Cascade algorithm must be trained to recognize human faces. The term for this is feature extraction. An xml file named `haarcascade_frontal face_default` contains the training data for the haarcascade algorithm. In this case, we are use the OpenCV detect Multi Scale module. To draw a rectangle around the faces in an image, this is necessary. There are three variables to take into account: scale Factor, min Neighbors, and min Size. The scale Factor parameter is used to specify how much a picture must be scaled down.

The number of neighbors that each candidate rectangle must have is specified by `minNeighbors`. Higher levels typically detect fewer faces but better-quality images. The minimal object size is specified by `minSize`.

4.2 FACE RECOGNITION

Preparing training data, training the face recognizer, and prediction are the three processes in the face recognition process. The photographs in the dataset will serve as the training data in this case. They will be given an integer label designating which student they belong to. Face recognition software is then used to these pictures. This system uses the Local Binary Pattern Histogram as a face recognizer. First, the full face's list of local binary patterns (LBP) is compiled.

4.3 UPDATED ATTENDANCE

Following the face recognition process, the excel sheet will have the recognized faces marked as present and the remaining faces marked as absent. The list of absentees will then be mailed to the appropriate faculties. At the conclusion of each month, faculties will receive an update with their monthly attendance sheet.

4.4 FIREBASE DATABASE

The Firebase Realtime Database is a cloud-hosted database. Data is stored as JSON and synchronized in realtime to every connected client. When you build cross-platform apps with our Apple platforms, Android, and JavaScript SDKs, all of your clients share one Realtime Database instance and automatically receive updates with the newest data.

V. SYSTEM DESIGN

Design Methodology

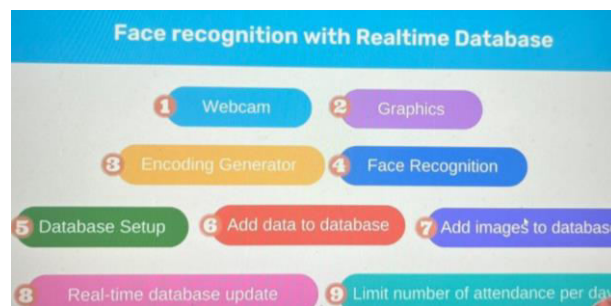


Figure 5.1 Face Recognition

WEBCAM

The purpose of a webcam is to record or broadcast video to a computer or computer network. They are mainly employed in video telephony, social networking, live streaming, and security.

Face detection with a webcam:

It is utilized to find human faces in photographs and films. It is now feasible to identify faces in images and videos regardless of the camera angles, the subject's head position, the lighting, or the subject's skin tone.

```
# import the opencv library
import cv2

# define a video capture object
vid = cv2.VideoCapture(0)

while (True):

    # Capture the video frame
    # by frame
    ret, frame = vid.read()

    # Display the resulting frame
    cv2.imshow('frame', frame)

    # the 'q' button is set as the
    # quitting button you may use any
    # desired button of your choice
    if cv2.waitKey(1) & 0xFF == ord('q'):
        break

# After the loop release the cap object
vid.release()
# Destroy all the windows
cv2.destroyAllWindows()
```

Figure 5.2 Sample code for webcam

GRAPHICS

A computer program called face detection, sometimes known as facial detection, searches for and recognizes human faces in digital photos and videos. Face detection technology is frequently utilized for real-time tracking and surveillance of individuals.

Encoding Generator Code

The algorithm for face recognition takes note of some critical facial features, such as the color, size, and slant of the eyes, the distance between the eyebrows, etc. All of them together define face encoding, the data extracted from the image utilized to identify a specific face.

FACE RECOGNITION

Face is recognized after the Encoding Generator

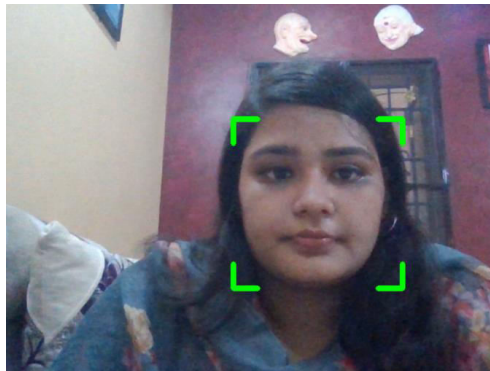


Figure 5.3 Face Recognition

ADD DATA AND IMAGES TO THE DATABASE

Adding Data to the Database:

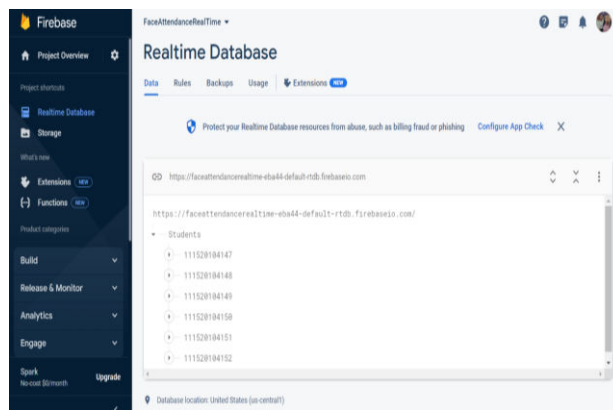
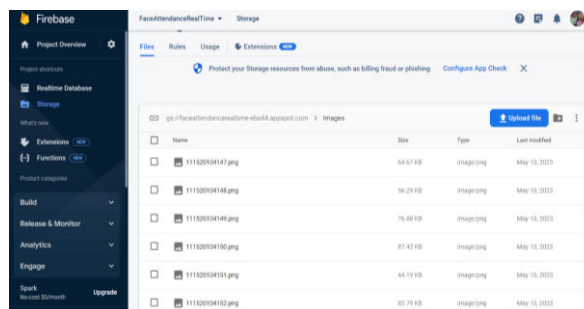
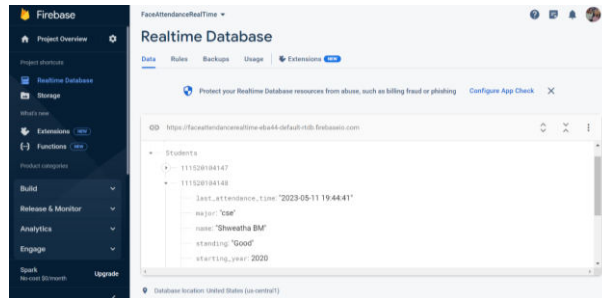


Figure 5.4 Database sample

Adding Images to the Storage



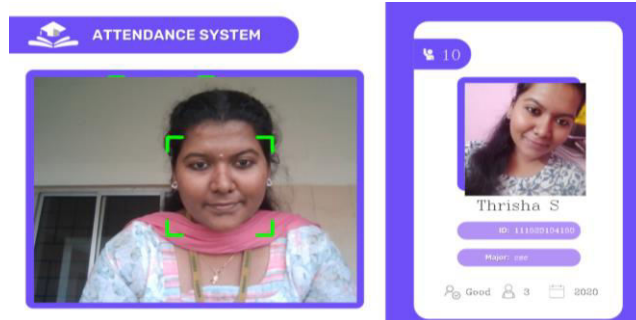
VI. REALTIME DATABASE UPDATE



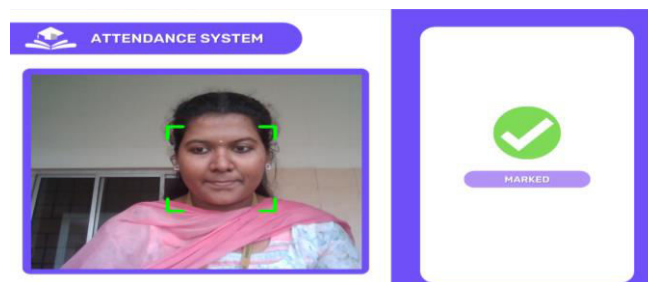
VII. CODE IMPLEMENTATION

FINAL PROTOTYPE 1:

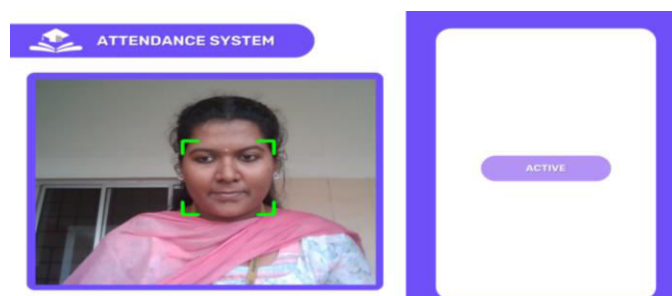
STEP 1: STUDENTS CREDENTIALS



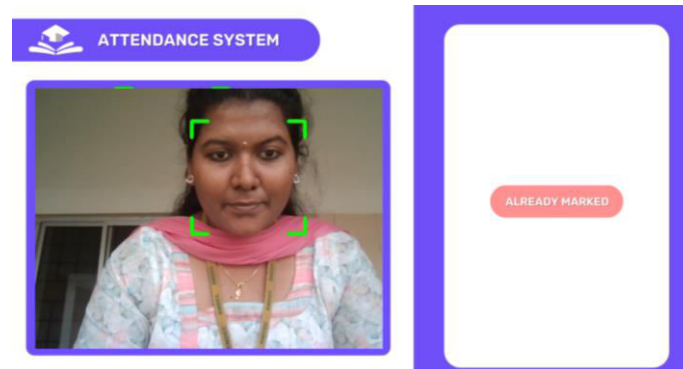
STEP 2: ATTENDANCE IS MARKED



STEP 3: STUDENT STATUS



STEP 4: ALREADY MARKED



THIS IS THE FINAL PROTOTYPE OF THE PROJECT.

VIII. CONCLUSIONS

These will lead us to the conclusion that the project intends to simplify the association's correspondence system. Simpler correspondence and reduced reliance on paper-based structure will be two of the biggest consequences. The assignment will cut down on the amount of time that different partners must spend communicating, and it may result in more productive work. The security and accessibility of information can also be improved by using a single correspondence medium. Additionally, past information can be efficiently looked up and written down. update the attendance record with the newly identified student. The goal of this system is to develop a reliable facial recognition system for tracking class attendance. The suggested system will have the ability to track attendance using face identification. It will use a webcam to detect faces and then identify them. After acknowledgment, it will record the presence of the students.

FUTURE WORK

Due to the COVID-19 pandemic, 10% of our project remains unfinished, including the following list of components:

1. Decreasing the number of attendees (which any user can accomplish with ease).
2. Improving PYCHARM and FIREBASE DATABASE synchronization. Our solution may be executed using a computer, and after adding the names of the desired students to the database, the user can take images (or upload them to the vision helper).

FUTURE RECOMMENDATIONS

These suggestions can help the system become more adaptable and scalable. Please be aware that the mechanism used here is only a prototype of the concept being explored in this project. The following are the suggestions:

- The system can be made more flexible to allow updating of templates in case student incurs significant amount of change in his facial features.
- The system can also be extended to allow better face recognition algorithm in which even rotational features of the face can be detected efficiently.

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