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Attendance using Face Recognition

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ABSTRACT: The main purpose of this project is to build a face recognition-based attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more efficient and effective as compared to before. The current old system has a lot of ambiguity that caused inaccurate and inefficient of attendance taking. Many problems arise when the authority is unable to enforce the regulation that exists in the old system. The technology working behind will be the face recognition system. The human face is one of the natural traits that can uniquely identify an individual. Therefore, it is used to trace identity as the possibilities for a face to deviate or being duplicated is low. In this project, face databases will be created to pump data into the recognizer algorithm. Then, during the attendance taking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be taken down automatically saving necessary information into a excel sheet. At the end of the day, the excel sheet containing attendance information regarding all individuals are mailed to the respective faculty.

I. INTRODUCTION

In today's networked world, the need to maintain the security of information or physical property is becoming both increasingly important and increasingly difficult. From time to time, we hear about the crimes of credit card fraud, computer breakings by hackers, or security breaches in a company or government building.

In most of these crimes, the criminals were taking advantage of a fundamental flaw in the conventional access control systems: the systems do not grant access by "who we are", but by "what we have", such as ID cards, keys, passwords, PIN numbers, or mother's maiden name.

None of these means are really define us. Recently, technology became available to allow verification of "true" individual identity. This technology is based in a field called "biometrics".

Biometric access control are automated methods of verifying or recognizing the identity of a living person based on some physiological characteristics, such as fingerprints or facial features, or some aspects of the person's behaviour, like his/her handwriting style or keystroke patterns. Since biometric systems identify a person by biological characteristics, they are difficult to forge. Face recognition is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness. It has the accuracy of a physiological approach without being intrusive. For this reason, face recognition has drawn the attention of researchers in fields from security, psychology, and image processing to computer vision.

II. REVIEW OF LITERATURE

2.1 Paper 1: Attendance Management System using Face Recognition

In this digital world with the prevalence and advance in technology, there has been a shift toward digital education. What seemed to be a move out of necessity has now become common practice. Despite the advancement in technologies, most teachers still rely on primitive methods such as calling out students' names to take their attendance. This is usually a tedious and time- consuming process and results in the wastage of precious class hours which can be better use in teaching. To replace this conventional method, we have created an automatic attendance management system. This automatic attendance management system is primarily based on facial recognition technology. Using

facial recognition technology, the attendance of students can be taken in a simple and efficient user-friendly manner with little to no time wasted compared to the conventional method. Authentication is an important feature of face recognition. Common difficulties, such as student proxies and students being tagged present despite not being physically there, can be avoided by employing this structure. In this system, the students must verify their physical presence by showing their faces to the camera. Once the camera recognizes the student it then automatically updates the attendance status of the student in the database. The attendance report will be made available after the validation of all the students from a particular class. We would aim to provide accurate results to the highest extent possible so that the system maintains its integrity and accuracy and can be trusted by all.

2.2 Paper 2: Attendance using Face Recognition Technology

In the world of education, recording student attendance is one crucial element. Student presence record is one of the determinants of student graduation. In almost every education field, attendance records that accurately recorded. The presence of facial recognition technology is one of the solutions used to record student attendance during class meetings. This article discusses the model of student attendance recording that can become part of the campus academic information system. The technologies used in recording student attendance include face recognition technology through Computer Vision and Matlab. This study discusses the system module and the factors that affect the accuracy and performance of the system. This model can be the basis for developing student attendance systems at universities or other educational institutions. This study proves that the process of recording through face recognition has the potential to be applied to educational systems in institutions, both as the primary system or as a support system of an existing system.

III. REPORT ON THE PRESENT INVESTIGATION

3.1 Theory

[1] 3.1.1 Artificial Intelligence and Computer Vision

Artificial Intelligence enables machines to replicate human-like decision-making processes. Within AI, **computer vision** is a key field that allows machines to interpret and analyse visual data from the environment. Face recognition combines both AI and computer vision to detect, extract, and identify facial features.

[2] 3.1.2 Face Detection and Recognition

Face detection identifies the presence and location of human faces in an image, while face recognition identifies whose face it is. Techniques such as Haar Cascade Classifier, LBPH (Local Binary Pattern Histogram), and CNN (Convolutional Neural Networks) are used for this purpose.

[3] 3.1.3 Algorithms in Face Recognition

- **Haar Cascade Classifier:** Used for detecting human faces quickly using feature-based learning.
- **LBPH (Local Binary Pattern Histogram):** Extracts texture features and converts them into numerical histograms for recognition.
- **CNN (Convolutional Neural Network):** A deep learning approach that automatically learns hierarchical facial features.

3.2 Methodology

[4] 3.2.1 System Overview

The intelligent attendance system consists of five main stages:

1. **Image Capture** – Real-time capture of facial images using a webcam.
2. **Face Detection** – Identifying and locating faces in the frame using Haar Cascade Classifier.
3. **Feature Extraction** – Converting detected faces into feature vectors using LBPH.
4. **Face Recognition** – Matching extracted features with existing images in the database.
5. **Attendance Marking** – Recording attendance automatically in an Excel or database file with date and time.

3.2.2 Hardware and Software Requirements

3.2.2.1 HARDWARE REQUIREMENTS

System	:	Pentium IV 2.4 GHz.
Hard Disk	:	40 GB.
Floppy Drive	:	1.44 Mb.
Monitor	:	14' Colour Monitor.
Mouse	:	Optical Mouse.
Ram	:	2 GB.
Keyboard	:	101 Keyboard Keys.

3.2.2.2 SOFTWARE REQUIREMENTS

Operating system	:	Windows 7 and Windows 10.
Coding Language	:	Python

[5] 3.3 Algorithm

Step 1: Start the system and initialize the webcam.

Step 2: Capture the live image of the user.

Step 3: Convert the image to grayscale.

Step 4: Detect face using the Haar Cascade algorithm.

Step 5: Extract facial features using LBPH.

Step 6: Compare with stored encodings in the database.

Step 7: If a match is found, mark attendance with a timestamp.

Step 8: Display success message ("Attendance Marked"). **Step 9:** End process.

[6] 3.3.1.1 DFD DIAGRAM

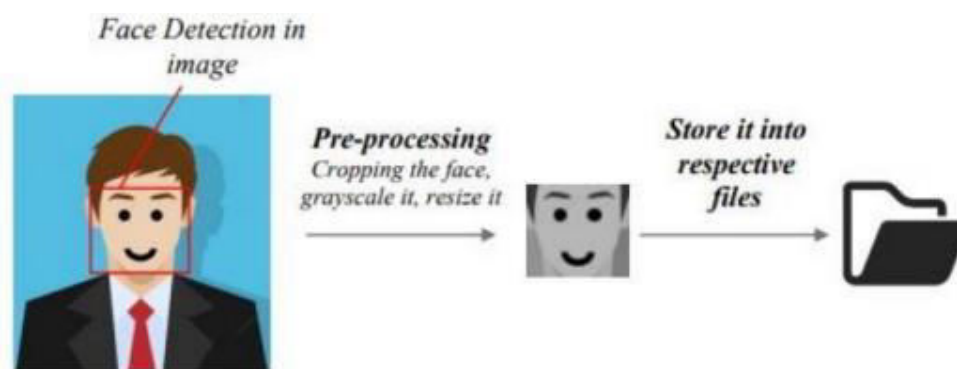


Fig: 3.3.1.1 - Level 0 DFD

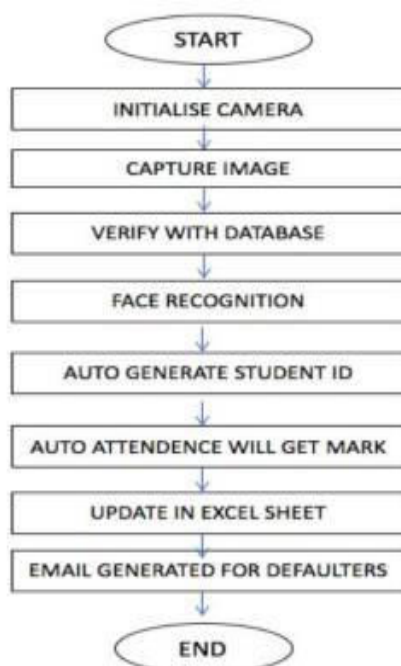


Fig. 3.3.1.2-Level 1 DFD

[7] 3.3.2 UML DIAGRAMS

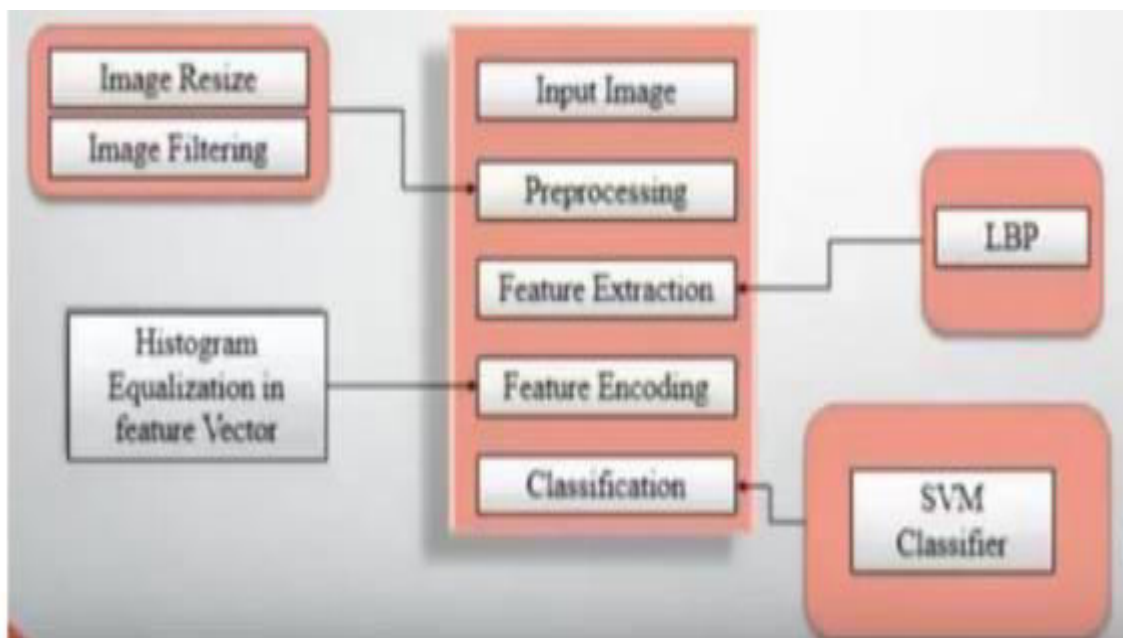


Fig: 3.3.2.1 - Activity Diagram

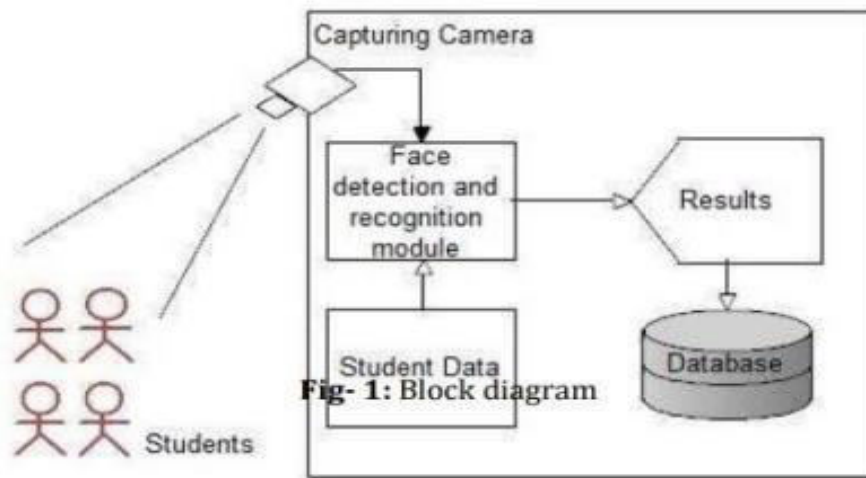


Fig: 3.3.2.2 - Communication Diagram for Image

IV. APPENDIX

```

import cv2
import numpy as np
import face_recognition
import os
from datetime import datetime
import datetime
# from PIL import ImageGrab

path = 'ImagesAttendance'
images = []
classNames = []
myList = os.listdir(path)
print(myList)
for cl in myList:
    curImg = cv2.imread(f'{path}/{cl}.jpg')
    images.append(curImg)
    classNames.append(os.path.splitext(cl)[0])
print(classNames)

def findEncodings(images):
    encodeList = []
    for img in images:
        img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
        encode = face_recognition.face_encodings(img)[0]
        encodeList.append(encode)
    return encodeList

def markAttendance(name):
    with open('Attendance.csv', 'r+') as f:
        myDataList = f.readlines()
        nameList = []
        for line in myDataList:
            entry = line.split(',')
            nameList.append(entry[0])
        if name not in nameList:
            now = datetime.now()
            dtString = now.strftime('%H:%M:%S')
            f.writelines(f'\n{name},{dtString}')

##### FOR CAPTURING SCREEN RATHER THAN WEBCAM
# def captureScreen(bbox=(300,300,690+300,530+300)):
#     capScr = np.array(ImageGrab.grab(bbox))
    
```

```
# capScr = cv2.cvtColor(capScr, cv2.COLOR_RGB2BGR)
# return capScr

encodeListKnown = findEncodings(images)
print('Encoding Complete') cap =
cv2.VideoCapture(0)

while True:
    success, img = cap.read() #img =
    captureScreen() imgS =
    cv2.resize(img,(0,0),None,0.25,0.25) imgS =
    cv2.cvtColor(imgS, cv2.COLOR_BGR2RGB)

    facesCurFrame = face_recognition.face_locations(imgS) encodesCurFrame =
    face_recognition.face_encodings(imgS,facesCurFrame)

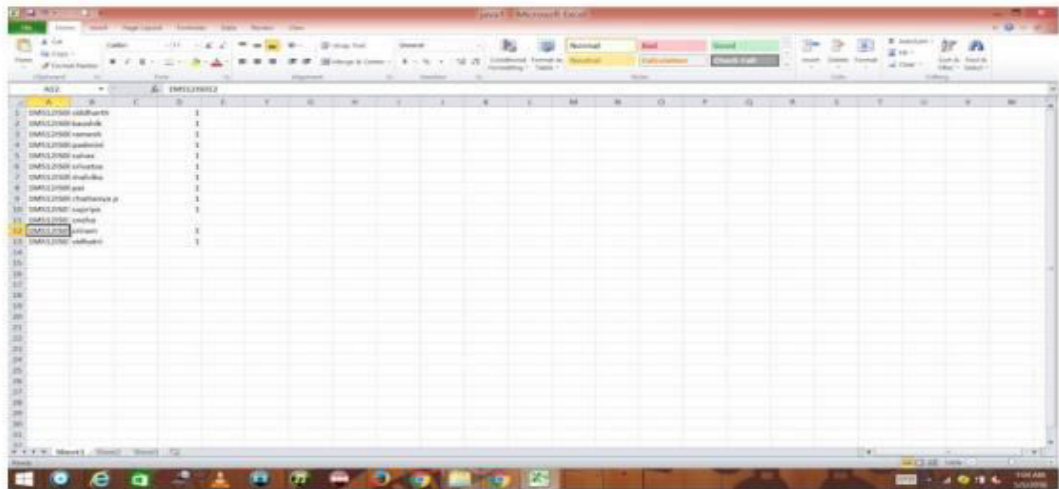
    for encodeFace,faceLoc in zip(encodesCurFrame,facesCurFrame):
        matches = face_recognition.compare_faces(encodeListKnown,encodeFace) faceDis
        = face_recognition.face_distance(encodeListKnown,encodeFace)
        #print(faceDis) matchIndex =
        np.argmin(faceDis)

        if matches[matchIndex]:
            name = classNames[matchIndex].upper()
            #print(name) y1,x2,y2,x1 = faceLoc y1, x2, y2, x1 = y1*4,x2*4,y2*4,x1*4
            cv2.rectangle(img,(x1,y1),(x2,y2),(0,255,0),2) cv2.rectangle(img,(x1,y2-35),(x2,y2),(0,255,0),cv2.FILLED)
            cv2.putText(img,name,(x1+6,y2-6),cv2.FONT_HERSHEY_COMPLEX,1,(255,255,255),2)
            markAttendance(name) cv2.imshow('Webcam',img) cv2.waitKey(1)
```

V. RESULT AND DISCUSSION



Fig: 5.1- Face Recognition

**Fig: 5.2- Updating in Excel Sheet**

VI. CONCLUSION

There may be various types of lighting conditions, seating arrangements and environments in various classrooms. Most of these conditions have been tested on the system and system has shown 100% accuracy for most of the cases. There may also exist students portraying various facial expressions, varying hair styles, beard, spectacles etc. All these cases are considered and tested to obtain a high level of accuracy and efficiency. Thus, it can be concluded from the above discussion that a reliable, secure, fast and an efficient system has been developed replacing a manual and unreliable system. This system can be implemented for better results regarding the management of attendance and leaves. The system will save time, reduce the amount of work the administration must do and will replace the stationery material with electronic apparatus and reduces the amount of human resource required for the purpose. Hence a system with expected results has been developed but there is still some room for improvement

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