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Smart Attendance Management using Face Recognition

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ABSTRACT: To maintain the attendance record with day to activities is a challenging task. The conventional method of calling name of each student is time consuming and there is always a chance of proxy attendance. The following system is based on face recognition to maintain the attendance record of students. The daily attendance of students is recorded subject wise which is stored already by the administrator.

A face recognition system is built for matching human faces with a digital image. Ultimately what a computer recognizes is pixel values ranging from 0-255. When the user wants to take attendance the system turns on video and starts detecting faces. After a face is detected it turns face image into pixels and compares with database. When a match is found then it will add student registered number to a text file which contains attendance of students. The system generates a text file after closing the application.

KEYWORDS: More accurate algorithm.

I. INTRODUCTION

The main objective of this project is to develop face recognition based automated student attendance system. In order to achieve better performance, the test images and training images of this proposed approach are limited to frontal and upright facial images that consist of a single face only. The test images and training images have to be captured by using the same device to ensure no quality difference. In addition, the students have to register in the database to be recognized. For better quality we have taken multiple images of single student.

We have used python modules like opencv-python , face_recognition . opencv module is used to take video , resize an image and to change color of image where as face_recognition module is used to compare faces . Our system is capable to identify multiple faces at a time.

II. PROPOSED ALGORITHM

Viola-Jones algorithm which was introduced by P. Viola, M. J. Jones (2001) is the most popular algorithm to localize the face segment from static images or video frame. Basically the concept of Viola-Jones algorithm consists of four parts. The first part is known as Haar feature, second part is where integral image is created, followed by implementation of Adaboost on the third part and lastly cascading process.

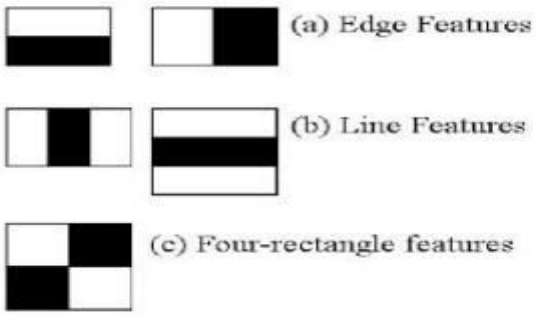

Figure 2.1 Haar Feature (Docs.opencv.org, 2018)

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Viola-Jones algorithm analyses a given image using Haar features consisting of multiple rectangles . Figure 2.1 shows several types of Haar features. The features perform as window function mapping onto the image. A single value result, which representing each feature can be computed by subtracting the sum of the white rectangle(s) from the sum of the black rectangle(s) . The illustration is shown in Figure 2.2

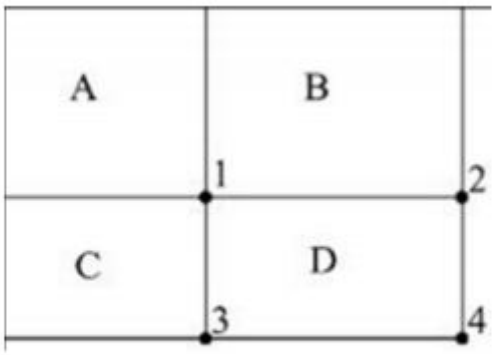

Figure 2.2 Integral of Image (Srushti Girhe et al., 2015)

The value of integrating image in a specific location is the sum of pixels on the left and the top of the respective location. In order to illustrate clearly, the value of the integral image at location 1 is the sum of the pixels in rectangle A. The values of integral image at the rest of the locations are cumulative. For instance, the value at location 2 is summation of A and B, (A + B), at location 3 is summation of A and C, (A + C), and at location 4 is summation of all the regions, (A + B + C + D) (Srushti Girhe et al., 2015). Therefore, the sum within the D region can be computed with only addition and subtraction of diagonal at location 4 + 1 − (2 + 3) to eliminate rectangles A, B and C. Burak Ozen (2017) and Chris McCormick (2013), they have mentioned that Adaboost which is also known as 'Adaptive Boosting' is a famous boosting technique in which multiple "weak classifiers" are combined into a single "strong classifier". The training set is selected for each new classifier according to the results of the previous classifier and determines how much weight should be given to each classifier in order to make it significant.

III. PSEUDO CODE

Algorithm: Viola-Jones Face Detection Algorithm

```
Input: original test image
Output: image with face indicators as rectangles
for i ← 1 to num of scales in pyramid of images do
    Downsample image to create image_i
    Compute integral image, image_ii
    for j ← 1 to num of shift steps of sub-window do
        for k ← 1 to num of stages in cascade classifier do
            for l ← 1 to num of filters of stage k do
                Filter detection sub-window
                Accumulate filter outputs
            end for
            if accumulation fails per-stage threshold then
                Reject sub-window as face
                Break this k for loop
            end if
        end for
        if sub-window passed all per-stage checks then
            Accept this sub-window as a face
        end if
    end for
end for
```

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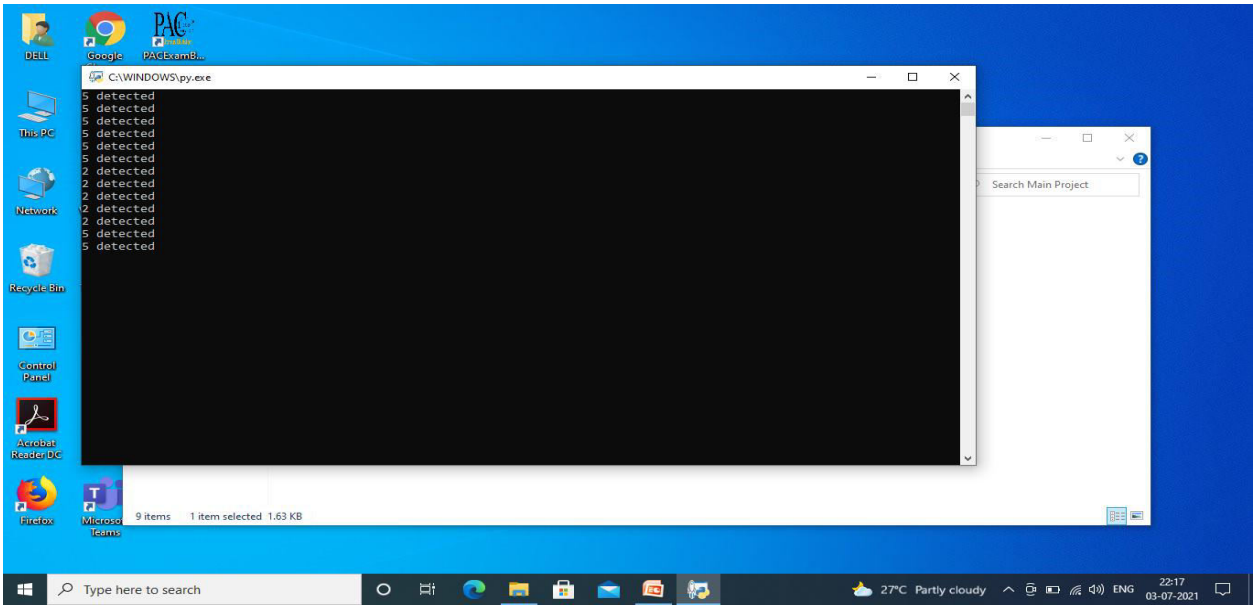
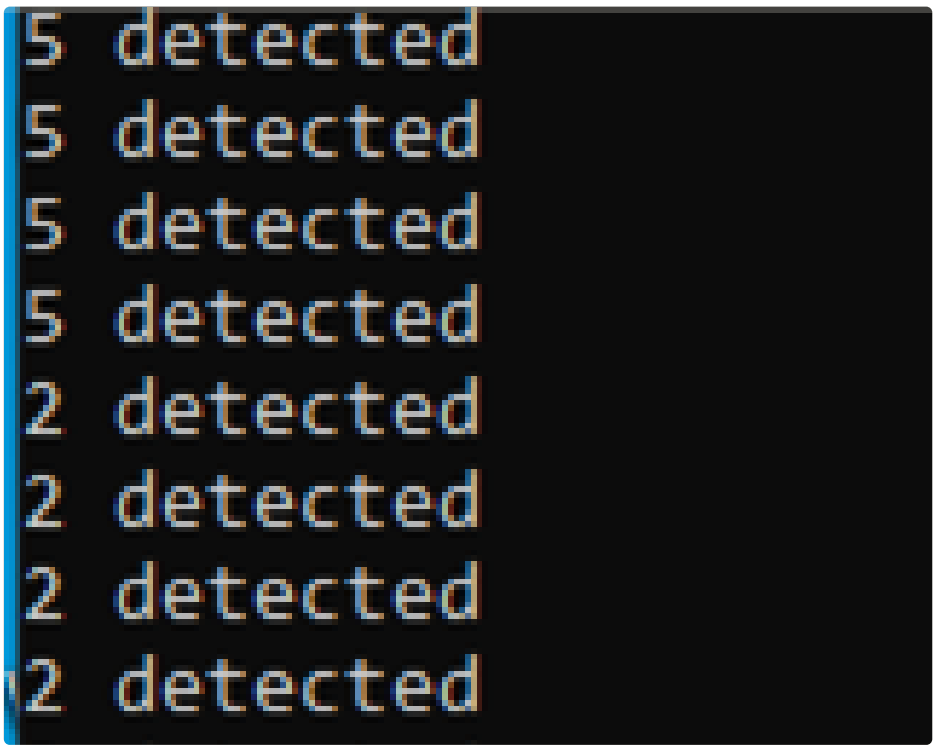
IV. SIMULATION RESULTS

Case 1 – Checking whether a face is detected or not.
Expected result – prints roll number of detected face.



Case 2 – Checking whether system is capable of detecting multiple faces or not.

Expected Result – System will detect and print all detected face roll numbers.



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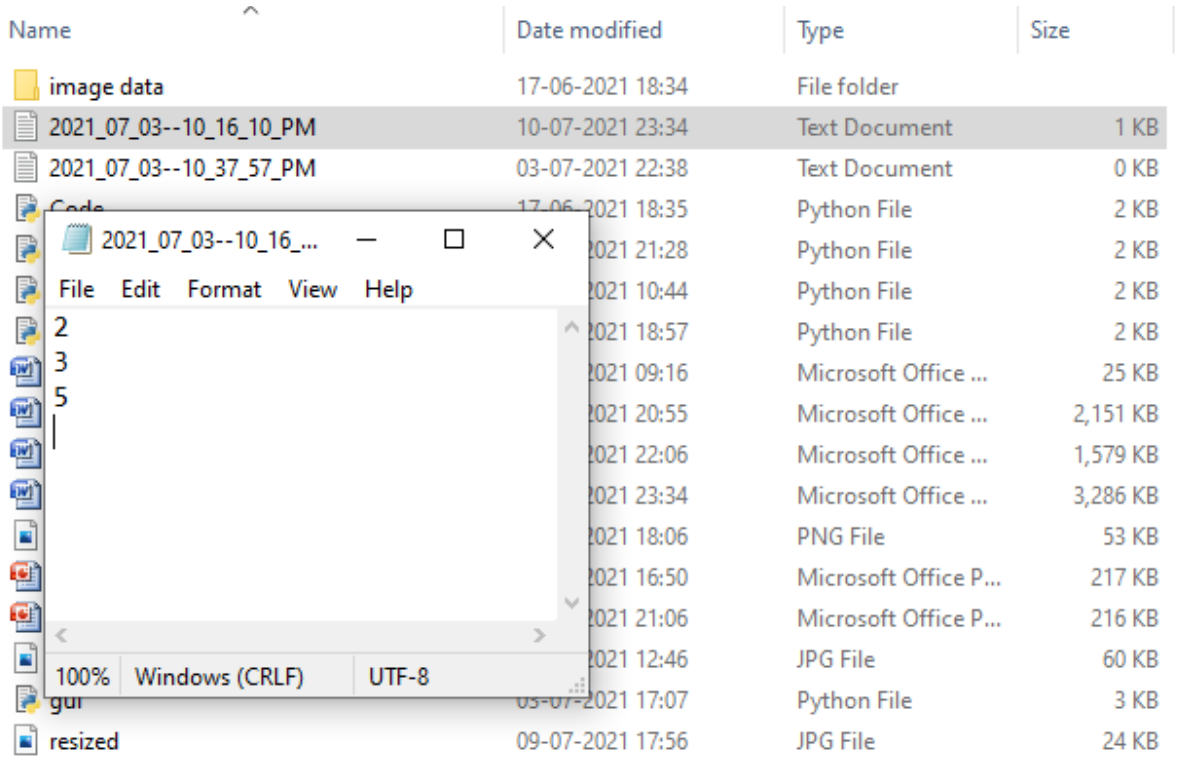
Case 3 – Unknown face detection

Expected result – Should display a warning message.

```
No match found for detected face
No match found for detected face
No match found for detected face
No match found for detected face
No match found for detected face
No match found for detected face
No match found for detected face
```

Test Case 4 - Attendance entry in text file.

Expected Result – Should contain valid matched roll numbers.



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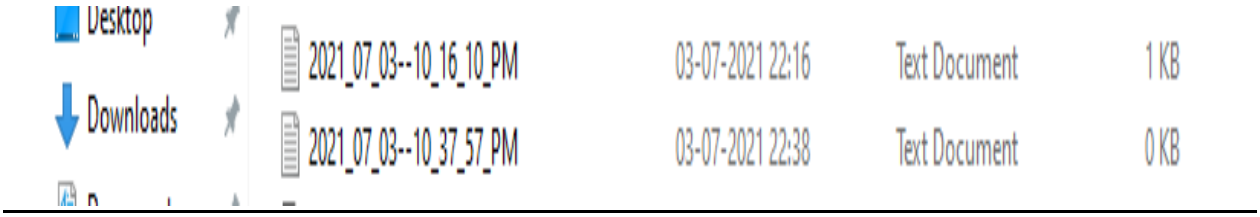
Test Case 4 - Checking naming convention of report

Expected Result – Name of the report should be date followed by time of attendance taken.



V. CONCLUSION AND FUTURE ENHANCEMENT

Finally we conclude that Smart attendance management system is based on face recognition to maintain the attendance record of students. This system is used to automate the process of manual attendance to overcome the disadvantages of manual attendance.

Future Enhancement

1. To develop an android application which has GUI.

2. To convert our project into cc-camera based attendance management system.

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4. https://youtu.be/mYVS7QjNjvg
5. https://www.youtube.com/watch?v=oP3MQyO-wwc

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