AUTOMATIC ATTENDANCE SYSTEM USING FACIALRECOGNITION

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in

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by

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INTRODUCTION

➢ **OBJECTIVE:**

Over the past decade, taking down students' attendance process had been developed and changed. The driven force of this development is the desire to automate, facilitate,speed up and save time and efforts.

Our project targets the students of different academic levels and faculty members. Itprovides facility for the automated attendance of students and uses live face recognition to recognize each individual and mark their attendance automatically.

It also utilizes video and image processing to provide inputs to the system. This willalso reduce manipulation of attendance record done by students and it will save timeas well.

Face recognition is a computer technology that determines the location and size of ahuman face in a digital image.

➢ **MOTIVATION:**

The human face is a unique representation of individual identity. Thus, face recognition is defined as a biometric method in which identification of an individual is performed by comparing real-time capture image with stored images in the databaseof that person.

Nowadays, face recognition system is prevalent due to its simplicity and awesome performance. For instance, airport protection systems and FBI use face recognition forcriminal investigations by tracking suspects, missing children and drug activities.

Apart from that, Facebook which is a popular social networking website implementface recognition to allow the users to tag their friends in the photo for entertainmentpurposes.

Furthermore, Intel Company allows the users to use face recognition to get access totheir online account.

Apple allows the users to unlock their mobile phone, iPhone X by using facerecognition.

➢ BACKGROUND:

Face recognition is crucial in daily life in order to identify family, friends or someonewe are familiar with. We might not perceive that several steps have actually taken in order to identify human faces. Human intelligence allows us to receive information and interpret the information in the recognition process. We receive information through the image projected into our eyes, by specifically retina in the form of light. Light is a form of electromagnetic waves which are radiated from a source onto an object and projected to human vision.

G., & Robinson-Riegler, B. (2008) mentioned that after visual processing done by thehuman visual system, we actually classify shape, size, contour and the texture of the object in order to analyze the information. The analyzed information will be compared to other representations of objects or face that exist in our memory to recognize. In fact, it is a hard challenge to build an automated system to have the same capability as a human to recognize faces. However, we need large memory to recognize different faces, for example, in the Universities; there are a lot of students with different race and gender, it is impossible to remember every face of the individual without making mistakes. In order to overcome human limitations, computers with almost limitless memory, high processing speed and power are used in face recognition systems.

The human face is a unique representation of individual identity. Thus, face recognition is defined as a biometric method in which identification of an individual is performed by comparing real-time capture image with stored images in the databaseof that person.

The work on face recognition began in 1960. Woody Bledsoe, Helen Chan Wolf and Charles Bisson had introduced a system which required the administrator to locate eyes, ears, nose and mouth from images. The distance and ratios between the located features and the common reference points are then calculated and compared. The studies are further enhanced by Goldstein, Harmon, andLesk in 1970 by using other features such as hair colour and lip thickness to automate the recognition. In 1988, Kirby and Sirovich first suggested principle component analysis (PCA) to solve face recognition problem. Many studies on face recognition were then conducted continuously until today.

PROJECT DESCRIPTION AND GOALS

DESCRIPTION:

➢ Face recognition is a computer technology that determines thelocation and size of a human face in a digital image.

➢ It is a biometric approach that employs automated methods to verifyor recognize the identity of a living person based on his/ her physiological characteristics.

➢ In general, a biometric identification system makes use of eitherphysiological characteristics or behavior patterns to identify a person.

➢ Our system uses this technology to record the attendance through ahigh resolution digital camera that detects and recognizes faces andcompare the recognize faces with students' faces images stored in faces database.

➢ Once the recognized face matches a stored image, attendance is marked in attendance database for that person. The process willrepeat if there are missed faces.

➢ For example, if there are 4 faces missed for a bad position while the detecting phase, then this phase will start again to detect the missedfaces and recognize them and continue the attending process.

➢ Hence maintaining attendance automatically with the help of face recognition is very helpful and less prone to errors as compared tomanual process.

METHODOLOGY:

➢ First, we get the location of where exactly the face is in the image .

- ➢ Then face encodings (markings of eyes, nose, mouth, jaws which remain the same for different images of the same person) are taken.

- ➢ Both these two steps are followed for the original and test image.Then a comparison between these two returned lists is done.

- ➢ The face distance function gets the value of that by how much the twoimages differ. The lower the distance the better the matching and vice versa.

- ➢ Now, a real-time face attendance system is built wherein webcam captured frames will be matched against the existing database images and if the match is found then it'll store it in a CSV file called'Attendance Register' along with name and time of capture.

- ➢ Only once the file will store the matched image's details, if the sameimage is received again then it'll not update.

PROJECT GOAL:

- ➢ Taking and tracking students' attendance manually, losing attendance sheets, dishonesty, wasted time and high error scales areproblems facing the lecturers use the existing attendance system.

- ➢ It is a hard process, take time and cause a lot of paper-based work.

- ➢ As a result, in order to solve these problems and avoid errors wesuggest to computerize this process by providing a system that record and manage students' attendance automatically without needing to lecturers' interference.

- ➢ Face Recognition technology can be utilized to build an automatedattendance system that makes counting and identifying students much easier and convenient.

- ➢ Face occlusions, face scaling, and posture are still importantproblems in such systems.

LITERATURE SURVEY

1. In this approach, the structure and musculature of the face is used mostly for computer animation based applications. Biomechanics model based on 3D shape and colour, biomechanics properties of skin and structure beneath the skin and anthropometric statistics along with natural changes in facial appearances adopted to combine 3D and 2D data of face images and proof the success in recognising the faces.

2. Various methods have been proposed in the literature for template matching. The Euclidean distance has been adopted for template matching. In which the whole image was represented in the intensity values of a two-dimensional array and compared via approximate metric .Recently, form the distinctive viewpoints the face template were compared of an individual. While from single view point but multiple distinctive smaller templates have been adopted for face recognition. Furthermore, the different parts of the template were utilised for matching such as eyes, nose and mouth. The main limitation appeared in template matching is computational complexity . In general, it is more logical as compared to feature matching based approaches for face recognition.

3. Infrared image or thermal images or thermograms shows the heat discharged from an object. These thermal changes represent uniqueness of every object according to their different characteristic of material and its temperature. Thermal imaging becomes more popular in face recognition field via analyzing the temperature generated by blood vessels under the facial skin . Hence, for thermal based face verification systems, particular kind of sensor or camera known as IR is utilized to capture the images which show the thermal changes among faces of various skin types and colors. NIR spectrum has been powerfully provide a detection rate for faces and adopted in numerous face recognition systems via computing feature extraction technique on thermal images.

4. In this paper, the idea of two technologies namely Student Attendance and Feedback system has been implemented with a machine learning approach. This system automatically detects the student performance and maintains the student's records like attendance and their feedback on the subjects like Science, English, etc. Therefore the attendance of the student can be made available by recognizing the face. On recognizing, the attendance details and details about the marks of the student is obtained as feedback.

5. In this proposed system the student is requested to stand in front of the camera to detect and recognize the iris, for the system to mark attendance for the student. Some algorithms like Gray Scale Conversion, Six Segment Rectangular Filter, Skin Pixel Detection is being used to detect the iris. It helps in preventing the proxy issues and it maintains the attendance of the student in an effective manner, but in one of the time-consuming process for a student or a staff to wait until the completion of the previous members.

6. This paper proposes that the system takes the attendance automatically recognition obtained by continuous observation. Continuous observation helps in estimating and improving the performance of the attendance. To obtain the attendance, positions and face images of the students present in the class room are captured. Through continuous observation and recording the system estimates seating position and location of each student for attendance marking. The work is focused on the method to obtain the different weights of each focused seat according to its location. The effectiveness of the picture is also being discussed to enable the faster recognition of the image.

7. Here, a method is proposed using Eigenface and Principal Component Analysis which has the architecture as the following step. The camera needs to install in the front which can capture an entire face of the student inside the class. The first phase after the camera has been captured; the captured image was transferred into the system as an input. The image capture from the camera sometimes come with the darkness or brightness which need to do an enhancement on it such as convert to gray image. The next step, Histogram Normalization is used in this system remove the contrast of the image. It is easy to recognize when has the student sit in the back row. The Median filter is used to remove noise from the image in case the camera is high definition camera, but sometimes it still contains the noise. The author also implements with skin classification which changes all the pixel to black except the pixel are close to the skin.

8. Here, a smart attendance marking system is proposed which combines two differencing algorithms such Principal Component Analysis and Artificial Neural Network. The purpose of the author is to solve the traditional attendance marking system and to resolve the time-consuming. In the system implement with Principal Component Analysis, it does an extraction and identify the similarities of the face database and acquire images. Artificial Neural Network is used to solve the problem of the input data or learn from the input data, and the expect value. In the system implemented by the author using back propagation algorithm and combines with mathematical function to perform in that system. As a result, written by the author research, it shows that the system can use to recognize in a different environment.

9. Here, face encounter algorithm Viola Jones and face recognition PCA algorithm are prompted with support for machine learning and SVM for extraction functionality. The author also incorporated reprocessing which includes the histogram equalization of the facial image extracted and is scaled to 100x100. The use of neural networks for facial recognition has been shown, and we can see the possibility of a semi-supervised learning approach that uses facial recognition support vector machines for satisfactory results. The process followed after the face is recognized is the subsequent processing in which attendance is generated weekly or monthly and can be sent to parents or guardians.

10. Here, a fully cell phone automatic attendance system is implemented. This is achieved using the Viola-Jones algorithm along with Ada-boost training for face finding, since according to the authors, they should work better in the real-life scenario. For the purposes of recognition, the Euclidean distance was determined for the 3 recognition methods, namely its Eigen face, Fisher face and LBP. A comparison of precision was made for all of the above-mentioned recognition techniques. The smartphone application was developed for the automatic attendance generating system.

TECHNICAL SPECIFICATION

Software Requirements:

- Windows 10, Windows 7(ultimate, enterprise)
- Sql 2019
- Visual studio 2020

Hardware Components:

- Processor – i10
- Hard Disk – 5 GB
- Memory – 2GB RAM

DESIGN APPROACH AND DETAILS

➢ **Comparison Among Algorithms**

- **HAAR ALGORITHM:**

It is an Object Detection Algorithm used to identify faces in an image or a real time video. The algorithm uses edge or line detection features proposed by Viola and Jones in their research paper "Rapid Object Detection using a Boosted Cascade of Simple Features" published in 2001. The algorithm is given a lot of positive images consisting of faces,and a lot of negative images not
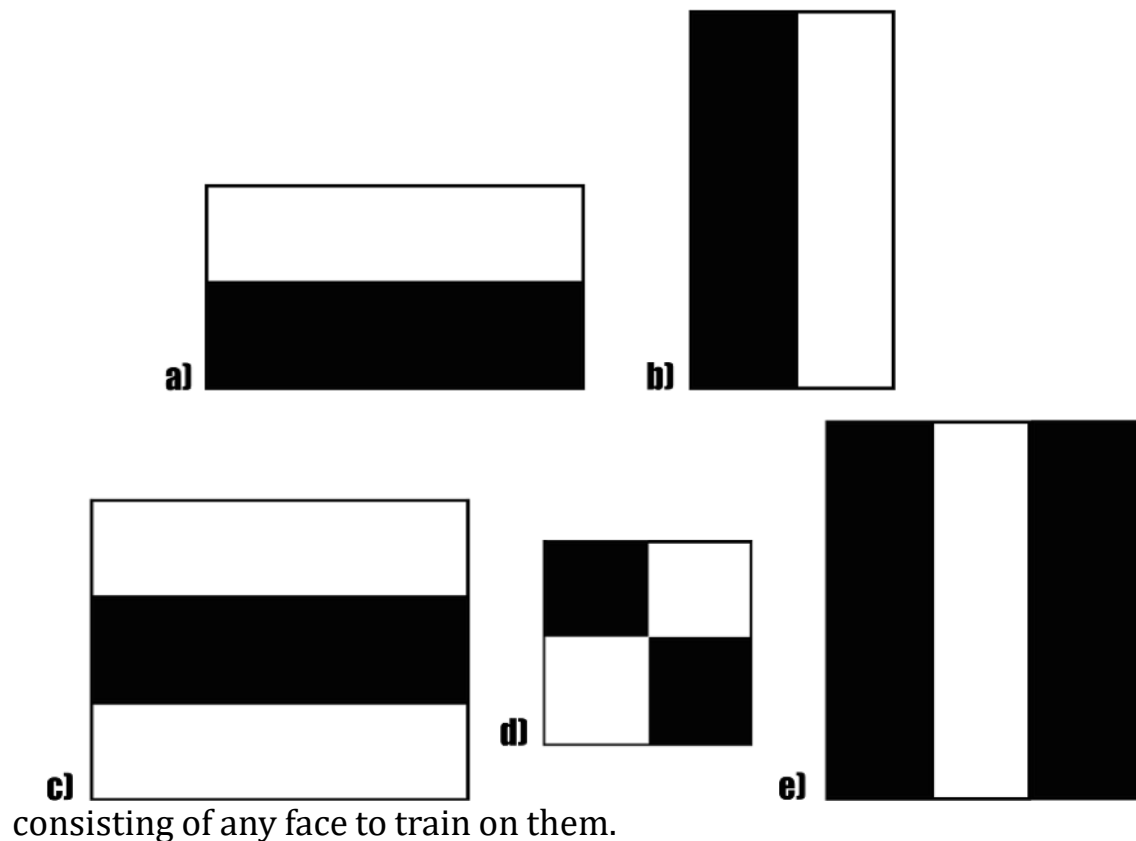

consisting of any face to train on them.

FIG.1

The first contribution to the research was the introduction of the haar features shown above. These features on the image makes it easy to find

out the edges or the lines in the image, or to pick areas where there is asudden change in the intensities of the pixels.
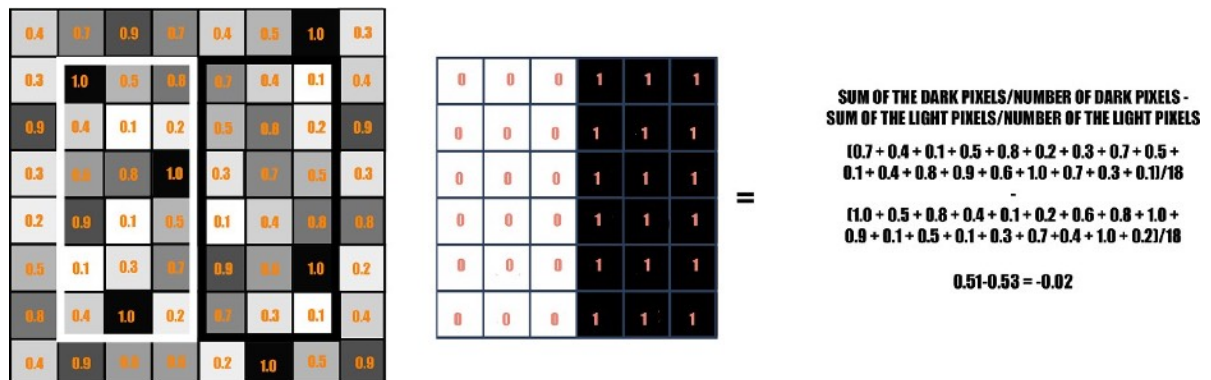

FIG.2

A sample calculation of Haar value from a rectangular image section has been shown here. The darker areas in the haar feature are pixels with values 1, and the lighter areas are pixels with values 0. Each of these is responsible for finding out one particular feature in the image. Such as an edge, a line or any structure in the image where there is a sudden change ofintensities. For ex. in the image above, the haar feature can detect a verticaledge with darker pixels at its right and lighter pixels at its left.

The objective here is to find out *the sum of all the image pixels lying in the darker area of the haar feature* and *the sum of all the image pixels lying in the lighter area of the haar feature.* And then find out their difference. Now if theimage has an edge separating dark pixels on the right and light pixels on the left, then the haar value will be closer to 1. That means, we say that there is an edge detected if the haar value is closer to 1. In the example above, thereis no edge as the haar value is far from 1.

This is just one representation of a particular haar feature separating a vertical edge. Now there are other haar features as well, which will detect edges in other directions and any other image structures. To detect an edgeanywhere in the image, the haar feature needs to traverse the whole image.

The haar feature continuously traverses from the top left of the image to thebottom right to search for the particular feature. This is just a representation of the whole concept of the haar feature traversal. In its actual work, the haar feature would traverse pixel by pixel in the image.
Also all possible sizes of the haar features will be applied.

Depending on the feature each one is looking for, these are broadly classified into three categories. The first set of *two rectangle features* are responsible for finding out the edges in a horizontal or in a vertical direction(as shown above). The second set of *three rectangle features* are responsible for finding out if there is a lighter region surrounded by darker regions on either side or vice-versa. The third set of *four rectangle features* are responsible for finding out change of pixel intensities across diagonals.

Now, the haar features traversal on an image would involve a lot of mathematical calculations. As we can see for a single rectangle on eitherside, it involves 18 pixel value additions (for a rectangle enclosing 18 pixels). Imagine doing this for the whole image with all sizes of the haar features. This would be a hectic operation even for a high performance machine.
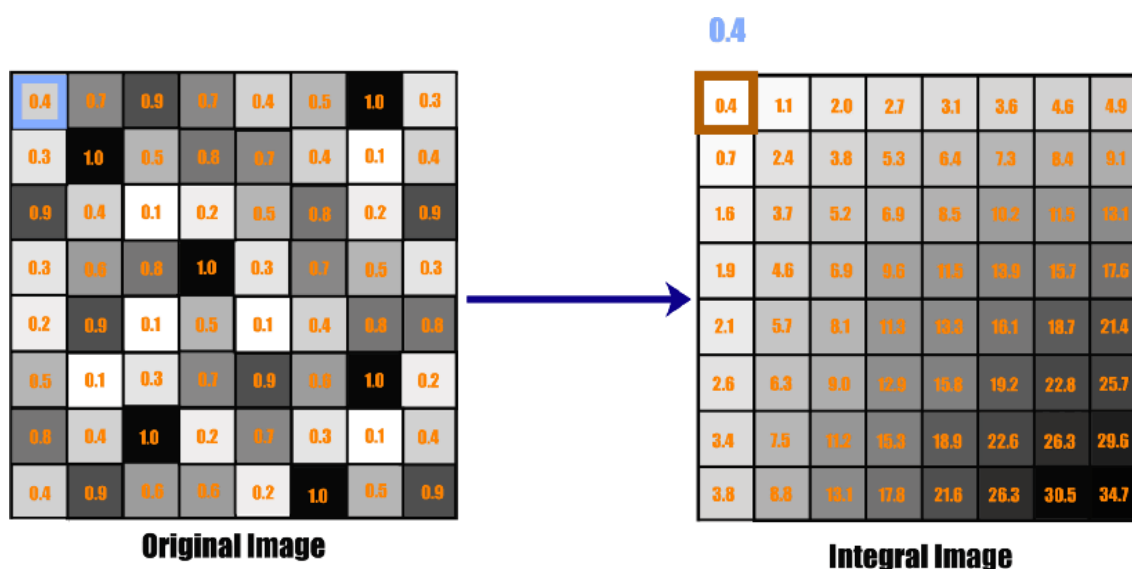

FIG. 3

Local Binary Pattern (LBP) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of eachpixel and considers the result as a binary number.

It was first described in 1994 (LBP) and has since been found to be a powerful feature for texture classification. It has further been determinedthat when LBP is combined with histograms of oriented gradients (HOG)

descriptor, it improves the detection performance considerably on somedatasets.

Using the LBP combined with histograms we can represent the face imageswith a simple data vector.

As LBP is a visual descriptor it can also be used for face recognition tasks, ascan be seen in the following step-by-step explanation.

Step-by-Step

Now that we know a little more about face recognition and the LBPH, let's go further and see the steps of the algorithm:

1. Parameters: the LBPH uses 4 parameters:

- Radius: the radius is used to build the circular local binary pattern andrepresents the radius around the central pixel. It is usually set to 1.

- Neighbors: the number of sample points to build the circular local binarypattern. Keep in mind: the more sample points you include, the higher thecomputational cost. It is usually set to 8.

- Grid X: the number of cells in the horizontal direction. The more cells, thefiner the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.

- Grid Y: the number of cells in the vertical direction. The more cells, thefiner the grid, the higher the dimensionality of the resulting feature vector. It is usually set to 8.

Don't worry about the parameters right now, you will understand themafter reading the next steps.

Training the Algorithm: First, we need to train the algorithm. To do so, weneed to use a dataset with the facial images of the people we want to recognize. We need to also set an ID (it may be a number or the name of theperson) for each image, so the algorithm will use this information to recognize an input image and give you an output. Images of the same person

must have the same ID. With the training set already constructed, let's see the LBPH computational steps.

3. **Applying the LBP operation**: The first computational step of the LBPH is to create an intermediate image that describes the original image in a better way, by highlighting the facial characteristics. To do so, the algorithm uses a concept of a sliding window, based on the parameters radius and neighbors.

The image below shows this procedure:

FIG. 4
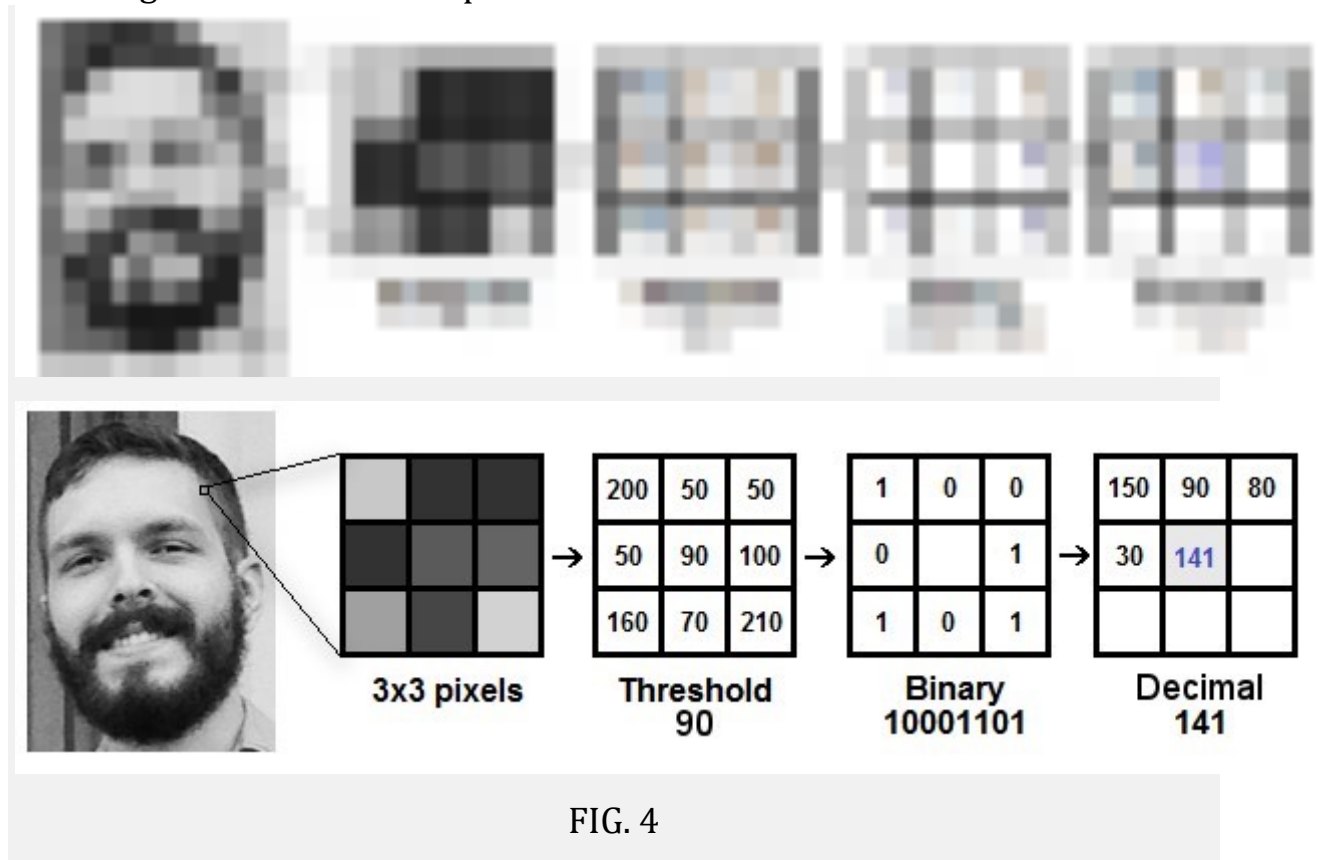
Based on the image above, let's break it into several small steps so we can understand it easily:

- Suppose we have a facial image in grayscale.

- We can get part of this image as a window of 3x3 pixels.

- It can also be represented as a 3x3 matrix containing the intensity of each pixel (0~255).

- Then, we need to take the central value of the matrix to be used as the threshold.

- This value will be used to define the new values from the 8 neighbors.

- For each neighbor of the central value (threshold), we set a new binaryvalue. We set 1 for values equal or higher than the threshold and 0 for values lower than the threshold.

- Now, the matrix will contain only binary values (ignoring the centralvalue). We need to concatenate each binary value from each positionfrom the matrix line by line into a new binary value (e.g. 10001101). Note: some authors use other approaches to concatenate the binary values (e.g. clockwise direction), but the final result will be the same.

- Then, we convert this binary value to a decimal value and set it to thecentral value of the matrix, which is actually a pixel from the originalimage.

- At the end of this procedure (LBP procedure), we have a new imagewhich represents better the characteristics of the original image.

- Note: The LBP procedure was expanded to use a different number ofradius and neighbors, it is called Circular LBP.

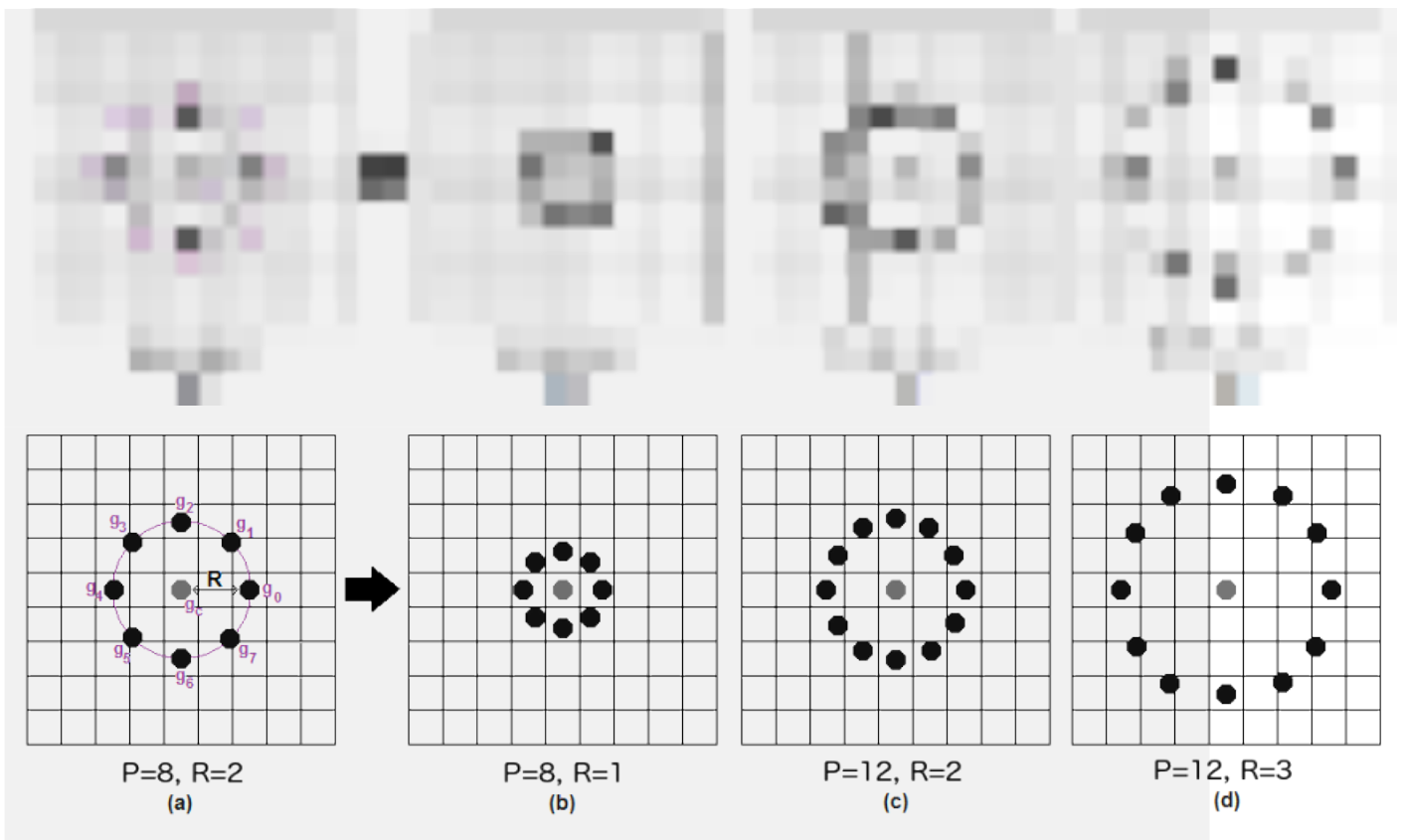P=8, R=2 (a)   P=8, R=1 (b)   P=12, R=2 (c)   P=12, R=3 (d)

FIG. 5

It can be done by using bilinear interpolation. If some data point is betweenthe pixels, it uses the values from the 4 nearest pixels (2x2) to estimate thevalue of the new data point.

4. Extracting the Histograms: Now, using the image generated in the last step, we can use the Grid X and Grid Y parameters to divide the image intomultiple grids, as can be seen in the following image:
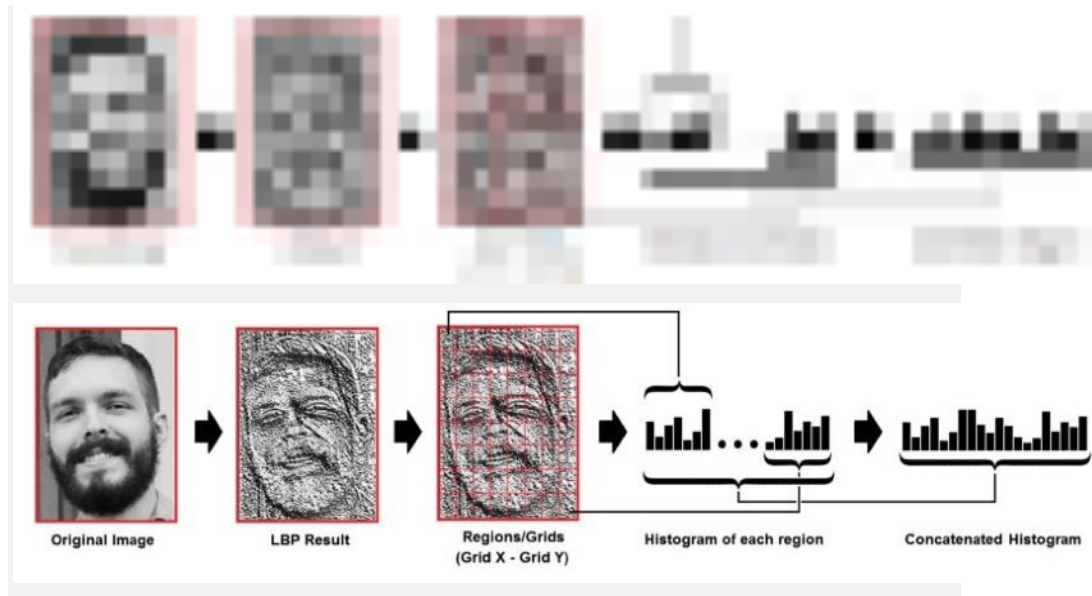

FIG. 6

Based on the image above, we can extract the histogram of each region asfollows:

- As we have an image in grayscale, each histogram (from each grid) will contain only 256 positions (0~255) representing the occurrences of eachpixel intensity.

- Then, we need to concatenate each histogram to create a new and biggerhistogram. Supposing we have 8x8 grids, we will have 8x8x256=16.384 positions in the final histogram. The final histogram represents the characteristics of the image original image.

The LBPH algorithm is pretty much it.

5. Performing the face recognition: In this step, the algorithm is already trained. Each histogram created is used to represent each image from thetraining dataset. So, given an input image, we perform the steps again for this new image and creates a histogram which represents the image.

- So to find the image that matches the input image we just need tocompare two histograms and return the image with the closest histogram.

- We can use various approaches to compare the histograms (calculate thedistance between two histograms), for example: euclidean distance, chi-square, absolute value, etc. In this example, we can use the Euclidean distance (which is quite known) based on the following formula:

$$D = \sqrt{\sum_{i=1}^{n} (hist1_i - hist2_i)^2}$$

FIG. 7

- So the algorithm output is the ID from the image with the closest histogram. The algorithm should also return the calculated distance, which can be used as a 'confidence' measurement. Note: don't be fooledabout the 'confidence' name, as lower confidences are better because it means the distance between the two histograms is closer.

- We can then use a threshold and the 'confidence' to automatically estimate if the algorithm has correctly recognized the image. We can assume that the algorithm has successfully recognized if the confidence islower than the threshold defined.

Conclusions

- LBPH is one of the easiest face recognition algorithms.

- It can represent local features in the images.

- It is possible to get great results (mainly in a controlled environment).

- It is robust against monotonic gray scale transformations.

- It is provided by the OpenCV library (Open Source Computer VisionLibrary).

• **PROPOSED METHOD:**

In our procedure comprises camera is used catching of the pictures of lecture hall image then directing pictures to picture enlargement segment.Spitting image rises identification and appreciation of the modules after theimage improvement and being present noticeable at particular time to the recorder system.
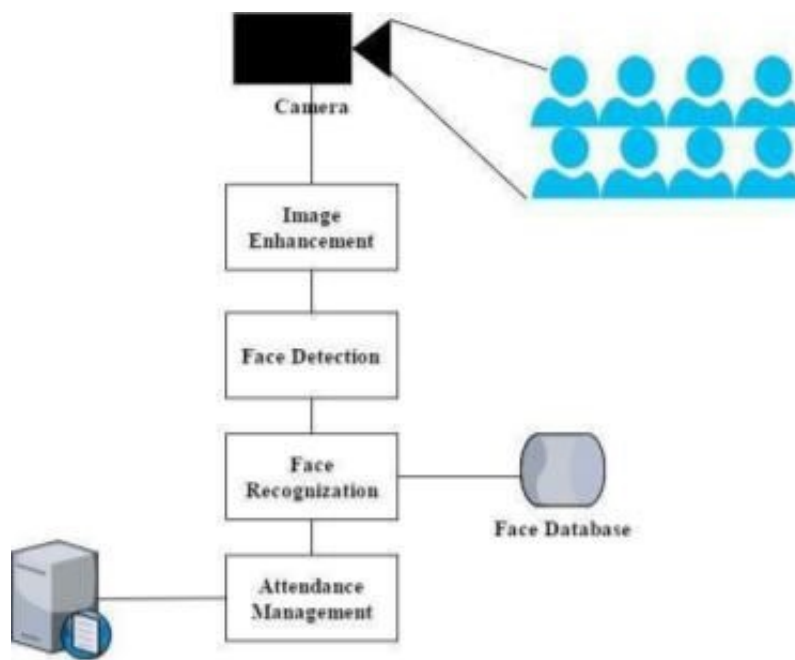

FIG. 8

```
                    Start

                 Input Image

                  Histogram
5.1 Algorithm flowchart    Normalization

                 Noise Removal

                    Skin
                 Classification

                Face Detection

              Select Region of
                  Interest

                   Face          ──►   Face Database
                Recognization

                 Attendance      ──►   Attendance
                                        Database

                 Any other
                   Face

                    End
```
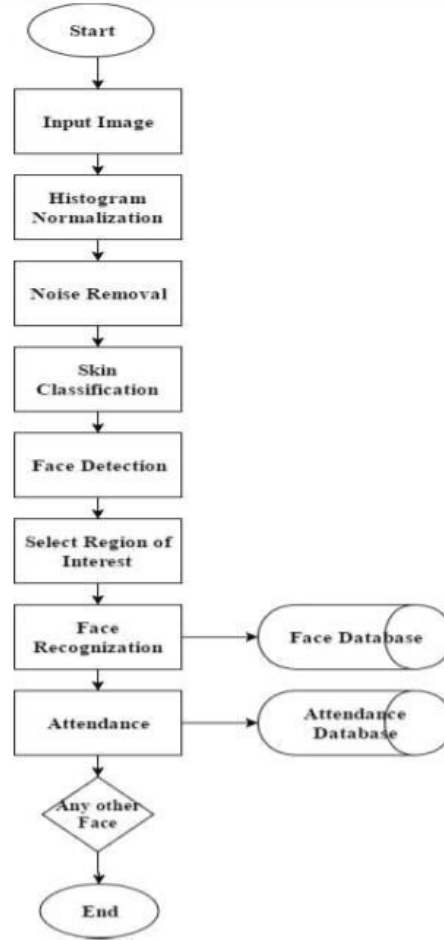
FIG. 9

In our work, we acknowledge the fact that capability of the LBP face recognition algorithm highly depends on the accuracy performance of feature extraction and comparison stage, which also highlydepends on the quality of both the input face images and the training/reference images participating in the face comparison process. In order to improve the face recognition accuracy of the LBP algorithm, we exploited the following image quality properties of our input and referenceface images: illumination, sharp, noise, resolution, scale and pose, so as to obtain the best quality images that will expose better details of image features for more accurate feature extraction and comparison.

Our first improvement approach is to apply the Contrast Adjustment method on our input face images as defined in equation (1). We tested thismethod with different values of alpha and beta to select the one that gives the best detection and recognition accuracy result, which are 1.5 (α) valueand 0.0 (β) value.(1)$g(x,y)=\alpha*f(x,y)+\beta$

We selected the filter that gives the best result in our case, which is thebilateral filter as defined in equation (2).

$$(2) \quad F(x,y)=\frac{\sum_{x=-N}^{N}\sum_{y=-N}^{N}I(x,y)W(x,y)}{\sum_{x=-N}^{N}\sum_{y=-N}^{N}W(x,y)}$$

where $W(x,y)$ is the filter weighting function, $I(x,y)$ is the input face imageneighborhood pixel and the denominator is the normalization of the weighting function, and $F(x,y)$ is the result of the bilateral filter applied on a $2N+1$ neighborhood. Now we defined $CF(x,y)$ in equation (3) as the function to reduce noise and control contrast effects in the input images, where $g(x,y)$ in equation (3) is the contrasted image and $F(x,y)$ is the applied filter.

$$(3) \quad CF(x,y)=g(x,y)*F(x,y)$$

The resultant image pixels derived from the above equation are equalized using the image histogram equalization method defined in equation (4) to finally address the global lightning issues in the processed facial images.

$$(4) \quad Eq=H'(CF(x,y))$$

where H' is the normalized cumulative distribution with a maximum value of 255 as in Ref. [28], finally, we appliedthe LBP algorithm on our detected face images for feature extraction & comparison.

A more formal description of the LBP operator can be given as follows in equation (5):

$$(5) \quad LBP_{p,r}(X_c,Y_c)=\sum_{p=0}^{p-1}2^p S(i_p-i_c)$$

where (X_c,Y_c) is gray- level value of the center pixel with i_p and i_c being the intensity of the neighbor pixel and p the surrounding pixels in the circle neighborhood witha radius r, and $S(X)$ is the sign function defined in equation (6), it's used to threshold the fixed 3X3 neighborhood as in Ref. [29].

$$(6) \quad S(X)=\begin{cases}1 & \text{if } x\geq 0 \\ 0 & \text{if } x<0\end{cases}$$

In our approach, we demonstrated the effect of using equations (1), (2), (3), (4) to improve the overall quality of our input face images so as to boost the accuracy performance of the LBP face recognitionalgorithm as shown in Fig. below.
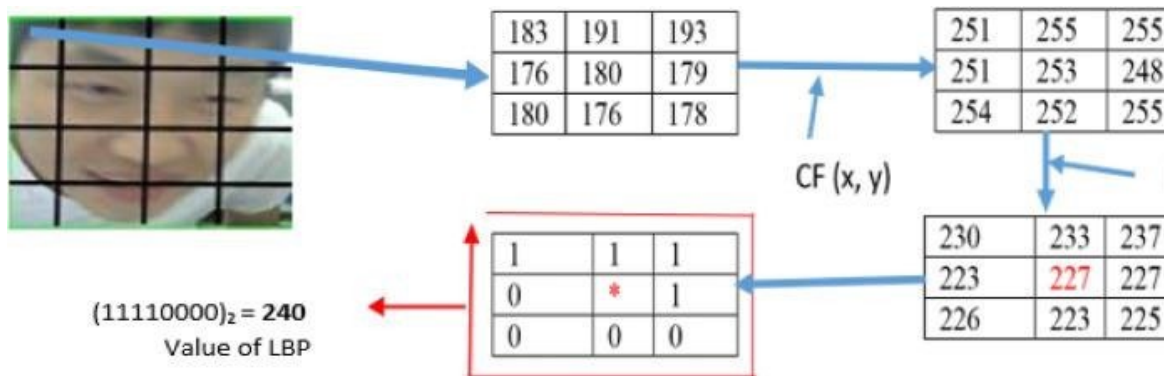
Fig. 10. The modified LBP operator.

Examining each window of the 3 × 3 neighborhood pixels of the resultant images from equations (3), (4)), the issues of noise, illumination, sharp, andresolution were highly mitigated. We obtained higher pixel and threshold values as shown in Fig. 2, after applying equations (1)–(4) to the original input images, we obtained an improved high quality images using our method, which implies better image quality that will expose better image features and enabled more accurate image histograms for facial image comparison as shown in section 4, Fig. 3 (a) to (d), thus resulted in an improved LBP codes, that will stimulate the overall face recognition accuracy.
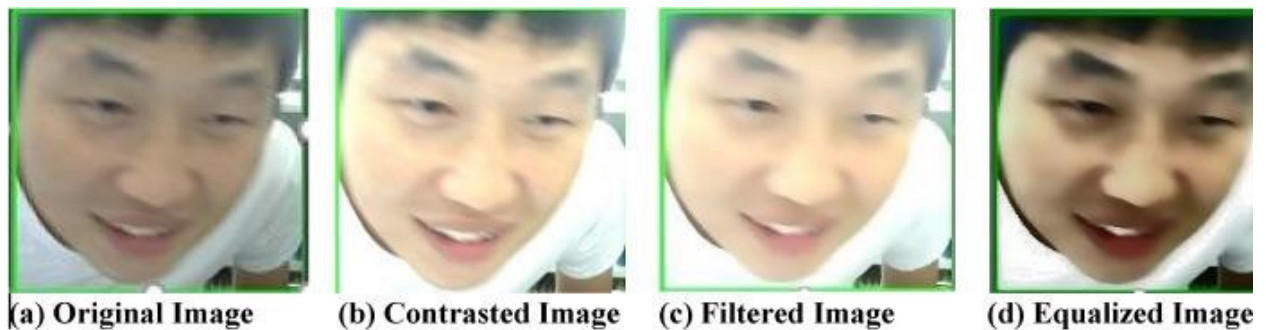

(a) Original Image   (b) Contrasted Image   (c) Filtered Image   (d) Equalized Image

Fig.11 Shows the original image and processed images defined inabove equations

	Total Faces	Haar	LBP	Proposed Method
True Positive	226	208	206	215
False Positive	226	18	20	11
False Negative	226	55	41	33
Detection Accuracy Rate		92%	91%	95%

Comparing the two methods in FIG., it is shown that our proposed method outperformed, the Haar Classifier algorithm for Face Detection and also in the number of detected faces, represented as true positive orfalse positive, represented as features that are incorrectly detected as faces or false negative, represented as faces that are not detected as faces in an image. In Table, for face detection, the Haar algorithm, the

original LBP and the improved LBP using our method are compared using a dataset of 226 images, which our method perform better in allcases.

➢ Codes and Standards

```
import cv2

import numpy as

np import

face_recognition

import os

from datetime import datetime


path =

'Train_Images

'images = []

className =

[]

myList =

os.listdir(path)

print(myList)

for c1 in myList:

    curImg = cv2.imread(f'{path}/{c1}')

    images.append(curImg)

    className.append(os.path.splitext(c1)[0])

print(className)


def

    findEncodings(im

    ages): encodeList

    = []

    for img in images:

        img = cv2.cvtColor(img,

        cv2.COLOR_BGR2RGB) encode =
```

```
        face_recognition.face_encodings(img)[0]
        encodeList.append(encode)
    return encodeList
```

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


print('Starting Encoding...')
encodeListKnow =
findEncodings(images)
print('Encoding Completed')


cap = cv2.VideoCapture("Test_Images/Test5.mp4")


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


    facesCurFrame = face_recognition.face_locations(imgS)
    encodeCurFrame = face_recognition.face_encodings(imgS, facesCurFrame)
```

```python
for encodeFace, faceLoc in zip(encodeCurFrame, facesCurFrame):
    matches = face_recognition.compare_faces(encodeListKnow,
    encodeFace) faceDis =
    face_recognition.face_distance(encodeListKnow, encodeFace)
    #print(faceDis)
    matchIndex = np.argmin(faceDis)

    if matches[matchIndex]:
        name =
        #className[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, 0.75, (255,255,255), 2)
        markAttendance(name)

    im = cv2.resize(img, (540,
    540)) cv2.imshow('Video', im)
    if cv2.waitKey(1) & 0xFF ==
        ord("q"): break
```

Sample Images:

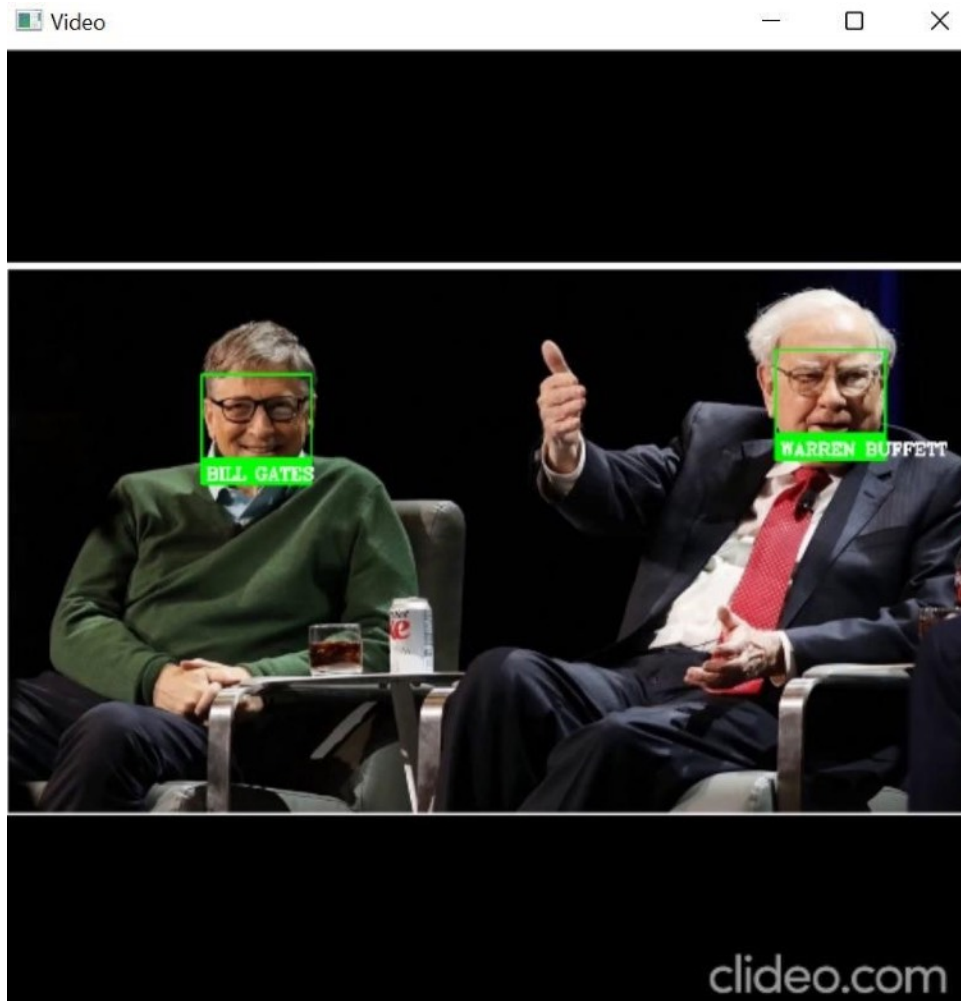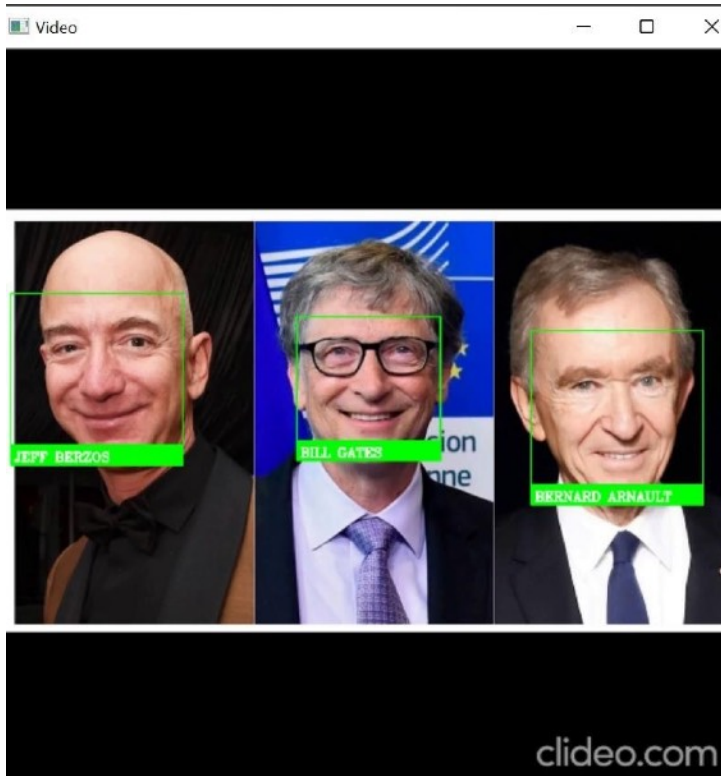|	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Name	Time																
2	LARRY PAGE	12:11:41																
3	LARRY ELLISON	12:11:45																
4	MARK ZUCKERBERG	12:11:50																
5	ELON MUSK	12:11:58																
6	SERGEY BRIN	12:12:02																
7	WARREN BUFFETT	12:12:11																
8	BILL GATES	12:12:11																
9	BERNARD ARNAULT	12:12:19																
10	JEFF BERZOS	12:12:19																

<u>Conclusion</u>

In this long yet useful chapter we managed to cover the entire structure of how the system has been developed and how it functionsto give the best outcome.

To conclude, we discussed the scheduling processes of developing thissystem. Additionally we have also identified how feasible the system is through the lens of evaluating using various feasibility studies

In order to develop this system, we gave enormous importance toscheduling because we believed if we want to provide the best of quality in a given period of time then we must give due importance to scheduling which also helped us to achieve a better results.

The figure below focuses the weekly work we had accomplished.

REFERENCES

1. N. B. Kachare and V. S. Inamdar, "Survey of face recognition techniques", International Journal of Computer Applications, vol. 1, no. 1, pp. 29-33, 2010.

2. A.S.Tolba, A.H.EL-Baz, and A.A.El-Harby, —Face Recognition: A Literature Review‖, International Journal ofInformation and Communication Engineering 2:2 2006

3. J. Dowdall, I. Pavlidis, G. Bebis, A face detection method based on multi-band feature extraction in the near-IR spectrum, Proc. IEEE Workshop Comput. Vis. Beyond Vis. Spectrum: Method Appl.

4. N.Sudhakar Reddy, M.V.Sumanth, S.Suresh Babu, "A Counterpart Approach to Attendance and Feedback System using Machine Learning Techniques",Journal of Emerging Technologies and Innovative Research (JETIR), Volume 5, Issue 12, Dec 2018.

5. Dan Wang, Rong Fu, Zuying Luo, "Classroom Attendance Auto-management Based on Deep Learning",Advances in Social Science, Education and Humanities Research, volume 123,ICESAME 2017.

6. Samuel Lukas, Aditya Rama Mitra, Ririn Ikana Desanti, Dion Krisnadi, "Student Attendance System in Classroom Using Face Recognition Technique", Conference Paper DOI: 10.1109/ICTC.2016.7763360, Oct 2016.

7. P. Wagh, R. Thakare, J. Chaudhari, and S. Patil, "Attendance system based on face recognition using eigen face and PCA algorithms," in 2015 International Conference on Green Computing and Internet of Things (ICGCIoT), 2015

8. J. Kanti and A. Papola, "Smart Attendance using Face Recognition with Percentage Analyzer," vol. 3,

9. Akshara Jadhav, Akshay Jadhav, Tushar Ladhe, Krishna Yeolekar, "Automated Attendance System Using Face Recognition", International Research Journal of Engineering and Technology

10. B. K. Mohamed and C. Raghu, "Fingerprint attendance system for classroom needs," India Conference (INDICON), Annual IEEE