Face Recognition Based Attendance Marking System

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Abstract - Over the past years, automatic face recognition has been dramatically improved in performance and are now widely used for security systems and commercial applications. It can also be used for a real-time automated system for human face recognition operating in the background for a college to mark the attendance of their students. So Smart Attendance based on Real Time Face Recognition is a real-world solution for day to day handling of students in educational institutes. The task is very difficult as the real-time background subtraction in an image is still a challenge[1]. Real-time human face and Principal Component Analysis is used to recognize the faces with a high accuracy rate. The systems mark the attendance if the face matched with the referenced students database. Student's attendance records are automatically maintained by our system. Entering the attendance of each student in logbooks is a difficult task and also wastes the time. So we designed an efficient module that uses face recognition to detect the student and manage the student's attendance records. Our module populates the database by enrolling the student's face[2]. This enrolling is only one-time process and student's face and its metadata will be stored in the database. A system is required during the time of face enrollment since it is a one time process. Also, a unique id is required to uniquely identify each student such that student enrollment number in the institute. The system will update the presence of each student in the database. The Real-Time Face Recognition based Attendance System system showed improved performance over the manual attendance management system. Attendance is marked only after identification of the student. More accurate results than that of existing attendance and leave management systems are given by our system.

I. INTRODUCTION

Attendance maintenance is one of the most tedious and important processes in every institute in order to check the presence of a student. Every institute has its own method of marking and maintaining the attendance. Some Institutes are taking attendance manually using the old paper or file-based approach and some have adopted Biometric techniques to automatically take attendance and also some have adopted Radio Frequency Card technology to mark the student's attendance. But in this, these methods time taken is very long because students have to wait in the queue for scanning there ID or fingerprints as the device in operation can serve only one person at a time. There are two steps in Face Recognition Based Attendance Marking System, in first step faces are detected in the uploaded image then in second step, all the detected faces are compared with the faces stored in a database for verification. There are many algorithms for face detection like Ada Boost algorithm, LBPHFaceRecognizer_create, the Float Boost algorithm, the S-Ada Boost algorithm Support Vector Machines (SVM), and the Bayes classifier. Our system uses Amazon Web Services (AWS) Recognition which in turn utilized one of these face detection algorithm in the given image of a class. Techniques of face recognition can be divided into two types, first type is Appearance-based in which texture features are used which are applied to whole face or some specific regions and the second type is Feature-based in which geometric features like mouth, eyes, nose, eyebrows, cheeks and the relation between them[3].

II. PROBLEM STATEMENT

The attendance marking process in schools and colleges is a very lengthy process. It takes a lot of time. The attendance cannot be taken multiple times because of the time constraints of a lecture or event. In manual attendance marking process, proxy attendance is very common and students may miss their roll call. Also, the attendance data need to be uploaded to the server or organization's system manually which is also a tedious task. To avoid the all of these errors and problems a system is required which should be capable of marking the attendance even if the attendee is busy with some other task, the system is also required to be simple, user-friendly, scalable, reliable and secure.

III. METHODOLOGY

This project uses a sophisticated algorithm which manages database population, event triggers and result display. We have used AWS (Amazon Web Services) to make this project ready to use as AWS provides sophisticated functions for development. The algorithm used by us is given below:

LambdaAlgo()

1. Convert the uploaded image into a binary image and store it into the database.
2. Open the image and recognize all the faces in the image and store the names and pixel location of known faces into a temporary table.
3. Compare the contents of the temporary table and class students table.
4. If a student name found in class students table then mark it as present in the database and draw a green square around

the face using pixel location stored in a temporary table.

5. If the face is recognized but unknown then mark the face by red square using pixel location stored in a temporary table.
6. Go through entries in class student table if the status is not "present" then mark the status as "absent".
7. Show the result on the user interface.

IV. PROCESS

The system requires the faculty to take the picture of each individual student one by one in order to enter the visual data of a student's face in the database. This can be done by uploading the image on the server using the web interface provided in the system. This is the first phase of the attendance marking system. In the second phase, the actual attendance marking done against the visual data in the database. End-user/ faculty takes a picture of a group of max 25 students and uploads that image on the server using the web interface. Server serves various application programming interfaces (APIs) to recognize the face of each individual in the group picture. After this, face recognition data used by the server scripts to detect known and unknown faces in the group and using another API it marks the attendance by updating the database. It also marks the known and unknown faces with green and red squares and sends the response back to the client side.

V. RESULT / SNAPSHOTS

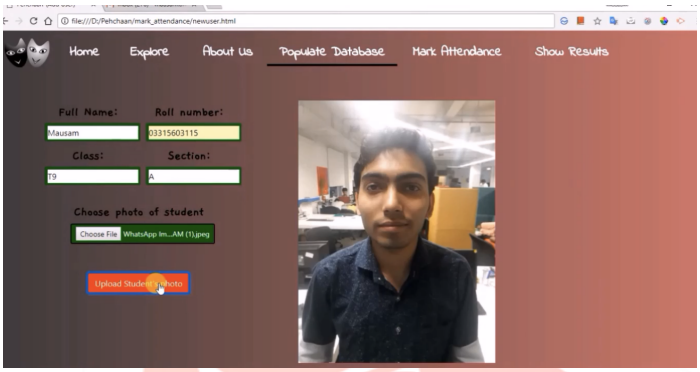

Fig.1 Interface for Populating Database

```
def index_faces(bucket, key):

    response = rekognition.index_faces(
        Image={"S3Object":
            {"Bucket": bucket,
            "Name": key}},
            CollectionId="class_collection")
    return response

def update_index(tableName,faceId, personroll,cls,sec,ful):
    response = dynamodb.put_item(
        TableName=tableName,
        Item={
            'RekognitionId': {'S': faceId},
            'roll_number': {'S': personroll},
            'full_name': {'S': ful},
            'class': {'S': cls},
            'section': {'S': sec}
            }
        )
```

Fig. 2 Functions for indexing of image and populating database

Here in the above image, we are storing information of a student into the database using our web interface.

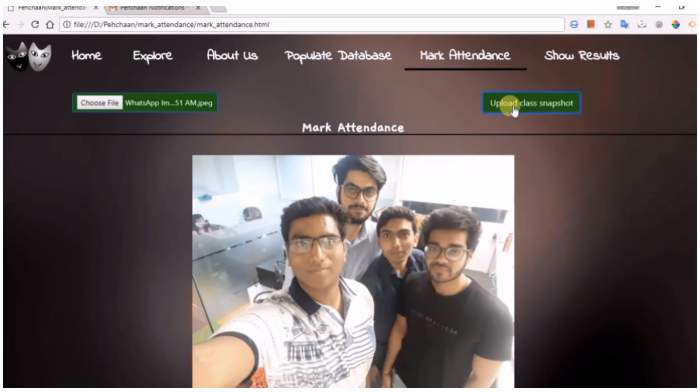

Fig.3 Interface for Marking Attendance

```
# Return results
for match in response['FaceMatches']:

    face = dynamodb.get_item(
        TableName='class_collection',
        Key={'RekognitionId': {'S': match['Face']['FaceId']}}
        )

    draw.rectangle(((mx1,my1,mx2,my2)), fill=None, outline="green")
    draw.rectangle(((mx1+1,my1+1,mx2-1,my2-1)), fill=None, outline="green")
    draw.rectangle(((mx1+2,my1+2,mx2-2,my2-2)), fill=None, outline="green")
    draw.rectangle(((mx1-1,my1-1,mx2+1,my2+1)), fill=None, outline="green")

    if 'Item' in face:
```

Fig. 4 Fetching info and marking face on photograph for known persons

```
        # s3.Bucket('pehchaan').put_object(Key=ktr, Body=local, ContentType='image/jpeg', ACL='public-read')
        s3.upload_file(out, 'pehchaan', ktr,ExtraArgs={'ContentType': 'image/jpeg','ACL': 'public-read'})

        os.remove(local)
        os.remove(out)
        print('5. output file uploaded')

    except Exception as e:
        print(e)
        print('problem while uploading changed image')
        pass

    try:
        dynamodb.put_item(
            TableName='stats',
            Item={
                'latest': {'S': 'latest_attendance_stats'},
                'unknown_faces': {'S': str(count-database)},
                'pr_known_faces': {'S': str(database)}
                })
        print('6. database updated')
```

Fig. 5 Code for storing results

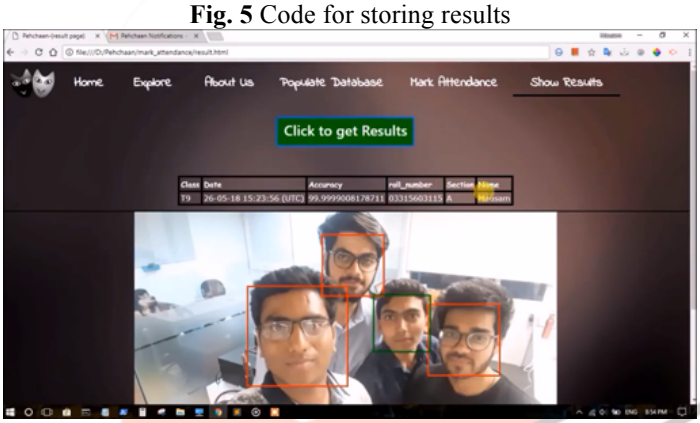

Fig.6 Interface for results

```
// Read the item from the table
table.scan(params = {TableName: 'present'}, function(err, data){
  if (err) {console.log(err, err.stack);
    //alert(err);
    results.innerHTML = 'ERROR: ' + err;}// an error occurred
  else  {
    //alert(data);
    //results.innerHTML = JSON.stringify(data.Items);
  }
    JSONholder=data.Items;
    CreateTableFromJSON(JSONholder);

    // print the item data
});
```

Fig. 7 Code for fetching result

VI. CONCLUSIONS

We created an attendance marking system in which the attendance is marked by recognizing the face of each individual in a photo of a group of people.

We extracted known and unknown faces in a group photo of people against the data stored in the reference database which is also created in the initial phase of the system setup.

VII. REFERENCES

[1] Kyungnam Kim "Face Recognition using Principle Component Analysis", Department of Computer Science, University of Maryland, College Park, MD 20742, USA.

[2] H.K.Ekenel and R.Stiefelhagen, Analysis of local appearance-based face recognition: Effects of feature selection and feature normalization. In CVPR Biometrics Workshop, New York, USA, 2006

[3] K.Senthamil Selvi, P.Chitrakala and A.Antony Jenitha "Face Recognition Based Attendance Marking System", International Journal of Computer Science and Mobile Computing.