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Video Based Student Attendance Management System

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Abstract: ***Mainly there are two conventional methods of marking attendance which are calling out the roll call or by taking student sign on paper. They both were more time consuming and difficult. Hence, there is a requirement of computer-based student attendance management system which will assist the faculty for maintaining attendance record automatically. In this project we have implemented the automated attendance system using MATLAB. We have projected our ideas to implement "Automated Attendance System Based on Facial Recognition", in which it imbibes large applications.***
Keywords: Attendance System, Automated Attendance, Image Processing, Face Detection, Feature Matching, Face Recognition

I. INTRODUCTION

Human face plays an important role in our day to day life mostly for identification of a person. Face recognition is a part of bio metric identification that extracts the facial features of a face, and then stores it as a unique face print to uniquely recognize a person. Bio metric face recognition technology has gained the attention of many researchers because of its wide application. Face recognition technology is better than other bio metric based recognition techniques like finger-print, palm-print, iris because of its non-contact process. Recognition techniques using face recognition can also recognize a person from a distance, without any contact or interaction with person. The face recognition techniques are currently implemented in social media websites like Facebook, at the airports, railway stations. The, at crime investigations. Face recognition technique can also be used in crime reports, the captured photo can be stored in a database, and can be used to identify a person. Facebook uses the facial recognition technique for automating the process of tagging people. For face recognition we require large data set and complex features to identify a person in all conditions like change of illumination, age, pose, etc. Recent researches show there is a betterment in facial recognition systems. In the last ten years there is huge development in recognition techniques.

But currently most of the facial recognition techniques is able to work fine only if the number of people in one frame is very few and under controlled illumination, proper position of faces and clear images. For face recognition purpose, there is a need for large data sets and complex features to uniquely identify the different subjects by manipulating different obstacles like illumination, pose and aging. During the recent few years, a good improvement has been made in facial recognition systems. In comparison to the last decade, one can observe an enormous development in the world of face recognition. Currently, most of the facial recognition systems perform well with limited faces in the frame. Moreover, these methodologies have been tested under controlled lighting conditions, proper face poses and non- blurry images. The system that is proposed for face recognition in this paper for attendance system is able to recognize multiple faces in a frame without any control on illumination, position of face.

II. PROBLEM DEFINITION

Attendances of every student are being maintained by every school, college and university. Empirical evidences have shown that there is a significant correlation between students' attendances and their academic performances. There was also a claim stated that the students who have poor attendance records will generally link to poor retention. Therefore, faculty has to maintain proper record for the attendance. The manual attendance record system is not efficient and requires more time to arrange record and to calculate the average attendance of each student. Hence there is a requirement of a system that will solve the problem of student record arrangement and student average attendance calculation. One alternative to make student attendance system automatic is provided by facial recognition. Challenges for Social Cognitive Models of the CRE. As reviewed above, the social-cognitive approach to face recognition biases such as the CRE has produced novel and provocative findings that have advanced the study of face memory.

For example, the demonstration of Cross Race-like biases across various ingroup/outgroup distinctions underscores the utility of considering generalized inter group effects when explaining face recognition biases. However, social cognitive models of the CRE have difficulty explaining some findings in the literature.

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These theoretical and empirical limitations are discussed below. Mixed Evidence Regarding Race Accessibility, Face Perception and Memory. One prediction of social-cognitive models is that the salience or accessibility of the racial group categorization will influence the CRE. Thus, the more accessible the racial outgroup category, the more it will reduce CR recognition. Notably, recent evidence indicates that manipulations intended to increase the accessibility of race-categorization (Rhodes et al., 2009) or designed to lead to outgroup categorization of racially ambiguous faces (Rhodes, Li, Ewing, Evangelista, & Tanaka, 2010) do not always affect face memory, contrary to social cognitive predictions.

III.METHODOLOGY

A. Image Training

Automated Attendance System based on Facial Recognition Department of ECE, SMVITM, Bantakal. The image of the person we want to find in the training set is transformed into a vector, reduced by the mean value and projected with the matrix of the Eigen vector. Classification is done by determining the Euclidean distance between the two vectors of the images of the training data set and the test image. If the minimum distance between the test face and training face is less than the threshold. It is considered to be known and belong to the person in the database otherwise it is considered to be unknown. Whenever a person is successfully recognized the system automatically marks his or her attendance in the database which is in the MS Excel. This is explained in the following section.

B. Store Recognized Files

Whenever the algorithm finds a match, we update the corresponding field of the person in the excel sheet with a '1' on that particular date. Else by default it is marked as '0' which says that the person is absent. MS Excel provides a very efficient way of storing the data. This is explained in the next section.

C. Update the Attendance Sheet in Excel

The MATLAB IDE and the MS Excel sheet is linked using the toolbox Spreadsheet Link Ex. Whenever a detected face matches with a person in the database, the value is updated in that particular Excel sheet. This is carried out through the function xlswrite(). The candidate's identity is determined through the index of the image with which the detected face matches with. A spreadsheet of the desired format has to be drafted beforehand (attendance.xls in our system) Using the index values corresponding cell in the sheet is updated with one along with the time and date of the classroom. The system designed is part of an in-house built learning management suite (Libri) . It is constructed in many modules: The system designed is part of an in-house built learning management suite (Libri). It is constructed in many modules:

1) Image capturing,
2) Face Detector and
3) Face recognizer.

The required infrastructure in classroom is a camera positioned centrally in the front of the classroom. Using this setup, the camera is capable to capture frontal images from students. A different approach would be to use a camera at the entrance of the classroom, which would individually detect faces for everyone entering the classroom. This way, the face detector would have much less work to do, but there would be only one chance to capture a good frame. A frontal camera in the middle of the classroom can take as many pictures as necessary. Physically the system is integrated on the existing South East European Universities infrastructure. To function, attendance will be taken and stored in Microsoft excel sheet.

D. Image Capturing

Images are captured using a module that is a digital camera whose link is integrated to the application that is developed using the proposed idea. After the camera has started the software captures images of all the recognized students and marks their attendance in a excel sheet. The camera keeps on taking the images until the system is told to stop.

E. Face Detection

Detecting a face is in essence an object detection task, where the object of interest in this case is the face. However, many factors can interfere with the face detection algorithms, factors such as face pose, scale, position, rotation, light, image colors, etc. The same problems arise when one wants to identify (recognize) a face, with addition to some other obstacles which is discussed shortly. The process of detecting faces from still pictures containing multiple faces can be separated in few steps.

There are plenty face detection algorithms which can effectively detect a face (or any other specific object) in a picture. In the system presented here, most students face the camera frontally hence we chose to use the HAAR classifier for face detection. This classifier is implemented on Intel's Open CV library. The classifier works by training a model using positive face images and negative face images. A positive image is an image that contains the desired object to be detected, in our case this object is a face. A negative image is an image that does not contain the desired object. After the model is trained, it is able to identify face features, which is later, stored on a XML file. A problem faced during this process was the large number of false-positives: objects mistakenly detected as faces. This was not such a big issue for us, since a false-positive does not result in a positive identification during the recognition phase. Because of this, we lowered the detection threshold, so all faces could be detected. After a face has been detected, the rectangle enclosing this face is cropped and processed later by the face recognition module. This rectangle represents a single face, and after being cropped as an image is stored to the data-set with the name and id associated with the face. Each file transferred is renamed to have a unique ID.

F. Face Recognition

Recognizing a face means to identify that particular face from a list of faces on a database. Our university, upon enrolment takes pictures from every student, and those images are stored in a database. Same as in face detection, there are many existing algorithms used to identify a face. Our system is programmed in Python which takes benefit of eigen faces to identify a face. This algorithm has many drawbacks: it depends on scale, pose and the color of the compared images. However the algorithm is very fast, and can compare only to images, thus we do not NEED to have multiple images of a person to train our system. Since our system is setup to capture only frontal images the pose of the face in not an issue. When a face is captured during the face detection phase, it is converted into gray scale. The same conversion is applied to faces on our student image database. We also do background subtraction on our images so other objects do not interfere during the process. Another issue is that faces are subject of change during time (facial hair, eyeglasses etc). Of course, a drastic change on a student's look causes the system to not identify that particular student. To solve this issue, we have included a module, which lists all unidentified faces and the teacher is able to manually connect a captured face with a student from the list. This image is also stored on our database, as an updated picture of this particular student. This manual recognition process is performed only once. In a subsequent scan, this student is identified automatically by our system. To speed up the face recognition process we only compare images captured in a classroom, with the database of students enrolled for that course only. This ensures that we process only a small subset of images available on our central data base.

IV. PROPOSED SYSTEM

All the students of the class must register themselves by entering the required details and then their images will be captured and stored in the data-set. During each session, faces will be detected from live streaming video of classroom. The faces detected will be compared with images present in the data-set. If match found, attendance will be marked for the respective student. At the end of each session, list of absentees will be mailed to the respective faculty handling the session. The system architecture of the proposed system is given below,

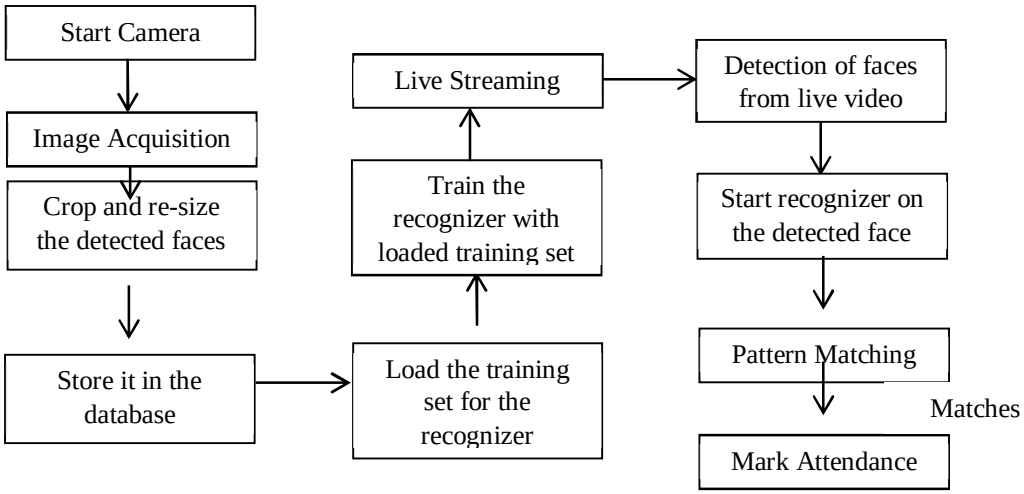


Fig 1: System Architecture

V. RESULTS AND DISCUSSIONS

The users can interact with the system using a GUI. Here users will be mainly provided with three different options such as, student registration, faculty registration, and mark attendance. The students are supposed to enter all the required details in the student registration form. After clicking on register button, the web cam starts automatically and window as shown in Fig.2. pops up and starts detecting the faces in the frame. Then it automatically starts clicking photos until 60 samples are collected or CRTL+Q is pressed. These images then will be pre-processed and stored in training images folder. The faculties are supposed to register with the respective course codes along with their email-id in the faculty registration form provided. This is important because the list of absentees will be ultimately mailed to the respective faculties.

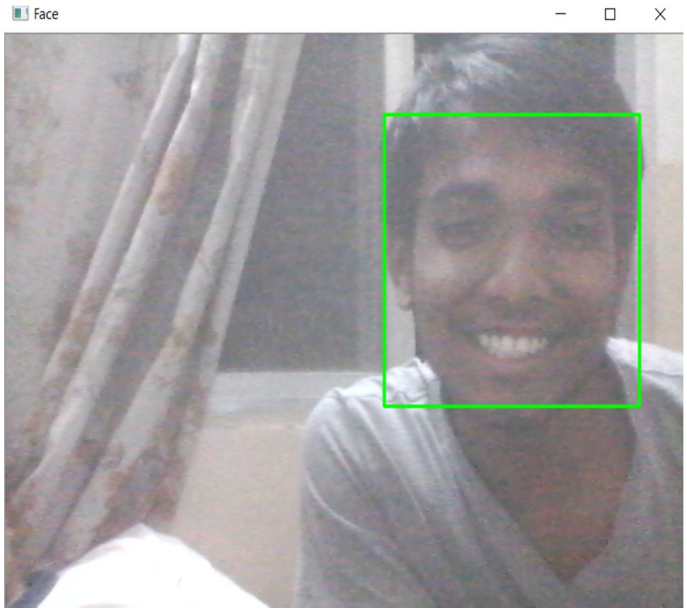


Fig 2: Face Detection

In every session, respective faculty must enter their course code. Then after submitting the course code, the camera will start automatically. The Fig.3. shows the face recognition window where two registered students are recognized and if in case they were not registered it would have shown ‘unknown’. By pressing CTRL+Q, the window will be closed and attendance will be updated in the excel sheet and names of absentees will be mailed to the respective faculty.

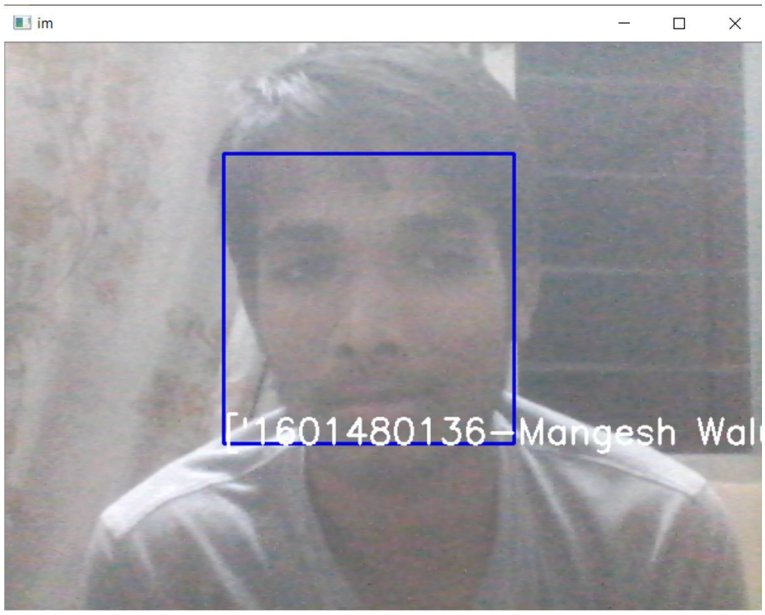


Fig 3: Face Recognition

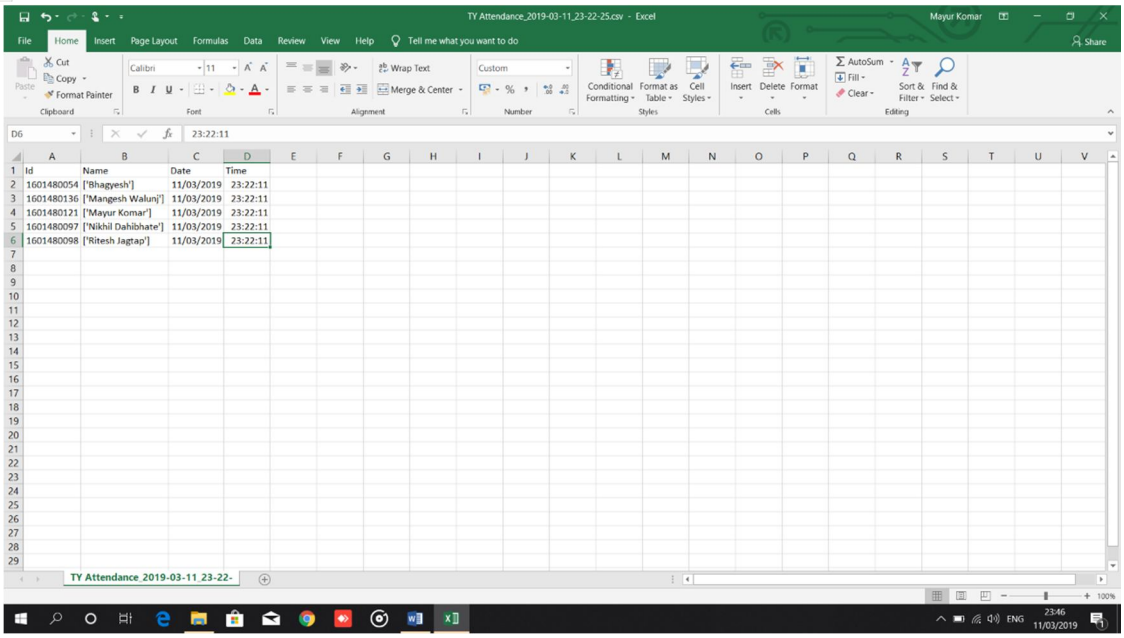


Fig 4: Attendance Sheet

The Fig 4. shows the attendance of the present students with date and time.

VI. CONCLUSION

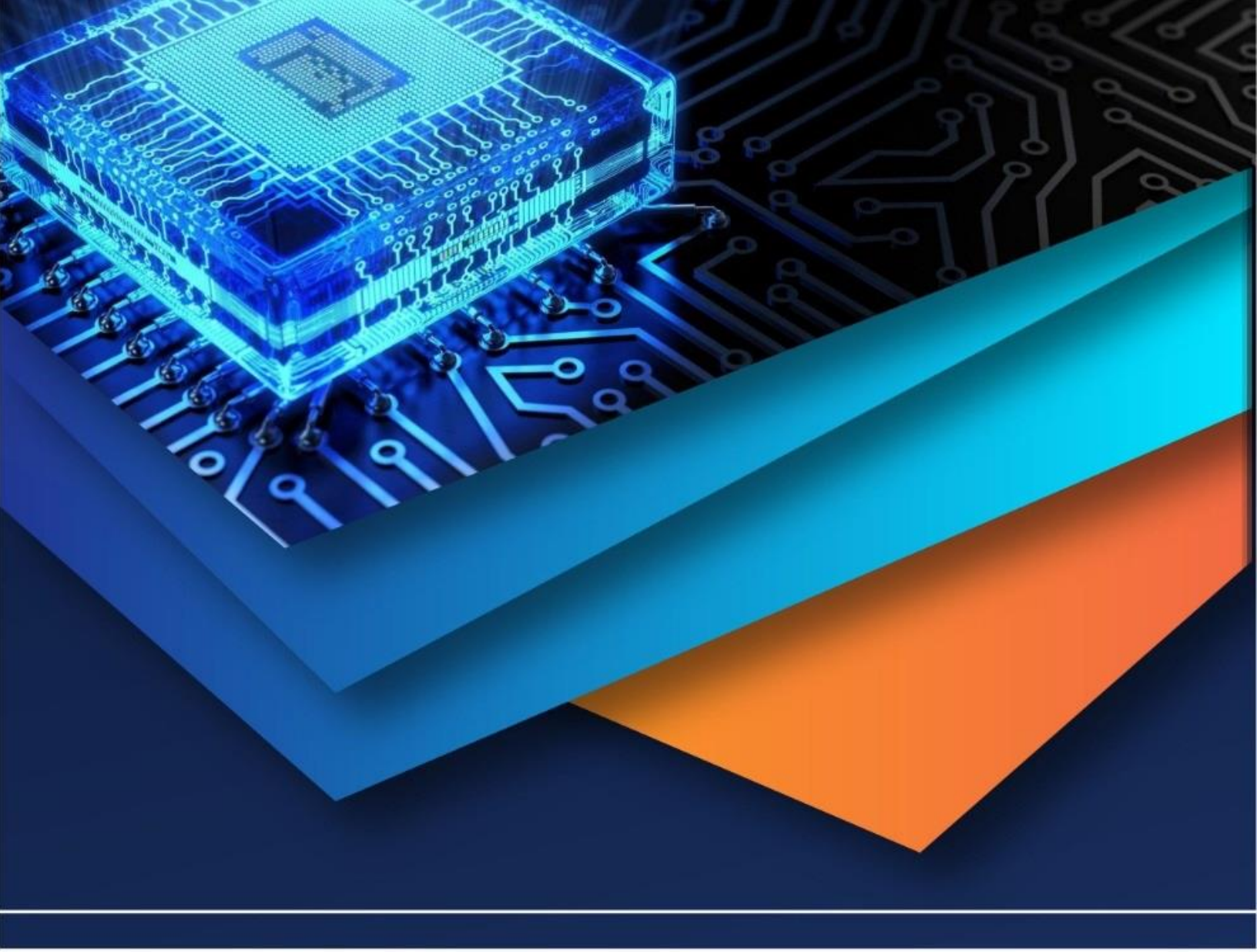
Face recognition is a challenging problem in the field of computer vision, which has received a great deal of attention over the past years because of its several applications in various domains. Although research efforts have been conducted vigorously in this area, achieving mature face recognition systems for operating under constrained conditions, they are far from achieving the ideal of being able to perform adequately in all various situations that are commonly encountered by applications in the real world. This paper on face recognition serves as a reference point towards an objective evaluation of the community's progress on face recognition research and to better address the challenges of face recognition in the real-world scenarios.

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