

Monitor Student's Presence in Classroom

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Abstract

The real time face detection and recognition is now a days a subject of interest in various daily applications like crowd identification, video conference, security measure, image analysis etc. This topic has brought attention of researchers because the human face is a dynamic object and has a high degree of variability in their appearances, which make face detection a difficult problem in computer vision. Many technique are being proposed, ranging from simple edge based algorithm to composite high level approaches utilizing advanced pattern recognition methods. The algorithms presented in this paper are Viola-Jones algorithm (Haar Cascade Classifier) and PCA (classified as either feature based and image based) and are discussed in terms of technical approach and performance. The objective of this paper is to find out a way to monitor student's presence in classroom using EmguCV (Computer vision Library and wrapper class of Open CV) and send important notification to parents to keep track of their child from remote location. This technology used to monitor their children and by this way teachers are trying to guard children's behaviors in order to reduce teachers' difficulties of classroom management, instead of helping children to learn effectively.

Keywords: EmguCV; Camera face detection; Face recognition system; PCA EigenFaces

Introduction

Today, we see an incremental growth in education percentage compared to the last decade because of awareness within folks and significant benefits of proper education for self and carrier development. The admissions of students are increasing day by day in schools and colleges which in turn increasing no. of students in the classroom. And, teachers/professors are finding difficulty to keep track of presence of all the students in the classroom that takes substantial time to take attendance as well. Therefore, to get rid of this, all are seeking for various alternatives of which 'Online Attendance' is an alternative.

In many institutions, Colleges and organization the attendance is very important criteria for students and organization Employees. The previous method in which manually taking and maintains the attendance records was very inconvenient work for teacher/faculty. Traditionally, students present or absent are taken manually by using attendance sheet given by the faculty members in class, which is a time consuming task. Moreover, it is very difficult event to verify one by one student in a big classroom whether the authenticated students are actually present or not. The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time. If an automatic detect and recognize system is developed for college, it eliminates the need for sheet of paper and personnel for the keeping of student records. Identifying students early on who show signs of absenteeism is a predictor of warning signs of students dropping out. Even though truancy is a major issue in middle school and high school, perhaps students should be identified and monitored early on in elementary school. Educators need to continue to find innovative ways to bridge the gap between home and school to communicate with parents the need for a strong partnership so students can find success. Students need to know that coming to school on time, every day is important. Educators, when faced with schools that have attendance problems may need to venture out beyond the wall of the school, into the community to involve families and work together. An automatic attendance management system using biometrics would provide the needed solution. The project – Monitor Student's Presence in Classroom will have a smart and real time attendance application that monitor and detect the exact presence of a student in classroom. This desktop camera authenticate student after recognizing face of that student and at the same time save record with details like student name, roll number, date, time etc. of present student

in classroom. Here, the application is using visual studio 2010, OpenCV library (EmguCV). Using this software, system perform multiple face detection, recognition, tracking of a position of student and provides the exact attendance of student is mark in the access database.

Literature Survey

Development of automated face recognition started in the 1960s, the first semi-automated system for face recognition required the user to locate features (such as eyes, ears, nose and mouth) on the photographs before it calculated distances and ratios to a common reference point, which were then compared to reference data. In the 1970s, Goldstein, Harmon and Lesk used 21 specific subjective markers such as hair colour and lip thickness to automate the recognition. The problem with both of these early solutions was that the measurements and locations were manually computed. In 1988, Kirby and Sirovich applied principle component analysis, a standard linear algebra technique, to the face recognition problem. This was considered somewhat of a milestone as it showed that less than one hundred values were required to accurately code a suitably aligned and normalized face image. In eigenfaces techniques, the residual error could be used to detect faces in images, a discovery that enabled reliable real time automated face recognition systems.

A portable fingerprint device has been developed which can be passed among the students to place their finger on the sensor during the lecture time without the instructor's intervention [1]. This system guarantees a fool-proof method for marking the attendance. The problem with this approach is that passing of the device during the lecture time may distract the attention of the students. A number of works related to Radio Frequency Identification (RFID) based Attendance Systems exist in the literature. Lim et al. [2] have proposed RFID based system in which students carry a RFID tag type ID card and

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Received March 24, 2016; **Accepted** August 11, 2016; **Published** August 25, 2016

Citation: Suryavanshi SR, Sankpal LJ (2016) Monitor Student's Presence in Classroom. J Inform Tech Softw Eng 6: 185. doi:10.4173/2165-7866.1000185

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they need to place that on the card reader to record their attendance. RS232 is used to connect the system to the computer and save the recorded attendance from the database. This system may give rise to the problem of fraudulent access. An unauthorized person may make use of authorized ID card and enter into the organization. Iris is another biometric that can be used for Attendance Systems. Kadry et al. [3] have proposed Daugman's algorithm based Iris recognition system. This system uses iris recognition management system that does capturing the image of iris recognition, extraction, storing and matching. But the difficulty occurs to lay the transmission lines in the places where the topography is bad. Tharanga et al. [4] have proposed a system based on real time face recognition which is reliable, secure and fast which needs improvement in different lighting conditions.

Proposed System

The feasibility analysis was timely performed to determine whether the system is capable of performing the intended job. The pilot project is executed, successfully implemented and achieved desired output from the system. The results improved performance over manual attendance management system [5,6].

This proposed system in school or college can easily be implemented, as this is based on Emgucv coding. The resources that are required to implement/install these are easily available from open sources. The personal of the organization have enough exposure to computers so the project is operationally feasible.

This technology supports the modern trends of face detection and recognition technology and easily accessible, more secure.

In this project, all the soft tools required to perform the job are open source. In the hardware section, in-built desktop CAMERA i.e. Windows Form Application which will be used to capture images. As numbers of students are increasing day by day in turn increasing schools/colleges counts. Therefore, giving a good potential forecast for the product or services to be opted by various schools/colleges to monitor student's presence or attendance in the classroom [7].

The Real-Time monitoring accelerates time to delivery. The main aim of our project is to monitor student behavior and hence provides security to students. It also aims to provide ease to teachers by providing them with real time and smart monitor system facilities which reduces their manual work and save time (Figure 1).

Implementation of System

Open CV.0

It stands for Open Source Computer Vision; it was designed especially for computational efficiency with strong focus on real time applications [8]. It is written in optimized C/C++, and can take advantage of multi-core processing. In Image processing it has been a great boon for the developers.

Emgu CV

1. EmguCV is a cross platform .Net wrapper to the OpenCV image processing library. Allowing OpenCV functions to be called from .NET compatible languages such as C#, VB, VC++ etc. The wrapper can be compiled in Mono and run on Windows, Linux, Mac OS X, iPhone, and Android devices.

2. Add the OpenCV .dll files required for Emgucv functions to work in project.

3. It is essentially a huge library of "wrapper" functions that allows

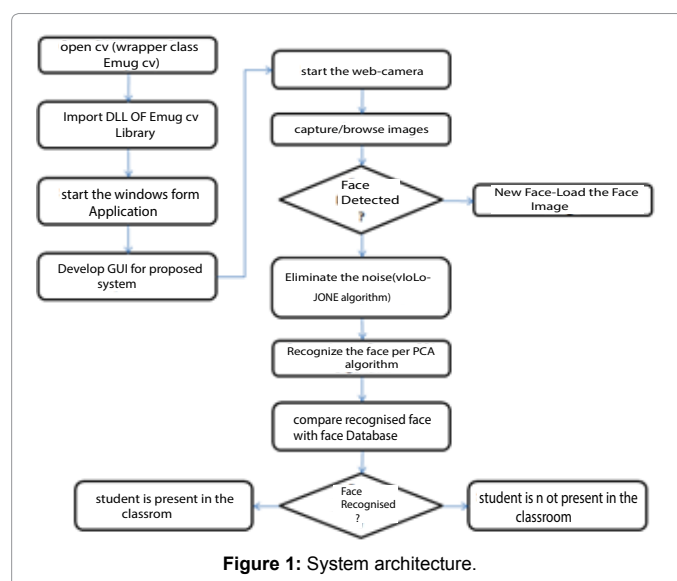


Figure 1: System architecture.

calling OpenCV funtions from Visual Studio Windows Form Application. It is necessary because Visual Studio/.NET is an "interpreted" environment that cannot directly call functions written in native C/C++.

Camera captures application

The in-built camera (Desktop Application) is used to capture the images. It should following steps,

1. Desktop camera is ON, capturing images continuously
2. An Image should be displayed in an EmguCV Image box
3. The application should start when "Start" button is pressed and pause when it is again pressed and vice versa.

Face detection

Face detection is a computer vision technology that determines the locations and sizes of human faces in arbitrary digital images. It detects facial features and ignores anything else, such as buildings, trees, background and bodies. Face detection can be considered as object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in a digital image that belong to a given class. Examples are video for classroom, student images/database. There are many methods to detect a face in a real time application. Some ways are easier and some are harder. Face detection approaches:

1. Finding faces in images with controlled background.
2. Finding faces by color.
3. Finding faces by motion.
4. Using a mixture of the color and motion.

Finding faces in unconstrained scenes:

1. Neural Net approach
2. Neural Nets using statistical cluster information
3. Model-based Face Tracking
4. Weak classifier cascades

The Viola Jones method is best model for Face detection. 'Haar Cascade Classifier' is used for detect faces from live desktop camera.

Extract the detected faces from input image

Each extracted face added to the Extracted Faces array. Then display each extracted face in the array to the picture box. Code behind the added buttons to navigate through the extracted faces array to display previous or next extracted face.

Face recognition

“Face recognition is the task of identifying an already detected object as a KNOWN or UNKNOWN face, and in more advanced cases, telling EXACTLY WHO'S face it is!” Face detection is to identify an object as a “face” and locate it in the input image.

Face Recognition nothing but is to decide if this “face” is someone KNOWN, or UNKNOWN, basing on the database of faces it uses to validate this input face. so face detection's output (the face) is in fact recognition's input and recognition's output is the final decision: face known/face unknown! Recognition algorithms can be divided into two main approaches:

1. Geometric: which looks at distinguishing features?
2. Photometric: which is a statistical approach that distills an image into values and comparing the values with templates to eliminate variances?

Recognition algorithms include

1. Principal Component Analysis using Eigenfaces
2. Linear Discriminate Analysis,
3. Elastic Bunch Graph Matching using the Fisherface algorithm,
4. The Hidden Markov model, and
5. The neuronal motivated dynamic link matching.

PCA based Eigenface method is at the most primary level and simplest of efficient face recognition algorithms and is therefore a great place for beginners to start learning face recognition! PCA based Eigenfaces method for recognition is as supported by EmguCV library as is Viola-Jones method for detection is!

Collect face images for training set database

Face Recognition results HIGHLY depend on the faces you store in the training Set. The faces try to recognize. Project task is to ENSURE that training set (faces database) is WELL made.

Mathematical Model

The model of Monitor Student's Presence in Classroom System as a Finite State Machine MSPCS is defined as a five tuples relationship

$$MSPCS \mid (S, \Sigma, s, F, \delta)$$

Where, S is a set of valid states that forms the domain of the MSPCS, $S = \{s_0, s_1, \dots, s_8\}$ where the states are: s_0 – Teacher Registration System, s_1 – Student Images capture by camera, s_2 – Database student Image, s_3 – Result of Image Compare, s_4 – Parents Registration, s_5 – Login and child Status checked s_6 – Attendance is taken s_7 – Entry is granted, s_8 – Entry denied s_9 – Exit Σ is a set of events that the Software may accept and process, $\Sigma = \{e_0, e_1, \dots, e_{12}\}$ where: e_0 – Start, e_1 – Face Detection, e_2 – Face Recognition Data, e_3 – Check for Student Image Match, e_4 – Match Found, e_5 – Match not found, e_6 – Status confirmed, e_7 – status not confirmed, e_8 – Attendance Marked.

Results and Snapshots

Results are explained through below mentioned figures (Figures 2-9).

Conclusion

The aim of project to introduce new face recognition method. This face recognition technology is used for many purposes. Pilot phase of this project would be to monitor the movement/behavior of children in the classroom. Parents can monitor presence/absence of their children from remote location without physically visiting to the

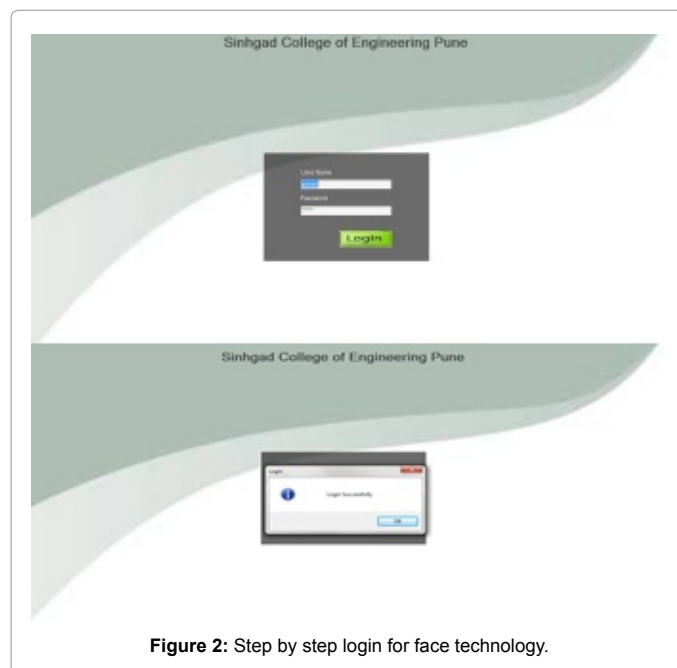


Figure 2: Step by step login for face technology.



Figure 3: Training set editor of face technology.



Figure 4: Snapshot of Sinhgad college of engineering.

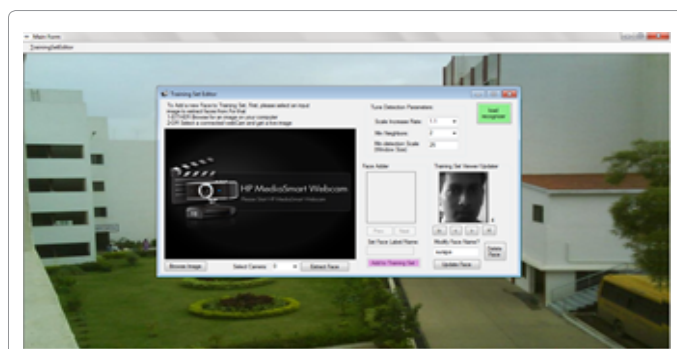


Figure 5: Training set viewer.

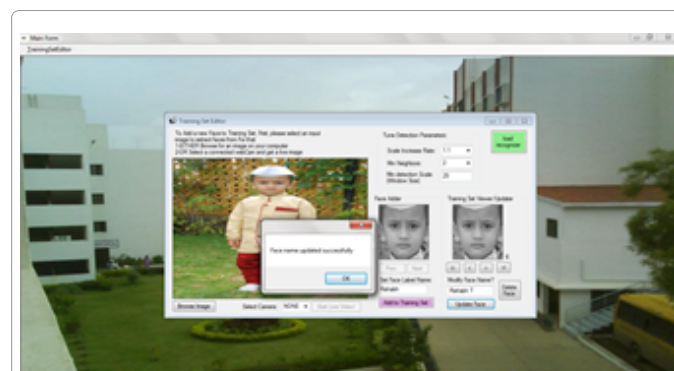


Figure 9: Final step in face technology.

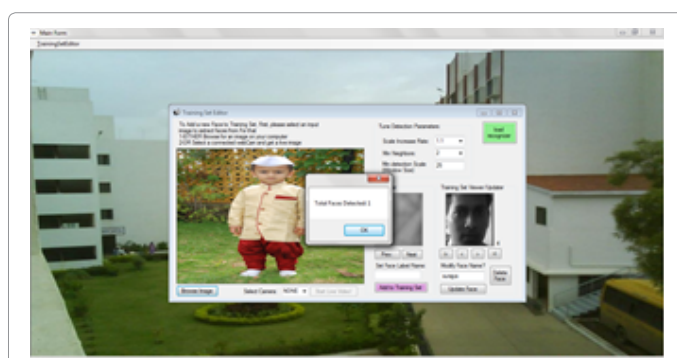


Figure 6: Training set updater.

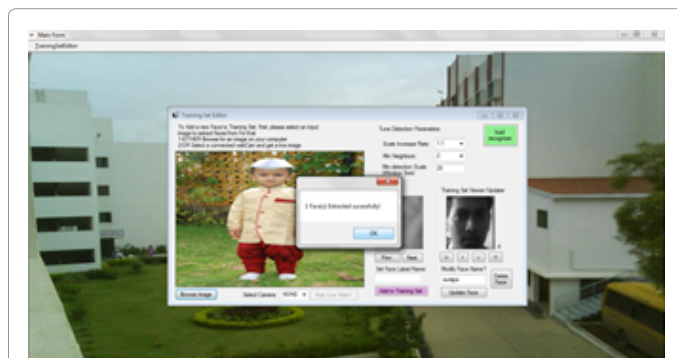


Figure 7: Step involved in extracting the faces.

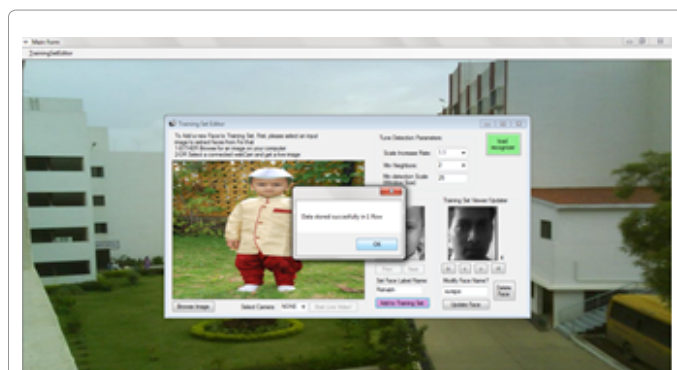


Figure 8: Data stored step of face technology.

college or school. However, after successful implantation of pilot, same concept might be implemented in various areas like institute, police department, constitution, organization etc.

Acknowledgement

A project of this magnitude has been a journey with various ups and downs. I am thankful to my guide Prof. Sankpal LJ, for the guidance and encouragement in this work. His expert suggestions and scholarly feedback had greatly enhanced the effectiveness of this work. I would also like to express my appreciation and thanks to all my colleagues and family members who knowingly or unknowingly have assisted and encouraged me throughout my journey.

References

1. Basheer KPM, Raghu CV (2012) Fingerprint attendance system for classroom needs. Annual IEEE. 433-438.
2. Lim TS, Sim SC, Mansor MM (2009) Rfid based attendance system in Industrial Electronics & Applications. IEEE Symposium 2: 778-782.
3. Kadry S, Smali K (2007) A design and implementation of a wireless iris recognition attendance management system. Information Technology and control 36: 323-329.
4. Tharanga JGR, Samara Koon SMSC, Karunarathne TAP, Liyanage KLPM, Gamage MPAW, et al. (2013) Smart attendance using real time face recognition (SMART-FR). Department of Electronic and Computer Engineering, Sri Lanka Institute of Information Technology (SLIIT), Malabe, Sri Lanka.
5. Behara A, Raghunadh MV (2013) Real time face recognition system for time and attendance applications.
6. Singh B, Kumar S, Bhulania P (2013) Lecture attendance system with face recognition and image processing. International Journal of Advance Research in Science and Engineering IJARSE 2.
7. Balcoh NK, Yousaf MH, Ahmad W, Baig MI (1995) Algorithm for Efficient Attendance Management: Face Recognition based approach. IJCSI International Journal of Computer Science 9: 146-150.
8. Eason G, Noble B, Sneddon IN (1995) On certain integrals of Lipschitz-Hankel type involving products of Bessel functions. Phil Trans Roy Soc London A 247: 529-551.