International Journal of Emerging Technologies in Engineering Research (IJETER)
Volume 5, Issue 3, March (2017) www.ijeter.everscience.org

Face Matching Algorithm for Gate Pass Automation System

Dr. A.V. Senthil Kumar
Head and Associate Professor, Department of Computer Applications, Hindusthan College of arts and Science, Coimbatore, Tamil Nadu, India.

D. Vignesh Kumar
PG Student, Department of Computer Applications, Hindusthan College of arts and Science, Coimbatore, Tamil Nadu, India.

Abstract – Gate pass generations based on biometric features are become popular nowadays. In this paper, we propose a new gate pass generation tool using face matching process. In this system we are designing the gate pass generation system which generates the out pass by recognizing student face. This tool is designed for college campus hostel to provide out pass for the students. Initially when the person need to go out from their campus the digital image of the person is captured by the camera and the facial details are extracted and matched with the image from database. These details are compared with the data base which verifies whether the person is authorized or not, if the user is authorized, then the system matches the rule and generates the out pass. In this paper, we propose a new face capturing algorithm for effective out pass generation.

Index Terms – Face matching, feature extraction, gate pass generation, Rule matching.

1. INTRODUCTION

The advances of computing technology have facilitated the development of real-time vision modules that interact with humans in recent years. Examples abound, particularly in biometrics and human computer interaction as the information contained in faces needs to be analyzed for systems to react accordingly. For biometric systems that use faces as non-intrusive input modules, it is imperative to locate faces in a scene before any recognition algorithm can be applied. An intelligent vision- based user interface should be able to tell the attention focus of the user (i.e., where the user is looking at) in order to respond accordingly. To detect facial features accurately for applications such as digital cosmetics, faces need to be located and registered initially to facilitate further processing. It is evident that face detection plays an important and critical role for the success of any face processing systems.

The Gate Pass Management process was computerized to have an easy mechanism for resident students to apply for a Gate Pass in the campus. The Gate Pass system is to ensure that the information on students' exit from and entry to the campus is maintained. Until recently this was managed through a manual system. This had its limitations with regard to application process, approval system, etc. The computerized Gate Pass Management System (GPMS) system using face matching is introduced to overcome the limitations of the manual system. The system also generates information base that is used by various other departments in the campus for optimum resources utilization.

Nowadays , for getting the gate pass the user need to fill the necessary details .The details include name, address, reason for getting the gate pass are included. These details are maintained through hand written. There is a chance to malpractice in the manually created gate pass. And the major drawback of the existing system is the lack of log report. The admin can't retain or review the In-time and out time of students easily. But in the modern world all the works are done automatically by the computer. By using this project all the manual works are maintained by the computer. The basic idea behind this project is to computerize the communication between the student and hostel.

It provides an efficient way of implementing the security system. Using this system, it is possible to retrieve the information about the students from database using face. This will generate a pass with image, name, and room number along with the outime. This will updated automatically when the face recognized. The Gate Pass Management process was computerized to have an easy mechanism for resident students to apply for a Gate Pass in the campus. The Gate Pass system is to ensure that the information on students' exit from and entry to the campus is maintained. Until recently this was managed through a manual system. This had its limitations with regard to application process, approval system, etc. The computerized Gate Pass Management System (GPMS) system using face matching was introduced to overcome the limitations of the manual system. The system also generates information base that is used by various other departments in the campus for optimum resources utilization.

2. LITERATURE SURVEY

The last decade has seen rich contributions in face matching. The stages involved in building automatic face matching are

detecting the location of the face in each frame of a video sequence from digital camera, segmenting and normalizing the face and finally recognizing the identity of the person. Every stage is crucial for the successful implementation of an online real-time face matching system where time and complexity form a delicate balance to achieve the desired accuracy and reliability.

A Biometric system is essentially a pattern-recognition system that recognizes a person based on a feature vector derived from a specific physiological or behavioral characteristic of the person [1]. Biometrics represents the most secure way of identifying individuals because verification of identity is established using a physical and unique biometric characteristic. Passwords or PINs used alone are responsible for accessibility frauds on corporate computer networks and the Internet because they can be guessed or stolen.

Face detection techniques:

Face detection is a challenging task because variations in scale, location, orientation, pose, facial expression, occlusion, and lighting conditions change the overall appearance of faces. Various approaches for face detection have been proposed which include, knowledge-based, and appearance-based methods, and through template matching, skin color, motion, etc., to mention a few.

A. Knowledge-based methods:

In this approach, rules are derived from the researcher's prior knowledge that a face often appears in an image with two eyes that are symmetric to each other, a nose, and a mouth [2]. At the highest level, all possible face candidates are detected by scanning a window over the input image and by applying a set of rules at each location. The rules at the higher level are general descriptions of what a face looks like while the rules at lower levels rely on details of facial features.

A multi-resolution hierarchy of images is created by averaging and sub-sampling. The lowest resolution image is searched for candidates and these are further processed at finer resolutions. Surviving candidate regions are then examined with another set of rules that respond to facial features such as eyes and mouth. In contrast to such a knowledge-based top-down approach, numerous bottom-up feature based methods [3] have been proposed to first detect facial features and then to infer the presence of a face.

Facial features such as eyebrows, eyes, nose mouth and hair-line are commonly extracted using edge detectors. Author in [4] has proposed a localization method to segment a face from cluttered background for face identification. An edge map in combination with heuristics is used to remove and group edges so that only the ones on the face contour are preserved. An ellipse is then fit to the boundary between the head region and the background.

B. Appearance based methods:

Appearance based methods rely on statistical analysis and machine learning to find the relevant characteristics of face and non-face images. The characteristics learnt are in the form of distribution models or discriminate functions that are subsequently used for face detection. Principal component analysis is a standard technique used to approximate the original data with a lower dimensional feature vector. The basic approach is to compute the Eigen vectors of the covariance matrix, and approximate the original data by a linear combination of the leading eigenvectors. The mean squared error in reconstruction is equal to the sum of the remaining Eigen values. Principal component analysis on a training set of face images is performed to generate the Eigen faces [5] which span a subspace called the face space. Images of the faces are projected onto the subspace and clustered. Similarly non-face images are projected onto the same subspace and clustered. Face images do not change radically when projected onto the face space, while projection of non-face images appears quite different.

To detect faces, each input image is scanned with a rectangular window and the distance measure between an image region within the window and the face space is computed for all locations in the image. The distance from face space is used as a measure features and these distances from the face space is the face map. A face can be detected from the local minima of the face map.

3. PROPOSED SYSTEM

The proposed system utilizes the network concepts to deal the out pass process in the college. The system simplifies the process by transferring the gate pass through face matching. So the person can’t edit the data in the gate pass. The system also helps to store and track the time log easily. Face Recognition is an emerging field of research with many challenges such as large set of images with noisy data, improper illuminating conditions etc., Eigen face approach is one of the simplest and most efficient methods to overcome these obstacles in developing a system for Face Recognition, this has been implemented in the gate pass generation in college hostel. Various face matching techniques are used for preprocessing the image in order to handle bad illumination and face alignment problem. In this paper, we propose a new software tool for face matching and pass generation for college campus.

This application is fully applied with the camera. Once the person wants the out pass then student should sit in front of the camera and the face is matched for further steps. Initially the application collects face from the camera and performs improved canny edge detection process.

The main objective of proposed system is to provide gate pass security to the college hostel. We introduce the face recognition by capturing the image of person and comparing it with the data

base. The authorized person will be allowing by the system to leave from the campus and if the person is found to be authorized then it will proceed for the generation of gate pass with effective rule matching. This system is divided in two parts , the face detection system and the generation of the gate pass for the authorized person.

Improved Threshold Defined Canny Edge Detection:

The Canny Edge Detector is one of the most commonly used image processing tools, detecting edges in a very forceful manner. The improved Canny edge detector is widely considered to be the standard edge detection method in the industry. Canny saw the edge detection problem as a signal processing optimization problem, so an objective function is developed to be optimized. The solution to this problem was a rather difficult exponential function, but Canny found numerous ways to approximate and optimize the edge-searching problem. The steps in the proposed edge detector are as follows:

1. Smooth the image with a two dimensional Gaussian. In large amount of cases the computation of a two dimensional Gaussian is costly, so it is estimated by two one dimensional Gaussians, one in the x direction and the other in the y direction.

2. Take the gradient of the image. This demonstrates changes in intensity, which indicates the occurrence of edges. This genuinely gives two consequences, the gradient in the x direction and the gradient in the y direction.

3. Non-maximal suppression- Edges will occur at points the where the gradient is at a maximum. Hence, all points at a maximum should not be suppressed. To facilitate this, the magnitude and direction of the gradient is computed at each pixel. After that for each pixel check if the magnitude of the gradient is greater at one pixel's distance away in either the positive or the negative direction perpendicular to the gradient. If the pixel is not larger than both, suppress it.

4. Edge Thresholding- The method of thresholding used by the Canny Edge Detector is referred to as "hysteresis". It makes utilize of both a high threshold and a low threshold. If a pixel has a value above the high threshold, it is set as an edge pixel. If a pixel has a value above the low threshold and is the neighbor of an edge pixel, it is set as an edge pixel as well. If a pixel has a value above the low threshold but is not the neighbor of an edge pixel, it is not set as an edge pixel. If a pixel has a value below the low threshold, it is never set as an edge pixel. The general algorithm for the Canny edge detector is as follows:

The algorithm runs in 5 separate steps: (canny sobal)

1. Smoothing: Blurring of the image to remove noise.

2. Finding gradients: The edges should be marked where the gradients of the image has large magnitudes.

3. Non-maximum suppression: Only local maxima should mark as edges.

4. Double thresholding: Potential edges are determined by thresholding.

5. Edge tracking: Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge.

Fig 1,0 edge detection process for facial feature matching

By using the improved canny edge detection method see fig 1.0, face can be segmented into temporally continuous and visually similar video segments. Three frames are extracted from each camera, which are the first frame, the key frame and the last frame of this segment.

The proposed system can be operated in two different sections, i.e. one for capturing and creating a data base and the other section is to capture the image and which is used for identifying or comparing the images in the database. Here in the second section we use Eigen faces methodology of face recognition for finding the matches.

4. IMPLEMENTATION AND RESULTS

Application:

The security architecture of the proposed system is carried out on the college out pass generation application, which needs student facial features should be matched by the real world human face datasets. Due to the security and insufficient dataset of real campus application a new software has been created for the evaluation. And then the system constructed a new scheme to perform the face matching process. The followings are the details about the implementation process and parameters.

The proposed system tested with huge number of students to evaluate the proposed system outcome.

Attributes	Count	description
Number of users	15	The system collects 15 students information along with their face images.

Table 1.0 Descriptions about Implementation Parameters

All the above parameters have been created from the gate pass application, which is developed for the implementation.

Biometric Features	**Type**	**Description about the procedure**
Facial features such as eyes, and lips for face matching	Face	Facial features are extracted and matched for the initial authentication

Table 2.0 Biometric Data Features

The system implements the biometric feature type and its description, based on this the system will authenticate users, as well as the system restricts if any other user if the feature is mismatches.

Tools Used:

The experiments are performed on an Intel Dual Core with a RAM capacity 2GB. The algorithms are implemented in ASP.Net for shopping site creation and C#.NET as coding language and are run under Windows family. The system has successfully implemented using Visual studio.Net and C#.net as code program.

Software Tool	
Dotnet	**Language : C#.Net** **Version : 2010** **Back end :Sql Server 2008**

Table 3.0 Tool specification

The proposed system has successfully implemented using face feature matching and alerting system. The proposed system developed the tool using C#.net.

5. CONCLUSION

The proposed system developed a new out pass generation software with face matching technique for college hostel. The application has different type of advantages such as face matching and restricting pass for unauthorized users, time based pass generation, out time reporting and alerting system via SMS. The application has tested with numerous students profile and finally reports the efficiency and accuracy of the proposed system.

REFERENCES

[1] Ahmad F, Abu Bakar H, "Human face recognition using neural Networks", Proceedings of IEEE international conference on image processing. Vol. 3, pp. 936-939, 1994 .

[2] G. Aggarwal K. Amit, R Chellappa, "A System Identification Approach for Video-based Face Recognition", Proceedings of the 17th International Conference on Pattern Recognition, Vol 4, pp. 175-178, Aug. 2004.

[3] Y. Adini, Y. Moses, and S. Ullman, "Face recognition: The problem of com-pensating for changes in illumination direction", IEEE Transactions Pattern Analysis and Machine Intelligence, Vol. 19, No. 7, pp. 721-732, July 1997.

[4] Acosta E, Torres L, Albiol A, Delp E, "An automatic face detection and recognition system for video indexing applications". Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing, Vol. 4, pp. 3644-3647, May 2002.

[5] A Albio, Torres L, and Delp E. J, "Optimum color spaces for skin detection". Proceedings of the International Conference on Image Processing, Vol. 1, pp. 122-124, 2001.

[6] P.N. Belhumeur, J.P. Hespanha and D.J. Kriegman, "Eigenfaces vs. Fisherfaces: Recognition Using Class Specific Linear Projection", IEEE Transactions, on Pattern Analysis and Machine Intelligence, Vol. 19, pp. 711-720, 1997.

[7] C. M. Bishop, "'Neural Networks for Pattern Recognition", Oxford University Press, 1995. H. Bourlard and Y.Kamp. " Autoassociation by multilayer perceptrons and singular value decomposition". Biological Cybernetics, Vol. 59, pp. 291-294, 1988

[8] J. Brand and J. Mason, "A Comparative Assessment of Three Approaches to Pixel-Level Human Skin Detection," Proceedings IEEE International Conference Pattern Recognition, Vol. 1, pp. 1056-1059, September 2000.