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SVM BASED HUMAN PRESENCE AND FACE DETECTION SYSTEM

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ABSTRACT

The face is one of the easiest ways to distinguish the individual identity of each other. Face recognition is a personal identification system that uses personal characteristics of a person to identify the person's identity. Human face recognition procedure basically consists of two phases, namely face detection, where this process takes place very rapidly in humans, except under conditions where the object is located at a short distance away, the next is the introduction, which recognize a face as individuals. Stage is then replicated and developed as a model for facial image recognition (face recognition) is one of the much-studied biometrics technology and developed by experts. There are two kinds of methods that are currently popular in developed face recognition pattern namely, Eigenface method and Fisherface method. Facial image recognition Eigenface method is based on the reduction of face- dimensional space using Principal Component Analysis (PCA) for facial features. The main purpose of the use of PCA on face recognition using Eigen faces was formed (face space) by finding the eigenvector corresponding to the largest eigenvalue of the face image. The area of this project face detection system with face recognition is Image processing. The software requirements for this project is matlab software.

Keywords: face detection, Eigen face, PCA, matlab

Extension: There are vast number of applications from this face detection project, this project can be extended that the various parts in the face can be detect which are in various directions and shapes

1. INTRODUCTION:

Face recognition is the task of identifying an already detected object as a known or unknown face.[1][5] often the problem of face recognition is confused with the problem of face detection Face Recognition on the other hand is to decide if the "face" is someone known, or unknown, using for this purpose a database of faces in order to validate this input face.

FACERECOGNIZATION:

DIFFERENT APPROACHES OF FACE RECOGNITION:

There are two predominant approaches to the face recognition problem: Geometric (feature based) and photometric (view based). As researcher interest in face recognition continued, many different algorithms were developed, three of which have been well studied in face recognition literature.

Recognition algorithms can be divided into two main approaches:

Geometric: Is based on geometrical relationship between facial landmarks, or in other words the spatial configuration of facial features.[2][11] That means that the main geometrical features of the face such as the eyes, nose and mouth are first located and then faces are classified on the basis of various geometrical distances and angles between features. (Figure3)

Photometric stereo: Used to recover the shape of an object from a number of images taken under different lighting conditions. The shape of the recovered object is defined by a gradient map, which is made up of an array of surface normals (Zhao and Chellappa, 2006) (Figure2)

Popular recognition algorithms include:

Principal Component Analysis using Eigenfaces,(PCA)

1.Linear Discriminate Analysis,Elastic Bunch Graph Matching using the Fisherfacealgorithm

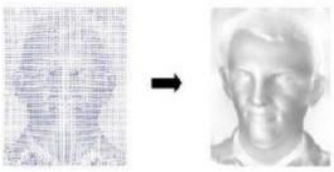


Figure 2 -Photometric stereo image.

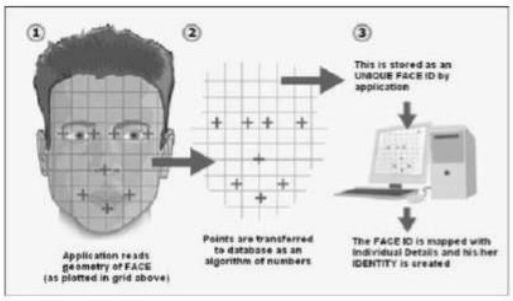


Figure 3 - Geometric facial recognition.

FACEDETECTION:

Face detection involves separating image windows into two classes; one containing faces (tarning the background (clutter). It is difficult because although commonalities exist between faces, they can vary considerably in terms of age, skin colour and facial expression. [4][10] The problem is further complicated by differing lighting conditions, image qualities and geometries, as well as the possibility of partial occlusion and disguise. An ideal face detector would therefore be able to detect the presence of any face under any set of lighting conditions, upon any background. The face detection task can be broken down into two steps. The first step is a classification task that takes some arbitrary image as input and outputs a binary value of yes or no, indicating whether there are any faces present in the image. The second step is the face localization task that aims to take an image as input and output the location of any face or faces within that image as some bounding box with (x, y, width, height).

The face detection system can be divided into the following steps:-

Pre-Processing: To reduce the variability in the faces, the images are processed before they are fedintothenetwork.Allpositiveexamplesthatisthefa ceimagesareobtainedbycropping images with frontal faces to include only the front view. All the cropped images are then corrected for lighting through standard algorithms.

Classification: Neural networks are implemented to classify the images as faces or nonfaces by training on these examples.[2][7][11] We use both our implementation of the neural network and the Matlab neural network toolbox for this task. Different network configurations are experimented with to optimize theresults.

Localization: The trained neural network is then used to search for faces in an image and if present localize them in a bounding box. [1] Various Feature of Face on which the work has done on:- Position Scale OrientationIllumination

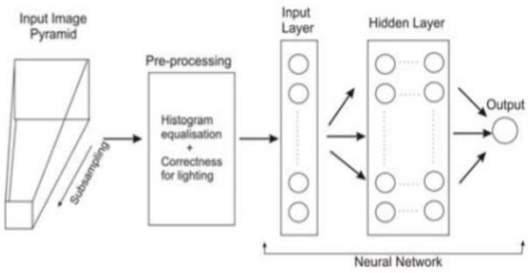
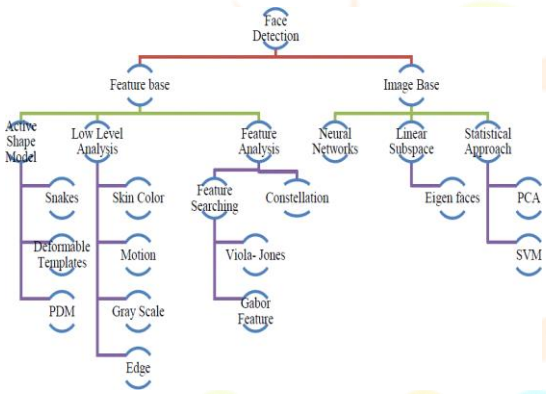


Fig: Face detection algorithm

LITERATURE SURVEY:

Face detection is a computer technology that determines the location and size of human face in arbitrary (digital) image. The facial features are detected and any other objects like trees, buildings and bodies etc are ignored from the digital image. It can be regarded as a _specific‘ case of object-class detection, [5][7] where the task is finding the location and sizes of all objects in an image that belong to a given class. Face detection, can be regarded as a more _general‘ case of face localization. In face localization, the task is to find the locations and sizes of a known number of faces (usually one). Basically there are two types of approaches to detect facial part in the given image i.e. feature base and image base approach.Feature base approach tries to extract features of the image and match it against the knowledge of the face features. While image base approach tries to get best match between training and testingimages.



FEATURE BASEAPPROCH:

Active Shape ModelActive shape models focus on complex non-rigid features like actual physical and higher level appearance of features Means that Active Shape Models (ASMs) are aimed at automatically locating landmark points that define the shape of any statistically modelled object in an image

DeformableTemplates:

Deformable templates were then introduced by Yuille et al. to take into account the a priori of facial features and to better the performance of snakes. Locating a facial feature boundary is not an easy task because the local evidence of facial edges is difficult to organize into a sensible global entity using generic contours.

PDM (Point DistributionModel):

Independently of computerized image analysis, and before ASMs were developed, researchersdeveloped statistical models of shape . The idea is that once you represent shapes asvectors, you can apply standard statistical methods to them just like any other multivariateobject. These models learn allowable constellations of shape points from training examplesand use principal components to build what is called a Point Distribution Model. These havebeen used in diverse ways, for example for categorizing Iron Age broaches.Ideal Point Distribution Models can only deform in ways that are characteristic of the object. Cootes and his colleagues were seeking models which do exactly that so if a beard, say, covers the chin, the shape model can \override the image" to approximate the position of the chin under the beard. It was therefore natural (but perhaps only in retrospect) to adopt Point Distribution Models

LOW LEVELANALYSIS:

Based on low level visual features like color, intensity, edges, motion etc.Skin Color BaseColor is avital feature of human faces. Using skin-color as a feature for tracking a face has several advantages. [5][11]Color processing is much faster than processing other facial features. Under certain lighting conditions, color is orientation invariant.

Edge Base:

Face detection based on edges was introduced by Sakai et al. This workwas based on analysing line drawings of the faces from photographs, aiming to locate facialfeatures. Than later Craw et al. proposed a hierarchical framework based on Sakai et al.‘swork to trace a human head outline. Then after remarkable works were carried out by many researchers in this specific area. Method suggested by Anila and Devarajan was very simple and fast. They proposed frame work which consist three stepsi.e. initially the images are enhanced by applying median filterfor noise removal and histogram equalization for contrast adjustment. In the second step the edge imageis constructed from the enhanced image by applying sobel operator. Then a novel edge trackingalgorithm is applied to extract the sub windows from the enhanced image

based on edges. Further they used Back propagation Neural Network (BPN) algorithm to classify the sub-window as either face or non-face.

Paul Viola and Michael Jones presented an approach for object detection which minimizes computation time while achieving high detection accuracy. Paul Viola and Michael Jones [39] proposed a fast and robust method for face detection which is 15 times quicker than any technique at the time of release with 95% accuracy at around 17 fps.The technique relies on the use of simple Haar-like features that are evaluated quickly through the use of a new image representation. Based on the concept of an ―Integral Image‖ it generates a large set of features and uses the boosting algorithm AdaBoost to reduce the overcomplete set and the introduction of a degenerative tree of the boosted classifiers provides for robust and fast interferences. The detector is applied in a scanning fashion and used on gray-scale images, the scanned window that is applied can also be scaled, as well as the featuresevaluated.

Gabor Feature Method:

Sharif et al proposed an Elastic Bunch Graph Map (EBGM) algorithmthatsuccessfullyimplements face detection using Gabor filters. The proposedsystem applies 40 different Gabor filters on an image. As aresult of which 40 images with different angles and orientationare received. Next, maximum intensity points in each filteredimage are calculated and mark them as fiducial points. Thesystem reduces these points in accordance to distance betweenthem. The next step is calculating the distances between thereduced points.

$$\psi_{u,v}(z) = \frac{\| k_{u,v} \|^2}{\sigma^2} e^{\left(-\frac{\|k_{u,v}\|^2 \|z\|^2}{2\sigma^2} \right)} \left[e^{i\vec{k}_{u,v} z} - e^{-\frac{\sigma^2}{2}} \right]$$

Where

$\phi_u = \frac{u\pi}{8}, \quad \phi_u \in [0, \pi)$ gives the frequency,

DIGITAL IMAGEPROCESSING:

Interest in digital image processing methods stems from two principal application areas:

Improvement of pictorial information for humaninterpretation

Processing of scene data for autonomous machineperception

In this second application area, interest focuses on procedures for extracting image information in a form suitable for computer processing.

Examples includes automatic character recognition, industrial machine vision for product assembly and inspection, military recognizance, automatic processing of fingerprints etc.

FUNDAMENTAL STEPS IN IMAGEPROCESSING

1.Image acquisition: to acquire a digitalimage

2.Image pre-processing: to improve the image in ways that increases the chances for success of the otherprocesses.

3.Image segmentation: to partitions an input image into its constituent parts ofobjects.

4.Image segmentation: to convert the input data to a from suitable for computerprocessing.

5.Image description: to extract the features that result in some quantitative information of interest of features that are basic for differentiating one class of objects fromanother.

MATLAB

INTRODUCTION:

The name MATLAB stands for MATrixLABoratory. MATLAB was written originally to provide easy access to matrix software developed by the LINPACK (linear system package) and EISPACK (Eigen system package) projects. MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming environment. MATLAB has many advantages compared to conventional computer languages (e.g., C, FORTRAN) for solving technical problems

MATLAB is widely used as a computational tool in science and engineering encompassing the

fields of physics, chemistry, math and all engineering streams. It is used in a range of applicationsincluding:

signal processing andCommunications

image and video Processing

controlsystems

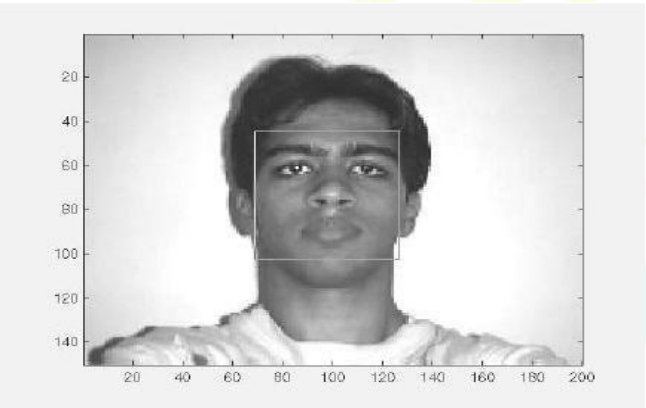
test andmeasurement

computationalfinance

computationalbiology

FACE DETECTION

The problem of face recognition is all about face detection. This is a fact that seems quite bizarre to new researchers in this area. However, before face recognition is possible, one must be able to reliably find a face and its landmarks. This is essentially a segmentation problem and in practical systems, most of the effort goes into solving this task. In fact the actual recognition based on features extracted from these facial landmarks is only a minor last step.



PRINCIPAL COMPONENT ANALYSIS(PCA)

Principal Component Analysis (or Karhunen-Loeve expansion) is a suitable strategy for face recognition because it identifies variability between human faces, which may not be immediately obvious. Principal Component Analysis (hereafter PCA) does not attempt to categorise faces using familiar geometrical differences, such as nose length or eyebrow width. Instead, a set of human faces is analysed using PCA to determine which 'variables' account for the variance of faces. In face recognition, these variables are called eigen faces because when plotted they display an eerie resemblance to human faces. Although PCA is used extensively in statistical analysis, the pattern recognition community started to use PCA for classification only relatively recently. As described by Johnson and Wichern (1992),

UNDERSTANDINGEIGENFACES

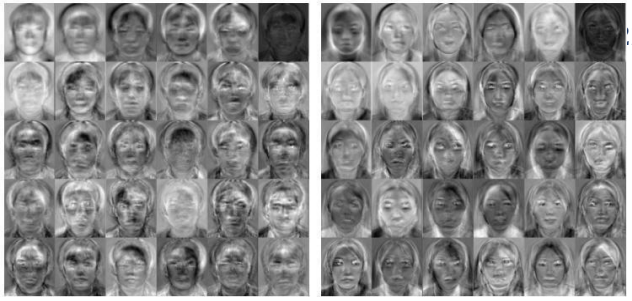
Any grey scale face image I(x,y) consisting of a NxN array of intensity values may also beconsider as a vector of N^2. For example, a typical 100x100 image used in this thesis will have to be transformed into a 10000 dimensionvector!

IMPROVING FACE DETECTION USINGRECONSTRUCTIN

Reconstruction cannot be used as a means of face detection in images in near real-time since it would involve resizing the face detection *window* area and large matrix multiplication, both of which are computationally expensive. However, reconstruction can be used to verify whether potential face locations identified by the deformable template algorithm actually contain a face. If the reconstructed image differs greatly from the face detection *window* then the *window* probably does not contain a face. Instead of just identifying a single potential face location, the face detection algorithm can be modified to output many high 'faceness' locations which can be verified using reconstruction. This is especially useful because occasionally the best 'faceness' location found by the deformable template algorithm may not contain the ideal frontal view face pixelarea.

CONCLUSION

The computational models, which were implemented in this project, were chosen after extensive research, and the successful testing results confirm that the choices made by the researcher were reliable.The system with manual face detection and automatic face recognition did not have a recognition accuracy over 90%, due to the limited number of eigenfaces that were used for the PCA transform. This system was tested under very robust conditions in this experimental study and it is envisaged that real-world performance will be far more accurate.The fully automated frontal



view face detection system displayed virtually perfect accuracy and in the researcher's opinion further work need not be conducted in this area.

The fully automated face detection and recognition system was not robust enough to achieve a high recognition accuracy. The only reason for this was the face recognition subsystem did not display even a slight degree of invariance to scale, rotation or shift errors of the segmented face image. This was one of the system requirements identified in section 2.3. However, if some sort of further processing, such as an eye detection technique, was implemented to further normalise the segmented face image, performance will increase to levels comparable to the manual face detection and recognition system. Implementing an eye detection technique would be a minor extension to the implemented system and would not require a great deal of additional research.All other implemented systems displayed commendable results and reflect well on the deformable template and Principal Component Analysis strategies.The most suitable real-world applications for face detection and recognition systems are for mugshot matching and surveillance

REFERANCE

1. Retrieval of Encrypted cloud data using multi-keyword C Rajeshkumar, Dr.K Rubasoundar International Journal of Innovative Research in Computer and Communication Engineering Vol.2, Iss.1, 2014
2. AAFPRS(1997). A newsletter from the American Academy of Facial Plasticand Reconstructive Surgery. Third Quarter 1997.
3. Baron, R. J. (1981). Mechanisms of human facial recognition. International Journal of Man Machine Studies,15:137-178
4. Beymer, D. and Poggio, T. (1995) Face Recognition From One Example View, A.I. Memo No. 1536, C.B.C.L. Paper No. 121.MIT
5. Preserving global and local features—A combined approach for recognizing face images Dr.K.Ruba Soundar, K Murugesan International Journal of Pattern Recognition and Artificial Intelligence 24- 5-2010
6. Brennan, S. E. (1982) The caricature generator. M.S. Thesis.MIT.
7. Brunelli, R. and Poggio, T. (1993), Face Recognition: Features versus Templates. IEEE Transactions on Pattern Analysis and Machine Intelligence,15(10):1042-1052
8. Craw, I., Ellis, H., and Lishman, J.R. (1987). Automatic extraction of face features. Pattern Recognition Letters, 5:183-187,February.
9. Deffenbacher K.A., Johanson J., and O'Toole A.J. (1998) Facial ageing, attractiveness, and distinctiveness. Perception.27(10):1233-1243
10. Dunteman, G.H. (1989) Principal Component Analysis. SagePublications.
11. LTE: An enhanced hybrid domain downlink scheduling L Rajaretnam Priya, K Ruba Soundar Journal of Cognitive Systems Research Vol.52, pp. 550-555, Elsevier
12. Gauthier, I., Behrmann, M. and Tarr, M. (1999). Can face recognition really be dissociated from object recognition? Journal of Cognitive Neuroscience, inpress.
13. Goldstein, A.J., Harmon, L.D., and Lesk, A.B. (1971). Identification of human faces. In Proc. IEEE, Vol. 59, page748
14. De Haan, M., Johnson, M.H. and Maurer D. (1998) Recognition of individual faces and average face prototypes by 1- and 3- month-old infants.
15. Development, Department of Psychology, BirkbeckCollege.
16. Hadamard, J. (1923) Lectures on the Cauchy Problem in Linear Partial Differential Equations , Yale UniversityPress