ANALYSIS THE EFFICIENCY & CROSSOVER ACCURACY BIOMETRIC TECHNOLOGY BY MATLAB

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ABSTRACT: Biometrics is technology of identifying human subjects by means of measuring & analyzing more than one intrinsic behavioral / physical trait. Such human body characteristics consist of fingerprints, eye retinas, voice patterns, irises, facial patterns & hand measurements. Biometric systems consist of applications that makes use of biometric technologies & allow identification and verification / authentication automatically. In principle, processing of personal data that involves use of a biometric system is considered by privacy experts to be justified within a place that demands a high level of security & strict identification procedures.

[1] Introduction

Face detection is a technique which refers to detection of face automatically by digital camera. Face Recognition is a term used for recognition of a person automatically/independently by computerized systems by taking a look at his/her face. Face detection is a popular characteristics used in biometrics, social tagging & digital cameras. Face detection & recognition has gained/earn more research attentions in last few years. Face detection is an almost unique biometric identity. There is very few chance of having two similar faces. For security hardening it could used in combination with key card or smart card. Face detection are very important feature in social tagging & digital camera. In digital cameras, Face detection is used because it controls contrast on face in clicked picture & it could also help to view clearer face than click without face detection. In social tagging, face tagging is used for tag people in picture or post.

Neural Network & Fuzzy Sets

Artificial Neural Networks (ANNS) is a family of statistical learning models inspired by biological neural network (the central nervous systems of animals, in particular brain) & is used to estimate or approximate functions that could depend on a big number of inputs & are generally unknown. An artificial neural network is usually presented as systems of interconnected neuron that send messages to every other. The connections had numeric weights that could be tuned based on experience capable of learning.

Neural Network is a system of programs & data structures that approximates operation of human brain. A neural network usually involves a large number of processors operating in parallel, every with its own small sphere of knowledge & access to data in its local memory. Typically, a neural network are initially "trained" or fed large amounts of data & rules about data relationships.

Back propagation, abbreviation for backward propagation of errors/mistakes, is a common method of training artificial neural networks used in conjunction within an optimization rule such that gradient descent.

Fuzzy Sets is collection of things that belong to some definition. Any item either is belongs to that set or does not belong to that set. That it could be either 0 or 1.

[2] Literature Review

Fernandez, Kristina Joyce E. Gob, D. Christina, Aubrey Rose M. Ron Jason J. Ravara, Leonidas, Elmer P. Dadios & Argel A. Bandala.[2] Simultaneous face recognition & detection using Viola-Jones Algorithm & Artificial Neural Networks for identity verification & authentification. IEEE, 2014.

The study presented aims to design & develop a face recognition system. The system utilizes Viola Jones Algorithm for detecting faces from a given image. Also this system is used for Artificial Neural Networks in recognizing faces detection from input. Upon experimentation system generated could recognize human faces with accuracy of 87.05%.

Motivation: From this paper, we had learnt about Viola jones algorithm for face detection. And we know that this algorithm could read faces with accuracy of about 87.05%.

Toufiq, Rizoan, & Md Islam.[3] Face recognition system using PCA-ANN technique with fusion method. In Communication Technology & Electrical Engineering & information, 2014 International Conference on, pp. 1-5. IEEE, 2014.

This paper presents a process of face recognition system that use to principle component analysis with Backward propagation neural network where features of face image had combined by applying face detection & edge detection technique. In this system, performance has been analyzed based on proposed feature fusion technique. At first, feature has been extracted & dimension of feature vector has been reduced using Main Component Analysis method. The reduced vector part has been classified by Back circulation neural network based classifier. In recognition stage, many steps are required. Finally, authors have been analyzed performance of system for different size of train database.

Motivation: From this paper, we had learnt about PCA-ANN Techniques. In this we use back propagation method of neural networking. This is done with combination of feature fusion technique.

C. Saravanan, M. Surender,[5] Algorithm for Face Comparison using Normalized Cross Correlation, Issue 4, vol. 2, pp. 930-934, IJEAT, April 2013.

They had proposed & developed algorithm for face comparison using normalized cross correlation. This paper present a face comparison algorithm that allows a template called extracted face of person which are Region of Interest from one image & start search for matching with different image/graphic point of view, or by different sensors using Normalized Cross-Correlation (NCC).

Motivation: From this paper, we had learnt about normalized cross correlation from the perspective of face detection. We had been studied this algorithm, its characteristics & basic face detection properties.

Zhen Lei, Li, S.Z, Zhiwei Zhang, Dong Yi. [8] Regularized transfer boosting for Signal Processing Letters, face detection across spectrum, Issue 3, vol. 19, pp. 131-134, IEEE, 2012.

They had worked on regularized transfer boosting for detection of face across spectrum. In this particular research, authors/writers had proposed a face detection technique to tackle issue of face detection by introducing a number of existing large scale visible face images & a few multispectral face images. They had cast problem of face detection across spectrum into transfer learning frame work and try to learn robust multi spectral face detection by exploring main knowledge from visible data domain.

Motivation: This paper told us about knowledge that is based upon face detection algorithm. We have studied this paper to learn about latest trends in face detection based on knowledge based method for evaluation of face detection methods.

[3] Proposed Work and Research Methodology

The existing system are using viola-jones algorithm for purpose of face detection combined with neural network for purpose of artificial neural network (ANN). The existing system is offering accuracy of 87.05 percent which makes it less efficient for live applications. Viola-jones is an accurate & fast algorithm for purpose of face detection. But viola-jones is not efficient in terms of false positives. Also it needs learning in initial stages, which is not possible in all of times. Whereas skin color based face detection is proved as more efficient in terms of accuracy, speed & false positives.

PROPERTY	EXISTING SYSTEM VALUE	PROPOSED SYSTEM VALUE
Accuracy in Normal	88.84%	97.37%
Accuracy in Lighting	86.69%	96.84%

Gaps in Study

A. The existing system are using viola-jones algorithm for purpose of face detection which produces large number of false positive results.

B. The existing system is offering less accuracy (87%) for face detection process. This makes are not suitable for face recognition systems. In case face detection algorithm does not extract face region, system would not be capable of recognizing person.

C. The existing system processes all of training samples with neural network. The neural network processes data on slow speed, which pushes algorithm to take longer processing time.

Development Phases of Proposed Model

Face detection algorithm are using skin color based matching & extraction to detect parts of that particular color, which are followed by face-like object finding by matching extract shapes with shape template of face.

Table 1: The proposed model vs existing model on basis of Accuracy

Approaches

There are many methods/ways for edge detection, but most of them could be grouped into two categories, search-based & zero-crossing based. Search-based ways detect edges by first computing a limit of edge strength, usually a first-order derivative expression for example gradient magnitude, & then searching for local directional maxima of gradient magnitude using a computed estimate of local orientation of edge, usually gradient direction. Zero-crossing based methods examine for zero crossings in a second-order derivative expression & is computed from image (picture) in order to find edges, usually zero-crossings of Laplacian or zero-crossings of a non-linear differential expression. As a preprocessing step to edge detection, a smoothing stage, usually Gaussian smoothing, is almost always applied.

The edge detection methods that had been published mainly differ in types of smoothing filters that are applied & way measures of edge strength is computed. As many of edge detection methods rely on computation of image (picture) gradients, they also differ in types of filters used for computing gradient estimates in x- & y-directions. A survey of a number of different edge detection methods could be found in (Ziou & Tabbone 1998); see also encyclopedia articles on edge detection in Encyclopedia of Computer Science & Engineering & Encyclopedia of Mathematic.
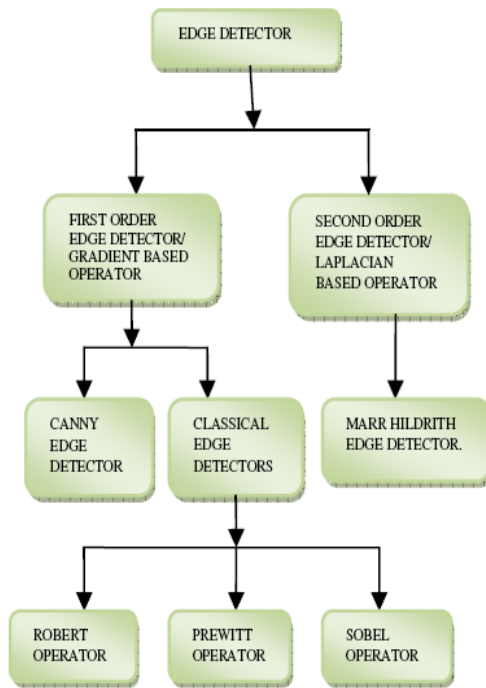
Types of edge detector

Fig 1 type of edge detector

[4] SIMULATION & ANALYSIS

The following systems were implemented using MATLAB 2012a & tested on an Intel Core i3 with 4GB of RAM running Windows 7. This platform should be taking as minimum hardware requirement since face detection & recognition algorithms could had been modified for increased accuracy on a more powerful testing platform. Automated face recognition has been become Holy Grail of computer vision artificial intelligence. It is probably most challenging & ambitious of computer vision projects that is being studied & is not just a fascinating theoretical difficulty, but there is a real-world need for such a system. This section of thesis represents some computational results of our proposed program.

Simulation Process Analysis Result

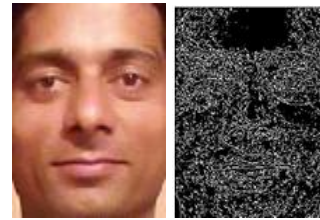We applied Canny Edge Detection on faces to get edges.

- Test 1

Fig. 2 When Values(1.3,2,1)

- Test 2

Fig. 3 When Values(1,3,1)

Face Recognition Implementation

- **Step 1**

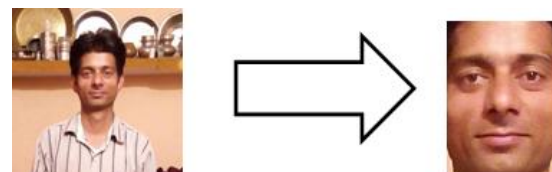Before comparison we crop face

Fig. 4 (Crop face)
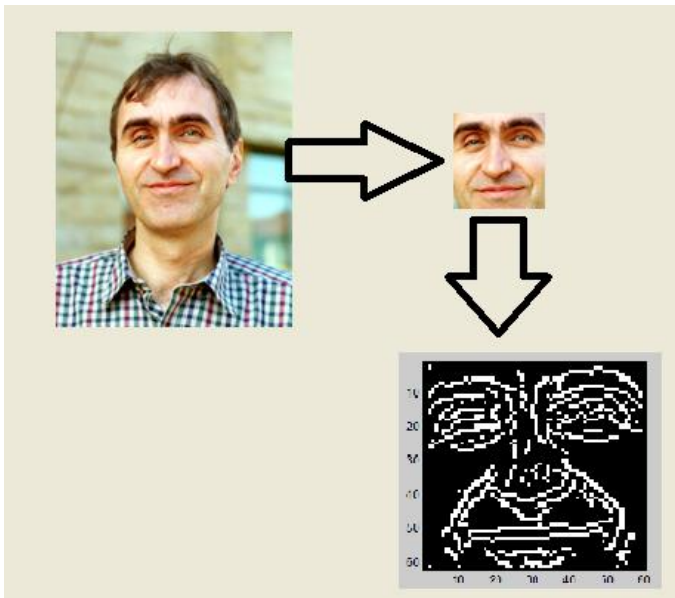
- **Step 2**

After cropping face edge are detected

Fig..5 (Detect Edge)

- **Step 3**

Store image(picture)as matrix in i

i=imread('face1.jpg')

- **Step 4**

apply canny to i matrix & store in ii

ii=canny(i,1,1,1)

- **Step 5**

Create histogram using surf command
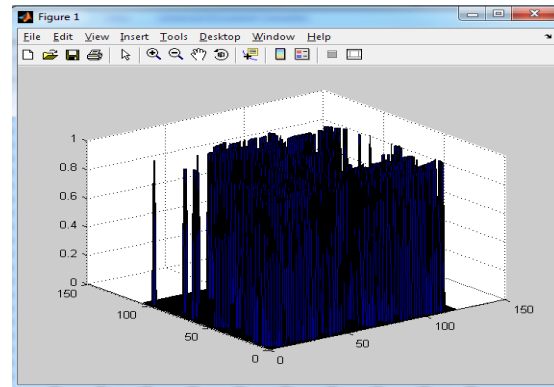
surf(ii)

Fig. 6 (Histogram of Image)

[5] Conclusion

By analyzing all these edge detection techniques , it are found that canny gives optimum edge detection .Following are some points that describe advantages of canny edge detector as matched to other detectors discussed in this paper:

- **Less Sensitive to Noise:** As matched to classical operators like Prewitt, Robert & Sobel. Canny edge detector is less sensitive to noise. Its use Gaussian filters which removes noise data to great extent as compared to above filters. Log operator is also highly or more sensitive to noise as differentiate twice in comparison to canny operator.

- **Remove streaking problem:** classical operators like Robert uses single threshold technique but it gives results into streaking. Streaking means, if edge gradient just above & just below set threshold limit it removes important part of connected edge, & leave disconnected final edge. To overcome from this drawback/disadvantage canny detector uses hysteresis technique which uses two threshold values t_{low} & t_{high} as discussed above in canny algorithm.

- **Adaptive in nature:** Classical operator had fixed kernels so cannot be adapted to a given picture or image. While performance of canny algorithm depends on variable or adjustable parameters like which are standard deviation of Gaussian filter & threshold values t_{low} $_{\&}$ t_{high}. Smaller value of E results

smaller Gaussian filter it turns results in finer edges. So user could changes these parameters & could improve result of canny algorithm.

- **Good localization:** Log operators cannot find edge position while canny operator provides edge gradient orientation/position whose results is good & accurate localization.

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