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FACE DETECTION SYSTEM USING SCILAB IMAGE PROCESSING TOOL

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Abstract:
The automatic identification and detection of a human face is a computer application applied to identify a person face form a digital image or a video frame. The work is performed based on the farcical features detection from the data base of different faces after the comparison of selected faces. The system is helpful in security system, classroom attendance system and applied to compare the features of multi faces systems. We address this problem with the use of corners correlation in facial features. In this approach, we use an algorithm to automatically find the facial features and its corners. The key idea used to achieve accurate detections is to not only learn the textural information of the facial feature to be detected but that of its corners and their correlations also The paper focus on the face detection, and extraction of a human face and multi human face using SLILAB Image and Video Processing Toolbox (SIVP).

Keywords: Human Face Detection, SCILAB, Multiface detection

1. Introduction

Biometrics is used in the process of authentication of a person by verifying or identifying that a user requesting a network resource is who he, she, or it claims to be, and vice versa. It uses the property that a human trait associated with a person itself like structure of finger, face details etc. By comparing the existing data with the incoming data we can verify the identity of a particular person [1]. There are many types of biometric system like fingerprint recognition, face detection and recognition, iris recognition etc., these traits are used for human identification in surveillance system, criminal identification. Advantages of using these traits for identification are that they cannot be forgotten or lost. These are unique features of a human being which is being used widely

The face is our primary focus of attention in social life playing an important role in conveying identity and emotions. We can recognize a number of faces learned throughout our lifespan and identify faces at a glance even after years of separation. This skill is quite robust despite of large variations in visual stimulus due to changing condition, aging and distractions such as beard, glasses or changes in hairstyle. Computational models of face recognition are interesting because they can contribute not only to theoretical knowledge but also to practical applications. Computers that detect and recognize faces could be applied to a wide variety of tasks including criminal identification, security system, image and film processing, identity verification, tagging purposes and human-computer interaction. Unfortunately, developing a computational model of face detection and recognition is quite difficult because faces are complex, multidimensional and meaningful visual stimuli.

Face detection [2, 3] is used in many places now a day's especially the websites hosting images like picassa, photo bucket and face book. The automatically tagging feature adds a new dimension to sharing pictures among the people who are in the picture and also gives the idea to other people about who the person is in the image. In our project, we have studied and implemented a pretty simple but very effective face detection algorithm which takes human skin colour into account.

Our aim, which we believe we have reached, was to develop a method of face recognition that is fast, robust, reasonably simple and accurate with a relatively simple and easy to understand algorithms and techniques. The examples provided in this thesis are real-time and taken from our own surroundings. Face is a complex multidimensional structure and needs good computing

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techniques for recognition. Our approach treats face recognition as a two-dimensional recognition problem. In this scheme face recognition is done by Principal Component Analysis (PCA). Face images are projected onto a face space that encodes best variation among known face images. The face space is defined by eigen face which are eigenvectors of the set of faces, which may not correspond to general facial features such as eyes, nose, lips. The eigen face approach uses the PCA for recognition of the images. The system performs by projecting pre extracted face image onto a set of face space those representssignificant variations among known face images. Face will be categorized as known or unknown face after matching with the present database. If the user is new to the face recognition system then his/her template will be stored in the database else matched against the templates stored in the database.

Face detection is essential front end for a face recognition system [6, 8]. Face detection locates and segments face regions from cluttered images, either obtained from video or still image. It has numerous applications in areas like surveillance and security control systems, content based image retrieval, video conferencing and intelligent human computer interfaces. Most of the current face recognition systems presume that faces are readily available for processing. However, we do not typically get images with just faces. We need a system that will segment faces in cluttered images. With a portable system, we can sometimes ask the user to pose for the face identification task. In addition to creating a more cooperative target, we can interact with the system in order to improve and monitor its detection. With a portable system, detection seems easier. The task of face detection is seemingly trivial for the human brain, yet it still remains a challenging and difficult problem to enable a computer /mobile phone/PDA to do face detection. This is because the human face changes with respect to internal factors like facial expression, beard, mustache glasses etc. and it is also affected by external factors like scale, lightning conditions, and contrast between face, background and orientation of face.

In recent years face recognition has received substantial attention from researchers in biometrics pattern recognition, and computer vision communities the machine learning and computer graphics communities are also increasingly involved in face recognition. This common interest mongresearchers working in diverse fields is motivated by our remarkable ability to recognize people and the fact that human activity is a primary concern both in everyday life and in cyberspace besides, there are a large number of commercial, security, and forensic applications requiring the use of face recognition technologies. These applications include automated crowd surveillance, access control, mugs hot identification (e.g., for issuing driver licenses), face reconstruction, design of human computer interface (HCI), multimedia communication (e.g., generation of synthetic faces) and content-based image database management. A number of commercial face recognition systems have been deployed, such as Cognitec, Eyematic, Viisage, and Identix. Face detection remains an open problem. Many researchers have proposed different methods addressing the problem of face detection. In a recent survey face detection technique is classified into feature based and image based. The feature based techniques use edge information, skin color, motion and symmetry measures, feature analysis, snakes, deformable templates and point distribution. Image based techniques include neural networks, linear subspace method like Eigen faces, fisher faces etc.

2. Related Work

Automatic facial feature detection algorithms tested and designed for frontal algorithms in 2D or 3D images exist. However, algorithms designed to utilize 2D and especially 3D non frontal pose images are noticeably lacking in the literature. Since by its nature 3D data can be directly rotated, its application on non frontal pose data would be ideal since the pose can be directly corrected through a 3D rotation. Facial feature detection algorithms operating on 2D color and grayscale images exist and are able to identify the eyes and mouth somewhat reliably. Examples of current methods for identifying facial features use eigenfeatures [9][6], deformable templates [10] [11] [12], Gabor wavelet filters [13], color manipulation methods [14], Edge Holistic [15], graph matching [16], etc. These methods work fairly well with facial feature identification rates ranging from 90-98%17]. The eyes are an important feature that can be consistently identified. In fact, facial identification algorithms that use only the eyes can achieve an 85% facial classification rate[8]. As a result, the center or edges of the eyes are commonly used by feature detection algorithms as a reference point. Commercial software to identify the eyes exists as well. Faceit [9] relies on identifying facial symmetry in black and white images. Genetic algorithms also exist that can deal with minor pose variation with success rates of 80% [2, 5].

Eigen face/Eigen feature methods on faces [6][9] utilize a mathematical method knows as Principal Component Analysis to simplify the representation of more

complex data based upon a training set. This simpler representation is a vector, which is typically then used to search for the nearest neighbor vector in a gallery to identify who the person is most likely to be. Performance for this varies widely and this type of biometric can be used in different forms for almost any distinguishing feature including face and ears [6] as well as being applicable for different types of measurements including 2D, 3D, or infrared images. This method is not limited to biometrics either and can be applied to generic object identification. Eye detection is an important step in eye tracking and eye state recognition. An improved AD AdaBoost algorithm [3] for eye detection is presented to slow the degradation in training step. Weight on negative samples which are classified correctly is released then the other samples' weight is normalized to slow the expansion of weight on difficult samples. The experiment results show that the approach proposed is real time and has higher detection accuracy. Detection of facial features like eye, pupil, mouth, nose, nostrils, lip corners, eye corners etc., with different facial expression and illumination is a challenging task. An improvement over AdaBoost detection [1] of eyes, mouth and nose are done by estimating the probable region for each features. Geometrical interpretations of location of facial features, used in the algorithms are described with pictorial descriptions.

3. Methodology

The face detection methodologies, including facial feature extraction techniques which are necessary to develop the proposed approach, are briefly introduced in the following sections.The proposed architecture of the system shows the step by step method to find the facial features in an image given in fig. 1. It shows how the face is detected. Firstly we take an input image and by applying Harris and Shi- Tomasi corner detector method convert an image and after that by applying arithmetic operations on that image it gets threshold and then segmented from RGB to LAB color. After segmentation the face is detected, now plot the rectangle by skin color detection method, taking out the maximum region of the face. Now divide the rectangular region in different similar blocks with the help of geometrical shapes of facial features to extract the different features of a face (eyes, nose, mouth and ears). Transform the image and get the facial features by browsing it in dialogue box and plot the result in the form of a table.

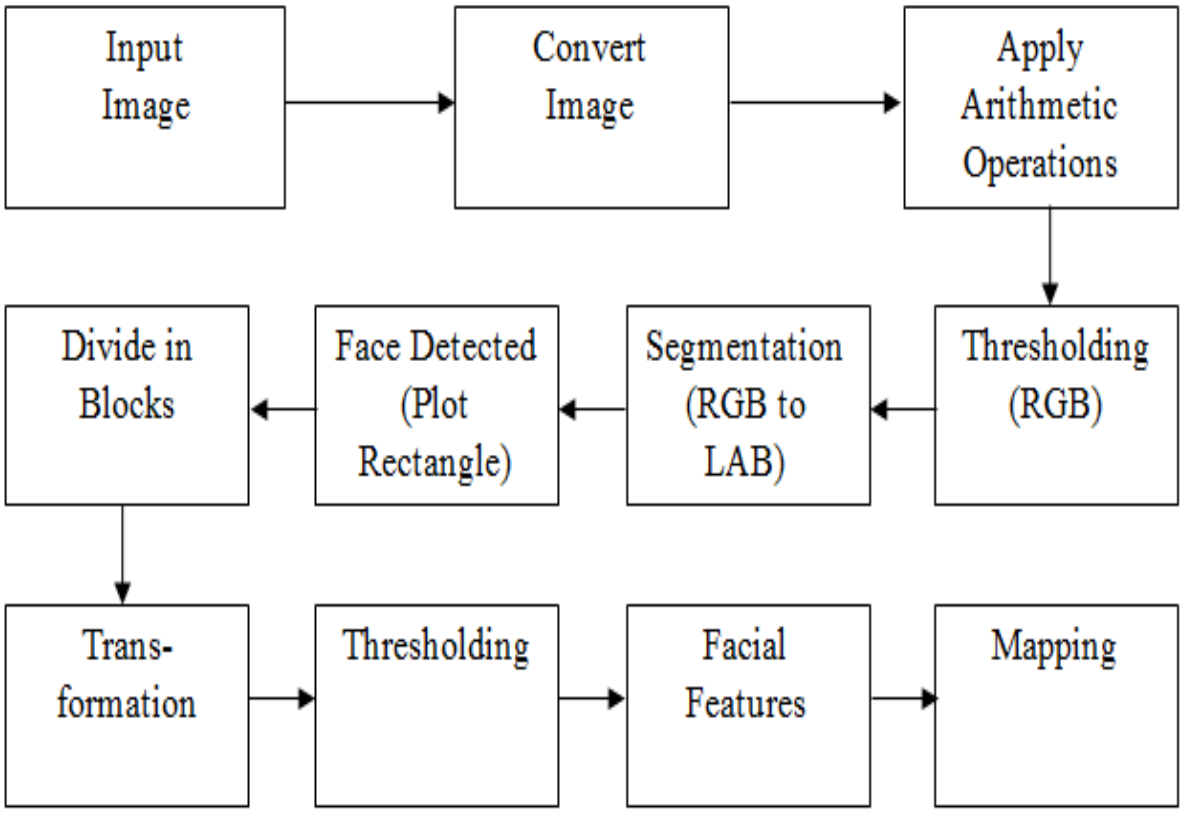

Figure 1: Block diagram of Facial Feature Detector

Arithmetic Operations: Color space, Conversion, Grayscale, Binarize.

Thresholding : The thresholding also called binarization is a method of image segmentation, separates an image into two parts: the relevant part of foreground and the irrelevant part of background. It refers to setting all the gray levels below a chosen threshold to zero and gray levels above the threshold to one. Mathematically, the thresholding or binarization transforms an image f to an output binary image or segmented image g as follows:

G(i,j) = 1 if f(i,j)≥ T

= 0 otherwise,

where T is the threshold, g(i,j)=1 for image elements of the foreground and g(i,j)=0 for image elements of the background.

Segmentation: Segmenting an image is an important step in many image processing problems. Segmentation is the process of partitioning a digital image inseveral regions or multiple segment (sets of pixels, also known as super pixels). The relationship amongst pixels of a region is defined by parameters such as color, intensity or texture of the region. The resulting image then provides more meaningful information that is useful in initializing the image. Several algorithms and techniques have been developed for image segmentation. They can be classified into three main groups: thresholding, edge- based and region- based. The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

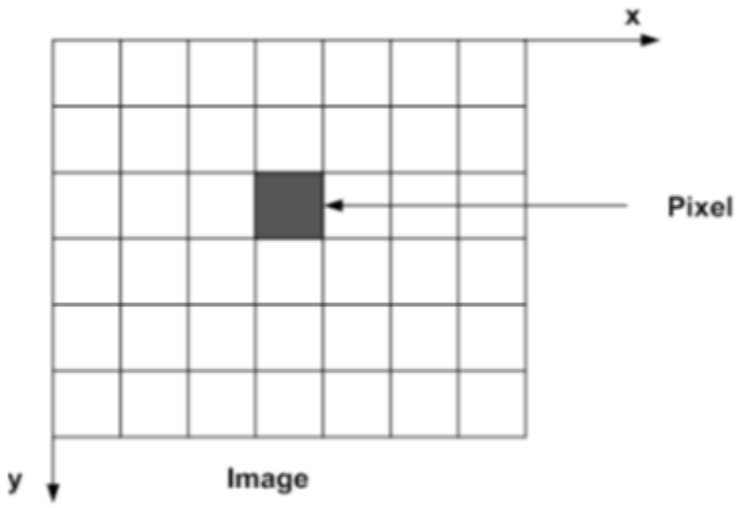

Figure 2: A pixel in an Image Array

Transformation: Transformation of an image from RGB to Lab color is performed, then thresholding is applied to get the facial features.

```
%load rgb image
src = 'C:\image.jpg';
rgbI = imread(src);
%convert to lab
labTransformation = makecform('srgb2lab');
labI = applycform(rgbI,labTransformation);
%seperate l,a,b
l = labI(:,:,1);
a = labI(:,:,2);
b = labI(:,:,3);
figure, imshow(l) , title('l');
figure, imshow(a) , title('a');
figure, imshow(b) , title('b');
```

***Mapping of Facial Features*:** The extracted facial features (eyes, ears, nose and mouth) are plotted in form of tables to give the experimental result. Facial features match values of different images gives the result for proposed work. A comparison table between proposed and existing approach is drawn to show which facial features are extracted by them following the time complexity in which proposed work gives the better result in less time. After that the concept can be used in the utilization of the face

detection for the students of a class room and attendance can be updated based on their faces.

4. Results

SCILAB 5.5.1 Calling Sequence
faces = detectfaces(im)
*Parameters:*im
The input image, color or gray image.
faces
An Nx4 matrix. Each row of the matrix contains information about a face position and size: [x,y,w,h]. (x,y) is the top-left corner coordinates of a rectangle contains a face; w,h are width and height of the rectangle respectively.
Description: The function finds faces in an image.
Fig. 3 to 7 shows the face detection system results in SCILAB.

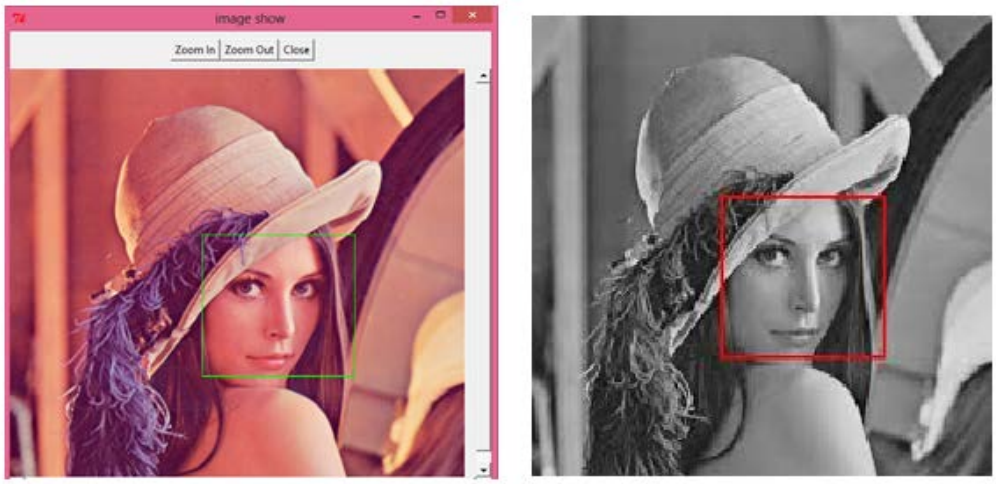

Figure 3: (a) Lena Image face detection (b) Black and white image

Figure 4: Multiface baby image

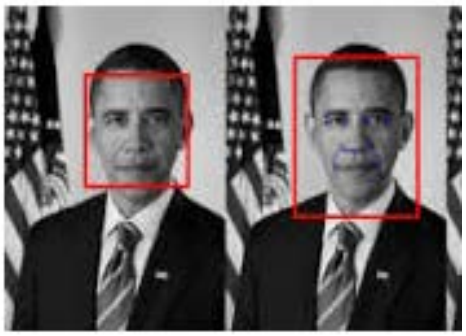

Figure 5: (a)&(b) Face detection of Obama face Image

Figure 6: (a) & (b) Face detection of Modiface Image

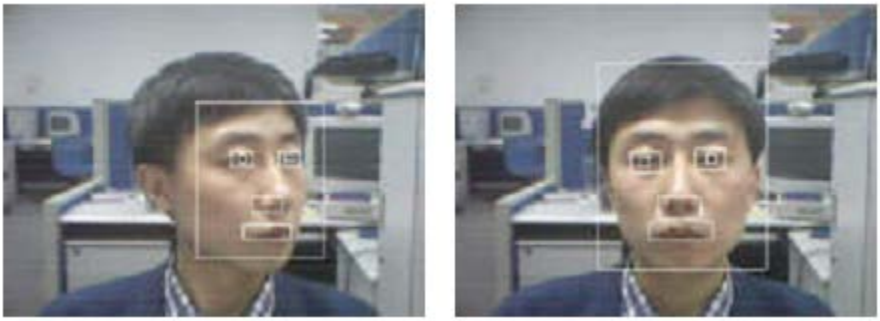

Figure 7: (a) & (b) Face detection of human face

5. Conclusion

We proposed an algorithm capable of extracting the intrinsic geometric features of facial surfaces using geometric invariants, and applying eigen decomposition to the resulting representation.Face recognition systems used today work very well under constrained conditions, although all systems work much better with frontal mug-shot images and constant lighting. All current face recognition algorithms fail under the vastly varying conditions under which humans need to and are able to identify other people. Next generation person recognition systems will need to recognize people in real-time and in much less constrained situations.Human face detection and recognition play important roles in many applications such as video surveillance and face image database management. Face detection and extraction is research for future systems to identify the persons in a group and authenticate the reality of human presence as in airport security system, gathering and class room attendance system.

References

1. Anima Majumder, L. Behera and Venkatesh K Subramanian, 2011 "Automatic and Robust Detection of Facial Features in Frontal Face Images" *UKSim 13th International Conference on Modeling and Simulation*, pp. 331-336.
2. Ali Athariferd and Sedigheh Ghofrani, 2011 "Component Based Face Detection in Color Images" *World Applied Sciences Journal* 13(4): 847-857.
3. B. Xiang and X. Cheng, 2010 "Eye detection based on improved ad A da Boost algorithm, "*IEEE 2nd International Conference on Signal Processing Systems (ICSPS)*, vol. 2, pp.617-620.
4. Jain, A. K., Pankanti, S., Prabhakar, S., and Ross, A. 2001. Recent Advances in Fingerprint Verification , In Proceedings of the Third international Conference on Audio- and Video-Based Biometric Person Authentication, June 2001 J. Bigün and F. Smeraldi, Eds. Lecture Notes In Computer Science, Vol. 2091. Springer-Verlag, London, pp. 182-191.
5. Jain, A.K.; Ross, A.; Prabhakar, S., An introduction to biometric recognition, IEEE Transactions on Circuits and Systems for Video Technology, Vol. 14, Iss. 1, Jan. 2004, pp. 4- 20
6. Liang Wang, Tieniu Tan, Huazhong Ning, Weiming Hu, Silhouette analysis-based gait recognition for human identification , IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 25, Iss. 12, Dec. 2003 pp. 1505- 1518
7. Nicolas Gourier, Daniela Hall and James L. Crowley, 2004 "Facial Features Detection Robust to Pose, Illumination and Identity" in *IEEE*, pp. 1-7.

8. Sanjay Kr. Singh, D.S. Chauhan, Mayank Vatsa and Richa Singh, 2003 "A Robust Skin Color Based Face Detection Agorithm" in *Tamkang Journal of Science and Engineering*, Vol. 6, No. 4, pp. 227-234.
9. Rafael C. Gonzalez, and Richard E. Woods. (2002). chapter:Image Enhancement inSpatial Domain, Digital Image Processing. Publisher: Tom Robines.
10. T. Barbu, 2011, "An Automatic Face Detection System for RGB images", in *Int. J. of Computers, Communications & Control ISSN*, 1841-9836, *E-ISSN*, 1841-9844, Vol (VI) No.1, pp.21-32.
11. Tarek M. Mahmoud, 2008 "A New Fast Skin Color Detection Technique" in *World Academy of Science, Engineering and Technology 43*, pp. 501-505.
12. Yousra Ben Jemma and Sana Khanfir, 2009 "Automatic local Gabor Features extraction for face recognition" in *(IJCSIS) International Journal ofComputer Science and Information Security,* Vol. 3, No. 1, pp. 1-7.
13. W. Huang and R. Mariani, Face detection and precise eyes location, in Proceedings of the 15th International Conference on Pattern Recognition, 2000,
14. Woodard, D.L.; Flynn, P.J., Personal Identification Utilizing Finger Surface Features , IEEE Computer Society Conference on Computer Vision and Pattern Recognition, 2005, Vol. 2, Iss., 20-26, June 2005 pp. 1030- 1036
15. Y. Guan, P.Wu, N. Lu, X. Liu, Efficient and robust face detection from color images;Proceedings of the 6th World Congress on Intelligent Control and Automation, June
16. 23, 2006,, pp. 9664- 9668
17. Y. C. Fan, L. D. Van, C. M. Huang, and H. W. Tsao, "Hardware-Efficient Architecture Design of Wavelet-based Adaptive Visible Watermarking," in Proceedings of 9th IEEE International Symposium on Consumer Electronics, 2005, pp. 399–403.
18. Yang Qianli and Cai Yanhong," A Digital Image Watermarking Algorithm Based on Discrete Wavelet Transform and Discrete Cosine Transform," IEEE international symposium on information technology in Medicine and Education, 2012.
19. Zhong, Yu.,Karu, K., and Jain, A.K. (1995), "Locating text in complex color images". Proceedings of the Third International Conference on Document Analysis and Recognition, 1, 14-16: 146-149.