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# An effective analysis on Face Detection and Recognition using Genetic Algorithm through skin segmentation

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***Abstract— one of the most relevant applications of image processing and biometric systems is Face detection. With varying applications automatic analysis of human face is still a challenging and emerging problem as images have huge information and characteristics quantities. In this paper, we proposed a neural network and genetic algorithm based face recognition system inspired by the Darwin Evolutionist Theory to recognize and verify the person. Although different people have different skin color, several studies have shown that the basic difference based on their intensity rather than their chrominance. Moreover, Human skin color is an effective feature used to detect faces. Therefore, this research includes a* general review of face detection studies and systems which based on different ANN approaches and algorithms.**
**Keywords**— ***Face detection, biometric, genetic algorithm, chrominance, image processing.***

## I. INTRODUCTION

Among many recognition subjects, face recognition has drawn considerable interest and attention from many researchers for the last two decades. Humans make use of face as an important clue for identifying people. This makes automatic face recognition very vital for a wide range of applications in areas like surveillance and security control systems, content-based image retrieval, Closed Circuit Television (CCTV) control, video conferencing and intelligent human computer interfaces [1] and so on. The human faces represent complex, multidimensional, meaningful visual stimulant. Developing a computational model for face recognition is difficult [2]. Face detection can be regarded as fundamental part of face recognition systems. The process of face detection is complex because of variability present across human faces such as: pose; expression; position and orientation; skin color; presence of glasses or facial hair; differences in camera gain; lighting conditions; and image resolution. In this paper, we propose an investigation of the Genetic Algorithms technique application in facial detection, which will solve the one step for face recognition. Inspired by Darwin Evolutionary Theory, Genetic Algorithms (GA's) are characterized as one search technique and shaped using some selection mechanisms used in Nature, according with that individuals who are abler in a population are those who have more survival possibility, when adapting themselves more easily to the changes that occur in their habitats.

## II. LITERATURE REVIEW & RELATED WORK

There are various approaches proposed by various researchers for face recognition. We can broadly classify these approaches or techniques based on the face on which they can be applied.

### *A. Eigen face-based Recognition Approach*

The information theory approach of encoding and decoding face images extracts the relevant information in a face image, encode it as efficiently as possible and compare it with database of similarly encoded faces. The encoding is done using features which may be different or independent than the distinctly perceived features like eyes, ears, nose, lips, and hair [3]. Mathematically, principal component analysis approach will treat every image of the training set as a vector in a very high dimensional space. The eigenvectors of the covariance matrix of these vectors would incorporate the variation amongst the face images. Now each image in the training set would have its contribution to the eigenvectors (variations). This can be displayed as an eigenface representing its contribution in the variation between the images. In each eigenface some sort of facial variation can be seen which deviates from the original image. The high dimensional space with all the eigenfaces is called the image space (feature space). Also, each image is actually a linear combination of the eigenfaces. The amount of overall variation that one eigenface counts for, is actually known by the eigenvalue associated with the corresponding eigenvector. If the eigenface with small eigenvalues are neglected, then an image can be a linear combination of reduced no of these eigenfaces. For example, if there are M images in the training set, we would get M eigenfaces. Out of these, only M eigenfaces are selected such that they are associated with the largest eigenvalues. These would span the M-dimensional subspace face space out of all the possible images (image space).

*B. 3D Face Recognition Approach*

Three-dimensional face recognition (3D face recognition) is a modality of facial recognition methods in which the three-dimensional geometry of the human face is used. It has been shown that 3D face recognition methods can achieve significantly higher accuracy than their 2D counterparts.3D face recognition has the potential to achieve better accuracy than its 2D counterpart by measuring geometry of rigid features on the face [4]. This avoids such pitfalls of 2D face recognition algorithms as change in lighting, different facial expressions, make-up and head orientation [4]. The main technological limitation of 3D face recognition methods is the acquisition of 3D image, which usually requires a range camera. Alternatively, multiple images from different angles from a common camera may be used to create the 3D model with significant post-processing. This is also a reason why 3D face recognition methods have emerged significantly later (in the late 1980s) than 2D methods.

*C. Principal Component Analysis (PCA)*

Derived from Karhunen Loeve's transformation, Principal Component Analysis (PCA) is one of the popular methods for feature selection and dimension reduction. Recognition of human faces using PCA was first done by Turk and Pentland [5] and reconstruction of human faces was done by Kirby and Sirovich [6]. The recognition method, known as eigenface method defines a feature space which reduces the dimensionality of the original data space. This reduced data space is used for recognition. But poor discriminating power within the class and large computation are the well known common problems in PCA method. This limitation is overcome by Linear Discriminant Analysis (LDA). LDA is the most dominant algorithms for feature selection in appearance based methods [6]. But many LDA based face recognition system first used PCA to reduce dimensions and then LDA is used to maximize the discriminating power of feature selection. The reason is that LDA has the small sample size problem in which dataset selected should have larger samples per class for good discriminating features extraction. Thus implementing LDA directly resulted in poor extraction of discriminating features. In this [7] Gabor filter is used to filter frontal face images and PCA is used to reduce the dimension of filtered feature vectors and then LDA is used for feature extraction. The performances of appearance based statistical methods such as PCA, LDA and ICA are tested and compared for the recognition of colored faces images in [8]. PCA is better than LDA and ICA under different illumination variations but LDA is better than ICA. LDA is more sensitive than PCA and ICA on partial occlusions, but PCA is less sensitive to partial occlusions compared to LDA and ICA. PCA is used as a dimension reduction technique in [9] and for modeling expression deformations in [10].A recursive algorithm for calculating the discriminant features of PCA-LDA procedure is introduced in [11]. This method concentrates on challenging issue of computing discriminating vectors from an incrementally arriving high dimensional data stream without computing the corresponding covariance matrix.

*D. Support Vector Machine (SVM)*

Support Vector Machines (SVM) is one of the most useful techniques in classification problems. One clear example is face recognition. However, SVM cannot be applied when the feature vectors defining samples have missing entries. A classification algorithm that has successfully been used in this framework is the all-known Support Vector Machines (SVM) [13], which can be applied to the original appearance space or a subspace of it obtained after applying a feature extraction method [14] [15] [16]. The advantage of SVM classifier over traditional neural network is that SVMs can achieve better generalization performance.

*E. Active Appearance Model (AAM)*

An Active Appearance Model (AAM) is an integrated statistical model which combines a model of shape variation with a model of the appearance variations in a shape normalized frame. An AAM contains a statistical model if the shape and gray level appearance of the object of interest which can generalize to almost any valid example. Matching to an image involves finding 27 model parameters which minimize the difference between the image and a synthesized model example projected into the image. The AAM is constructed based on a training set of labeled images, where landmark points are marked on each example face at key positions to outline the main features [17].

## III. PROPOSED WORK AND OBJECTIVE

The main objectives are to enhance the image quality and recognize the face with precision from the input image with accuracy. And the entire propose work has divided into two modules

*A. Face Detection*

*1)* Initially for the input we consider a color image for a system. The reason behind concentrating on color image is we require a color skin region of a human face.

*2)* After receiving a color image there is a need to detect a skin region by following color patterns.
*3)* Now, if the skin region of a human face is detected and accepted properly, then from the available database we will load the features images and then locate various features in skin area.
*4)* Finally, we present the output in the form of Face regions with features.
*5)* If skin region is not present in the image, then we discard this image and no further processing is done.

*B. Face Recognition*

*1)* For recognizing the face, firstly load the detected image as an input to the face recognition system.
*2)* Then train artificial neural network using Genetic algorithm.
*3)* Finally load the trained file and test the Input image using Artificial Neural Network. Analyze and fetch result with recognize face.

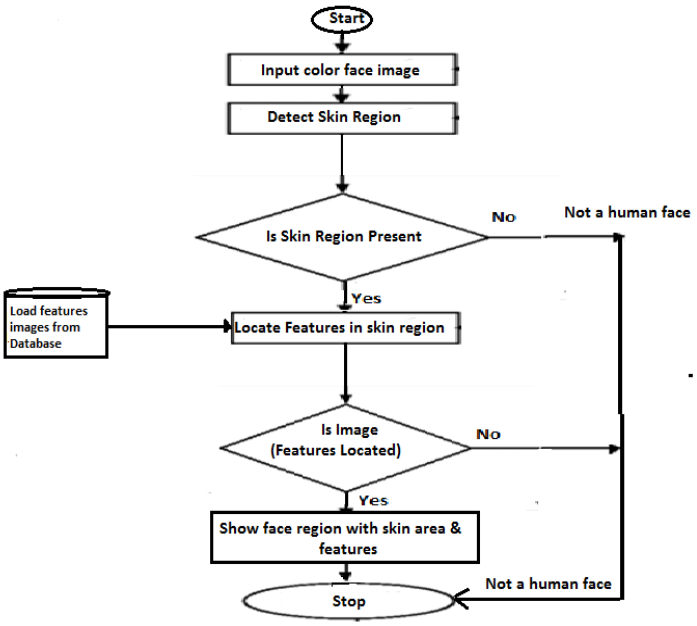


FIGURE 1: PROPOSED METHOD FOR FACE DETECTION

## IV. CONCLUSION

This paper includes a summary review of literature studies related to face detection systems based on ANNs. Different architecture, approach, programming language, processor and memory requirements, database for training/testing images and performance measure of face detection system were used in each study. Each study has its own strengths and limitations. In future work, a face detection system will be suggested based specific method for generating features vector of the whole face in an image, by first detecting face regions using the color of skin which presents a robust overlooked in different background, accessory and clothing. It is a fast algorithm for extracting human faces in color images and easy to implement. GA is then applied to perform the recognition task. This system proves to be very useful for security such as access control, comparing surveillance images to know terrorists, legislature i.e. identify of voter prior to vote, Banking minimize fraud by verifying identity of person.

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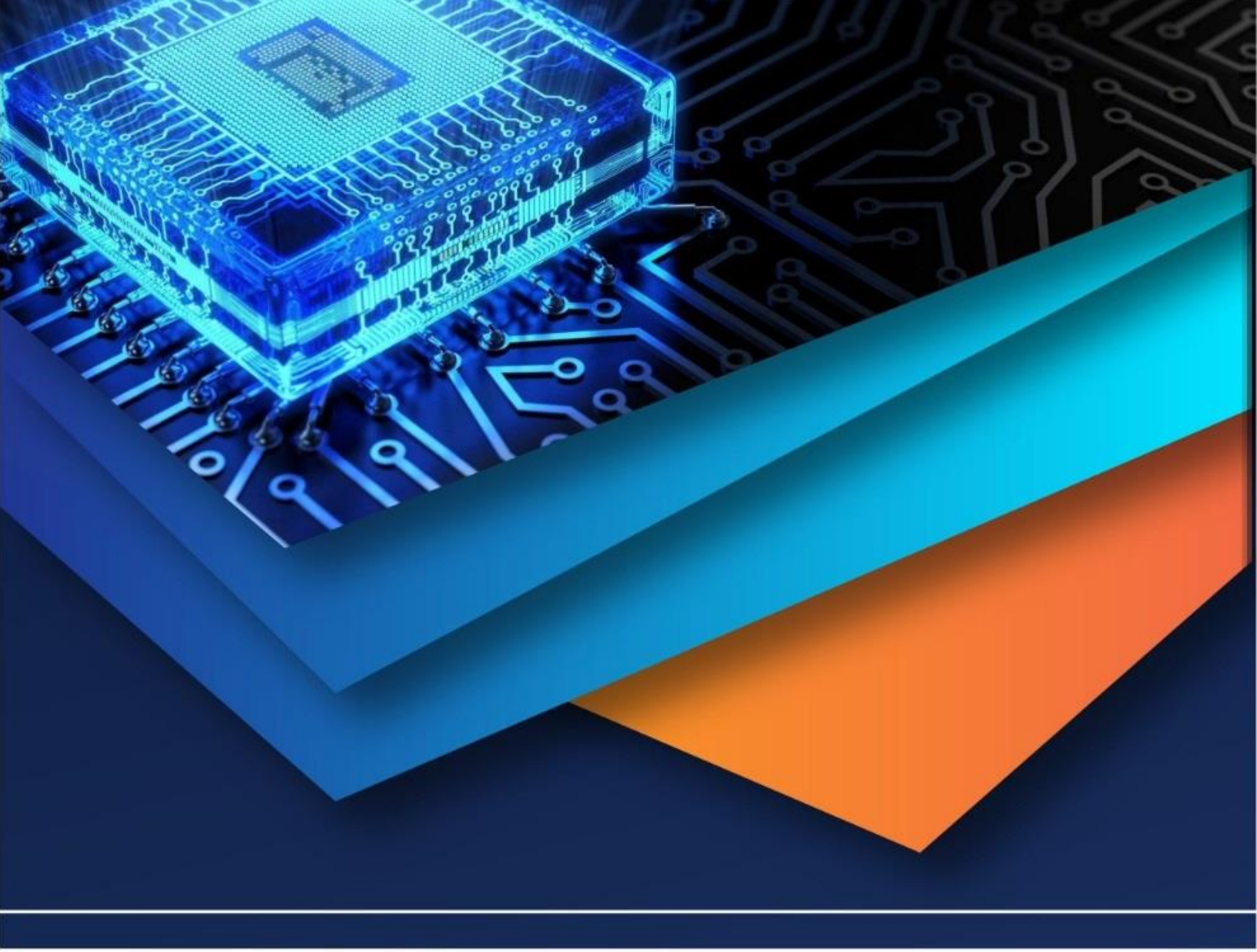

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