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Neural Network Based Face Recognition Using Erosion and Dilation Technique: A Review

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Abstract:
It has been observed that many face recognition algorithms fail to recognize faces after plastic surgery and wearing the spec/glasses which are the new challenge to automatic face recognition. Face detection is one of the challenging problems in the image processing. This project, introduce a face detection and recognition system to detect (finds) faces from database of known people.
To detect the face before trying to recognize it saves a lot of work, as only a restricted region of the image is analyzed, opposite to many algorithms which work considering the whole image. In This , we gives study on Face Recognition After Plastic Surgery (FRAPS)and after wearing the spec/glasses with careful analysis of the effects on face appearance and its challenges to face recognition.
To address FRAPS and wearing the spec/glasses problem, an ensemble of An Optimize Wait Selection By Genetic Algorithm For Training Artificial Neural Network Based On Image Erosion and Dilution Technology. Furthermore, with our impressive results, we suggest that face detection should be paid more attend to. To address this problem, we also used Edge detection method to detect i/p image properly or effectively. With this Edge Detection also used genetic algorithm to optimize weight using artificial neural network (ANN)and save that ANN file to database .And use that ANN file to compare face recognition in future .

Keywords: *erosion and dilation, artificial neural network (ANN), face recognition, genetic algorithm, FRAPS*

1. Introduction

In recent years, plastic surgery has become popular worldwide. People take facial plastic surgery to correct feature defects or improve attractiveness and condense. According to the statistics from American Society for Aesthetic Plastic Surgery [2], from 1997 to 2011, there has been over 197% increase in the total number of cosmetic procedures. The above statistical recognized lead to a practical requirement on identity authentication after plastic surgery. Especially, for face- based biometrics, plastic surgery poses a great challenge, because not only local skin texture but also face components such as eyelid and nose might be disturbed or reshaped in plastic surgery. Even the holistic appearance of face may greatly change because of the global face plastic surgery such as face lift or skin peeling [1].

Face recognition is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness. It has the accuracy of a physiological approach without being intrusive [3]. For this reason, since the early 70's (Kelly, 1970), face recognition has drawn the attention of researchers in fields from security, psychology, and image processing, to computer vision.

Face detection is the essential front end of any face recognition system, which locates the face regions from images. Most of the current face recognition systems presume that faces are readily available for processing. However, in reality, we do not get images with just faces. We need a system, which will detect the face in image, so that this detected face can be given as input to face recognition systems. Given an image, the goal of a face detection algorithm is to identify the location and scale of all the faces in the image. The task of face detection is so trivial for the human brain, yet it still remains a challenging and difficult problem to enable a computer to do face detection.

This is because the human face changes with respect to plastic surgery and wearing the spec/glasses. To achieve high accuracy, the recognition should be performed based on intrinsic properties, and the algorithms should be able to deal with unfavorable influences due to extrinsic factors and misalignment. There is a ways to validate this assumption :-Here we can use erosion and dilution techniques With this technique we firstly give i/p image then if face is present then crop the image ,after that enhance that image ,the

we crop eye section then dilute crop eyes section and erase original i/p image eye section with newly diluted eye section . At last we recognized image using neural network and genetic algorithm.

2. Litrature Review

The method for acquiring face images depends upon the underlying application. For instance, surveillance applications may best be served by capturing face images by means of a video camera while image database investigations may require static intensity images taken by a standard camera. Some other applications, such as access to top security domains, may even necessitate the forgoing of the non-intrusive quality of face recognition by requiring the user
to stand in front of a 3D scanner or an infra-red sensor. Therefore, depending on the face data acquisition methodology, face recognition techniques can be broadly divided into three categories: methods that operate on intensity images, those that deal with video sequences, and those that require other sensory data such as 3D information or infra-red imagery [3].

Recently, human face detection algorithms based on color information have been reported. The face regions are initially segmented based on the characteristic of skin tone colors. The color signal is usually separated into its luminance and chrominance components in an image or video. Experimental results show that the skin-like regions can be segmented by considering the chrominance components only. Although skin Colors differ from person to person, they are distributed over a very small area on the chrominance plane. However, human face detection and facial feature extraction in gray-level images may be more difficult because the characteristics of skin tone color are not available [4,5,6]. K.K. Sung proposed an example-based learning approach for locating vertical frontal views of human faces in complex scenes. A decision-making procedure is trained based on a sequence office and non-face examples. Six face clusters and six non-face clusters are obtained according to 4150 normalized frontal face patterns. The face regions are located by matching the window patterns at different image locations and scales against the distribution-base face model. T.S. Huang proposed a hierarchical knowledge-based method consisting of three levels for detecting the face region and then locating facial component in an unknown picture. Images of different resolutions are used in the two higher levels. Two sets of rules based on the characteristics of a human face region are applied to the images. At third level, the edge of facial components is extracted for the verification of face candidates. However, the computational requirements of these methods may be too high for some applications, which may be unable to detect and locate a tilted human face reliably. Extraction of facial features by evaluating the topographic gray-level relief has been introduced [4,8,9] . Since the intensity is low for the facial components, the position of the facial features can be determined by checking the mean gray-level in each row and then in each column.

In facial feature detection based on the geometrical face model was proposed. The model is constructed based on the relationships among facial organs such as nose, eyes, and mouth. However, these methods can work properly only under well-lit conditions [9,10].

3. Proposed Work

In that project, we used erosion and dilution technique for face recognition based on neural network and genetic algorithm.

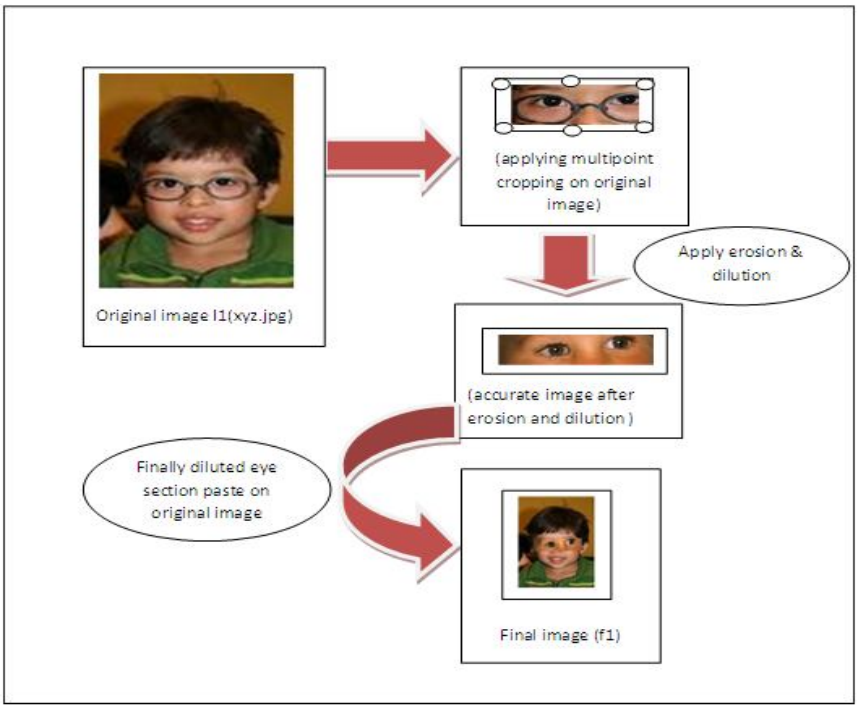

Figure 1: Face recognition using erosion and dilution technology

- Following flowchart shows how exactly my project will work:-

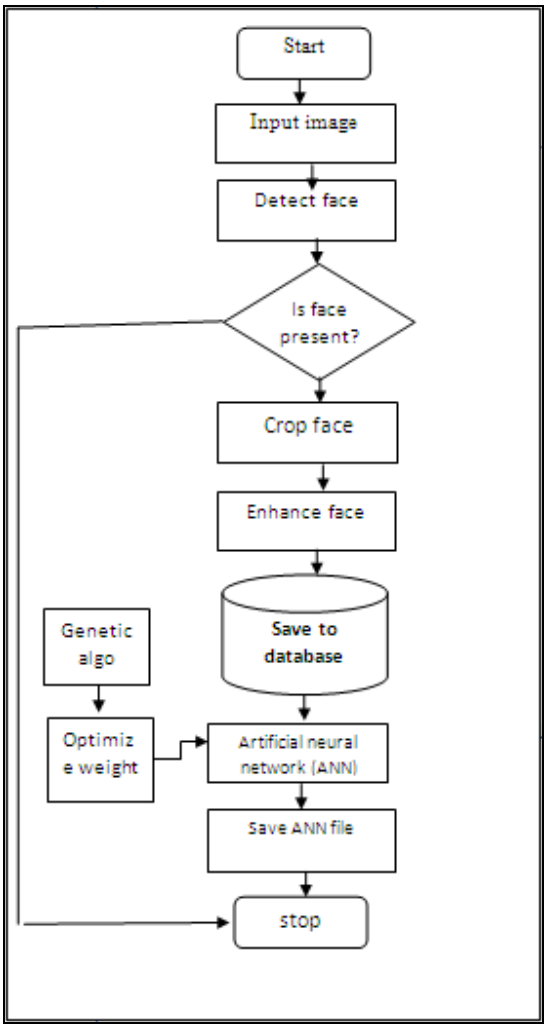

Figure 2 (a): Propose work for database creation

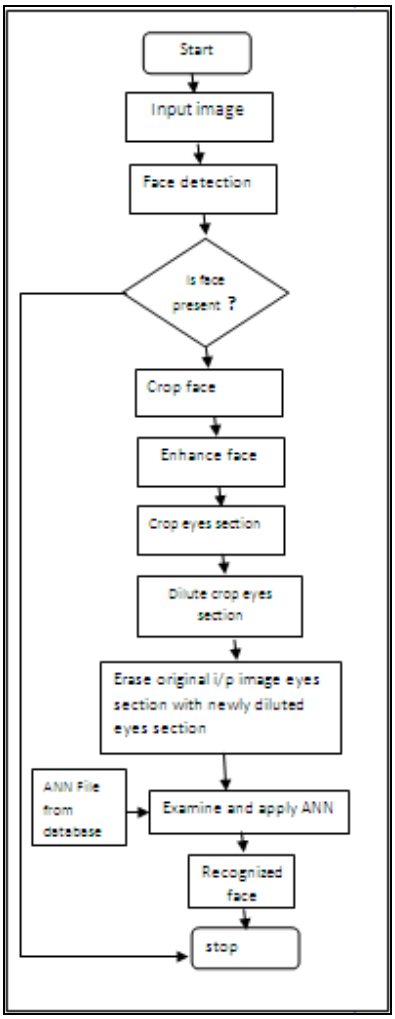

Figure 2 (b): Propose work for Testing

3.1. Introduction to Erosion and Dilation Technique

Erosion is one of two fundamental operations (the other being dilation) in morphological image processing from which all other morphological operations are based. It was originally defined for binary images. The basic idea in binary morphology is to examine (probe) an image with a simple, pre-defined shape, drawing conclusions on how this shape fits or misses the shapes in the image. This simple "probe" is called structuring element, and is itself a binary image (i.e., a subset of the space or grid).

Dilation is , In computer graphics, the process of improving the quality of a digitally stored image by manipulating the image with software. It is quite easy, for example, to make an image lighter or darker, or to increase or decrease contrast. Advanced image enhancement software also supports many filters for altering images in various ways. Programs specialized for image enhancement, are sometimes called image editors.

Algorithm used for erosion and dilation on method:-

```
// start with an input image
        // crop eye section
                {If i/p image ware spec/glass}
//enhance crop eye section
                //dilute eye section
// paste that dilated section in original i/p image.
        end;
```

Figure 3: Erosion and dilation algo

3.2. Eadge Detection

Edge detection is a type of image segmentation techniques which determines the presence of an edge or line in an image and outlines them in an appropriate way [20]. The main purpose of edge detection is to simplify the image data in order to minimize the amount of data to be processed [21].

Computerized human face recognition has been an active research area for the last 20 years. It has many practical applications, such as bankcard identification, aces control, mug shots searching, security monitoring, and surveillance systems. Face recognition is used to identify one or more persons from still images or a video image sequence of a scene by comparing input images with faces stored in a database. It is a biometric system that employs automated methods to verity or recognizes the identity of person based on his/her physiological characteristic. In general, a biometric identification system makes use of either physiological characteristics or behavior patterns to identify a person. Because of human inherent protectiveness of his/her eyes, some people are reluctant to use eye identification systems. Face recognition has the benefit of being a passive, nonintrusive system to verify personal identity in a "natural" and friendly way.

The purpose of detecting sharp changes in image brightness is to capture important events and changes in properties of the world. It can be shown that under rather general assumptions for an image formation model, discontinuities in image brightness are likely to correspond to:[23][24]

An edge in an image is a contour across which the brightness of the image changes abruptly. In image processing, an edge is often interpreted as one class of singularities. In a function, singularities can be characterized easily as discontinuities where the gradient approaches infinity. However, image data is discrete, so edges in an image often are defined as the local maxima of the gradient. Edge detection is an important task in image processing. It is a main tool in patten recognition, image segmentation, and scene analysis. An edge detector is basically a high pass filter that can be applied to extract the edge points in an image.

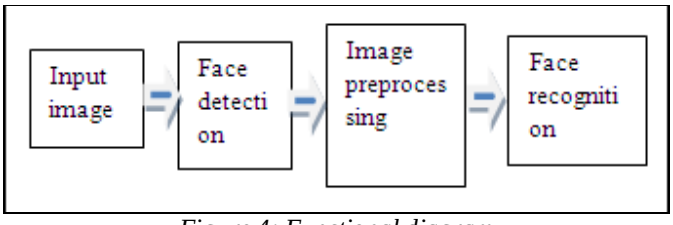

Figure 4: Functional diagram

- Algorithm:-

STEP 1: Get the edge map image (edge (I,j)) from RGB image using sobel operator.

STEP 2: For each pixel (I,j),get the corresponding H and S values.

STEP 3:if (colorhistogram(H,S)>skinthresold) and(edge(I,j)<edgethresold) then skin(I,j)=1 i.e. (I,j) is a skin pixel , else skin(I,j)=0 i.e. (I,j) is a non-skin pixel

STEP 4: Find the different regions in the image by implementing connectivity analysis using 8- connected neighborhood.

STEP 5: Find height, width and centroid for each region and percentage of skin in each region

STEP 6: For each region, if (height/width) or (width/height) is within the range (goldenration ± tolerance) and (percentage of skin>percentage of threshold) then the region is a face, else it is not face.

Figure 6: Edge detection algorithm

3.3. Genetic Algorithm

Genetic Algorithms (GAs) are adaptive heuristic search algorithm based on the evolutionary ideas of natural selection and genetics. As such they represent an intelligent exploitation of a random search used to solve optimization problems. Although randomized, GAs are by no means random, instead they exploit historical information to direct the search into the region of better performance within the search space. The basic techniques of the GAs are designed to simulate processes in natural systems necessary for evolution, especially those follow the principles first laid down by Charles Darwin of "survival of the fittest.". Since in nature, competition among individuals for scanty resources results in the fittest individuals dominating over the weaker ones.[19]

Genetic Algorithms are used for a number of different application areas. An example of this would be multidimensional OPTIMIZATION problems in which the character string of the CHROMOSOME can be used to encode the values for the different parameters being optimized.[20]

When the GENETIC ALGORITHM is implemented it is usually done in a manner that involves the following cycle: Evaluate the FITNESS of all of the INDIVIDUALs in the POPULATION. Create a new population by performing operations such as CROSSOVER, fitness-proportionate REPRODUCTION and MUTATION on the individuals whose fitness has just been measured. Discard the old population and iterate using the new population. [19]

One iteration of this loop is referred to as a GENERATION. There is no theoretical reason for this as an implementation model. Indeed, we do not see this punctuated behavior in POPULATIONs in nature as a whole, but it is a convenient implementation model. [19]

3.4. ANN

Face recognition is a visual pattern recognition problem. In detail, a face recognition system with the input of an arbitrary image will search in database to output people's identification in the input image. Face detection segments the face areas from the background. In the case of video, the detected faces may need to be tracked using a face tracking component. Face alignment aims at achieving more accurate localization and at normalizing faces thereby, whereas face detection provides coarse estimates of the location and scale of each detected face. Facial components, such as eyes, nose, and mouth and facial outline, are located; based on the location points, the input face image is normalized with respect to geometrical properties, such as size and pose, using geometrical transforms or morphing. The face is usually further normalized with respect to photometrical properties such illumination and gray scale. After a face is normalized geometrically and photo metrically, feature extraction is performed to provide effective information that is useful for distinguishing between faces of different persons and stable with respect to the geometrical and photometrical variations. For face matching, the extracted feature vector of the input face is matched against those of enrolled faces in the database; it outputs the

identity of the face when a match is found with sufficient confidence or indicates an unknown face otherwise. Artificial neural networks were successfully applied for solving signal processing problems in 20 years. Researchers proposed many different models of artificial neural networks. A challenge is to identify the most appropriate neural network model which can work reliably for solving realistic problem.[25]

A neural network for the face detection task is challenging because of the difficulty in characterizing prototypical "nonface" images. Unlike face recognition

, in which the classes to be discriminated are different faces, the two classes to be discriminated in face detection are "images containing faces" and "images not containing faces". It is easy to get a representative sample of images which contain faces, but much harder to get a representative sample of those which do not. We avoid the problem of using a huge training set for non-faces by selectively adding images to the training set as training progresses This "bootstrap" method reduces the size of the training set needed. The use of arbitration between multiple networks and heuristics to clean up the results significantly improves the accuracy of the detector. [26]

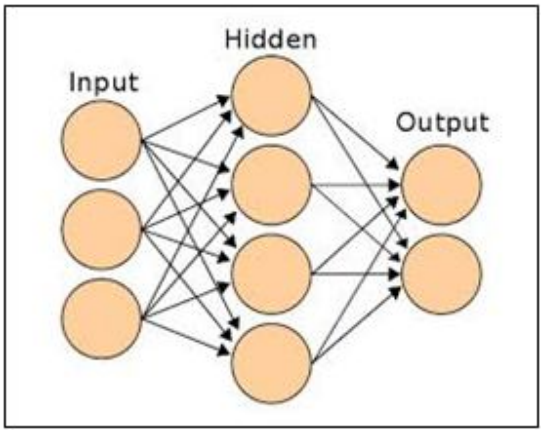

Figure 7: ANN

4. Conclusion

This paper has attempted to review a significant number of papers to cover the recent advanced development in the field of neural network. this methodology express the idea of erosion and dilation technique used for face recognition also for the enhancements of face we discussed edge detection for detecting the face in accurate manner.

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