IMPROVED ACCURACY FOR FACIAL FEATURE POINT DETECTION AND FACIAL EXPRESSION RECOGNITION

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ABSTRACT

In this paper algorithm to detects human facial features like the mouth, nose and eyes in a full frontal face image is proposed. The new algorithm is proposed in order to detect automatically face features (eyes, mouth and nose) and extract their corresponding geometrical point. This project presents and implements a facial feature point extraction and recognition method of facial expression and emotion from still images. There are two steps to recognize the facial emotion. Detecting facial feature point with ROI, and verifying the facial of characteristic with Gabor. .In this paper a new algorithm based on a set of images to facial feature point and facial expression recognition has been proposed. This process calls for four stages pre-processing, edge detection, feature extraction, face detection.

Keywords: Morphological operation (OPENING AND CLOSING), ROI, Gabor Filter, Feature point Detection, Facial expression and recognition

I. INTRODUCTION

Face detection is a very challenging field that target methods make effective human computer interaction. Therefore, facial expressions are the most important information for emotions perception in face to face communication. For classifying facial expressions into different categories, it is necessary to extract important facial features which contribute in identifying proper and peculiar manifestations.

Recognition and classification of human facial expression of computer is an important issue to develop automatic facial expression recognition system in vision community. An automatic method to recognize facial expressions in images or video For face portion segmentation basic image processing operation like morphological dilation, erosion, reconstruction techniques with disk structuring element are used. Six permanent Facial features like eyebrows (left and right), eye (left and right), mouth and nose are extracted using facial geometry, edge projection analysis and distance measure and feature vector is formed considering height and width of left eye, height and width of left eyebrow, height and width of right eye, height and width of right eyebrow, height and width of nose and height and width of mouth along with distance between left eye and eyebrow, distance between right eye and eyebrow and distance between nose and mouth. Experiments are run out on JAFFE facial expression database and any sample human face images.

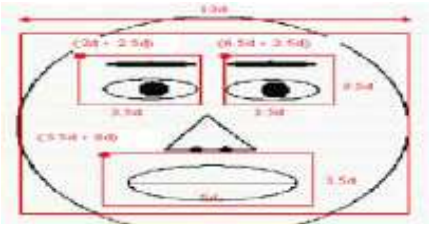

Fig 1 Geometric face model

Fig. 1 Few samples of facial expressions of person

II. RELEATED WORK

Face detection determines the locations and sizes of faces in an input image. They are easily located in cluttered scenes by infants and adults alike; however automatic human face detection by computers is a real challenging task because face patterns can have significantly variable image appearances. For example, human faces vary from genders, ages, hair styles and races, etc. In addition, the variations of scales, shapes and poses of faces in images also hinder the success of automatic face detection systems. To stand for the geometrical relations of those three areas. Based on the face model, three initial rectangles can be quickly located from the face detected by the previous step. Since geometric relations between the optics and the mouth vary a slight bit from person to person, we have to refine these three initial rectangles to fit their correct parts. It uses the information of the horizontal and the vertical edges of the regions enclosed by the three initial rectangles to refine the locations and sizes of the rectangles. Illustrates three refined rectangles. While there are 30 feature points uniformly spread in each of the upper rectangles, 24 feature points are uniformly spread in the mouth rectangle.

Segmentation is very important to image retrieval process. The shape feature and the layout feature both depend on good segmentation technique. Image segmentation algorithms are generally based on one of the two basic properties of intensity values: zIn Region based segmentation the objective is to partition an image into regions. This report explains the algorithms for finding Region of Interest from the facial images and extraction of features from the respective Region of Interest. In the proposed techniques, the different ROI's from the facial data are taken as Lips and Eyes of the human facial image. These are detected from the face with the help of skin color and the knowledge based methods in concern with the human face data.

Recognizing someone from facial features makes human recognition a more automated operation. Basically the extraction of facial feature points, (eyes, nose, mouth) plays an important role in many applications, such as face recognition, face detection model based image coding, expression recognition, facial animation and head pose determination. Facial recognition can be used mostly for police work purposes. For example, public safety, suspected terrorists, and missing children. Facial feature extraction has some problems which must be believed and be solved. Some problems of facial feature extraction are given as follow: Small variations of face size and orientation can be effected the result. As the input image comes from the webcam in the room condition the captured image has different brightness, shadows and clearness which can be failed the process. Sometimes facial features may be covered with other things, such as a hat, a glass, hand or hairs. Human faces have a change of emotions by many different expressions, only this arrangement can detect the corner of the features in

the case of neutral, sad, happy and surprise. Most facial feature extraction methods are sensitive to various non-ideals such as variations in illumination, noise, orientation, time-consuming and color space used. In the next section we briefly describe the related work also comparing the techniques.

III. SYSTEM ARCHITECTURE DESIGN

The given input image is load and converted to gray level for processing. It is transformed to Histogram equcation.Then using morphological operation where closing and opening process of image is carried out. Using segmentation, the region of interest(ROI) points are calculated and extracted. For each parts are of the image do segmentation process. Fig 3 Represent below,

- First, To extract the feature points are eye, lip, and nose extraction.
- Second, Facial expression detection is happy, sad, anger, and etc
- Third, Facial expression recognition

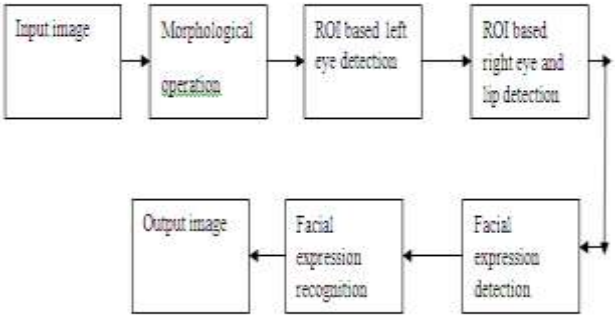

Fig 3 Block Diagram

3.1 Dataflow Diagram

The Skin Color Segmentation algorithm is applied to the loaded image to find the skin color for the detection of faces from the image given to the system.

1. pixels are considered as the width and height of the face present .
2. To check the possibility to have a face in the given image, the height and width of the face area must follow the following criteria.

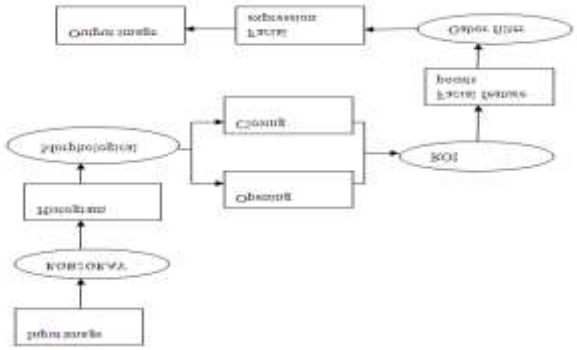

Fig 4 Dataflow Diagram

$$height \geq 50 \text{ , } width \geq 50 \; 1 \leq height\, width \leq 2$$

3. After Face , convert the facial image into Binary image.

4. Then cut the Face from the binary image according to skin color pixels present in the image by considering height and width.
5. To apply morphological operation is opening, closing (erosion and dilation).
6. Then find Region of Interests (ROI) from the face as Left Eye, Right Eye and Lip according to knowledge based method of face detection.
7. Then Gabor filter using to identify facial expression detection.
8. Finally facial expression is detected and recognized from the database.

IV. MODULE DESCRIPTION

- Preprocessing
- Morphological operation
- ROI based feature segmentation
- Facial expression detection.
- Facial expression recognition

4.1 Preprocessing

Pre-processing is applied on images at the lowest level of abstraction and its aim is to reduce undesired distortions and enhance the image data which is useful and important for further processing . It is usually necessary and required for improving the performance of image processing methods like image transform, segmentation, feature extraction and fault sensing. This report is focused on filtering pre-processing methods.

4.2 Morphological Operation

Morphological operations are affecting the shape, structure or shape of an aim. Applied on binary images (black & white images – Images with only 2 colors: black and blank). They are practiced in pre or post processing (filtering, diluting, and pruning) or for generating a representation or description of the physical body of objects/regions (boundaries, skeletons convex hulls).

Black pixel: in grayscale values for a 8 bits/pixel indexed image its value will be 0

White pixel: in grayscale values for a 8 bits/pixel indexed image its value will be 255.

4.3 The Dilation

It is best described in a sequence of steps:

1. If the source of the structuring element coincides with a 'white' pixel in the image, there is no change; move to the adjacent pixel.

2. If the source of the structuring element coincides with a 'black' in the image, make black all pixels from the image covered by the structuring element

Notation: $A \oplus B$

4.4 The erosion

The corrosion process is similar to dilation, but we turn pixels to 'white', not 'black'. As in front, slide the structuring element across the picture and then pursue these stairs:

1. If the source of the structuring element coincides with a 'white' pixel in the image, there is no change; move to the adjacent pixel.

2. If the source of the structuring element coincides with a 'black' pixel in the image, and at least one of the 'black' pixels in the structuring element falls over a blank pixel in the image, and so modify the 'black' pixel in the image (corresponding to the spot on which the essence of the structuring element falls) from ‘black’ to a 'white'

. **Notation**: A Θ B

4.5 ROI Based Feature Segmentation

Image segmentation is the process of partitioning a digital picture into multiple segments (sets of picture elements, also recognized as super pixels). The goal of partitioning is to simplify and/or alter the representation of an image into something that is more meaningful and more comfortable to break down. Image segmentation is typically applied to locate objects and boundaries (lines, bends, etc.) in images. More precisely, image segmentation is the procedure of assigning a label to every pixel in an image such that pixels with the same label share certain visual features.

In Region based segmentation the objective is to partition an image into parts. This report explains the algorithms for finding Region of Interest from the facial images and extraction of features from the respective Region of Interest. In the proposed techniques, the different ROI’s from the facial data are taken as Lips and Eyes of human facial image an facial data.

4.6 Facial Expression Detection

The facial expression presented in the image sequence. The movements of facial points (eyebrows, eyes, and mouth) have a substantial relation to the information about the facial construction. Consequently, many approaches greatly depend on the tracking of permanent facial features (eyebrows, eyes, lip, and creases that have become permanent with age) and/or transient facial features (facial wrinkles and wrinkles that are not present at a neutral state).

4.7 Facial Expression Recognition

A facial recognition system represents a data processor-driven application for automatically authenticating a person from a digital picture or a picture sequence. It performs the recognition by comparing selected facial characteristics in the input image with a face database. Any recognition process is divided into two main operations:

1. Face identification
2. Face verification.

Facial identification consists in putting the input face image to one mortal of a known group, while face verification consists in validating or rejecting the previously detected person identity..

V. IMPLEMENTATION AND RESULT

The images are resized to 256 x 256. Once an input image is submitted to the system the images are pre-processing using filtering technique. Afterward that the Feature Extraction using color and luminance is performed for segmented images. From the extracted features to identify facial expression and facial expression recognition images.

- Preprocessing

- Morphological operation
- ROI based feature segmentation

5.1 Preprocessing

Noise Reduction: Filtering is used for blurring and noise reduction**.**

Mean filter : Reducing the amount of intensity variation between one pixel and the next pixel. It is often used to reduce noise in images.

Histogram: Histogram is a graphical representation of distributed data and it also represents the tabulated frequencies.

5.2 Morphological Operation

The two principal morphological operations are dilation and erosion. Dilation allows objects to expand, thus potentially filling in small holes and connecting disjoint objects. Erosion shrinks objects by etching away (eroding) their limits..

5.3 ROI Based Feature Segmentation

In Region based segmentation the objective is to partition an image into parts. This report explains the algorithms for finding Region of Interest from the facial images and extraction of features from the respective Region of Interest. These are detected from the face with the help of skin color and the knowledge based methods in concern with the human face data.

5.4 Feature Extraction

Feature extraction is a special form of rejection. Transforming the input data into the set of features is called feature extraction. There may be a number of Features of an image, including point, edge, line region and corner point

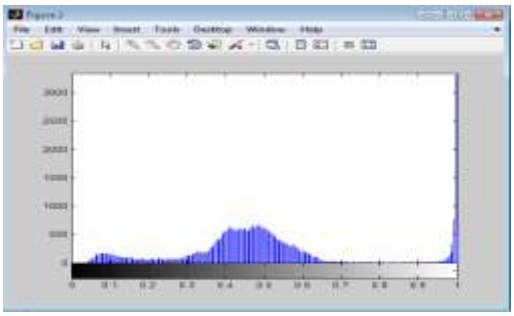

Figure 6.1 Histrogram

Figure 6.2 Morphological Operation

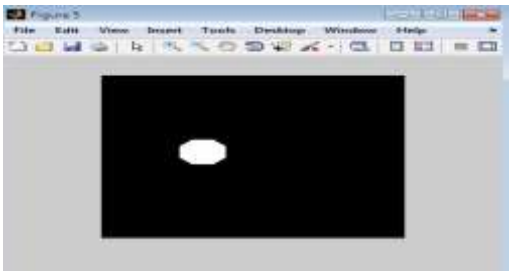

Figure 6.3 ROI

Build 6.4 To Detect Left Eye

VI. CONCLUSION

In this report the proposed an accurate and high speed facial detection system. The feature-based detections to find skin-color fast and selected candidate blocks carefully. It used lighting compensation to improve the performance of the morphological based scheme, and reduce the computation of feature-based scheme.. To ROI to measure the pixel points (X, Y) distance is different for every image posing different emotions. Due to the proposed method has simple structure, it is suitable to be implemented into achieving very high performance and low power system.

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