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Intelligent Emotion Detection System Using Facial Images

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Abstract - *Facial image recognition has seen many developments in the recent past. The human face plays a prodigious role for automatic recognition of emotion and the interaction between human and computer for some real time applications. The emotions are effectively changeable happenings, so in real life application, detection of emotion is a very challenging task. An emotional state of a person may influence concentration, task solving and decision making skills and as such the main vision is to make systems able to recognize and influence human emotions in order to enhance the productivity and effectiveness of humans in performing any task. In this paper we have surveyed one such intelligent system to recognize human facial expressions automatically. The system has been segmented into four phases. The first phase involves pre-processing and face detection. The second phase involves segmentation and feature point extraction. The third phase involves data reduction method which reduces the dimension of feature points of the facial components obtained by feature point extraction. The fourth phase involves the emotion classification wherein the face is classified based on the emotions it exhibit.*

Key Words*: *Emotion detection; Facial expressions; Face detection; Feature point extraction; Dimension reduction; Facial components.

1.INTRODUCTION

The article introduced here has mainly concentrated on the creation of smart framework with the inherent capabilities of drawing the inference for emotion detection from facial expressions. Recently, the notion of emotion recognition is attaining mostly the researcher's mind in the area of exploration on smart system and interaction between human and computer. Based on facial attributes the facial expression recognition can be classified one of the six well known fundamental emotions: sadness, disgust, happiness, fear, anger and surprise

2. System Architecture

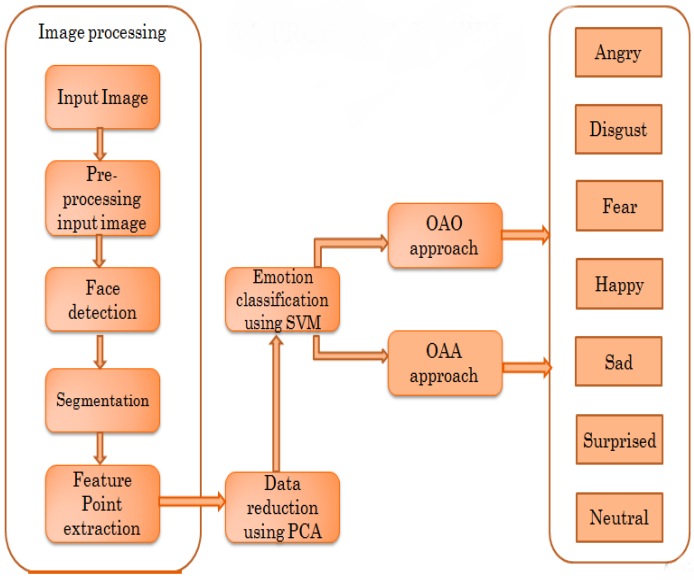


Fig -1: System Architecture

Pre-processing input image:

Before the processing of face detection, image pre-processing is important to whole course, which can improve the rate of detection and image analysis. The image is pre-processed and the facial area is located. The common methods are image gray transform, smoothness and filter etc. Among of these, histogram is an efficient method, but simple gray transform cannot sufficiently protect the image edge. As such we have used the Rough Sets Theory to processing and analysis of image, which is more efficient in some aspect than other methods.

Face Detection:

Face Detection is an important module in this system architecture as we are only dealing with facial image input so as to detect emotions. Input provided other than facial images would not be accepted and pre-processed. As such we have analyzed such an intelligent system which would automatically detect and process the facial input image otherwise discard the pre-processing if any input other than facial images is provided.

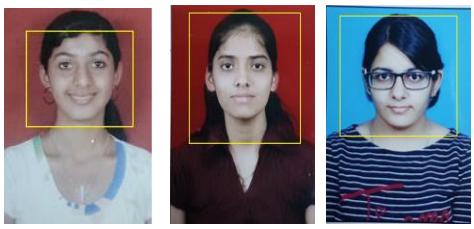


Fig -2: Face Detection

Above are three samples of input facial images wherein the face is detected and the facial area is located. Locating the facial area is an important step as the components of the face needs to be analyzed.

Facial Component Detection:

After the face has been detected several facial components such as Right eye, Left eye, Eye-brows, Eyes, Lips, Nose etc. are identified. This phase is important because different face components exhibit different behaviors during the representation of any particular emotion.

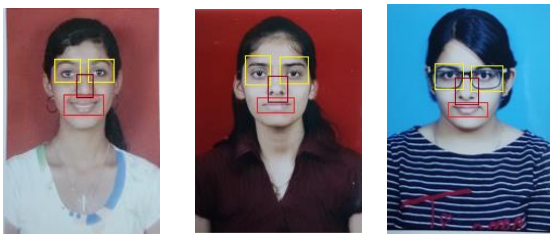


Fig -3: Facial Component Detection

After having detected the facial area the system then performs facial component detection wherein several components of the face are identified and segmented.

Segmentation:

Segmentation refers to the sub-division of various facial components and processing them individually. Segmentation is important so as to justify the behavior of every component specifically so that the resulting emotion generated would be accurate at an alarming extent.

Feature Point Extraction:

The original image is converted into binary image and the noise is removed. Further, any unwanted small objects in the binary images are removed, which results in obtaining non-distortion binary image that helps to detect the face without noise. For face detection we initially identify the center pixel of the image and move vertically up to reach the boundary . All the components such as lips, eye-brows, eyes etc. are extracted and processed individually.

Data Reduction:

The pixel positions of facial components are extracted as feature points and used for further processing. These feature dimensions are then reduced by applying Principal Component Analysis (PCA).

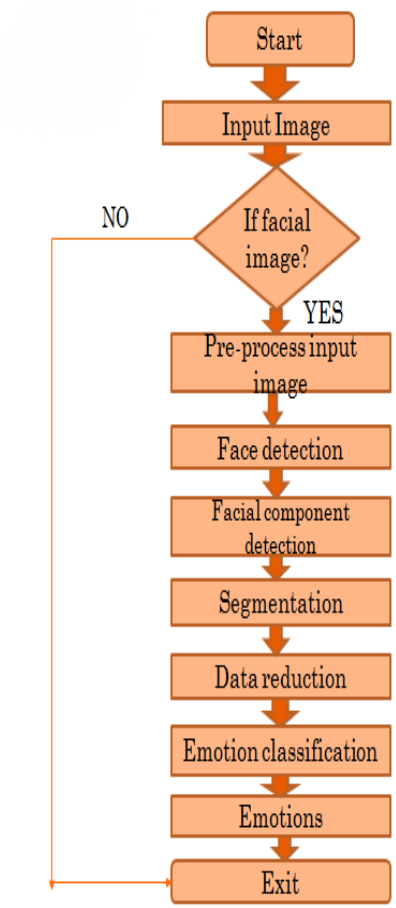
Emotion Classification:

The Support Vector Machine (SVM) is used for classifying feature set as expressions. The SVM classifies the input data into seven classes based on emotions. A multiclass SVM is considered, which has two types of classification scheme, say One Against One (OAO) and One Against All (OAA). The OAO considers one class and classifies against all possible combinations. Similarly, the OAA is also classified and here, one of the classes is used for training and others are classified. This procedure will repeat until we complete all the known classes of emotions.

Emotions:

Finally the SVM produced output will produce various class of emotions depending upon what type of facial image parameter is given as an input to the system.

3. Flowchart



4. CONCLUSIONS

Here, we have analyzed and presented a system which can be used in intelligent feedback system, which classifies the facial images based on emotions. The systematic architecture provides automatic facial expression recognition and analysis process effectively. The intelligent feedback system classifies the images based on emotions.

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