Facial recognition in education system

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Facial recognition in education system

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Abstract. Human beings exploit emotions comprehensively for conveying messages and their resolution. Emotion detection and face recognition can provide an interface between the individuals and technologies. The most successful applications of recognition analysis are recognition of faces. Many different techniques have been used to recognize the facial expressions and emotion detection handle varying poses. In this paper, we approach an efficient method to recognize the facial expressions to track face points and distances. This can automatically identify observer face movements and face expression in image. This can capture different aspects of emotion and facial expressions.

1. Introduction

Over a decade, spontaneous facial expression has established a major role in identifying human emotions. As one of the most successful applications of image analysis, face recognition has recently gained significant attention. Human-computer interaction takes an important role like face recognition, extracting facial features, emotion detection. For detecting faces, many different techniques appeared over the years. Probably the most successful is based on emotion detections and recognizing.

Usually, expression contains numerous principal emotions: exited, confused, concentrated and nervous. Many methods used geometric features for facial expressions. Almost methods used for facial expression recognition are based on facial action coding system (FACS) introduced by Ekman and Friesen. Each expression is identified by the action unit (AU).

2. Related Work

[1] explored person reliant and independent recognition of expressions where diverse approaches were compared. Tree-Augmented-Naive Bayes (TAN) classifier was introduced which is acquired between the facial features [2]. An integrated system was available which performs interaction between man and machine [3].

The development in emotion recognition using SAMMI (Semantic Affect-enhanced Multimedia Indexing) was achieved [4]. For only normal face expression, effectiveness in several features is compared and three features sets like coordinates, distances and points was studied[5].

Using CK+ dataset they have introduced a frame work for recognizing facial expressions using multimodal interfaces [6][9].Adaptive learning and facial expressions were recorded in video using Ekman and Friesen coding system [7]. Recognizing a student's sensitive state and providing personalized feedback, built on integrated pedagogical models has been considered to be one of the main constraints of traditional tools of e-learning [8] [10] [11].

An improvement in performance of the facial expression recognition system in more than one application recognizes emotions. In this type of system, some of the emotions are typically misclassified [6]. Although several approaches have been proposed to recognize emotions based on facial expression there are issues due to variations in viewing pose illustrated in the figure (1). The head pose is classified into three categories: One stated as pitch; the other as roll and other as yaw.

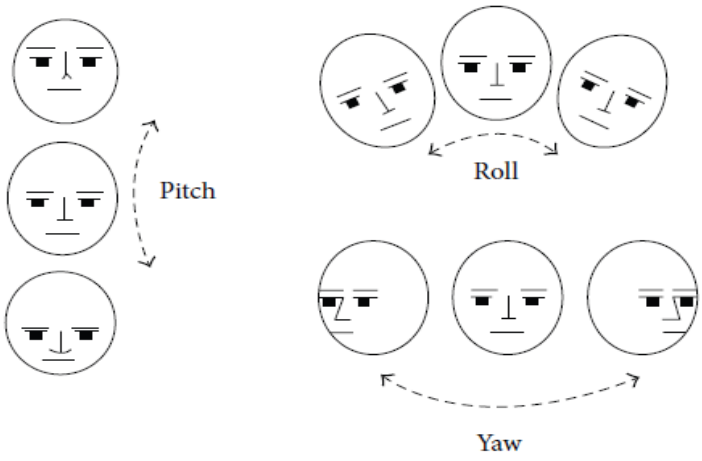

Fig. 1 Head pose angles

3. Proposed Method

The development of an automated system that senses the facial expressions is rather difficult. The extraction of different expression and creating a template of it using face points and distances is successfully achieved. A complete study of facial expressions is described by Ekman and Friesen and has been argued that emotions are linked directly to the facial expressions related to exited, confused, concentrated and nervous. They implemented the basic universal emotions like excited, confused, concentrated and nervous.

3.1 Excited:

This expression was considered when an alert state with a high rate of facial expression occurred.

Indications: Open-mouth smile, wide eyes and raised eyebrows.

3.2 Confused:

This expression was considered by noticing the different facial expression.

Indications: Nose and forehead are upwards, one eyebrow raised higher than the other and pursed lips.

3.3 Concentrated:

This expression was focused on the task ignoring the possible distracting elements of the environment.

Indications: Fixed eyes with reduced blinking slightly raised eyebrows.

3.4 Nervous:

This expression was categorized as nervous when they showed a high rate of facial expression related with this emotional state (i.e. biting their lips, etc.).They were also included in this category when they confirmed this state in the emotional report

Indications: Neutral eyes with one side of lip turned up and pulled back.

We approached the features like face points and face point distances that can automatically detect the user emotion and facial expressions for different facial actions like excited, confused, concentrated and nervous. The features used for emotion recognition is briefly discussed along with the following dimensions: Facial feature, Face point feature extraction, Face distance feature extraction. We have proposed the emotion detection mechanism from images which demonstrated to work for emotion recognition to track characteristic face points and face point distances. Face points are well-defined as: Eye region, Mouth region, Nose region, Forehead region. We consider point feature set and distance feature set for feature extraction:

3.5 Point Feature Set:

We extract 3 set features corresponding to the feature points signifying the average measure of points belonging to the regions defined.

3.6 Distances Feature Set:

We have attempted to extract some more meaningful features from these feature sets. This process is resulted in 3 set features distance defined as eyes region distance, mouth region distances and head displacements which is shown in figure 7 and 8.Considering the points of x1, x2 and y1, y2 using equation of Line ([x1, x2], [y1, y2]) plot a line from one coordinate to another as in equation 1. Using these two points we are finding the distance between the coordinates.

Distance= sqrt $[(x2)^2 - (x1)^2]$ ------- Eq. 1

3.7 Overview of proposed system

The overview of the system is to analyse an image and extract the features based on the facial points and distances which is shown in figure (2). If the face action is present it gives the output as emotion is identified.

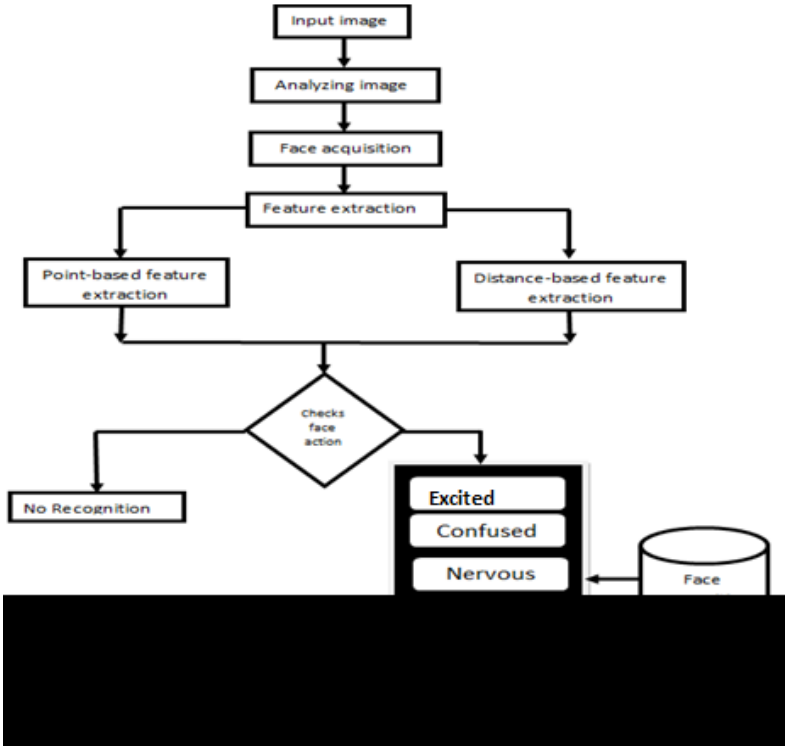

Fig. 2 Overview of the proposed system

4. Results and Discussion

The proposed method has been implemented using Mat lab 2013a.The below figure 3 shows how the face is detected and the other figures 4, 5,6 depicts how the features of the face are extracted.

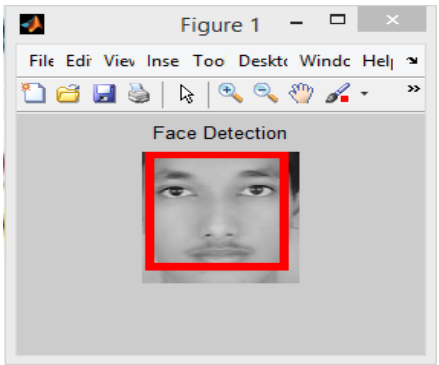

Fig. 3 Face Detection

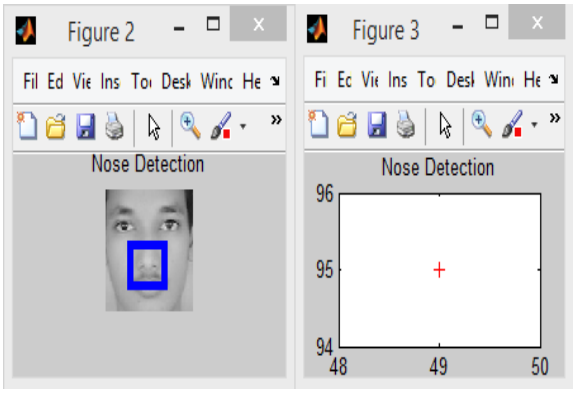

Fig. 4Nose extraction

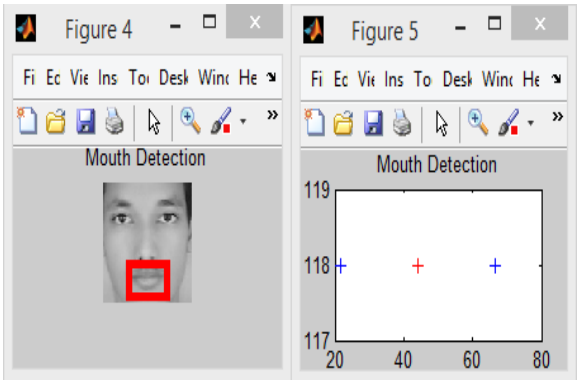

Fig. 5Mouth extraction

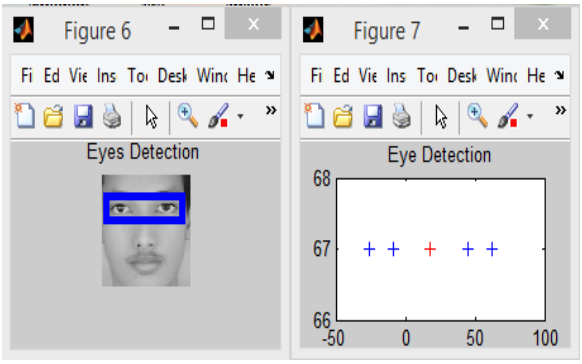

Fig. 6Eyes extraction

5. Conclusion and Future Work

Finally, the work shows that facial expressions are used to spontaneously identify the behavior of a student in a learning environment. The proposed system can be implemented further using video features for continuously assessing the emotion of student and keep track of the changes in the emotion. By this we can achieve a complete automated invigilation in the examination centers, to minimize the malpractice of the students. This type of automated system is suited for all domains. The methodology can be improved with more efficient feature extraction algorithm.

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