Facial Expression emoticons based on real time video

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Abstract

Facial expression is an important channel for human communication and can be applied in many real applications. One critical step for facial expression recognition (FER) is to accurately extract emotional features. Current approaches on FER in static images have not fully considered and utilized the features of facial element and muscle movements, which represent static and dynamic, as well as geometric and appearance characteristics of facial expressions. The primary objective is to recognize human emotion based on his facial expression. Among the seven basic categories happiness and surprise are the vital categories which can evaluate the mental satisfaction of human being

Keywords: FER,SVM,FACS,DSP.

1. INTRODUCTION

Facial expression is one of the most powerful, natural and immediate means for human beings to communicate their emotions and intensions. Automatic facial expression analysis is an interesting and challenging problem, and impacts important applications in many areas such as human–computer interaction and data-driven animation. Deriving an effective facial representation from original face images is a vital step for successful facial expression recognition. It is important not to confuse human emotion recognition from facial expression recognition: the latter is merely a classification of facial deformations into a set of abstract classes, solely based on visual information. Indeed, human emotions can only be inferred from context, self-report, physiological indicators, and expressive behavior which may or may not include facial expressions.

2. LITERATURE SURVEY

There are two common approaches to extract facial features: geometric feature-based methods and appearance-based methods. Geometric features present the shape and locations of facial components, which are extracted to form a feature vector that represents the face geometry. Geometric feature-based methods provide similar or better performance than appearance-based approaches in Action Unit recognition. However, the geometric feature-based methods usually require accurate and reliable facial feature detection and tracking, which is difficult to accommodate in many situations. With appearance-based methods, image filters, such as Gabor wavelets, are applied to either the whole-face or specific face-regions to extract the appearance changes of the face. Hence Gabor wavelet is resistant to illumination and low resolution images and also efficient to extract features from dynamic data.

3.EXISTING SYSTEM

Automatic facial expression recognition has attracted much attention from behavioral scientists since the work of Darwin in1872[2].Suwa[3]made the first attempt to automatically analyze facial expressions from image sequences in 1978.In some existing work, optical flow analysis has been used to model muscles activities or estimate the displacements of feature points. However, flow estimates are easily disturbed by the no rigid motion and varying lighting, and are sensitive to the inaccuracy of image registration and motion discontinuities. Facial geometry analysis has been widely exploited in facial representation where shapes and locations of facial components are extracted to represent the face geometry. For example, Zhang[4]used the geometric positions of 34 fiducially points as facial features to represent facial images. In image sequences, the facial movements can be qualified by measuring the geometrical Displacement of facial feature points between the current frame and the initial frame. Valstar[5]presented AU detection by classifying features calculated from tracked fiducially facialpoints. However, the geometric feature-based representation commonly requires accurate and reliable facial feature detection and tracking, which is difficult to accommodate in many situations.

4. METHODOLOGY

There are three main components to this system: a face tracker, an optical flow algorithm and an expression recognition system. The face tracker is a modification of, and an extension to, the ratio template algorithm. Optical flow is determined by a real-time version of a multichannel gradient model, whilst the final expression recognition system uses Support Vector Machines (SVMs) [7]. These components are integrated into a single system running at 4 fps on a 384 247image on a 450-MHz Pentium III machine with Matrox Genesis's boards. The system is summarized in Fig. 1. The system developed is able to find and recognize the facial expressions of any user who sits in front of a computer equipped with acamera in real-time, even in cluttered and dynamic scenes.It recognizes expression of the three basic emotions, namely happiness, surprise, neutral.

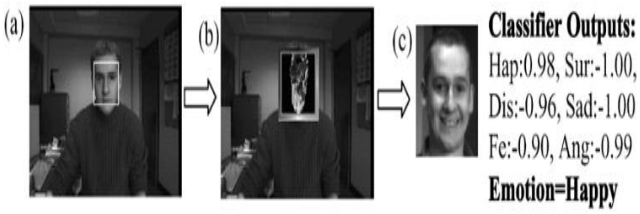

Fig. 1. System summary. (a) Face in the scene is located using a face tracker. (b) Motion of the face region only is determined using an optical flow algorithm. (c) Processed motion data is input into SVM classifiers.

Once a face has been located in the scene by the face tracker, an optical flow algorithm determines the motion of the face. The multichannel gradient model(MCGM) is employed to determine facial optical flow [8].The MCGM is based on a model of the human cortical motion.

Pathway, and operates in three dimensions (two spatial, and one temporal), recovering the dense velocity field of the image at all locations. The model involves the application of a range of spatial and temporal differential filters to the image, with appropriate ratios being taken to recover speed and direction. Interestingly, there is evidence to suggest that the MCGM is a biologically plausible model of the human cortical motion pathway as it has been shown to correctly predict a number of motion-based optical illusions. It runs at speeds of 18 fps on a 64 41 image using the Matrix Genesis DSP boards and thus is ideal for incorporation into a real-time expression recognition system. The system used four consecutive frames of motion data generated by the MCGM to represent each example of a facial expression. As the overall system frame rate was 4 fps, these four frames represent one second of facial motion and consist only of the start phase of a facial expression (i.e., from neutral face to expressive face).

Emotion recognition via video information is based on observing facial deformation of specific facial regions or movement of characteristic points. Mouth, eyes, wrinkles and furrows regions are used for emotion recognition. Facial expressions represent a visible consequence of facial muscle and autonomic nervous system actions. Ekman and Friesen[1] propose the Facial Action Coding System (FACS) in order to measure all visible movements. Once facial motion has been determined, it is necessary to place the motion signatures into the correct class of facial expression (either a no expression or one of the six basic emotions).The motion signatures produced are then classified using Support Vector Machines as either no expressive or as one of the six basic emotions. The expression recognition system described in this section is summarized in Fig. 2.

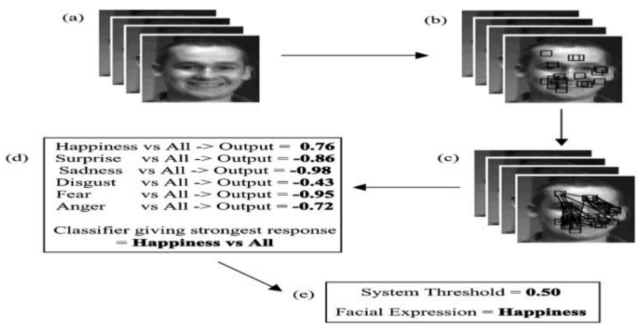

Fig 2. Summary of expression recognition approach.

The facial elements, especially key elements, will constantly change their positions when subjects are expressing emotions. As a consequence, the same feature in different images usually has different positions, as shown in Fig.3 (a). In some cases, the shape of the feature may also be distorted due to the subtle facial muscle movements. For example, the mouth in the first two images in Fig. 3 (b) presents different shapes from that in the third image. Therefore, for any feature representing a certain emotion, the geometric-based position and appearance-based shape normally changes from one image to another image in image databases, as well as in videos. This kind of movement features represents rich pool of both static and dynamic characteristics of expressions, which play a critical role for FER.

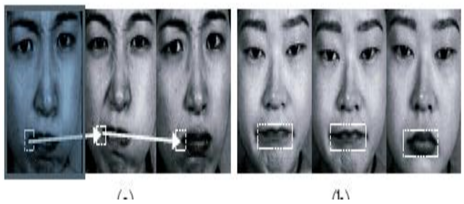

Fig 3. Facial movement features(a) Feature position (left mouth corner) changes. (b) Feature shape (mouth) changes

Not every expression is shown in the same area of face.eg:-Surprise(upper part) with wrinkles in the forehead and raised eyebrows, while smile is mostly shown in lower face. Surprise can be characterized by identifying raised and curved eyebrows, stretched skin below the eyebrows, horizontal wrinkles across the forehead, open eyelids, dropped jaw, parted lips while happy can be identified primarily by a smile as shown in fig 4.

Fig 4.1. Mouse and eye position in a) neutral b) happy c) surprise d) sadness.

The system performance can be increased by measuring all visible movements of horizontal Wrinkles between eyes, horizontal wrinkles on theforehead,nasolabial fold.

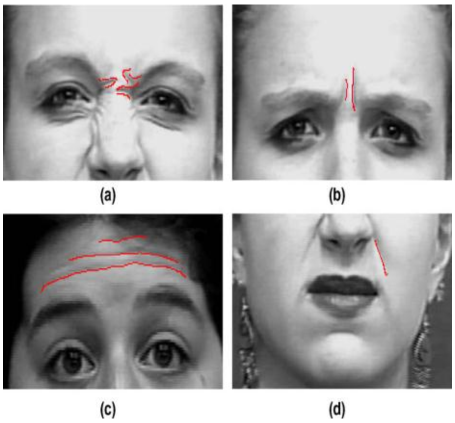

Fig.4.2. Transient feature detection: (a) vertical furrows between brows, (b) horizontal wrinkles between eyes, (c) horizontal wrinkles on the forehead, and (d) nasolabial fold

4.2 Set up Phase:

Figure 4.displays all of the seven universal emotions of one subject. Furthermore, images with detected edges are also displayed under an appropriate image.

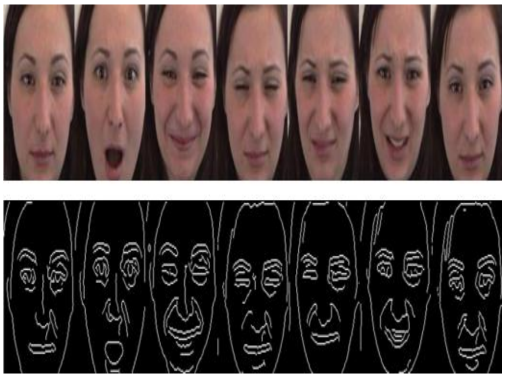

Fig. 5. Seven universal emotions from one subject in the FEEDTUM database

The described system, its functions and scripts were developed in MATLAB 7.6.0.

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