FACIAL EXPRESSION RECOGNITION METHOD ON STATIC AND DYNAMIC IMAGE

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This article is dedecated to analyse various facial expression recognition method based on different type of image, which aim at extracting feature on the image. Considering the method to optimize existing method.

Introduction

Expression is a word that is mentioned a lot in our daily life. In interpersonal communication, people can enhance their communication effect by controlling their facial expressions. Facial expressions are an important way to spread human emotional information and coordinate interpersonal relationships. According to research, in human's daily communication, the information transmitted through language only accounts for 7% of the total information, while the information transmitted through facial expressions reaches 55% of the total information.

Expression is an indicator of emotion projected by humans and other animals from their physical appearance, mostly referring to the state formed by facial muscles and five senses, such as smiling, angry eyes, etc. It also includes the body language expressed by the body as a whole. Some expressions can be interpreted accurately, even among members of different species, with anger and extreme satisfaction being prime examples. However, some expressions are difficult to interpret, even among familiar individuals, with disgust and fear being the main examples. In general, the various organs of the face are an organic whole, expressing the same emotion in a coordinated manner. Facial expressions are part of the human physical language, a physiological as well as psychological response, and are usually used to convey emotions.

I. Expression recognition system

The face expression recognition system mainly consists of four parts: face image acquisition, face detection, feature extraction, and feature classification.

The face expression recognition system has developed into an independent research direction due to the fact that the open source expression database is now relatively abundant, the image acquisition is not too difficult, and the face detection algorithm is relatively mature, so the research on face expression recognition is mainly reflected in the last two steps of the system: feature extraction and feature classification.

II. Feature extraction method

Emotion feature extraction mainly uses mathematical methods and relies on computer technology to organize and process data from digital images of human face expressions, extract expression features and remove non-expression noise. In some cases, the feature extraction algorithm extracts the main features of the image and objectively reduces the dimensionality of the image.

The generation of facial expressions is a complex process, and if psychological and environmental factors are not taken into account, what is presented to the observer is simply muscle movement and the resulting changes in facial shape and texture. The static image presents the expression state of a single image when the expression occurs, and the dynamic image presents the movement process of the expression between multiple images. Therefore, the expression feature extraction algorithms are broadly divided into static image based feature extraction methods and dynamic image based feature extraction methods according to the state of expression occurrence and the processing object.

III. Feature extraction methods based on static images

1. Integral method. Face expressions rely on muscle movements to reflect. The static image of face expression visually shows the changes of facial shape and texture produced by the movement of face muscles when the expression occurs. From a holistic perspective, such changes cause significant deformation of facial organs, which can have an impact on the global information of the face image, and therefore face expression recognition algorithms that consider expression features from a holistic perspective have emerged.

The classical algorithms in the holistic approach include principal component analysis (PCA), independent component analysis (ICA) and linear discriminant analysis (LDA). The FastICA algorithm is used to extract expression features, and the method not only inherits the features of ICA algorithm that can extract hidden information between pixels, but also can accomplish the separation of expression features quickly through iteration. Support vector discriminant analysis

(SVDA) algorithm, which is based on Fisher linear discriminant analysis and support vector machine, is able to make the expression data with maximum inter-class separability in the case of small sample data, and does not require the decision function needed to construct SVM algorithm. The recognition rate of this algorithm is experimentally demonstrated to be higher than that of PCA and LDA.

2. Partial method. Face expressions on static images not only have overall variations, but also local variations exist. The information contained in the local deformation of facial muscles such as texture and wrinkles can help determine the attributes of expressions accurately. The classical methods of local method are Gabor wavelet method and LBP operator method.

IV. Dynamic image based feature extraction method

The difference between dynamic images and static images is that dynamic images reflect the process of facial expression occurrence. Therefore, the expression features of dynamic images are mainly expressed in the continuous deformation of the face and the muscle movement of different regions of the face. The current feature extraction methods based on dynamic images are mainly divided into optical flow method, model method and geometric method.

1. Optical flow method. Optical flow method is a method to reflect the grayscale changes of corresponding objects between different frames in dynamic images. Early face expression recognition algorithms mostly used optical flow method to extract expression features of dynamic images, mainly because the optical flow method has the advantages of highlighting face deformation and reflecting face movement trend. Therefore, this algorithm remains an important method among traditional methods to study dynamic image expression recognition. Firstly, the optical flow field and gradient field between consecutive frames are used to represent the spatial and temporal changes of the image respectively to achieve the tracking of expression regions in each frame of face image; then, the movement of face muscles is represented by the change of motion direction of feature regions, which then corresponds to different expressions.

2. Model method. The model method in face expression recognition refers to the statistical method to parametrically describe the expression information of dynamic images. Commonly used algorithms mainly include Active Shape Model Method (ASM) and Active Appearance Model Method (AAM), both of which can be divided into two parts: shape model and subjective model. As far as the appearance model is concerned, ASM reflects the local texture information of the image, while AAM reflects the global texture information of the image.

3. Geometric method. In the expression feature extraction method, the researchers consider that the generation and presentation of expressions are largely reflected by the changes of facial organs. The main organs of the human face and their folds will be the regions where the expression features are concentrated. Therefore, marking feature points in the facial organ regions and calculating the distance between feature points and the curvature of the curve where the feature points are located becomes a method to extract facial expressions using geometric forms. The faces with different expressions are represented on a grid using a deformation grid, and the change of grid node coordinates between the first frame and the largest frame of that sequence of expressions is used as a geometric feature to realize the recognition of expressions.

V. Conclusion

The development and application of facial expression recognition technology can better realize the communication between intelligent technology and people, separate the specific expression state from the given static image or dynamic video sequence through machine recognition, so as to determine the psychological emotion of the recognized object and realize the computer's understanding and recognition of human facial expression, which can fundamentally change the relationship between human and computer, so that the computer can better serve human and thus achieve better human-computer interaction. Moreover, expression recognition technology is an effective way for people to explore and understand intelligence.

VI. References

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