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COMPARATIVE STUDY OF DIFFERENT EMOTIONS DETECTION METHODS

Siya C Sover [1], Beena M V [2]

Department of Computer Science & Engineering
Vidya Academy of Science & Technology,
Thalakkottukara P. O, Thrissur, Kerala, India

ABSTRACT

Face is a powerful channel of nonverbal communication. Facial expressions are used to understand user emotions. Emotions are the fundamental requirements of a human-computer interaction system. There are different methods for automatic emotion detection and classification. All the emotion detection methods have three basic steps. They are : Preprocessing, Feature Extraction and Classification. Emotion detection system uses facial motion to characterize frontal views of facial expressions. It is able to recognize six emotions, universally associated with unique facial expressions. The emotions are happiness, sadness, disgust, surprise, fear, and anger. This literature also gives a description of various local features extraction and classification methods which are used to detect features and classifies the emotions.

Keywords: Skin tone , Scale Invariant Feature Transform ,Artificial neural networks.

1. INTRODUCTION

Some emotions leading to human actions. The Facial Action Coding System [6] is the most commonly used system for facial behavior analysis. Based on Facial Action Coding Sysem the facial muscular movement can be described by a set of facial action units. which is anatomically related to the contraction of a specific set of facial muscles. The goal of facial expression analysis is to create systems that can automatically analyze facial feature changes and map them to facial expressions.It's applications such as bankcard identification, access control, Mug shots searching, security monitoring,and surveillance system, is a fundamental human behavior that is essential for effective communications and interactions among people.

2. OVER VIEW

Emotion detection and classification systems have 3 basic steps. First the images are preprocessed, here apply skin ton-detection that means all the unwanted information's are removed and make the images more suitable for further steps. The 2nd step is feature extraction, it is the most important step and useful features are extracted. In this project local features are needed. The features should be extracted from all the images and for different classes they should be different. The last step is classification, according to the features extracted the classifier classifies the images in to different classes. For that neural network techniques are used.

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3. DIFFERENT TYPES OF AUTOMATIC SYSTEMS FOR EMOTION DETECTION

Littlewort et al. [1] presented "The Computer Expression Recognition Toolbox (CERT) "in 2011 which is a software tool for fully automatic real-time facial expression recognition. CERT provides automatically code the intensity of 19 different facial actions from FACS and 6 different universal facial expressions. Although some of these approaches show very promising recognition rates on emotions/action units they do not fully exploit the connections among action units and emotions provided in facial action coding system as well as they are pure discriminative classifiers. Action unit detection and classification of facial expression in terms of a number of discrete emotion categories are referred from[2].

Chang et al.[3] presented "Metaanalysis of the first facial expression recognition challenge,"in 2004 a probabilistic video based facial expression recognition method on manifolds. Manifold of facial expression is based on the observation that the images of all possible facial deformations of an individual make a smooth manifold embedded in a high dimensional image space. The probabilistic approach can recognize expression transitions effectively.

Michel F. Valstar et al.[5] presented "Biologically vs. logic inspired encoding of facial actions and emotions in video," in 2006 A comparison is made between detection of emotions directly from features vs a two-step approach where first detect AUs and use the AUs as input to either a rule base or an ANN to recognize emotions. The results suggest that the two-step approach is possible with a small loss of accuracy and that biologically inspired classification techniques outperform those that approach the classification problem from a logical perspective suggesting that biologically inspired classifiers are more suitable for computer-based analysis of facial behaviour than logic inspired methods.

Vinay Bettadapura et al. [6] presented "Face Expression Recognition and Analysis:The State of the Art"discusses facial parameterization using FACS Action Units (Aus) and MPEG-4 Facial Animation Parameters (FAPs) . Face detection, tracking and feature extraction methods. Facial Action Coding is a muscle based approach.It involves identifying the various facial muscles that individually or in groups cause changes in facial behaviors.These changes in the face and the underlying (one or more) muscles that caused these changes are called Action Units(AU).The FACS is made up of several such action units.For example AU 1 is the action of raising the Inner Brow. It is caused by the Fronta lis and Pars Medialis muscles. Moving Pictures Experts Group (MPEG) introduced the Facial Animation(FA) specific actions in the MPEG -4 standard. Version 1 of the MPEG -4 standard (along with the FA specification) became the international standard in 1999

Daugman J.G.[7] presented "Complete discrete 2-D Gabor transforms by neural networks for image analysis and compression"in 2002 which discribes a three layered neural network is described for transforming two-dimensional discrete signals into generalized nonorthogonal 2-D Gabor representations for image analysis,segmentation,and compression. These transforms are conjoint

spatialspectral representations and which provide a complete image description interms of locally windowed 2-D spectral coordinates embedded within global 2-D spatial coordinates.

Zhou Wang[8] presented ”Image Quality Assessment: From Error Visibility to Structural Similarity” in 2004 which describes objective methods for assessing perceptual image quality traditionally attempted to quantify the visibility of errors(differences) between a distorted image and a reference image using a variety of known properties of the human visual system.Under the assumption that human visual perception is highly adapted for extracting structural information from a scene so introduce an alternative complementary framework for quality assessment based on the degradation of structural information. example of this concept develop a Structural Similarity Index and demonstrate its promise through a set of intuitive examples as well as comparison to both subjective ratings and state of-the-art objective methods on a database of images compressed with JPEG and JPEG2000.

Thomas M.[9] presented ”Face Recognition Using a Color Subspace LDA Approach”in 2008 This paper delves into the problem of face recognition using color as an important cue in improving the accuracy of recognition. To perform recognition of color images use the characteristics of a 3D color tensor to generate a color LDA subspace, which in turn can be used to recognize a new probe image.

To test the accuracy of our methodology and computed the recognition rate across two color face databases. And then observe that the use of the LDA color subspace significantly improves recognition accuracy over the standard gray scale approach without sacrificing computational efficiency.

Jan Wang [10] presented”3D Facial Expression Recognition Based on Primitive Surface Feature Distribution”in 2006 which contains the creation of facial range models by 3D imaging systems has led to extensive work on 3D face recognition. In this paper investigate the importance and usefulness of 3D facial geometric shapes to represent and recognize facial expressions using 3D facial expression range data. Propose a novel approach to extract primitive 3D facial expression features and then apply the feature distribution to classify the prototypic facial expressions. In order to validate our proposed approach have conducted experiments for person-independent facial expression recognition using our newly created 3D facial expression database. And also demonstrate the advantages of our 3D geometric based approach over 2D texture based approaches in terms of various head poses.

4. METHODOLOGY OF AUTOMATIC EMOTIONS DETECTION

Automatic emotions detection systems have 3 common steps.

- Preprocessing
- Feature Extraction
- Classification

4.1 Preprocessing

It is the process of manipulating the image in such a way that the images become more suitable for a particular application. That is, the preprocessed images are used for feature extraction and classification. So in every system, preprocessing of images is done in different ways appropriate for their processing.

In [16], preprocessing is to improve the image quality to make it ready to further processing by removing or reducing the unrelated.Some of the pre-processing includes image enhancement, cropping, de-noising, etc.

In [17] , preprocessing step comprises of operations like image scaling, image brightness and contrast adjustment and other image enhancement operation.

In [18], A skin detector is transforms a given pixel into an appropriate colour space and then uses a skin classifier to label the pixel whether it is a skin or a non-skin pixel. A skin classifier defines a decision boundary of the skin colour class in the colour space.

4.2 Feature Extraction

In[3],To reduce the variation due to scaling and face poses, we first applied Active Wavelets Networks (AWN) on the image sequence for face registration and facial feature localization.

In[5], The particle filtering scheme results for every image sequence in a set of points P with dimensions $n * 20$, where n is the number of frames of the input image. For all points pi, where i = [1 : 20] denotes the facial point, we compute two features for every frame n: f1 (pi) = pi,y,n − pi,y,1, f2 (pi) = pi,x,n − pi,x,1 that correspond to the deviation of respectively the y and the x coordinate from the related coordinates at the first frame. Then, for all pairs of points pi , pj ,i 6= j we compute in each frame the features f3 (pi , pj) = ||i − pj || ,f4 (pi , pj) = f3 (pi , pj) − || pi,1− pj,1|| is the L2 norm. Finally, we compute the first time derivative df/dt of all features defined above, resulting in a set Fn of 840 features per frame.

In[19] the SIFT features are effective in describing the edges and finer appearance features. Since deformations corresponding to facial expressions are mainly in the form of lines and wrinkles.Chose SIFT features for our experiments.

4.3 Classification

In[5], Our one-step approach to emotion recognition from face image sequences is based on support vector machines (SVMs). SVMs are very suitable for the task in question because, in general, the high dimensionality of the feature space does not affect the training time,which depends only on the number of training examples. To solve our six emotion detection problem we used a one-versus-one multiclass SVM classifier.

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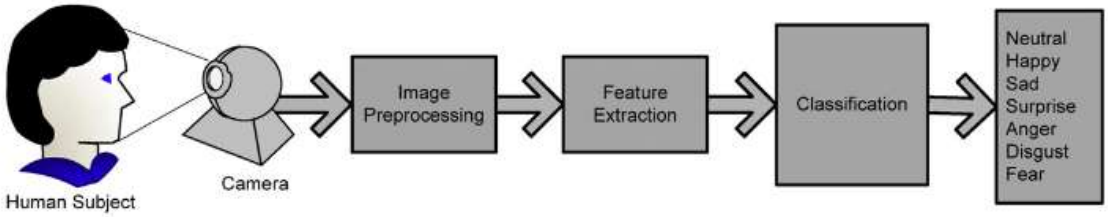
In[20],Artificial neural networks (ANNs) more suitable for tackling the problem of emotion recognition from action units as such techniques emulate human unconscious problem solving processes in contrast to rule based techniques, which are inspired by human conscious problem solving processes.

5. CONCLUTIONS

Facial coding system standard has been used for many years for recognizing and classification of human emotions keeping these standards as base. In the work implemented we used these concepts at better efficiency with aid of skin mapping,Pattern matching and local features of the human face to gain the accurate result possible. The system has the capacity to perform accurately with addition of the data base where n number of humans and respective emotions can be recognized.

In this paper give the feature Extraction method is SIFT features. In[19] the SIFT features are effective in describing the edges and finer appearance features. Since deformations corresponding to facial expressions are mainly in the form of lines and wrinkles.classification method given in this paper is neural networks.In[20],Artificial neural networks (ANNs) more suitable for tackling the problem of emotion recognition from action units as such techniques emulate human unconscious problem solving processes in contrast to rule based techniques, which are inspired by human conscious problem solving processes.



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