ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

FACIAL EMOTION RECOGNITION USING GABOR (HAPPY, SAD, ANGER, NEUTRAL MOOD)

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ABSTRACT

The best way to communicate the emotions and intentions is facial expressions. This is powerful because as per the psychological research 55% of the total communicated message is the human facial expression. Therefore deriving an effective facial representation from the original face image is a vital step and very tough task in the field of computer science for successful facial expression recognition. Human facial recognition usually uses image processing, gesture signal processing and physiological signal processing. Most use of this system is in the area of security, psychological studies, and social interaction [Ekman et al., 1997] [5]. Facial expression reflects not only emotions but other mental activities, social interaction and physiological signals. Gabor filters are used to extract the features of facial expressions. GF represents the behavior of receptive fields in human visual systems (HVS) very effectively even in case of slight object rotation, distortion and variation in illumination. Here we have considered face database in which the different expressions of facial images are stored. Different facial expressions will be recognized as neutral, disgust, happy, sad, and anger. In this first we extracted the features of face by using Gabor filter and then applied SVM to classify into different mood. Finally mood is recognized and verified by using confusion matrix.

KEYWORDS: Image acquisition, Digital image processing, Face recognition, Feature extraction, Gabor filters, SVM.

INTRODUCTION

Facial expression recognition is defined as the method by which a change that happens in response to human internal emotional states. At the time of face to face and verbal communication, facial expression and gesture plays a major role. As per the research 55% of total communication is facial expression. 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. Due to its wide range of applications, automatic facial expression has attracted much attention in recent years [1-4]. Though much progress has been made [5-10], recognizing facial expression with a high accuracy remains difficult due to the subtlety, complexity and variability of facial expression. And it is very difficult to integrate the internal feelings of a person with facial expression; if the person is fraud then his facial expression will be different from his internal feelings. The basic facial expression that recognized by psychologists are: neutral, happiness, sadness, anger, fear, surprise and disgust.

There are many methods which have been proposed for human facial expression recognition from static images (image database) to image sequence (video) (B. Fasel et al., 2003) [2,6].

Human facial expression analysis is a computer system that automatically analyzes and recognizes facial features and classifies those (Fernando De La Torre et al., 2011)[7].

Following steps involve in Human Facial expression recognition system are:-

Preprocessing:
This step comprises of operations like image scaling, image brightness and contrast adjustment and other image enhancement operation.

The human facial expression system uses an image database to train and test the performance of the classifier.

Feature Extraction:
The key parameters that efficiently represent the particular facial expression need to be extracted from the images. These parameters are used to discriminate between expressions.

Classification:
Feature vector of test image is compared with feature vector of trained database and classify them accordingly (Shishir Bashyal et al., 2008)[8,11].

The existing facial expression system may misclassify certain expressions. This is due to facial expressions in training database may be different from spontaneous expressions (Fei Long et al., 2012)[9].

RELATED WORK

Many techniques have been used for human facial expression recognition from 1978 onwards.
Shishir Bashyal et al. (2008)[8,11] used Gabor filter and learning vector quantization to develop a facial expression recognition system. Gabor filter was used to extract the features from JAFFE database images. This paper proposed that learning vector quantization (LVQ) performs better in recognition of fear expressions than multilayer perceptron (MLP). Performance of recognition rate was about 90.22%.

Le Hoang Thai et al. (2011) used Canny, principal Component Analysis and Artificial Neural Network for classification of facial expression. Canny was applied for pre-processing phase to locate the region of detection. After that PCA was applied to extract the facial features. At last Artificial Neural Network applied to classify the facial expression. The performance of the system was about 70%.

Wenfei Gu. Et al. (2012)[10] used Gabor filter for feature extraction and classifier synthesis. The system supports person-independent expression recognition and variation in illumination. Gabor filters have the useful property of robustness against slight object rotation, distortion and variation in illumination. The performance of the system was 91.5%.

PROPOSED METHOD

Following figure 5 shows the flow diagram of method for human facial expression recognition. This method is divided into three parts:
Image Input:
In this phase sample image from random location or from the JAFFE database is given as input to the algorithm.

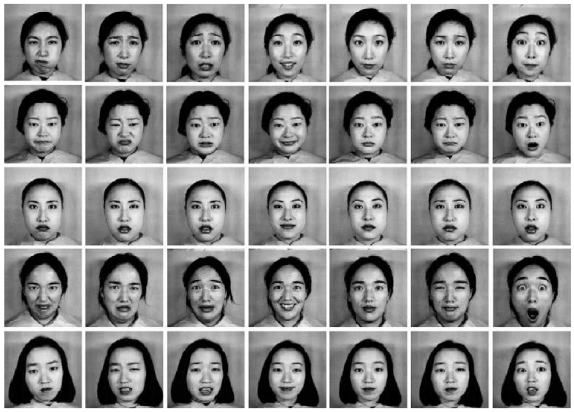

Figure 1 Sample Images of different expression

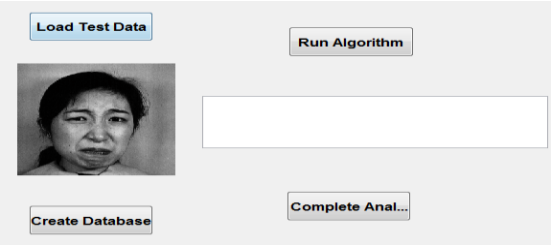

Figure 2. Loading of input image

Pre-Processing Phase:

The input image is processed and converted into the input which is able to feature extraction phase.

- Detect faces from the input image.
- Convert image into 4 parts of gray scale image
- Each gray scale image has 4x4 vector i.e. 16 features of a single image.
- Resize the image before input it into the next phase.

Feature Extraction Phase

On the basis of features of an image, the expression is identified in the next phase.

Gabor filters are used to select the features that are necessary to represent expressions. There are 5 scales and 8 orientation of Gabor filter in general that can represent feature for each image. The Gabor filter produces two parts: the real part and the imaginary part. Real and imaginary parts are transformed into two kinds Gabor feature: the magnitude and phase. There are 40 Gabor features for each image. Gabor wavelet features computation is expensive, due to convolution of facial images with a set of Gabor wavelet.

Classification Phase:

Multiclass SVM is used to classify all different classes of expressions like happy, sad, disgust, anger, neutral. SVM convert Gabor features into vector form, when a test image is input, firstly Gabor is created for that image and converts it into a vector. In SVM the data is partitioned into two parts that one is called training set and other is known as the testing set and each having the instances of the attributes. Each instances having one target means class labels and several attribute. The goal of the SVM is that to produce the model which predicts the target value of instances in the testing set which are given by only attributes value. It is based on supervised learning methods. SVM has unique property that it creates the hyper plane which has taken into the consideration for the classification. It defines the functional margin means a good separation is achieved by the hyperpalne that has the largest distance to the nearest data points of any class. Greater the margin it is easy to find better accuracy and minimal errors has found.

Figure 3. Maximum margin Hyperplane

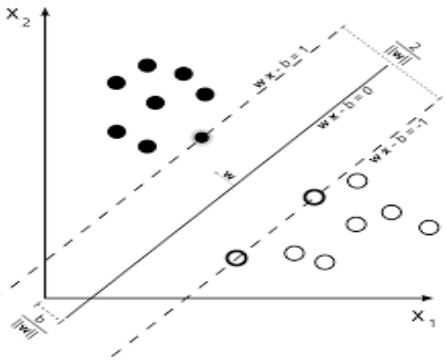

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Figure 4 Classified facial expression Identification

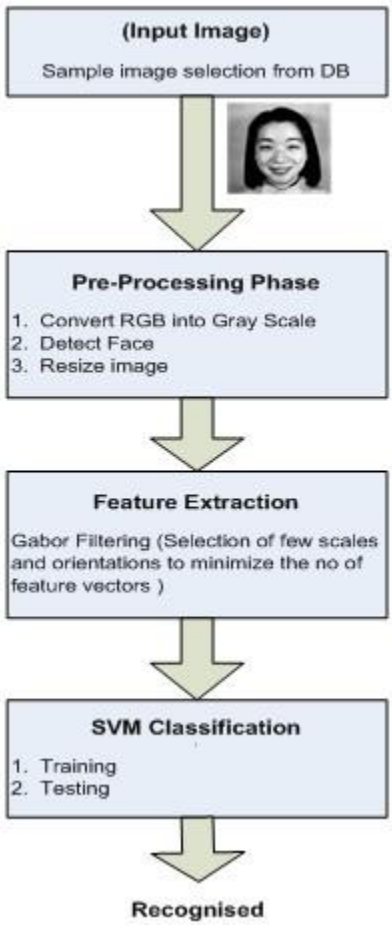

Figure 5 Flow diagram of overall process of Human Facial Expression Recognition.

CONCLUSION

In this paper we have different modules for Human facial expression recognition using an appearance based minimum feature extraction algorithm. Selection of best Gabor Features will reduce the space complexity of the system. The output of Gabor will be input into SVM classifier. SVM compares the test data with trained data and classify the expression accordingly. The overall confusion matrix and final recognition rate is shown in the below figure 6.

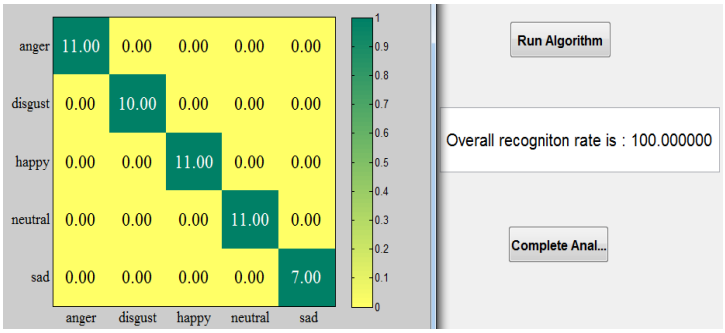

Figure 6 Confusion Matrixes and Recognition Rate

REFERENCE

[1] M. Pantic, L. Rothkrantz, Automatic analysis of facial expressions: the state of art, IEEE Transactions on Pattern Analysis and Machine Intelligence 22 (12) (2000) 1424–1445.
[2] B. Fasel, J. Luettin, Automatic facial expression analysis: a survey, Pattern Recognition 36 (2003) 259–275.
[3] M. Pantic, L. Rothkrantz, Toward an affect-sensitive multimodal human–computer interaction, in: Proceeding of the IEEE, vol. 91, 2003, pp. 1370–1390.
[4] Y. Tian, T. Kanade, J. Cohn, Handbook of Face Recognition, Springer, 2005 (Chapter 11. Facial Expression Analysis).
[5] Ekman, P., & Rosenberg, E. L.," what the face reveals: Basic and applied studies of spontaneous expression using the Facial Action Coding System (FACS)", New York: Oxford University Press, 1997.
[6] B. Fasel, J. Luettin, "Automatic facial expression analysis: a survey", Pattern Recognition, Vol. 36, pp 259-275, 2003.
[7] Fernando De La Torre & Jeffrey F. Cohn, 'Facial Expression Analysis', Springer, VAH, pp 377-409, 2011.
[8] Shishir Bashyal, Ganesh K. Venayagamoorthy, "Recognition of Facial Expression using Gabor wavelets and learning vector quantization", Elsevier, EAAI 21, pp 1056-1064, 2009
[9] Fei Long et al., "Learning Spatiotemporal feature by using Independent component analysis with application to facial expression recognition", Elsevier Trans., Neurocomputing, 126-132, 2012.
[10] Wenfei Gu, et al., "Facial expression recognition using radial encoding of local Gabor Feature and Classifier Synthesis", Elsevier Ltd Trans., 2012.
[11] Shishir Bashyal et al., "Recognition of facial expression using Gabor wavelet and learning vector quantization" ,Elsevier Trans. ,Engineering Application of Artificial Intelligence 21, 1056-1064, 2008