Emotion Recognition System Using Connectionist Models

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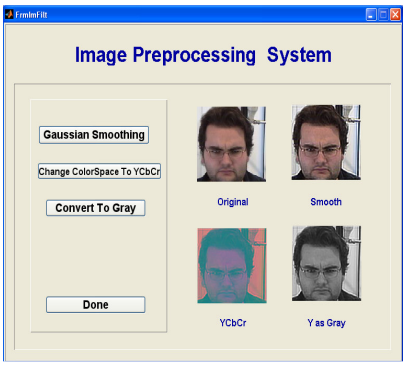
Abstract: This paper discusses the application of Gabor filter based feature extraction in combination with neural network for the recognition of five different facial emotions (happy, sad, angry, fear and neutral) as illustrated in Figure 1. Facial expressions provide rich information about human emotion and play an essential role in human communication. The recognition system considered Eyebrows, Nostrils, Lip Line, Wrinkles, Jaw Line and Eyelids to detect the emotions. The neighboring region of a pixel is described by the response of a group of Gabor filters in different frequencies and directions, which have a reference to the specific pixel. The proposed Gabor Filtering method generated 24 features values accompanied by variance for each feature. The Face Emotion Recognition (FER) is achieved in two parts; Image processing and classification. The first part investigates a set of image processing methods suitable for recognizing the face emotion [1]. The acquired images then undergo few preprocessing methods including Gaussian smoothing, conversion to YCbCr and grey scale conversion (Figure 2a).

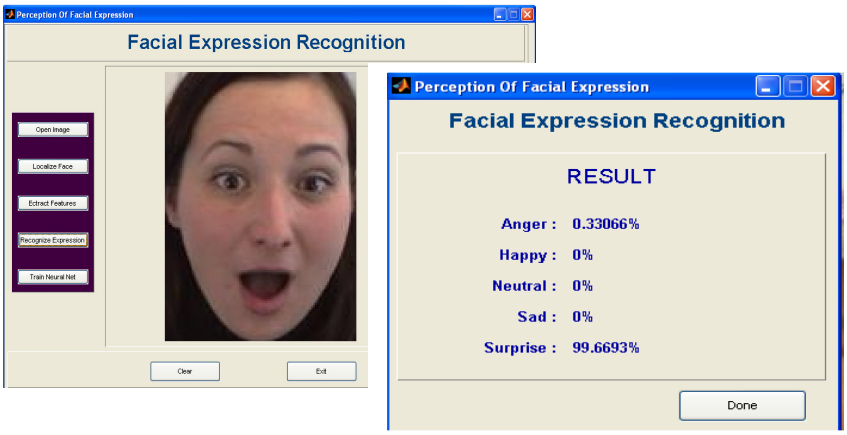
a) Happy b) Sad c) Angry d) Surprise e)Neutral

Figure1. Examples of Five facial Expression images from YALE database



(a) (b) (c)

Figure2 (a). Image preprocessing system (b) Recognized anger emotion (c) Expression recognition system



An artificial neural network trained using Levenberg Marquardt algorithm was developed for emotion recognition through facial expression [2]. Table 1 illustrates the comparative performance with other approaches [3-5]. As evident the proposed approach has given very given performance for the datasets considered. We plan to extend this work for intelligent surveillance systems to detect anomaly behaviors (example: predict potential terrorist activities) in public places. We also target to develop adaptive selection strategies to detect important features etc.

Classifier	Recognition performance (%)
Neural network	98%
k-nearest neighbour	80%
Rule –based system	88%
Optical flow based system	98%
Multilayer perceptron	93.3%
Template matching	95.5%
Hidden Markov models (HMM)	85%
Support Vector Machines(SVMs)	79.3%
Adaptive neuro-fuzzy inference system (ANFIS)	76.7%

Table 1. Comparison of different approaches for Facial Expression Recognition

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