Improved Gabor Filter Feature Extraction Technique for Facial Expression Recognition

Harshita, Kirti Chaudhary, Anushi, Sandeep K. Gupta

Abstract— **For increasing the recognition rate features using different ways or projection should be extract but there is probability of increasing of redundancy which can be responsible of reducing the recognition rate. High dimension and high redundancy is a problem issue for Gabor while it has maximum variance of features. Dimension and redundancy should be reduced using some technique. The dimension reduction technique for gabor is called filtering so this whole technique is called gabor filter. These filtering technique are sampling etc. In the proposed gabor feature extraction technique the gabor features are filtered using proposed average filter and obtained optimum features for gesture recognition.**

Index Terms—**Facial expression recognition**

INTRODUCTION

Facial expression provides sensitive cues about emotional response and plays a major role in human interaction and nonverbal communication [1]. Facial expressions have been studied by cognitive psychologists, social psychologist, neurophysiologists, cognitive scientist and computer scientists. Facial expression recognition also follows the research framework of the traditional pattern recognition, which is composed of three main aspects: facial expression acquisition, feature extraction, and expression classification[2]. Feature selection (FS) is a global optimization problem in machine learning, which reduces the number of features, removes irrelevant, noisy and redundant data, and results in acceptable recognition accuracy [3]. Zhang Zhong et al. [4] have proposed a scheme of feature extraction for face recognition based on wavelet curvelet fractal technique which is based on embedded similarities of facial emotion image. Different conditions like lighting changes the emotion of face. So for this they suggested to recognize the face by making use of Line Edge Map. The application where it is used as recognition of patterns, psychology, mathematical areas, and physiology and in many computer vision based areas. Xiaoyn Zhang [5] proposed the VQ-based technique. Hazim Kemal Ekenel and Rainer Stiefelhangen [6] suggested in their research that there are suggestive steps to identify the appearance of facial image.

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Harshita, Suresh Gyan Vihar University, Jaipur, India
Kirti Chaudhary, Suresh Gyan Vihar University, Jaipur, India
Anushi, Suresh Gyan Vihar University, Jaipur, India
Sandeep K. Gupta, IRSE, India

Related Work

In feature extraction we convert the original image into a more compact and separable representation by using reduces dimensionality. Also we can say that absorbing the features is similar to reduce dimensions. When the input data to an algorithm is too large to be processed and it is suspected to be notoriously redundant (much data, but not much information) then the input data will be transformed into a reduced representation set of features (also named set of features vector). Converting the input data into the set of features is called feature extraction [7].

a) Gabor Filter

A Gabor filter can be represented by the following equation [8].

$$\psi(x,y,\lambda,\theta) = \frac{1}{2\pi s_x s_y} e^{\frac{1}{2}\left(\frac{x_1^2}{s_x^2}+\frac{y_1^2}{s_y^2}\right)} e^{j\frac{2\pi x_1}{\lambda}} \quad (1)$$

(x, y), the pixel position in the spatial domain.

λ, Wavelength or a Reciprocal of frequency of pixels.

θ , Orientation of a gabor filter.

S_x, S_y, Standard deviation of the x & y directions.

The parameters x_1 and y_1 are given as equation X1=xcosθ + ysinθ y1= -xcosθ + ysinθ (2)
.

The feature extraction method can then be defined as a convolution operation of the given face image I(x, y) with the Gabor filter Ψ(x,y) of size u and angle v are given as equation [9].

$G_{u,v}(x,y)=I(x,y)*\Psi(x,y)$ (3)

b) Gabor sampling filter

In Gabor Sampling filter technique, features are extracted by selection some samples from each Gabor matrices by selecting random features and discarding remaining features.

PROPOSED WORK

The proposed feature extraction technique for face recognition calculate consolidate value of Gabor feature matrices along orientation for each scale for reducing features and redundancy without losing feature values. In the proposed system, 5 different scales and 7 different orientations or total 7*5= 35, Gabor matrices are generated. Thus we have done a down sampling of Gabor feature matrices by 7 without losing any information. Then features are selection suing sampling filter.

EXPERIMENT AND RESULTS

The JAFFE dataset (Lyons et al., 1998; Zhang et al., 1998) used in experiment contains 213 images posed by 10 female. Among 213 images 140 (70 %) are training image and 73 (30%) are testing image. The images were taken from 10 Japanese female models. Each image has a resolution of 256 x 256 pixels. The multiclass AdaBoost classifier is applied for classification of facial expressions.

Sno	Feature Extraction Method	Average Recognition Rate %
1	Gabor Filter method	62%
2	Proposed method	73%

Table 1. Comparison of recognition rate for different technique on JAFEE dataset using Adaboost Classifier

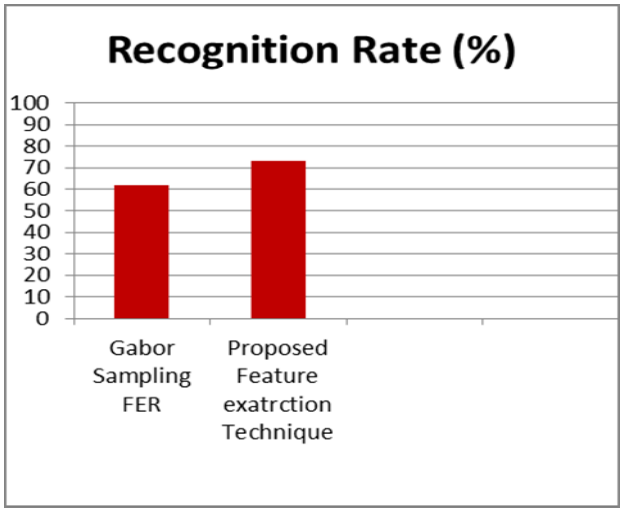

Fig. 1: Comparative Analysis of recognition rate

CONCLUSION

In thesis report an average Gabor filter feature extraction technique is proposed. The experiments result show that proposed method have 73% average correct classification rate which is higher average correct classification rate compared to 62% for Gabor Filter for facial expression recognition for JAFEE dataset with 70/30 training/testing ratio.

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