CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 Conclusion

Pattern recognition is a fast developing research area due to its application in the fields such as emotion and biometric identification. Image Pre-processing, feature selection and classification are the stages of feature extraction technique. Among this Feature Extraction is crucial step of facial expression recognition methodology on which the accuracy of system is depended, so by improving the Feature Extraction process the accuracy of the overall system can be improved.

From the results achieved by different techniques (literature), it is concluded that Gabor feature extraction have higher accuracy compared to discrete wavelet transform and discrete cosine transform. From the analysis of result of Gabor features, it is analyzed that Gabor is better extraction technique for edge or shape features extraction compared to DWT and DCT. In DWT and DCT feature extraction, features are extracted from Low frequency feature sub band (LL) and other frequency bands are discarded. So some of features are lost which are the causes of lower accuracy compared to Gabor. Gabor with scale projection achieved better accuracy compared to Gabor without scale. The problem with Gabor filter is generation of high redundant features and huge dimension of feature matrix which can be reduced effectively using feature reduction techniques.

Gabor extract the edge and local texture pattern from image and it is robust to illumination changes. The scale Gabor is better for resolution changes. In the proposed work we have used scale Gabor filter with 7 different orientations and 3 scales for extracting edge and local gesture textures. The Gabor generates 21 Gabor banks which is four dimensional problems with redundant pattern also. This problem is solved by proposed feature reduction technique effectively.

We have proposed two different three phase feature reduction scheme, (1) Gabor-average-DWT-DCT, (2) Gabor-average-DCT-DWT. The proposed techniques are implemented in
MATLAB and results are validated on JAFFE as well as COHN-KANADE (CK) dataset for robustness of results on some variability in dataset as illumination, obstruction etc.

The results shows that proposed first technique (Gabor-average-DWT-DCT) achieved 93% accuracy on JAFFE dataset and 92.5% accuracy on CK Dataset in terms of recognition rate. Second technique (Gabor-average-DCT-DWT) achieved 86% accuracy on JAFFE dataset and 85% accuracy on CK Dataset in terms of recognition rate. From the results, it is concluded that Accuracy of proposed 3 tier Gabor Average + DWT + DCT feature extraction technique achieved better accuracy compared to Gabor-average-DCT-DWT. The results of this technique were also compares with the results of other existing techniques and concluded that Gabor Average + DWT + DCT provides better results compared to Gabor PCA and other feature extraction techniques for facial expression recognition as mentioned in table 5.8. From table 5.9 and figure 5.16 it is analyzed that images of fear have minimum accuracy while anger, natural and surprise have maximum accuracy.

6.2 Reliability

Gabor kernel of different angle is convolved with face image using different scale but it generates a four dimensional Gabor feature matrix with large level of redundant features. The dimensional and size of feature matrix affect running time of system proportionally and the redundancy of features affect the accuracy of system inversely and reduces the correct recognition rate (CRR) of system. For increasing accuracy of system, redundant features are reduced. In the proposed Gabor feature extraction technique the Gabor features is filtered using 3 tier combination of Average , DWT, DCT feature extraction process and obtain optimum features for facial gesture image using multi level optimization process for enhancing the accuracy. More over this, analysis of results of 3 tier feature extraction technique is done for emotion recognition system and results of proposed technique is compared from other models of feature extraction technique for facial gesture recognition.

COHN-KANADE (CK) has captured with more illumination variation compared to JAFFE technique. Accuracy of both of technique does not vary too much so it is robust to illumination changes / variations. The Gabor-mean-DWT-DCT Technique varies less
compared to Gabor-mean-DCT-DWT technique so Gabor-mean-DWT-DCT Technique is more robust to illumination change compared to Gabor-mean-DCT-DWT technique.

6.3 Future Scope

Although the aim of this research was reached but stills several possible extensions or improvements can be envisaged for the works reported in this thesis. In research work the system is designed only for datasets of images, further system can be designed for real time videos for crime diagnosis.

Further research can be considered in the following directions:

In this research optimization techniques used are DWT and DCT beside these other techniques like Principle Component Analysis or Linear Discriminant Analysis Feature reduction technique can also be used for optimization purpose. The proposed model can be used for real time facial gesture recognition and further for customer satisfaction index evaluation.