Chapter 7

Conclusion and Future Scope
7.1 Conclusion

This thesis presents a number of new and novel results. Current trends in CBIR design is to use different multiscale transform as feature extraction tools. The extracted transform feature are used as an input to different kinds of classifiers for compact generations of signature of the particular class of the image. Different combination of MRA tools and classifiers has been used for various kinds of images as reported in the literature. But no extensive study has been done so far on which MRA tool to be associated with a particular type of classifier in order to get the best result for CBIR design for a particular class of the image. In the present thesis, extensive study has been made on this issue and it was found that the combination of NSCT with parameters 'pyrexc' and 'sinc' along with LSSVM classifier can produce best results for most of the natural image classes.

We have also shown that one of the major problems of conventional CBIR is the semantic gap, that exist between low level image representation and actual visual response. To bridge this gap, relevance feedback mechanism is used. In this present thesis, we have proposed relevance feedback model using fuzzy set theoretic approach, which used both transform feature vector, as well as pre-classified feature vector (using some standard classifier like LSSVM) as input. It is found that the number of the iterations requires to achieve the same level of accuracy is much lower in the case of pre classified feature vector which makes the CBIR system very efficient and accurate.

In the fuzzy based relevance feedback mechanism, the relative weight associated with feature component is getting updated, but if values of some component of the feature vector are relatively small, then they will have insignificant influence in the final result of the similarity computation. As a result, some of the important contributions of the lower valued feature components may be overshadowed by the higher valued features, resulting in an erroneous ranking of the images. To overcome this problem, we have introduced a graph theoretic based re-ranking relevance feedback mechanism in this thesis. This method
gives quite satisfactory retrieval accuracy and can outperforms the weight updation based relevance feedback mechanism.

The thesis also presented two interesting applications on medical CBIR. These CBMIR systems have been designed for radiographic X-ray image database and for color endoscopic image database respectively. In reality, as there exists no classifier, whose accuracy is absolute (100%) So the accuracy of any classifier based CBIR system is always restricted by the accuracy limit of the classifier used. To reduce this accuracy gap, the similarity positional score has been proposed in radiographic X-ray based image retrieval system. This approach has helped the CBMIR system to achieve fairly high accuracy. We have also presented, CBMIR system for endoscopic image retrieval. In this system, NSCT (extract color and texture features) with GGD are used for compact, feature vector generation, and a pre-classifier LSSVM is using auto learning. It is found from the initial results that accuracy achieved using these features is quite promising with small size (300) database. Experimentation with larger endoscopic database extensive performance evaluation is the future scope.

7.2 Future work

The following research works can be undertaken based on the results obtained in this thesis as future research task.

1. NSCT based features with the LSSVM classifier combination can also be used for accurate interframe dissimilarity measurement. This can be used for achieving results with higher accuracy in various video analytic problem like abrupt and gradual shot detection, fading, zooming etc.

2. In Content Based Video Retrieval system (CBVR), relevance feedback mechanism can be used to bridge the gap between semantic notions used for search relevance and
the low level representation of video frame content. Based on the result obtained in this thesis, it can infer that a graph theoretic based re-ranking mechanism in relevance feedback can be used with suitable modification for achieving higher accuracy in CBVR system design.

3. The design of CBMIR system for endoscopic image may be improved further with relevance feedback mechanism based on graph theoretic based re-ranking and using PCNN based shape features beside color and texture. The robustness of such system to be tested large size endoscopic image database (2000 – 5000), which was not available during our thesis work.