CHAPTER 7

CONCLUSIONS

7.1 CONCLUSIONS

This thesis represents the research work of developing new approaches for implementing image retrieval system for ultra sound kidney image database. Various features of ultra sound kidney images have been extracted in four directions using gray level co-occurrence matrices, analyzed and stored for the retrieval purpose. Image retrieval has been found successful for a large database of ultra sound kidney images. The efficiency and retrieval time of these techniques were found to be very impressive. Images have been retrieved from the database using different mathematical techniques such as $t$ test, Max-Min approach and neural approach. The results in brief are given below.

Feature selection and Image retrieval has been developed using student $t$ test. The images given by the user and also the images in the database were subjected to the student $t$-test analysis. The power values are calculated from this test. The images with the power values less than 0.05 are considered as the selected images in the selection process for retrieval purpose. The system searches for the resultant image by comparing the feature values of the query and database images using statistical student $t$ test.

Various features have been extracted using GLCM in four directions namely $0^0$, $45^0$, $90^0$ and $135^0$ angles from the segmented ultra sound
kidney images and it has been analyzed using statistical $t$ test. From the analysis of features, two directions namely $0^0$ angle and $45^0$ angle are selected for the retrieval process. These values are used to retrieve the correct image from the database using Max-Min approach. In this approach, the image which is more similar to the query image has been retrieved as the resultant image based on the maximum number of occurrences of features with minimum difference. If the query image does not match with the stored database image, the query image will be added as a new image in the database.

In the neural approach, as a first step the user has to select the feature which will be used for comparison with the query image. Any one feature or combination of features may be selected for retrieval purpose. Then, the entire images are trained by using 800 epochs in the back propagation network. For training the images, error rate was set as 0.1. The entire image database has been trained for the target value 1 and the appropriate image which is matched with a query image has been retrieved from the database within a short time. The results showed that the neural technique has 83.04% recall and 68.68% precision which is found to be better than the other methods such as linear combining methods and rank based methods.

7.2 FUTURE WORK

The future work can be concentrated for large medical image database and also applied to perform multiple tasks i.e. different types of work which include a detailed image analysis, detection of various diseases and diagnosis for different image types. Some of the image formats viz. x-ray, MRI, mammogram may be used for creation of image database. Different modalities such as PET/CT scanners or the use of image fusion techniques also create multi-dimensional data that needs to be analyzed and retrieved in
the medical domain. This may improve the performance of the system. Various other features may also be extracted and the database may be developed. Combination of features may also be considered for the image comparison and retrieval process. In this work, we have taken single feature for the comparison of images. More than one feature like combination of energy and entropy or contrast and homogeneity may also be performed for the image comparison.

Different distance measures like Euclidean distance, weighted average distance can also be used to develop image retrieval system for ultrasound kidney images. Other statistical tests may also be tried.

The present work may be tested for some other types of images as well. Images of other body parts viz. liver, brain etc. can be taken to see if the same results also apply to them or not. In addition, other type of images like MRI, CT scan, X ray images etc. can also be taken and effects of various parameters can be studied on them.

The image retrieval systems may be developed by using other neural networks such as Radial Basic Function (RBF) network, Bayesian Network etc. Different mathematical techniques such as fuzzy logic may also be used to develop retrieval system. These retrieval processes may be used for diagnosis purpose.