CHAPTER 6: CONCLUSIONS AND FUTURE WORKS

This chapter presents the conclusion of the thesis. This chapter is organized in two sections. Section 6.1 presents concluding remarks and section 6.2 discuss the possible scope for future works.

6.1 Conclusions

The research contributions and achievements of the thesis are as follows:

Chapter 1 introduced the fundamental concept of cancer and microscopic biopsy images. The problem description and steps involved in detection of cancer from microscopic biopsy images .The motivations and objective of the thesis also provided in chapter 1.The contribution of the thesis is also presented in this chapter. At the end of this chapter the originations of chapter of this thesis is describes.

Chapter 2 illustrated the theoretical back ground of the work done in the area of cancer detection from microscopic biopsy images. An automated CAD tools required to process the microscopic biopsy images for cancer detection is model. The design steps of the CAD tool for cancer detection from microscopic biopsy images were investigated as pre-processing, Segmentation, Feature extraction and finally classification. Classification is used to classify the microscopic biopsy images in normal, benign and malignant. Various performance measures for segmentation and classifications are discussed. A brief description of data set description used in testing and experimentation of a CAD tools are also provided. Finally measuring metrics for performance of the overall system are also described.

Chapter 3 describes the detection of cancer from microscopic biopsy images using clinically significant set of hybrid features. In this chapter at each and every stage the better approach is taken and recommended to develop an automated CAD tool for cancer detection. From obtained results KNN is best suited classification algorithm for detection of Non-cancerous and cancerous microscopic biopsy images containing of all four fundamental tissues. SVM provides average results for all the tissues types but not better than KNN. Fuzzy KNN is comparatively less good classifier. RF classifier provides very low sensitivity and down accuracy rate as compared to KNN classifier for this data set. Hence, from experimental results, it was observed that KNN classifier is performing better for all categories of test cases present in the selected test data. These categories of test data are connective tissues, epithelial tissues, muscular tissues, and nervous tissues. Among all categories of test cases, further it was observed that the proposed method is performing better for connective tissues type sample test cases.

Chapter 4 provides the description and implementation of hybrid color k –means approach for segmentation of microscopic biopsy images. The proposed approach was based on tissues level microscopic observations of cell and nuclei for breast biopsy images of benign and malignant tissue. For testing and experimentation purpose, 31 benign and 27 malignant images of 896×768 were taken from breast tissue dataset. Finally, the ROI segmented image of microscopic biopsy was compared to ground truth images. The quantitative and qualitative evaluation of various segmentation approaches for all 58 sample images were performed. From experimental results and analysis, it was observed that the proposed approach is associated with larger value of accuracy, sensitivity, specificity, random index (RI), and smaller value of FPR, FNR, GCE, and VOI in comparison to other methods. Thus hybrid color k –means segmentation approach may be used for segmentation of microscopic biopsy images for cancer detection.

Chapter 5 presented an adaptive fourth order PDE based FCM approach for segmentation of microscopic biopsy images in presence of Passion noise. The proposed AFPDEFCM approach is performing better in terms of all parameters used to measure goodness of segmentation approaches. Thus it is suitable for the segmentation of microscopic biopsy images for cancer detection. This approach is also capable of effectively reducing the blocky artifacts while achieving good tradeoff between Poisson noise removals with edge preservation of the microscopic biopsy images.

From the above conclusions we are in position to conclude that there are four fundamental steps for detection of cancer from microscopic biopsy images, namely preprocessing, segmentation, features extraction and finally classification. Among these steps the segmentation of most challenging and important steps. From a CAD tool every steps is implemented and tested in histology data set of 2828 microscopic biopsy images. For segmentation there are two approaches hybrid color k-means and AFPDEFCM approaches are proposed.

6.2 Scope for future works

Cancer detection cannot be achieved only through pathologists, but the collaboration between pathologists and image processing, pattern recognition professionals and biomedical engineers were play important role to develop robust and effective tools for cancer detection from microscopic biopsy image. Some soft computing approaches also may be used to improve the overall performance of CAD to for detection of cancer from microscopic biopsy images. The methods proposed in this thesis may aid researchers and medical practitioners of the area of cancer detection to go through the state-of-the-art methods for recent development in cancer detection and segmentation from microscopic biopsy images. Further, research may be carried out for enhancement, restoration, segmentation, feature extraction, and classification methods to build more robust systems. The concepts discussed in this thesis may also be extended to other applications such as cancer detection from liver ultrasound images, CT images etc.