CHAPTER-VIII
CONCLUSIONS AND FUTURE DIRECTIONS

8.1 Conclusions

In this thesis, a Decision Support System for Congenital Heart Septum Defect Diagnosis using Neural Networks is developed. Since the Decision Support System is designed using MATLAB's GUI feature, without help and guidance, a user can interact with the system. This makes the developed system user friendly.

The developed Decision Support System is mainly considered to perform Congenital Heart Septum Defect Diagnosis classification. Because the diagnostic procedure of Congenial Heart Septum Defect is a multi stage (Physical & Clinical) tests, the developed Decision Support System is also built based on the multi stage diagnostic procedure. In this thesis, the Decision Support Systems are presented for handling both Physical and Clinical Evaluation tests. The Backpropagation Neural Network Model of Artificial Neural Networks is used to develop the Decision Support Systems and a Delta Learning Rule is used to train the network.

At first, a DSS is presented for Congenital Heart Septum Defect Diagnosis based on Signs and Symptoms in order to perform the Physical Evaluation of a patient. By using the developed system, the patients who suffer with Congenital Heart Septum Defect can be identified at an early stage of the

diagnosis, which can make significant life saving. Also the developed DSS reduces the diagnosis time and increases the accuracy of the diagnosis.

Since the Clinical Evaluation of Congenital Heart Septum Defect Diagnosis includes ECG, Chest X-ray and Echocardiography, respective Decision Support Systems are developed in this thesis.

To extract ECG features automatically, a feature extraction algorithm is developed using Discrete Wavelet Transformation. The Daubaches Wavelet Transformation of level 8 is used for both noise removal and for Peak Detections. Further, a DSS is designed and implemented for classification based on the extracted ECG features by using Backpropagation Neural Network.

To extract Chest X-ray features automatically, a feature extraction algorithm is developed using Digital Image Processing Techniques. A median filter is used for noise removal, threshold based segmentation to extract the contour of heart field so on. Further, a DSS is designed and implemented for classification based on the extracted Chest X-ray features by using Backpropagation Neural Network.

Similarly, to extract Echocardiography features automatically, a feature extraction algorithm is developed using Digital Image Processing Techniques. A median filter is used for noise removal and gray level based threshold is applied to extract the required field and some other techniques are used for efficient extraction of data. Further, a DSS is designed and implemented for

classification based on the extracted Echocardiography features by using Backpropagation Neural Network.

Finally, a DSS is presented to diagnose Congenital Heart Septum Defect based on the resultant values of Signs and Symptoms Diagnosis, ECG Diagnosis, Chest X-ray Diagnosis and Echocardiography Diagnosis. This system gives a final decision taken by the physician.

As individual Decision Support Systems are developed for handling each of the diagnostic tests, the performance of the Decision Support System for Congenital Heart Septum Defect Diagnosis is more when comparing with the manual diagnosis.

8.2 Future Work

- In this study, the major types of Congenital Heart Defects (Congenital Heart Septum Defects) are considered for the Chest X-ray feature extraction, Echocardiography feature extraction algorithms and also for the diagnosis classification. The other types of Congenital Heart Defects like defects in blood vessels and valves are not considered. It may also be considered in the extension of the work.
- In this study, to perform Congenital Heart Septum Defect diagnosis classification, the network is trained using Supervised Learning Rule with the actual values. To deal the uncertainty, Fuzzy Neuro Systems can be developed in future study.