CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 CONCLUSION

This thesis presented the steps involved in the design and development of computer aided diagnosis system. A single-ended MDSS is implemented by combining the features of MCDM, computational intelligent techniques and image processing capabilities for CAD diagnosis. Disease diagnosis and performance analysis is carried out using MATLAB R2013a Version.

The preliminary CAD risk prediction is carried out by designing MCDM model as described in Chapter 3. TOPSIS and SAW methods are incorporated in this model to provide a two class solution for predicting either absence or presence of CAD by analyzing the risk attribute values of CAD. The attribute weights generated from AHP method is applied to the proposed MCDM and computational intelligent techniques for obtaining accurate diagnosis results. The system has provided CAD risk prediction results with an average sensitivity of 97.56%, specificity of 94.44%, accuracy of 97% and precision of 98.77% for TOPSIS method and an average sensitivity of 98.73%, specificity of 85.71%, accuracy of 96 % and precision of 96.30 % for SAW method.

The hybrid Neuro-fuzzy MDSS is implemented by using ANN and ANFIS as explained in Chapter 4 The attribute weights computed using AHP
method are used for initializing the input nodes of ANN. Better convergence in CAD risk prediction is obtained as a result of applying AHP to the neural network. MLBPNN trained using adaptive gradient descent function provided CAD risk prediction results. On presence of CAD, the risk severity level is determined by executing ANFIS. Proposed hybrid system provided CAD diagnosis results with an average sensitivity of 91.44%, specificity of 95.99%, accuracy of 94.15% and precision of 92.61%.

The proposed system illustrated in Chapter 3 and Chapter 4 primarily prevents the hazards of invasive CAD diagnosis methods. Only on positive prognosis of CAD, the coronary angiogram obtained from invasive medical process is used for automatic stenosis grading to confirm the CAD risk is explained in Chapter 5. Pre-processing of input coronary angiogram image, coronary artery segmentation, stenosis detection and its grading are the four steps carried out in the proposed medical image processing phase for confirming the presence and severity level of CAD. The proposed automatic stenosis grading system provided CAD diagnosis results with an average sensitivity of 94.74%, specificity of 83.33%, accuracy of 92% and precision of 94.74%. Based on the kappa value, the system obeys perfect agreement for stenosis grading.

The final diagnostic results of the system act as a second opinion for confirming the presence of CAD and prevent further severity of disease if the risk status is in curable level. Also, the advantage of computing percentage of stenosis in the system is very useful for clinicians in the medical community to provide appropriate dosage of medicines to the patients. Furthermore, the system provided promising results similar to the diagnosis results prescribed by the experienced cardiologists. The system also helps the patients for periodic medical follow up in an easy manner.
6.2 FUTURE WORK

The proposed system provided promising results in the CAD risk diagnosis decision-making by including thirteen commonly used CAD risk attributes prescribed in Cleveland heart disease dataset. More risk attributes can be added to check the performance of the system. Also it is planned to implement the system as a mobile application for feeding medical information and obtain disease diagnosis results. Few more computational intelligent techniques can be developed and the performance of the system is checked for predicting CAD risk and classifying the risk severity level. The framework can be extended for diagnosing heart diseases other than coronary artery disease which will go a long way in helping the medical professional to save lives of common people. It is hoped that future researches could be taken up by extending the evolved computer aided diagnosis system by using medical image processing techniques for screening diseases like cancer & its kinds, brain diseases, kidney diseases and liver diseases. Efficient medical decision support system can improve the life expectancy by reducing the mortality rate drastically.