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ABSTRACT

The main objective of the thesis is to develop a Decision Support System for Congenital Heart Septum Defect Diagnosis using Artificial Neural Network Techniques. The proposed system increases the accuracy of the diagnosis and decreases the diagnosis time.

Design and implementation of *Intelligent Systems* has become a crucial factor for the innovation and development of better products for society. Artificial Neural Networks (ANNs) have been widely advocated as tools for developing Artificial Systems. The major tasks of Artificial Neural Networks are Function Approximation, Classification, Clustering, Decision Support Systems, etc.,

Decision Support System (DSS) has been identified as one of the important solution providers in the emerging field of Artificial Neural Networks. Decision Support Systems are gaining an increased popularity in various domains including business, engineering, military and medicine.

Medical or Clinical Decision Support System (MDSS or CDSS) is an interactive Decision Support System Software, which is designed to assist physicians and other health professionals in decision making tasks and helps to determine diagnosis of patient disease. The Medical or Clinical Decision

Support System reduces the diagnosis time and improves the accuracy of diagnosis.

In this thesis, a Decision Support System is proposed to diagnose Congenital Heart Septum Defect (CHSD) using Artificial Neural Networks. The most commonly used Backpropagation Neural Network model of ANN is implemented in the present study. As the diagnosis process of Congenital Heart Septum Defect includes both Physical (Signs & Symptoms) and Clinical Evaluation (ECG, Chest X-ray and Echocardiography) of a patient, the proposed system develops individual Decision Support Systems for both Physical and Clinical Evaluation of the diagnosis.

To perform Physical Evaluation of Congenital Heart Septum Defect, a Decision Support System using Neural Networks based on Signs and Symptoms is proposed.

Since the Clinical Evaluation of Congenital Heart Septum Defect is based on the Image Analysis, feature extraction algorithms are developed to analyze and extract the features from the images automatically.

To extract the ECG features automatically, an algorithm is developed using Discrete Wavelet Transformations. The Daubaches Wavelet Transformation of level 10 is used for both noise removal and Peak Detections.

To extract the Chest X-ray features automatically, an algorithm is developed using Digital Image Processing Techniques such as median filter for noise removal, threshold based segmentation to extract the contour of heart field and so on.

In order to extract the features automatically from Echocardiography, an algorithm is developed using Digital Image Processing Techniques. Here, also a median filter is used for noise removal, gray level based threshold is applied to extract the required field and some other techniques are used for efficient extraction of data.

In the present study, individual Decision Support Systems using Neural Networks are proposed for Clinical Evaluation to automatically diagnose Congenital Heart Septum Defect based on the extracted clinical features respectively for Congenital Heart Septum Defect diagnosis based on ECG features, for Congenital Heart Septum Defect diagnosis based on Chest X-ray features, for Congenital Heart Septum Defect diagnosis based on Echocardiography features.

Finally by considering the resultant values of all the DSSs, a Neural Network is constructed for the diagnosis of CHSD. In addition to the diagnosis, the proposed system also stores and retrieves the resultant values.

The user friendly Decision Support Systems are designed and implemented in MATLAB 7.3 with GUI features.