www.elsevier.com/locate/cbm

Automated Diagnosis of Congestive Heart Failure Using Dual Tree Complex Wavelet Transform and Statistical Features Extracted from 2 Seconds of ECG Signals

Vidya K Sudarshan, U Rajendra Acharya, Oh Shu Lih, Muhammad Adam, Tan Jen Hong, Chua Kuang Chua, Chua Kok Poo, Tan Ru San

PII: S0010-4825(17)30026-4
DOI: http://dx.doi.org/10.1016/j.compbiomed.2017.01.019
Reference: CBM2591

To appear in: *Computers in Biology and Medicine*

Received date: 16 December 2016
Revised date: 15 January 2017
Accepted date: 28 January 2017

Cite this article as: Vidya K Sudarshan, U Rajendra Acharya, Oh Shu Lih Muhammad Adam, Tan Jen Hong, Chua Kuang Chua, Chua Kok Poo and Tar Ru San, Automated Diagnosis of Congestive Heart Failure Using Dual Tree Complex Wavelet Transform and Statistical Features Extracted from 2 Seconds of ECG Signals, *Computers in Biology and Medicine* http://dx.doi.org/10.1016/j.compbiomed.2017.01.019

Automated Diagnosis of Congestive Heart Failure Using Dual Tree Complex Wavelet Transform and Statistical Features Extracted from 2 Seconds of ECG Signals

Vidya K Sudarshan[1*], U Rajendra Acharya[1,2,3], Oh Shu Lih[1], Muhammad Adam[1], Tan Jen Hong[1], Chua Kuang Chua[1], Chua Kok Poo[1], Tan Ru San[4]

[1]Department of Electronics and Computer Engineering, Ngee Ann Polytechnic, Singapore.
[2]Department of Biomedical Engineering, School of Science and Technology, SIM University, Singapore.
[3]Department of Biomedical Engineering, Faculty of Engineering, University of Malaya, Malaysia
[4]Department of Cardiology, National Heart Centre, Singapore
[*]Corresponding Author: Department of Electronics and Computer Engineering, Ngee Ann Polytechnic, Singapore 599489. Tel.: +(65) 91761371. vidya.2kus@gmail.com

ABSTRACT

Identification of alarming features in the electrocardiogram (ECG) signal is extremely significant for the prediction of congestive heart failure (CHF). ECG signal analysis carried out using computer-aided techniques can speed up the diagnosis process and aid in the proper management of CHF patients. Therefore, in this work, dual tree complex wavelets transform (DTCWT)-based methodology is proposed for an automated identification of ECG signals exhibiting CHF from normal. In the experiment, we have performed a DTCWT on ECG segments of 2 seconds duration up to six levels to obtain the coefficients. From these DTCWT coefficients, statistical features are extracted and ranked using Bhattacharyya, entropy, minimum redundancy maximum relevance (mRMR), receiver-operating characteristics (ROC), Wilcoxon, *t*-test and reliefF methods. Ranked features are subjected to k-nearest neighbor (KNN) and decision tree (DT) classifiers for automated differentiation of CHF and normal ECG signals. We have achieved 99.86% accuracy, 99.78% sensitivity and 99.94% specificity in