ISSN 0511-5728
The West Indian Journal of Engineering
Vol.39, No.1, July 2016, pp.81-89

A Biosensor for Automated Feature Extraction and Non-invasive Cardiovascular Diagnosis Using Photoplethysmography Waveforms

Nalini Gayapersad[a] and Sean Rocke[b,Ψ]

Department of Electrical and Computer Engineering, The University of the West Indies, St. Augustine Campus, Trinidad and Tobago, West Indies;
[a]E-mail: gayapersad.nalini@gmail.com
[b]E-mail: sean.rocke@sta.uwi.edu

[Ψ] *Corresponding Author*

(Received 29 October 2015; Revised 16 April 2016; Accepted4 June 2016)

Abstract: *Indices derived from the morphological features of photoplethysmography waveforms are increasingly being investigated and linked to cardiovascular diseases, and may eventually be used to enhance patient risk assessments. These indices can be retrieved faster than the results for cholesterol tests (i.e., which are typically required for many risk assessments), are non-invasive, and may be less costly. This paper presents an overview of the development of a non-invasive, continuous, compact and portable device used to acquire the cardiovascular data necessary for assessment and diagnosis in real-time. Typically these indices are not evaluated in real-time, but are instead assessed offline and manually, once the waveform is retrieved. The system presented performs real-time, automatic feature extraction for cardiovascular diagnosis by identifying the 'a', 'b' and 'e' waves derived from the second derivative of the photoplethysmogram waveform, followed by calculating indices associated with these waves. Results demonstrate the feasibility and utility of such a system as an enabler of personalised cardiovascular care systems. Results from demonstrative tests with test subjects are comparable to those in the literature. This paper also offers valuable insights into the challenges in deploying automated, non-invasive, continuous monitoring systems for extraction of cardiovascular health indicators beyond heart rate and blood pressure.*

Keywords: *Automatic feature extraction, biosensor, cardiovascular diagnosis, medical device, photoplethysmography*