ASSESSMENT OF HEART RATE VARIABILITY (HRV) FROM ELECTROCARDIOGRAM

Paulo Urbano dos Santos [1]
Eduardo Guy Perpétuo Bock[2]

ABSTRACT

Cardiovascular diseases were the global leading cause of death in 2017, according to the Pan American Health Organization. It is one of the main diseases that cause morbidity and mortality globally, despite significant progress in preventive and treatments of these diseases. Among the clinical methods most used to assess the health of the cardiovascular system is the electrocardiogram, due to its characteristic of being one of the main non-invasive clinical methods and being sensitive to the detection of changes in the time interval between heartbeats, which are due to dynamic way. These dynamic changes are known clinically as Heart Rate Variability (HRV), a parameter that can be followed by R peaks (GEORGIEVA-TSANEVA, 2016; VANDERLEI *et al.*, 2009). Through heart rate variability, the health of the autonomic nervous system can be monitored, with the parameters rMSSD and pNN50 being obtained from specific variability to assess the behavior of the parasympathetic nervous system. In order to extract the R peaks from the ECG, the signal can be decomposed with the wavelet transform. In Matlab software there is a specific code to extract the wavelet transform, in the format of the V5 derivation of the ECG. The main objective of this work was to analyze the feasibility of an algorithm that performs the execution of heart rate variability using the rMSSD (Root mean square of the successive NN interval difference) and pNN50 methods (Normal-to-normal NN intervals whose difference exceeds 50 milliseconds), based on records from the electrocardiogram. To carry out this study, exams obtained from the PhysioNet database were used, specifically from individuals with arrhythmia, supraventricular arrhythmia,

[1] Mestrando em Engenharia Mecânica no Instituto Federal de Educação, Ciência e Tecnologia do Estado de São Paulo - IFSP, purbano@ymail.com;
[2] Professor orientador: Doutor, Instituto Federal de Educação, Ciência e Tecnologia do Estado de São Paulo, Laboratório de Bioengenharia e Biomateriais - IFSP, eduardobock@gmail.com.

normal sinus rhythm and individuals who were undergoing polysomnography. The data obtained indicate that individuals with a normal sinus rhythm have both rMSSD and pNN50 values lower than in other clinical conditions, which proves that the capacity of cardiac autonomic modulation was altered in some diseases of the cardiovascular system, favoring significantly for the development of arrhythmias, these findings follow the records found in the literature. Thus, it was possible to visualize the correlation between heart rate variability and cardiovascular diseases, as well as the effectiveness of the implemented algorithm.

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17th Congress of Latin American Society of Artificial Organs, Biomaterials, and Tissue Engineering

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Paulo Urbano dos Santos [3]
Eduardo Guy Perpétuo Bock [4]

SUMMARY

Cardiovascular diseases were the leading cause of death in the world in 2017, according to the Pan American Health Organization. It is one of the main diseases that cause morbidity and mortality globally, despite significant progress in preventive programs and treatments for these diseases. Among the clinical methods most used to assess the health of the cardiovascular system is the electrocardiogram, due to its characteristic of being one of the main non-invasive clinical methods and being sensitive to the detection of changes in the time interval between heartbeats, which are due to dynamic way. These dynamic changes are known clinically as heart rate variability, a parameter that can be accompanied by ECG landmarks with R peaks (GEORGIEVA-TSANEVA, 2016; VANDERLEI et al., 2009). Through heart rate variability, the health of the autonomic nervous system can be monitored, with the parameters rMSSD and pNN50 being obtained from specific variability to assess the behavior of the parasympathetic nervous system. In order to extract the R peaks from the ECG, the signal can be decomposed with the wavelet transform. In Matlab there is a specific code to extract the wavelet transform, in the format of the V5 derivation of the ECG. The main objective of this work was to analyze the feasibility of an algorithm that performs the execution of heart rate variability, in Matlab software, using the rMSSD (Root mean square of the successive NN interval difference) and pNN50 (Normal-to-normal NN difference) methods. intervals whose difference exceeds 50 milliseconds) from records from the electrocardiogram. To carry out this study, exams obtained from the PhysioNet database were used, specifically from individuals with arrhythmia, supraventricular arrhythmia, normal sinus rhythm and individuals who were undergoing polysomnography. The data obtained indicate that

[3] Master's student in Mechanical Engineering at the Federal Institute of Education, Science and Technology of the State of São Paulo - IFSP, pururbano@ymail.com;
[4] Advisory Professor: Doctor, Federal Institute of Education, Science and Technology of the State of São Paulo - IFSP, bock@ifsp.edu.br.

individuals with a normal sinus rhythm have both rMSSD and pNN50 values lower than in other clinical conditions, which proves that the capacity of cardiac autonomic modulation is altered in some diseases of the cardiovascular system, favoring significantly for the development of arrhythmias, these findings follow the records found in the literature. Thus, it was possible to visualize the correlation between heart rate variability and cardiovascular diseases, as well as the effectiveness of the implemented algorithm.

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