

ECG SIGNAL PROCESSING USING THE MATLAB SOFTWARE

Adriana Maria CIUPE¹,
Alexandru Rares IUSAN², Nicolae Marius ROMAN³

Abstract. *The aim of this article is to improve the process of the ECG signal using the Matlab software. In this case, we implemented some filters: Notch and Hanning ones. Also, we detected the R-R peaks, in order to determine the heart beat rate and developed an algorithm for the baseline wander, in order to detect the ST segment.*

Keywords: ECG signal, data acquisition, Hanning, Notch, Matlab, baseline wander

1. Introduction

The electrocardiogram (ECG) is one of the oldest and most important clinical investigations for diagnosing of heart diseases. This method is a noninvasive examination and the signal is obtained from the electrical currents which are present on the body surface. Each heartbeat is represented as a series of electrical waves characterized by peaks and valleys. An ECG gives two kinds of information: the duration of the electrical wave crossing the heart and the amount of electrical activity passing through the heart muscle. [1]

The recognition of the ECG signal is a very important part of the cardiac diagnosis process. That's why it is necessary to detect the QRS complex and the P, T and U waves. [2]

The frequency range of the electrocardiogram is between 0.05 and 100 Hz and the signal range is at about 5 mV for an adult. This signal is characterized by 5 peaks and valleys: P, Q, R, S and T and in some cases another peak is present: U. Still, the performance of an ECG analysis depends mainly of the accurate detection of the QRS complex, which is the most important task in this signals analysis.

In figure 1 it is shown a representation of one normal ECG period.

While analyzing the ECG signal, a series of abnormalities can appear. Some of the most common are represent the in table 1.

¹Ph.D. student, Faculty of Electrical Engineering, Technical University of Cluj-Napoca, Romania (Adriana.Ciupe@et.utcluj.ro)

²Ph.D. student, Faculty of Electrical Engineering, Technical University of Cluj-Napoca, Romania (iusan_resh@yahoo.com).

³Prof., PhD, Electrical Engineering Faculty, Technical University of Cluj Napoca, Cluj Napoca, Romania, (Marius.Roman@et.utcluj.ro).