Determination of low hemoglobin level in human using the analysis of symbolic dynamics of the heart rate variability

I. Introduction

Hemoglobin is the major transporter of oxygen to cells in the human body. Reduced hemoglobin level (anemia) is an undesirable state of an organism, which leads to a number of clinical consequences [1]. In addition, a decreased level of hemoglobin is a contraindication for a blood donation. World Health Organization (WHO) recommends to exclude the donation from men with hemoglobin concentration below 135 g/l and from women with hemoglobin concentration below 125 g/l [2]. Therefore, the issue of quick, non-invasive and painless determination of a hemoglobin value is essential. Recently, the correlation between an electrocardiogram (ECG) and a concentration of hemoglobin in a human blood was found [3]. Particularly, authors had found that tachycardia and some ECG findings correlate with hemoglobin level. Electrocardiography is one of the most powerful, reliable and well-studied non-invasive testing technology and diagnostic method of cardiovascular diseases [4].