

## I. Introduction

A human body is a complex physiological system, which generates the signals of a different nature in the process of vital activity such as electrical, thermal and others [1]. Those signals and their fluctuations reflect the internal dynamics of the processes occurring in the body. At the same time, the cardio dynamics of the human body is managed by a compound interaction of two opposing components: sympathetic regulation, which accelerates the heart rate, and parasympathetic regulation, which slows it. Mathematical models, which demonstrate this interaction, are the key elements of the screening diagnostics of a cardiovascular system, as well as the autonomic nervous system (ANS) in general. ANS, which is regulated by the hypothalamus, along with the heart rhythm, is also associated with the digestive, respiratory and urogenital systems [2], which allows making a conclusion about an existence of the indirect connection between the heart muscle activity and systems mentioned above. And that, in turn, provides a potential opportunity to analyze the work of internal organs basing on the analysis of the heart muscle activity. Wherein, the analysis of heart rate variability (HRV) occupies one of the leading positions. For example, myocardial infarction is an acute manifestation of the ischemic heart disease. Earlier [3], an effective hierarchical method of the automatic diagnosing of myocardial infarction was proposed basing on the analysis of the properties of cardiac cycles (sensitivity of the method is 92.3%, specificity is 88.1%). Zewdie et al. offered the algorithm, which does not require sophisticated parameter setting and provides higher values of sensitivity and specificity using the same database (98.7% and 96.4%, respectively). A signal of an electrocardiogram (ECG) is represented as a solution of a second-order differential equation with time-dependent coefficients. Coefficients are estimated by the method of the ordinary least squares, and their maximum values in the considered time interval become the input of the SVM classifier. Another example is hypertension - a persistent increased blood pressure, which increases the risk of heart attacks and hemorrhages. Recent studies show that HRV analysis allows predicting the risk of acute pathological conditions (heart attack, stroke, syncope) with a sensitivity level of 71.4% and a specificity of 87.8% [4].