Chapter 9

Real–Time Cardio Monitoring and Characterization of Diseases Introducing Statistical and Spectrogram Analysis

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ABSTRACT

This chapter provides significant theoretical and systematic frameworks and the latest empirical research towards the development of an automated cardiovascular disorder diagnostic system with the classifier. This research proposes an accurate non-invasive model of the cardiovascular diseases diagnostic system. This model of diagnostic system support superior mobility with continuous real-time monitoring facility. This monitoring system will uncover a new dimension towards cardiovascular research. A physician will able to monitor several heart patients remotely with this device. Also, they can prescribe proper medicine remotely to the patient in an emergency. The system also has a provision to alert the patient by predicting the specific type of cardiovascular disorder accurately. An automated cardiovascular disorder diagnostic system development focuses towards the prime objective. Another objective is the adoption of modern classification technique for detecting cardiovascular disorders with high accuracy.

INTRODUCTION

The cardiovascular disorder has now been a massive problem throughout the world. According to the W.H.O. (World Health Organization) The cardiovascular diseases were responsible for an estimated 17.7 million deaths globally in 2015, representing around 31% of all global deaths (World Health Organization

[WHO], 2017). The malfunction of human heart and disorder in the blood circulation system including arteries and vain are responsible for the cardiovascular disorder. Several important factors are responsible for cardiovascular disorder including taking a heavy amount of medicine, unbalanced and unhealthy lifestyles like drinking excessive alcohol, smoking, and excessive consumption of high-caloric food like red meat, egg, and high blood pressure, obesity, diabetes, mental stress. These risk factors severely reduce functional activity of heart and blood circulation system. The abnormal functionality of heart pumping and blood circulation system is the main cause of several fatal diseases like mitral stenosis, rheumatic heart disease, mitral valve regurgitation, and aortic regurgitation, myocardial infarction, tricuspid regurgitation, aortic stenosis, asthma, tricuspid stenosis, ischemic heart disease with including the deadly heart attack. As a result, the scientists are looking forward to taking advantage of further development related to cardiovascular disorders. The effect of advancement in engineering in our society; a vast change has taken place in medical science. Now the conceptual development of an automated cardiovascular disorder diagnostic system has been proposed for detecting several cardiovascular diseases with the high level of accuracy. The diseases we are dealing with here are Myocardial Syndrome, Myocardial Infarction, Heart Attack, and Sinus Syndrome.

Myocardial infarction (MI) is the irreversible death (necrosis) of heart muscle secondary to prolonged lack of oxygen supply (ischemia). Patients with typical MI may have the prodromal symptoms in the days preceding the event such as Fatigue, Chest discomfort, Malaise.

Acute myocardial infarction is a life-threatening cardiovascular problem that occurs when blood flow to the heart muscle is abruptly cut off. That is a serious cause of permanent tissue damage. This life-threatening condition generally occurred due to the blockage in one or more of the coronary arteries in the cardiac system.

Sick sinus syndrome also is known as sinus node disease or sinus node dysfunction is the name for a collection of heart rhythm problems (arrhythmias) in which the sinus node the heart's natural pacemaker doesn't work accurately. The sinus node is an area of specific cells in the upper right chamber of the heart that controls the rhythm of the heart. Normally, the sinus node of the heart produces a steady pace of regular electrical impulses. In sick sinus syndrome, these signals are abnormally paced. It is relatively uncommon, but the risk of developing sick sinus syndrome increases with age.

A heart attack appears if the flow of oxygen-rich blood to a segment of heart muscle abruptly becomes blocked and the heart can't get oxygen. If blood flow isn't restored quickly, the section of heart muscle begins to die.

A view of the heart's activity, which generated during the cardiac cycle, is provided by the view of electrocardiogram (ECG). The condition human cardiovascular system can be depicted through the detailed analysis of ECG signal graph. Here in this scenario, two different types of classification models are introduced in the segment of cardio-diagnostic system for efficiently detecting a specific type of heart disease.

THE ECG signal analysis and simulation in terms of spectrogram representation is the essential element in this study for diagnosing various cardiovascular disease. The spectrogram analysis of the human heart ECG signal for detecting the abnormalities of the cardiovascular system has been studied. The spectrum of the signal frequencies is visually represented by spectrogram analysis with the variation of time and frequency. The innovative spectrogram analysis model of ECG signal has been proposed for visual detection of various fatal heart problem like myocardial infarction, myocardial syndrome, sick sinus syndrome, heart attack. Along with this, the generalized study of heart ECG signal has been observed. An electrocardiogram abbreviated as EKG or ECG is a test that measures the electrical activity

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