A Study of Signal Processing Techniques in Wireless Body Sensor Network for Heart Rate Estimation with Context Awareness

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Abstract—Continuous monitoring of vital signs is helpful for the healthcare professionals in early diagnosis of diseases and to take preventive action. Blood pressure, heart rate is some of the vital signs that can be monitored using a wearable device. In order to help the healthcare professional in identifying the situation, context should be recorded. The objective of this research is to design a Body Sensor Network (BSN) to measure Heart Rate (HR) with context awareness sensing. In HR estimation, to remove Motion Artifacts (MA), Least Mean Squares (LMS) algorithm is used and a HR estimation algorithm is developed. To collect the data, a device is manufactured which can transmit data wirelessly to a database. The selected signal processing methods are applied to these collected data to estimate HR along with the context of the user.

Keywords—Wireless Body Sensor Network, Deep learning, Signal Processing, Context aware sensing

I. INTRODUCTION

Wearable devices are used to monitor vital signs in medicine, and sports fields. It is important to provide continuous physiological data such as blood glucose levels, blood pressure, pulse rate, Electrocardiography (ECG or EKG) and respiration rate for healthcare professionals to assist them in medical situations. This will also lead to reduce healthcare costs since it will facilitate disease prevention and enhance the quality of life. But without the context of the patient, healthcare professionals cannot make correct decisions based on Heart Rate (HR). To give a solution to this problem, a wireless Body Sensor Network (BSN) is designed to estimate HR and the difference with other systems is that this includes context awareness sensing. Motion Artefacts (MA) are removed by applying signal processing methods and HR is estimated. In order to detect the context, deep learning methods are used.

II. BACKGROUND

2.1 Heart Rate Acquisition

To monitor health of a patient vital signs are monitored and HR is one of them. The most commonly used method is to take the heart rate using the pulse. The disadvantage of this method is that continuous monitoring is not possible with this method. Photoplethysmography (PPG) and ECG are the other ways