

Study on Acquisition System of Diversification Heartbeat Information based on Body Sensor Network*

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Abstract - Heartbeat information and motion parameters have a close relationship with human's health and emotion. The feasibility of acquisition heartbeat information associated with emotional states based on body sensor network is a hot research topic. In this paper, we investigate four kinds of method to collect heartbeat information, which contain complementary information of different biological information dimension. This study truly displays the concept of biological information system theory, which can collect heartbeat information with all of a human body's biological system information. The information collected from several collecting methods will be validated from various angles for each dimension.

Index Terms - Heartbeat Information; Sensor; Data Fusion; Biological Information Systemic; Body Sensor Networks;

I. Introduction

Remote home monitoring of symptoms and physiological variables may allow early detection and treatment of many physical and mental illness, there are growing evidences to support that physical illness and mental illness are very closely linked[1].The biological signals based on body sensor networks may carry specific characteristics that reflect basic dynamics of the human body[2].Therefore, acquiring a full range of information of the person by body sensor network is a hot topic[3, 4], reviewing the ancient and modern literature of traditional Chinese medicine and western medicine, The human heartbeat information is a well-studied topic, heartbeat signals carry specific signatures that are related to human physiologic mechanisms and psychological mechanisms[5], such as tachycardia is a resting heart rate more than 100 beats per minute. It can be led emotional conditions such as anxiety or stress, human motion, and so on. Athletes are interested in monitoring their heartbeat information to gain maximum efficiency from their training. Heartbeat information include emotion factor[6, 7], movement factor, and about 174 pathology Irregular heartbeats[8], and so on. The heartbeat information analysis has made positive contributions to the timely detection and better management of physical illness and mental illness in home or clinical situations[9].

Heartbeat information monitors allow measurements to be taken continuously and can be used during exercise when manual measurement would be difficult. Traditional, the

objective heartbeat information can use a few means to achieve. such as the measurement of heart rate usually can be measured by checking the pulse or listening to the heartbeat with a stethoscope with doctor. At present, The first, heartbeat information might obtain through probing the bioelectrical of drive heartbeat, and ECG is precise method of determining heartbeat information with this theory; the second, it can be obtained by pulse wave according to Chinese medicine; the third, it can also get by blood oxygen volume. The fourth, photoplethysmogram(PPG), This optical technique measures heart rate by monitoring the subtle changes in skin color as the capillaries in the tissue expand and contract with each heartbeat[10, 11].

The characterizations of heartbeat information have heart rate, waveform shape features, the electrical activity of the heartbeat. Heart rate, the speed of the heartbeat, can vary as the body's need to absorb oxygen and excrete carbon dioxide changes, such as during physical exercise, sleep or illness.

However, as science and technology was the rapid development, many new methods is been emergence. Professor William T. Freeman, Massachusetts Institute of Technology, they are able to visualize the flow of blood as it fills the face using Eulerian Video Magnification framework for visualizing the human pulse[12], Daniel Lakens demonstrates the feasibility of measuring heart rate differences associated with emotional states such as anger and happiness with a Smartphone [6], in this paper we practice a new method to obtain heart rate by pressure cushion recording of the body vibrations with body sensor network. In the future, sensing data of clothes on our body and around the body of the sensor transmit our physiologic and psychological information to specific doctor in real time.

II. Obtaining heartbeat information with pressure cushion

A. raw data of collecting system

In this paper, the architecture of acquisition heartbeat information system is proposed, depicted in Fig. 1, they are basically composed of three modules: sensing, processing and transmitting. Sensing module is composed of four pressure sensor; processing module is used AVR single-

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