Real-Time Health Monitoring System: A Review

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ABSTRACT

Generally in critical case patients are supposed to be monitored continuously for their heart rate, oxygen saturation level, blood pressure, body temperature, pulse-oximetry (SPO2) and ECG etc. In the previous methods, the doctors need to be present physically on sight, so that the real time health monitoring system is used every field such as hospital, home care unit, sports using wireless sensor network. This health monitoring system use for chronicle diseases patients who have daily check-up. So, researchers design a system as portable device. Researcher designed different health monitoring system based on requirement. Different platform like Microcontroller, ASIC, PIC microcontroller and embedded systems are used to design the system based on this performance and in the recent years cloud based e-healthcare systems have emerged. In future FPGA based or using IoT we can develop a system which will help to monitor different health parameters.

Keywords: Real-Time Health Monitoring, Wireless Sensor Network, ECG, Body temperature, Oxygen saturation, Blood pressure, SPO2.

I. INTRODUCTION

In today's life, health problems are occur more than last 25-30 years ago because of modernization, industrialization. Suddenly, changes in environment are directly effect to health condition. So, more health related problems are occurring day by day, require to daily check-up health condition. Researchers design health monitoring system by considering the health condition of patients. Therefore, make device as portable which can handle by any one person and also have ability to provide more flexibility. Many new research is focused at improving quality of human life in terms of health by designing and fabricating sensors which are either in direct contact with the human body (invasive) or indirectly (non-invasive) in contact.

Many type of sensors have been developed, which can measure a variety of bio-signals. For example, electroencephalograms (ECG), pulse rate, body temperature, blood pressure, oxygen saturation, respiration rate and so on. Through the monitoring of these indicators we can roughly understand the body's physical health and illness. By medicine subjects, we know that the body's normal average temperature is between 36-37 ℃, the body's normal blood pressure is systolic blood pressure, less than 120, in special circumstances 120-139 is normal, diastolic blood pressure less than 80, in special circumstances 80-90 is normal, blood oxygen content greater than or equal to 95 Normal, pulse between 60-100 times per minute is normal. The traditional method is to check the patient to the hospital or specialized clinic by a doctor using fixed diagnostic medical equipment, the biggest drawback of the method is inconvenient for patients, not flexible, especially for elderly patients, disabled patients and remote mountain patients, and because of fatigue and back and forth to the hospital to see patients with adverse reactions and other complex equipment of the psychological pressure, making the diagnosis not matching the data with the real situation may lead to wrong diagnosis. In this paper it designs a new type of wireless network monitoring systems, using a variety of sensors automatically collect patient physiological indicators, the use of multi-channel high-frequency wireless data transmission, a doctor's examination and consultation, the biggest advantage of the approach is that eliminates patients' running around between home

and hospital; patients accept checks in the free space and mind of peace, measure accurately; enhance the hospital's modern information management and increase efficiency; especially for rural patients in underserved areas and chronic diseases and aging patient care. The wireless sensor network is to remote health care to provide a more convenient, fast and accurate means of technology.

II. LITERATURE SURVEY

Augustus E. Ibhaze, MNSE, Francis E. Idachaba [1] it is important to measure basic health parameters for aged people often to reduce the risk of ill of falling and dying. So the microcontroller based system is designed to monitor the both heart rate and temperature. This system sends the text message to the mobile phone. When the readings are not normal or increased beyond the threshold level, the device makes used of the sim808 GPRS/GSM/GPS to send the reports of patient's health and the location to a doctor's and caretaker mobile phone. By using Arduino microcontroller sensors attached to the finger of patient for measuring temperature and heart rate. Also it is designed to recognize the location of the patient. This device takes 9v powered battery.

Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour [2] Here authors used Arduino shield to connect different sensors like temperature LM-35 sensor, blood glucose sensor and blood pressure sensor. By using LabVIEW software one can take reading of different parameters from the patient's body. The updated data displayed on LabVIEW front panel using Data Dashboard application. This collected biometric information sent wirelessly via ZigBee.

Abhilasha Ingole, Shrikant Ambatkar [3] this paper based on basic health parameter monitoring without using heavy or bulky system. The credit card size minicomputer placed beside the patient's bed with power and results can see on the screen of computer which is in the same area network. It provides readings of body temperature and heartbeat. For temperature monitoring system used DS18B20 sensor and for heartbeat, it works on the principle of light modulation by blood flow through finger at each pulse. The detected values uploaded on the webpage. This web page created by written the code in HTML. As the Python is user friendly, used to interface different measurement parameters with Raspberry Pi. One can see the actual status of the system on LX Terminal.

Rajalakhshmi.S S.Nikilla [4] this paper based on Real Time Health Monitoring System using Arduino. In this paper, researcher implemented a prototype model for the real time patient monitoring system. This method is used to measure the physical parameters like body temperature, heart beat rate, and oxygen level monitoring with the help of different biosensors. In this novel system the patient health is continuously monitored and the acquired data is transmitted to a using Wi-Fi wireless sensor networks. Transmission and reception of the signal is done by using HT12D & HT12E is a 212 series decoder IC (Integrated Circuit) for remote control applications manufactured by Holtek. It is commonly used for radio frequency (RF) wireless applications. By using the paired HT12E encoder and HT12D decoder one can transmit 12 bits of parallel data serially.

Dongdong Loua, Xianxiang Chen, Zhan Zhao, Yundong Xuana, Zhihong Xua, Huan Jina, Xingzu Guo, Zhen Fanga [5] this paper is based on a wireless health monitoring system based on android operating system, which consists of a mobile health monitoring system which consists of a portable multifunctional physiological parameters detecting 3AHcare node and a mobile program for real-time data telemetry based on the smartphone with the android operating system. The 3AHcare node is a health monitoring device with embedding Bluetooth module is used which is capable of measuring a subject's ECG, blood pressure, blood oxygenation, respiration, temperature and motion – almost equivalent to the feature set of a hospital bedside patient monitor. The android application is used to receive physiological parameters such as ECG via the socket connection between the Android device and the detecting module: using special algorithms to get steady waves the received data has been processed and stored in microSD flash memory: displayed in the form of digit and waveform. The monitoring system is small, portable, low-cost and easy-to-use without the limit of time and places. The use of Bluetooth standard communication protocol for data transmission and Android operating system for software development make the monitoring system more interchangeable. Physiological parameters can also be transmitted between Android smartphone and the remote server via WiFi or 3G, this makes a very important significance for mobile health care.
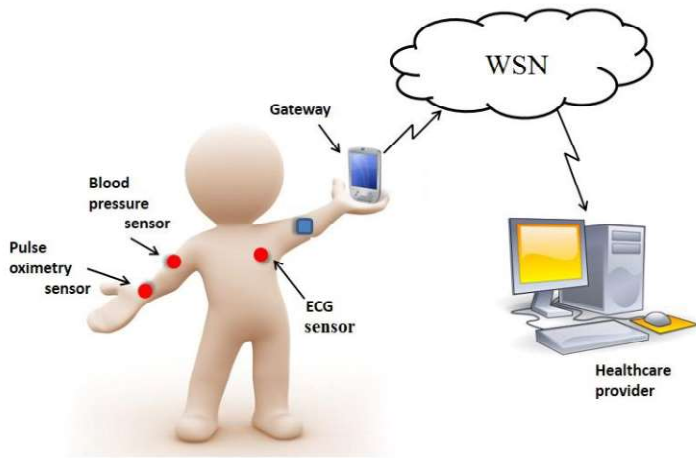
Fig 1 Health Monitoring System

Won-JaeYi, Oishee Sarkar, Thomas Gonnot [6] this paper presents an architecture of fall detection system paired with the Wireless Intelligent Personal Communication Node (W-iPCN) and Android smartphone is presented. Data received from accelerometer and gyroscopes for falls detection through the W-iPCN. Bluetooth consumes more battery power. To overcome this problem, W-iPCN is introduced. 6LoWPAN is based on IEEE 802.15.4 MAC layer which gives flexibility with another packet switched network like internet. In the process they used one accelerometer on the patient's thigh i.e ADXL345 and a combination of one LSM303 accelerometer and one L3GD20H gyroscope on his chest. These sensors data can access by W-iPCN to check whether the patient is fallen, lying own, sitting down or upright.

Type of Bio-signal	Type of Sensor	Description
Electrocardiogram	Skin/Chest electrodes	Electrical activity of heart
Heart rate	Pulse oximeter/skin electrodes	Frequency of the cardiac cycle
Blood pressure	Arm cuff based monitor	Refers to the force exerted by circulating blood on the walls of blood vessels especially the arteries
Body temperature	Temperature probe or skin patch	A measure or the body's ability to generate and get rid of heart
Respiration rate	Piezoelectric/ piezo resistive sensor	Number of movements indicative of inspiration and expiration per unit time
Oxygen saturation	Pulse oximeter	Indicates the oxygenation or the amount of oxygen that is being carried in a patient's blood

REFRENCES

1. Augustus E. Ibhaze, MNSE, Francis E. Idachaba, "E-Health Monitoring System for the Aged" 2016 IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies (EmergiTech), 978-1-5090-0706-6/16/$31.00 ©2016 IEEE.

2. Amna Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour, and Mohammed, "Real time wireless health monitoring application using mobile devices" International Journal of Computer Networks & Communications (IJCNC) Vol.7, No.3, May 2015, DOI : 10.5121/ijcnc.2015.7302.

3. Abhilasha Ingole, Shrikant Ambatkar, Sandeep Kakde, "Implementation of Health-care Monitoring System using Raspberry Pi" This full-text paper was peer-reviewed and accepted to be presented at the IEEE ICCSP 2015 conference. 978-1-4799-8081-9/15/$31.00 © 2015 IEEE.

4. Rajalakhshmi.S S.Nikilla, "Real Time Health Monitoring System using Arduino" South Asian Journal of Engineering and Technology Vol.2, No.18 (2016) 52–60 52, 11/03/2016, ISSN No: 2454-9614.

5. Dongdong Loua, Xianxiang Chen, Zhan Zhao, Yundong Xuana, Zhihong Xua, Huan Jina, Xingzu Guo, Zhen Fanga, "A Wireless Health Monitoring

System based on Android Operating System" 2013 International Conference on Electronic Engineering and Computer Science, IERI Procedia 4 (2013) 208 – 215.

6. Won-Jae Yi, Oishee Sarkar, Thomas Gonnot, Ehsan Monsef and Jafar Saniie, "6LoWPAN-enabled Fall Detection and Health Monitoring System with Android Smartphone",978-1-4673-9985-/16/$31.00 ©2016 IEEE.

7. Alexandros Pantelopoulos and Nikolaos G. Bourbakis, "A Survey on Wearable Sensor-Based Systems for Health Monitoring and Prognosis" IEEE TRANSACTIONS ON SYSTEMS, MAN, AND CYBERNETICS—PART C: APPLICATIONS AND REVIEWS, VOL. 40, NO. 1, JANUARY 2010.

8. Dr. Deepak Choudhary, Prof. Rakesh Kumar, Ms. Neeru Gupta,"Real-Time Health Monitoring System on Wireless Sensor Network" VOLUME 1 NUMBER 5 (Sep/Oct 2012) ISSN: 2277–1891, IJAITI 2012.

9. Chen Li-Wan, Chen Qiang, and Li Hong-Bin, "Wireless Sensor Network System for the Real-Time Health Monitoring" W. Hu (Ed.): Electronics and Signal Processing, LNEE 97, pp. 9–14. Springerlink.com © Springer-Verlag Berlin Heidelberg 2011.

10. S. Da gtas¸ G. Pekhteryev Z. S¸ahino glu, H. C¸ am and N. Challa, "Real-Time and Secure Wireless Health Monitoring" Hindawi Publishing Corporation International Journal of Telemedicine and Applications Volume 2008, Article ID 135808,10 pages doi:10.1155/2008/135808 Research.

11. Priyanka Kakria, N.K.Tripathi and Peerapong Kitipawang, "A Real-Time Health Monitoring System for Remote Cardiac Patients Using Smartphone and Wearable Sensors" Hindawi Publishing Corporation International Journal of Telemedicine and Applications Volume 2015, Article ID 373474, 11 pages http://dx.doi.org/10.1155/2015/373474.

12. Souvik Das," The Development of a Microcontroller Based Low-Cost Heart Rate Counter for Health Care Systems" International Journal of Engineering Trends and Technology-Volume4Issue2- 2013