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Available online at: www.jrrset.com
ISSN (Print) : 2347-6729
ISSN (Online) : 2348-3105
JIR IF : 2.54
SJIF IF : 4.334
Cosmos: 5.395
Volume 4, Issue 7 - July 2016 - Pages 22-28

RESPIRATORY AND HEARTBEAT MONITOR OVER IoT

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ABSTRACT— The analysis of heart rate variability (HRV) has been widely used to non-invasively investigate the cardiac autonomic regulation in healthy subjects and patients with various diseases. Decreased HRV indicates the imbalance of the autonomic nervous control of heart rate and may predict adverse outcomes including all-cause mortality. On the other hand, high HRV is associated with a good prognosis in both healthy and disease states. There exist only few studies on the reproducibility of HRV indices calculated on the basis of short-term (5–7 min) stable ECG recordings in healthy young adults. From the point of view of medical practice, it is important to evaluate physiological and pathological phenomena using reliable and validated tools to ensure reproducible results and present meaningful findings.

INDEX TERMS- Respiratory and heart beat monitoring over IOT, Heart rate variability, Raspberry Pi, Arduino, Microcontroller and Sensors.

1.INTRODUCTION

In the present study we have investigated whether the impact of HR and respiratory rate on the HRV repeatability could be detectable even in two separate measurements performed in stable and comparable circumstances. To this end, we evaluated differences between two short-term HRV measurements among healthy adults and their association with differences in HR and respiratory rate.The main aim of this project is to make an affordable and portable health monitor system, this system measures the heart and breathing rate of a person and displays the readings on the 16x2 LCD. The readings will also be sent to the Cloud, GUI, and Android device. Raspberry pi is the heart of this project. The respiration rate is measured by the LM35 sensor and the heart rate is measured by the heart rate sensor and both these readings are fed as analogue inputs to Arduino which interprets the analogous inputs and feeds these readings to the Raspberry pi where these readings are interpreted and are stored in the cloud, the readings are

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further displayed on the GUI,16x2 LCD and Android device in case of critical condition a notification is sent to nearest ones

2.LITERATURE REVIEW

Wireless sensors and sensor networks are playing a vital role in scientific, technological and research fields. Though sensor networks have been using since several years, the wireless applications brought drastic changes in the development of sensors. These sensors networks are different when compared with normal wireless networks and computer networks. Many new researches are going on to design new sensors which make direct or indirect contact with human body to improve the quality of human life. So it rises more challenges to solve like limited energy, restricted life time etc. Many new researches are focused to develop quality of human life in terms of health by designing and fabricating sensors which are either in direct contact with human body or indirectly. Using wireless sensor networks (WSN) in medical systems has become a major effort in recent years. But in most of these research tasks like signal data processing, health state decision making and urgent messages sending is done by using a remote server. The monitoring of health using mobile computing, sensors and communication technologies can be termed as M-health. In past days, wireless monitoring involves measuring of physiological parameters namely heartbeat, blood pressure, blood ox meter and physiological signals etc. Other signals include measuring of parameters like movement monitoring, fall detection, place tracking and other activities. The features of wireless networking are explained with different examples and applications. Mobile health monitoring to detect physiological deterioration requires technology that can alert a first responder capable of reversing the condition in a timely manner, and be broadly deployed throughout the continuum of care. A wireless on-body digital architecture, sot era's visa mobile system is developed for continuous measurement of different parameters like heart rate or ECG, respiration rate, body temperature and blood pressure. In view of all these, a wireless monitoring system is developed. This system enables the doctor to remotely monitor a patient staying at home. The system enables interactive communication between the patient and the doctor, can remotely direct the course of rehabilitation and treatment. The doctor has access to the biomedical parameters monitored, such as ECG, heart rate, respiration rate, temperature etc

3. BLOCK DIAGRAM

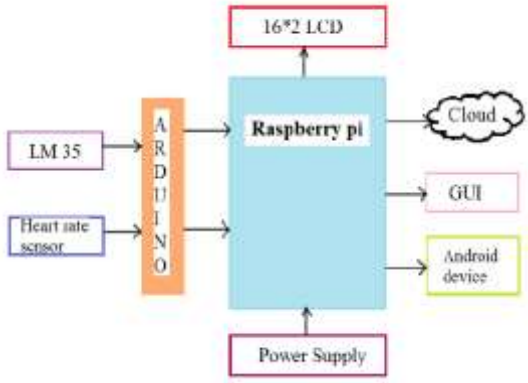

Fig .1 Block Diagram

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This project is designed to measure the breathing and heart beat rate of a person, the power supply is provided by a 9V battery to raspberry pi. The pi is the core of the project alongside Arduino. , initially a person needs to breath for few seconds and the sampling rate of the change in temperature of theLM35 sensor is calculated and is measured in terms of breath per min(BPm) and for the heart rate measurement the person needs to hold the pulse for few seconds till the sense readings are noted down by the Arduino. The Arduino converts the analogue readings into digital and these digital values are processed forward to the raspberry pi the pi interprets the values and based on the threshold values set in the code of the Arduino the required necessary steps like informing a person related to the patient about the emergency through an offline text and via an email. The system measures the heart and breathing rate of a person and displays the readings on the 16x2 LCD. The readings will also be sent to the Cloud, GUI, and Android device. Raspberry pi is the heart of this project. The respiration rate is measured by the LM35 sensor and the heart rate is measured by the heart rate sensor and both these readings are fed as analogue inputs to Arduino which interprets the analogous inputs and feeds these readings to the Raspberry pi where these readings are interpreted and are stored in the cloud, the readings are further displayed on the GUI,16x2 LCD and Android device in case of critical condition a notification is sent to nearest ones. therefore it can be carried to any place without much effort. Decreased Cost: When healthcare providers take advantage of the connectivity of the healthcare solutions, patient monitoring can be done on a real time basis, thus significantly cutting down on unnecessary visits by doctors. In particular, home care facilities like this device that are advanced are guaranteed to cut down on hospital stays and re-admissions. It is affordable to common people. Improved Outcomes of Treatment: Connectivity of health care solutions through cloud computing or other virtual infrastructure gives caregivers the ability to access real time information that enables them to make informed decisions as well as offer treatment that is evidence based. This ensures health care provision is timely and treatment outcomes are improved. Improved Disease Management: When patients are monitored on a continuous basis and health care providers are able to access real time data, diseases are treated before they get out of hand. Reduced Errors: Accurate collection of data, automated workflows combined with data driven decisions are an excellent way of cutting down on waste, reducing system costs and most importantly minimizing on errors. Enhanced Patient Experience: The connectivity of the health care system through the internet of things, places emphasis on the needs of the patient. That is, proactive treatments, improved accuracy when it comes to diagnosis, timely intervention by physicians and enhanced treatment outcomes result in accountable care that is highly trusted among patients. Use of Arduino: It's ready to use structure makes it really easy to use. You don't have to take care of burner, fuse settings, Serial Monitor Software etc. There are many functions present in the software of Arduino which makes coding so easy and fast that is not possible with

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simple microcontroller. Well it is obvious now that everyone is using Arduino nowadays that's why you can get help anytime from anywhere whenever you will have stuck somewhere. Use of Raspberry Pi: The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B.

4. DESIGN OF THE PROJECT

4.1 RASBERRY PI

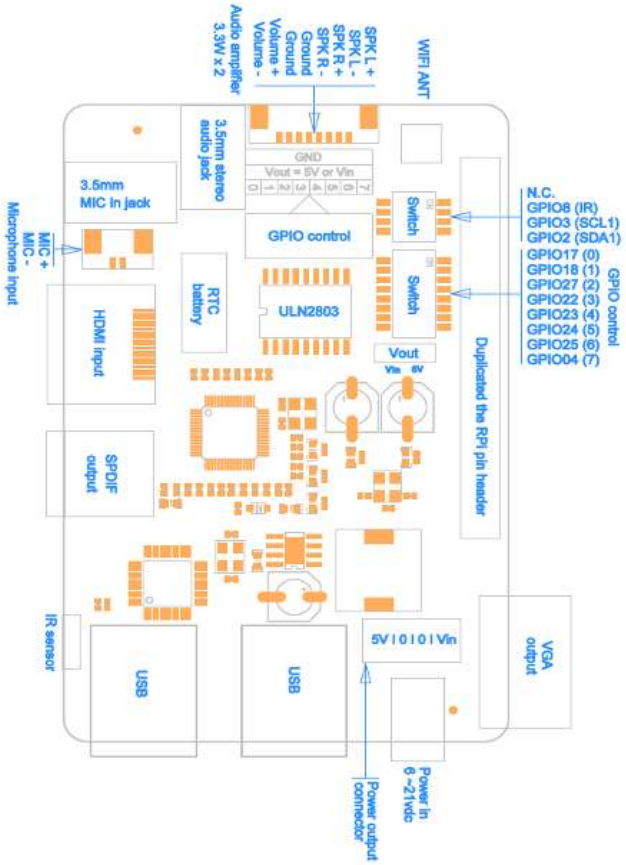

FIG 2 RASBPERRY PI BLOCK DIAGRAM

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. Several generations of Raspberry Pi have been released. The first generation (Raspberry Pi 1 Model B) was released in February 2012. It was followed by a simpler and inexpensive model A. In 2014, the foundation released a board with an improved design in Raspberry Pi 1 Model B+. These boards are approximately credit-card sized and

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represent the standard mainline form-factor. Improved A+ and B+ models were released a year later.

FIG3. RASPBERRY PI

Hardware

The Raspberry Pi hardware has evolved through several versions that feature variations in memory capacity and peripheral-device support. This block diagram depicts Models A, B, A+, and B+. Model A, A+, and the Pi Zero lack the Ethernet and USB hub components. The Ethernet adapter is internally connected to an additional USB port. In Model A, A+, and the Pi Zero, the USB port is connected directly to the system on a chip (SoC). On the Pi 1 Model B+ and later models the USB/Ethernet chip contains a five point USB hub, of which four ports are available, while the Pi 1 Model B only provides two. On the Pi Zero, the USB port is also connected directly to the SoC, but it uses a micro USB (OTG) port**.**

Processor

The Broadcom BCM2835 SoC used in the first generation Raspberry Pi is somewhat equivalent to the chip used in first modern generation smartphones (its CPU is an older ARMv6 architecture), which includes a 700 MHz ARM1176JZF-S processor, Video Core IV graphics processing unit (GPU), and RAM. It has a level 1 (L1) cache of 16 KB and a level 2 (L2) cache of 128 KB. The level 2 cache is used primarily by the GPU. The SoC is stacked underneath the RAM chip, so only its edge is visible. The Raspberry Pi 2 uses a Broadcom BCM2836 SoC with a 900 MHz 32-bit quad-core ARM Cortex-A7 processor, with 256 KB shared L2 cache. The Raspberry Pi 3 uses a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache.

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CONCLUSION

We propose that this system should be implanted in biomedical fields and the system provides a simple, low cost, and accurate approach .Also it gives better decisions during the time of emergency and helps the victim to save their life by an automated notified .Simulation results show that the performance of our system is close to ideal case on emergency gains .Also our approach outperforms GM and mixed solutions. We further conduct a real time prototype with some experiments to verify our approach

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