ARDUINO BASED SMART FLUID LEVEL INDICATOR FOR HEALTH MONITORING APPLICATION

[1]Dr.R.C.Karapagalakshmi [2]A.Priyadharshini [3]A.Uma [4]K.Yazhini

1.Professor/CSE, Gnanamani College of Technology, Namkkal- 637018, TamilNadu

2.1V-B.E/CSE, Gnanamani College of Technology, Namkkal- 637018, Tamilnadu

3.1V-B.E/CSE, Gnanamani College of Technology, Namkkal- 637018, Tamilnadu

4.1V-B.E/CSE, Gnanamani College of Technology, Namkkal- 637018, Tamilnadu

Abstract-In India, near about 20% of the total population loses their lives due to interrupted health monitoring system that is in most of the hospitals, doctor visits patients either in morning shift or in evening shift or in both shifts. What happens if patient's health becomes critical in between that interval or when a doctor is not available with a patient. The answer is a patient may lose her\his life. So to avoid this critical situation. we are proposing a smart embedded system device which monitors patients health continuously. This system monitors patients heart rate, body temperature and saline liquid level.If any of the above parameters goes beyond the threshold value, this smart device informs doctors or care taker and ask for corrective actions to save patients life.

keywors- *Wireless Data Transfer,Cost Effective,Patient Monitoring,Android Device,Sensors,Arduino,GSM Module*

I. INTRODUCTION

Patient Monitoring System is a process in which a doctor can constantly supervise more than one person, in excess of one parameter at a time in a remote area. Heart beat indicates the soundness of human heart. It helps in assessing the condition of patient's cardiovascular system. Human heart supply oxygen-rich blood to the muscles. It conveys cell wastes apart from tissues. Heart rate varies proportionately to the requirement of muscles to excrete carbon dioxide and absorb oxygen modifies such thing take place during exertion or sleep. Usually, the heart rate which is calculated for normal resting adult males is about to 70 bpm and for adult females is 75 bpm. This heart beat monitoring system help us to compute the heart beats per minute and by comparing it with standard heart beats; the information can track the current heart condition without difficulty.

Body temperature is also a common indication of body condition. Normal human body temperature is (98.6 ° F ± 0.7°F) and it differs activity of the person as well as place of measurement. When a person is excessively hot then the blood vessels in human skin inflate to transfer the excess heat to human skin surface. And because of this reason, the person starts sweating. Then the sweat evaporates and this process supports to cool human body. When a person is too cold, human blood vessels contracted so the blood flow in human skin gets reduced to preserve temperature of body. As a result, he/she starts shivering and it is an instinctive, rapid abbreviation of the muscles.

The amount of Normal Saline intake taken by patient is completely depend on physiological condition of

patient but usually, it is between 1.5 to 3 liters per day for an adult. Generally, in hospitals saline level is monitored by nurses and patients relatives. The saline level must check after certain time.

Regular monitoring of biomedical parameters is important for better treatment. In this era of contaminated environment, concern about human health is top priority than ever before. Everything gets worthless if one is unwell or dead. Nowadays, people spending so much money to sound healthy. In most of the cases, it is found that it gets too late to receive appropriate medical treatment. So that unpredicted incident happens for being delayed action. Since heart rate, saline level, and body temperature are the most crucial noteworthy parameters of the human health, an affordable device to measure such parameters will be helpful for human health. In emergency situation, time should not be wasted. Sometimes continuous assessment is also necessary. Therefore, an automated system for continuous measuring of heart rate, body temperature and saline level is very much essential. In this study, an Arduino based patient monitoring system is developed. Since the system provides the information about all three parameters through android application, anyone can monitor physical status easily. Moreover, the system may be useful for monitoring condition of serious patients from remote place. Rest of the paper explains existing approaches, our system model, system development and finally system performance measurement.

II. LITERATURE SURVEY

There are some number of approaches existing and industrialized for measuring heartbeat, body temperature and saline level. At present, the recent technologies for measuring heart rate are consisting of several methods using electrical and optical methods. In electrical method, a bulky straps are around patient's chest [7]. On the other hand in the optical method no such straps are required also can be used more effectively. In optical method, Light Dependent Resister (LDR) and powerful LED are used to pulse sensing [8]. By an amplifier circuit, the pulse signals are amplified and then filtered through a band pass filtering circuit. The filtered and amplifiedpulses are then sent to the microcontroller; here the analog signals are get checked whether they are valid or not comparing with a standard voltage. Microcontroller counts the heart beat and displays the results on an LCD display. Another approach exists where infrared Rx and Tx are used. In that system the pulses sensed, amplified and filtered via. a low pass filters. Finally, the signals are sent to a microcontroller [9], [10]. The output compared with a reference voltage is also given by microcontroller. In both the approaches, inaccurate results are getting because analog signal varies from patient to patient and these approaches fail to calibrate signal of pulses for each patient. M. M. A Hashem et al. [8] developed an infrared technology-based device to measure heart rate also used analog temperature sensor to determine temperature of body. It uses wireless communication to send a data to the computer through serial port. Then by using the internet the data is sent to the web server and also it can be observed as of anywhere in the web browser. The disadvantage of this developed approach is that it requires a computer for sending the data to the web server through the internet. A telemedicine system is presented by N. Navale et al. in [11]. In the system, the user carries a hardware device connected with an android application through Bluetooth connection. The device measures the patient's parameters and sends it to the android application. Android application sends the information to the server and if the user has any problem like heart attack then it sends an emergency message to the patient's doctor and guardians containing the current location of the patient .N. Indumathy, and K. K. Patil [12] developed an android based patient health care monitoring system using several sensors like temperature, heart rate measuring sensor, eye blink detection sensors to detect the current condition of the patient. The system is developed such a way that if patients unable to speak or move his\her hand or any part of body then by just

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blinking patient's eyes 5 times then an SMS send to the caretaker about the current condition of the patient and continually send the information about heart rate and body temperature to the server. An android application running in the caretaker phone receives the message and generates voice sound so that caretaker can recognize the patient's current situation. At the same time, doctor can realize the current situation of the patient accessing the server.

Ahmed, Salman, et al. developed system in which patient's body temperature, heart rate and electrocardiography (ECG) are transferred wirelessly through an agent such as Bluetooth technology. Wang, P. [3] in this approached system, the alert SMS is sent from data acquisition system to hospital's monitoring center via. ZigBee wireless communication module.

The aim of this project is to develop a device which is interfaced with an Android application so that the heart rate, temperature of body and saline level are monitored efficiently. The remote health monitoring system described above is entirely dependent on proper communication between the server and client. So it may arise severe condition that server connection gets congested and patient's situation is serious then it creates a problem to recognize the present situation of the patient. For this reason, the main aim of project is to design a portable Android assistant heart rate, body temperature, and saline level monitoring device which is affordable and user-friendly, at the same time low-cost, accurate, and durable.

III. PROPOSED SYSTEM

The framework considerably encompasses the segments like Pulse rate sensor, temperature sensor, saline level sensor, Arduino Uno (ATmega328P) and GSM modem.

This introduces a ton of plans that consolidated into the effectiveness of this device in order to reveal required components like cost, plan comprehensive nature, programming innovation, size, weight, deficiency of flexibility etc. This configuration utilizes a scaled down sensors which have been enhanced for extremely precise detecting of changes in the pulse rate, temperature and saline level. The framework of the system with the assistance of the microcontroller is as shown in Fig.1

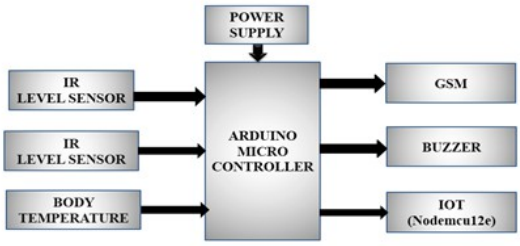

Fig 1: Block Diagram

The whole diagrammatic hardware setup is as shown in above fig.1. The components of above subsections are used to make the smart board system to which patient's body parameters are monitored. By using sensors, raw data of patient's medical parameters are sensed and transferred to back-end server application using GSM technology.

A. Arduino uno

The microcontroller is the heart of patient monitoring system design; it holds the main logic of the system. Arduino, Beagle-Bone and PIC these are the types of microcontroller that are available is market also they are well performing. The choice falls on Arduino Uno with respect demonstration proposes its specifications and simplicity of utilizing. Arduino Uno as depicted in fig:1ATmega32 microcontroller-based board consists of a set of 14 digitalpins (input\output pins), out of which 6 pins can be used as a PWM output, 6 analog inputs, a DC power jack, a reset button, ICSP header a ceramic resonant of 16 MHz and an USB interface.

B. Sensors

T**emperature sensor**:

Simple LM35 IC type of sensor that was chosen for this project. A suitable circuit was constructed that would simulate the behaviour of a temperature data-gathering device Upon activating the circuit, the LM35 IC is constantly measuring the surrounding temperature and converting this measured temperature to voltage levels that were received into an Arduino Uno package that was the heart of the whole system.

For basic Centigrade temperature sensor, the rating is (+2˚Cto +150˚C) and temperature vs. voltage relation is represented through

Vout=0mV+10.0mV/˚C (1)

Level sensor:

The Level sensor uses the physical characteristics and various other effects of a particular frequency with level. It transmits or receives the signal which is available in piezoelectric or electromagnetic forms. The piezoelectric type of sensor has lowered cost and easy to use and it has propagation velocity approximately 340 m/s in the air at 15°C of air or atmospheric temperature, the same as sonic velocity so choice falls to use this type of sensor. Theultrasound velocity is affected by its temperature and the medium; thus the velocity in the air is designed using the formula below

V= 340+0.6(t-15) m/s (2)

t: temperature, °C

Here we considered a room temperature of 25°C, and the velocity of ultrasound is 343 m/s. As the travel distance is very much small, the travel time is affected by temperature. Approximately it takes 29.15μsec for the ultrasound to transmit waves through 1cm distance; thus, the system requires 1cm resolution [6].

C. GSM (Global System for Mobile Communication)

It sends an SMS to the doctor's mobile in alarming condition. This GSM module has an RS232 interface for serial communication having exterior peripheral. The HyperTerminal is a Windows application. Alert SMS are sending via. GSM network which works via. AT commands. The coded Results are getting received at the microcontroller; then it gets retransmitted at the HyperTerminal through controller. The microcontroller is pre-programmed for receiving and transmitting data which has a baud rate of 9600.

D. NodeMCU

NodeMCU is an open source IoT platform.It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

E. Buzzer

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

IV. CONCLUSION

The implemented Arduino based smart fluid level indicator for health monitoring application is the enhanced technology as compare to the existing technology because it sends the SMS quickly, easy to use, also it can work in longer distances at a very low cost. It sends measured heart rate, body temperature and saline level to the doctor so if any critical situation happens in patient's biomedical parameters then doctors can easily take action.

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REFERENCES

[1] Taiyang.Wu, Fan.Wu, Jean Michel Redoute Mehmet Rasit Yuce,"An Autonomous Wireless Body Area Network Implementatio Iot Connected Health Care Application".2017

[1] R. G. Landaeta, O. Casas, and R.P. Areny, "Heart rate detection from plantar bioimpedance measurements", 28th IEEE EMBS Annual International Conference, USA, 2006, pp. 51135116.

[2] Ahmed, Salman, et al. "Wireless health monitoring system for patients." 2015 IEEE International WIE Conference on Electrical and Computer Engineering (WIECON-ECE). IEEE, 2015.

[3] Wang, P., 2008, December. "The real-time monitoring system for in-patient based on zigbee". In Intelligent Information Technology Application, 2008. IITA'08. Second International Symposium on (Vol. 1, pp. 587-590). IEEE.

[4] Arduino Uno, Arduino - ArduinoBoardUno, Accessed: (13/11/2015), available athttps://www.arduino.cc/en/Main/ArduinoBoardUno.

[5] Jaiee Sitaram Adivarekar1, Amisha Dilip Chordia2, Harshada Hari Baviskar3, Pooja Vijay Aher4, Shraddha Gupta. "Patient Monitoring System Using GSM Technology". International Journal of Mathematics and Computer Research, 2013

[6] Determining Heart Rate from the Electrocardiogram, August24, 2015

http://www.cvphysiology.com/Arrhythmias/A020.htm

[7] M. M. A. Hashem, R. Shams, Md. A. Kader and A. Sayed, "Design and development of a heart rate measuring device using fingertip," 3rd IEEE International Conference on Computer and Communication Engineering (ICCCE'10), Kuala Lumpur, Malaysia, May 11-12, 2010.

[8] Heart rate measurement from fingertip, August 24, 2015, http://embeddd-lab.com/blog/?p=1671

[9] Wireless Human Health Online Monitor, March20, 2015.
http://embedded -lab.com/blog/?p=1671

[10] M. Navale, S. Damare, R. Chavan, R. Dube, and S. Patil "Android Based Heart Monitoring and Reporting System", International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue5, May 2014