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DESIGN AND IMPLEMENTATION OF HEART RATE MEASUREMENT DEVICE USING WIRELESS SYSTEM

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ABSTRACT:

Heart Rate (HR) is an important live signal not only in clinic diagnosis but also in daily live. This paper presents the design of an HR measurement SoC (System on Chip), which incorporates an hard macro cell as its processor core. This SoC takes the HR signals as inputs, and measures the HR. The architecture of this SoC and the algorithm of HR measurement will be discussed in the paper. The development of mixed signal design flows has been the focus of much attention over the past few years. In traditional IC designs, different parts of the design have been on different chips, reducing the need to simulate at the top level and verifying the interfaces between the chips has been considered to be enough for traditional IC designs. Today's SoC (System on Chip) designs, however, combine analog, digital, and RF designs on the same chip; this places absolute requirements on the efficiency of the design process all the way from specification definition to sample test, without sacrificing design time, design performance, chip area, reliability and cost. Heart Rate (HR) is an important live signal not only in clinic diagnosis but also in daily live. To measure the HR, there are some technologies can be used, such as blood measurement, heart voice measurement, ECG measurement, and so on. An analog and digital mixed-signal SoC used for HR measurement is designed in this paper. The SoC is also divided into two parts, one is an analog signal process circuit module, and another is a digital process module. As a mixed-signal SoC, how to deal with the interaction between

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analog module and digital module is the challenge and the design method is discussed in this paper.

Keywords: Spo2, Heart beat sensor, LM35, WSN.

I. INTRODUCTION

Wireless Sensor Networks (WSNs) have been conceptualized to monitor and record physical parameters with the help of dedicated sensor nodes. The University of California, Berkeley announced the idea of ‘‘Smart-Dust’’, in 2003 for the collection of information with the help of small sized devices. Later, Berkeley noticed the limitations in the expected size vis-a-vis energy storage requirements. However, research continued for the design and development of cost-effective and sustainable sensor nodes. Electronic chips having small sizes and low power consumptions are used in the design of wireless sensor nodes. Primarily, they carry a small battery source, low memory, and small processing power to monitor targeted parameters for longer durations [1]. Authors have designed energy efficient source nodes as well as sink nodes for the conservation of energy available in sensor nodes [2]. The radio module of the sensor node consume the highest power. Energy efficient routing protocols [3–10] are designed for saving energy and enhancement of network lifetime. Some authors emphasize on the estimation of path loss a priori so that an optimum amount of power is transmitted by the radio module [11]. WSNs are currently employed in various applications, viz., industrial processes, battlefield information, environmental monitoring, security, surveillance, etc. [12–14]. Several authors have used low-power WSN and presented case studies for monitoring target applications. Evers et al. [15] have discussed a case study of employing wireless sensor networks for managing logistics processes. Returnable Transport Items (RTI) are used to load items as per the order list. The process is manual and prone to errors. Authors conceptualized a WSN based system architecture to automate the distribution process. Some researchers [16] have presented a case study of deploying wireless sensor networks for health monitoring of structures in two underground tunnels of Prague and London. WSN allows quick deployment and the authors found this feature helpful in installing sensor nodes in time-restricted scenarios of underground railways. Authors highlight radio

connectivity issues and address them by deploying relay nodes and multiple gateways. Tsitsigkos et al. [17] discussed a case study based on IoT, WSN, and mobile devices for monitoring of movements in the house with a future target of caring elderly residents. Tuna et al. [18] presented a case study on link reliability and node lifetime evaluation for smart grid applications. They used the data of field tests in electric power environments to derive the results. The authors suggested to consider the node transmission power, range, and communication channel characteristics while formulating WSN monitoring solutions. Ningombam et al. [19] used Zigbee based WSN technology to design an automated system for tea plantations. Their central decision support system decides control measures for the management of irrigation, pesticides, fertilizers, and frost processes. WSNs will become more smoothly integrated into the physical world as sensor devices miniaturize, and computation and communication capabilities keep improving. Avalanches are a major risk in mountainous places, causing deadly accidents, infrastructure damage, and life threats to mountaineering expeditions in snow-covered terrain [20]. India's avalanche zones are located in the northern Himalayan states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, and Sikkim [21]. The Greater Himalayan range has the highest number of such accidents. There are 216 settlements and 11 important roads under avalanche-prone slopes in Jammu and Kashmir, Himachal Pradesh, and Uttarakhand. Military operations and civilian expeditions are carried out in the rugged terrain of mountains, where the locations and movements of team members need to be monitored continuously. Planned moves are observed by state agencies or the central control station so that Search and Rescue (SAR) operations could be launched in case of an eventuality. The operations are time-critical due to weather uncertainties and the cold climate prevailing in mountains.

2. LITERATURE SURVEY

1. A Comprehensive Ubiquitous Healthcare Solution on an Android™ Mobile Device

Nowadays It Has Become Important To Focus On Healthcare Awareness And Also The Growth Of Wireless Mobile Technologies. For This Reason Ubiquitous Health Care Solutions Has Become Important As It Provides Services At Anytime And Anywhere. To Complete Our Needs Android Smart Phone Device Has Put Fourth Mobile Monitoring Terminal To

Observe And Analyse Ecs [Electrocardiography] Waveforms From Wearable Ecg Devices In Real Time Under The Coverage Of Wireless Sensor Network. Due To Use Of Wireless Sensor Network In A Healthcare We Are Able To Reduce Complications Of Wire Networks And We Can Move A Healthcare From One Location To Another Desired Location. Mobile Phones Are Used As Barcode Decoder For Medicinal Care As An Extension To Monitoring Schemes. In Order to Provide Better and More Comprehensive Healthcare Services. We Can Use Barcode Decoder To Verify And Assist Out Patient In The Medication Administration Process.

2. Android Based Body Area Network for the Evaluation of Medical Parameters There Are Various Vital Parameters

In This System. They Are ECG, Heart Rate, Heart Rate Variability, Pulse Oximetry, Plethysmography And Fall Detection. The Tele-medical System Is the System Which Focuses on the System Which Focuses on the Measurement and Evaluation of These Vital Parameters. In a Android Smart phones There Are Two Different Designers Of A (Wireless) Body Networks The Real Time System Features Several Capabilities. Data Acquisition In The (W) Ban Plus The Use Of The Smartphone Sensors, Data Transmission And Emergency Communication With First Responders And Clinical Server. It Is Very Important To Smart And Energy Efficient Sensors. This Can Be Compensated. In The First ZigBee Based Approach, Sensor Nodes Acquire Physiological Parameter Perform Signal Processing and Data Analysis and Transmit Measurement Value to the Coordinator Node. Sensors Are Connected Via Cable to an Embedded System In The Second Deign. In The Both Types Of System, Bluetooth Is Used For Transferring The Data To An Android Based Smartphone.

3. Communication and Security in Health Monitoring Systems - A Review

The Fast Improvement Of Sensing Devices And Radios Lets Us Move Powerful And Flexible Remote Health Monitoring System. In The Vision of the Future Internet of Things (IOT). This Vision Leads To The New Requirement And Challenges, And These Have To Manage. So as To Design and Implement of Such System. Maintaining The Gap Between

Sensors Nodes And The Human Body And The Internet Becomes Challenging Task In Terms Of Comfortable And Suitable Communication. The System Will Not Have To Provide Functionality But It Should Have To Be Highly Secure. In This Paper, We Provide A Survey An Existing Communication Protocols And Security Issue Related To Pervasive Health Monitoring By Explaining Their Limitation, Challenges, And Possible Solutions. We Introduce A Generic Protocol Stack and Design towards Handling Interoperability in Heterogeneous Low Power Wireless Body Area Networks.

4. Design and Development of E-Health Care Monitoring System

As We Are Dealing With E-Health Care Monitoring System, Our System Designs Is Based On The Wireless Sensor Networks (WSN) And Smart Devices. It Is Very Important To Have Strong Networks Between Doctor, Patient, And Care Givers Judges The Condition Of The Patient. Sensors Are Used To Monitoring Of Patient Surrounding As Well As Health, These Sensors Are Medical And Environmental Sensors. Sensors Are Relayed To The Prior Devices Through The Transmitter And Them To The End User. In This System Doctor And Care Takers Can Observe Patient Without Exactly Visiting The Patient Actually. And Furtherly They Can Upload Medicines And Medical Reports On The Web Server Which After Can Be Accessed By The Patient Anywhere At Any time. It Is Very Much Easy Process and Convenient For both the Doctors and Patient. With The Help of This Data Doctors Can Understand and Observe Patient from Private Home Patient to Public Health Care Centre Patient. This Is The Cost Reducing Technique. We Have Also Define The Sets Of Add On Services Which Include Real Time Health Advice And Action (Retina) And Parent Monitoring.

EXISTING SYSTEM

Existing system, presents a Wireless Sensor Network (WSN) for monitoring patient's physiological conditions continuously using Bluetooth. Here the physiological conditions of the patient's are acquired by sensors and the output of these sensors is transmitted via Bluetooth and the same has to be sent to the remote wireless monitor for monitoring the observed patient's physiological signal. The remote wireless monitor is constructed of

Bluetooth and Personal Computer (PC). The measured signal has to be sent to the PC, which can be able to monitor. Bluetooth is having a better data transmission rate with less power consumption. The first procedure of the system is that the wireless sensors are used to measure heart rate, temperature and blood pressure from human body using bio sensors. Next procedure of the system is to process the signals using a microcontroller. The final procedure is to transmit the processed signals using Bluetooth and monitoring the signal in a PC.

3. PROPOSED SYSTEM

The purpose of this project is to develop IoT enabled Smart Health Monitoring System. In this project we are sensing health parameters like Heart rate, Body Temperature and SpO2 (Blood Oxygen) level. The Health parameters are displayed on web browser on Wi-Fi enabled devices like smart phone or Laptop.

Technology is being used everywhere in our daily life to fulfill our requirements. We are employing different sensors for different applications sometimes we may even use same sensors differently for different applications. Whatever it may be the final output is life has increased its speed with the technology boosters. We can not only increase the speed of life but also increase security with good ideas to make use of this technology. One of the ideal ways of using technology is to employ it to sense serious health problems so that efficient medical services can be provided to the patient in correct time. This idea to provide efficient health service to patients has given birth to the project heart beat monitoring system with interfacing to iot. Heart beat monitor and display Graf system is a portable and a best replacement for the old model stethoscope which is less efficient. The heart beat rate is calculated manually using stethoscope where the probability of error is high because the heart beat rate is in between 70 to 90 per minute whose occurrence is less than 1 sec, so this device can be considered as a very good alternative instead of a stethoscope.

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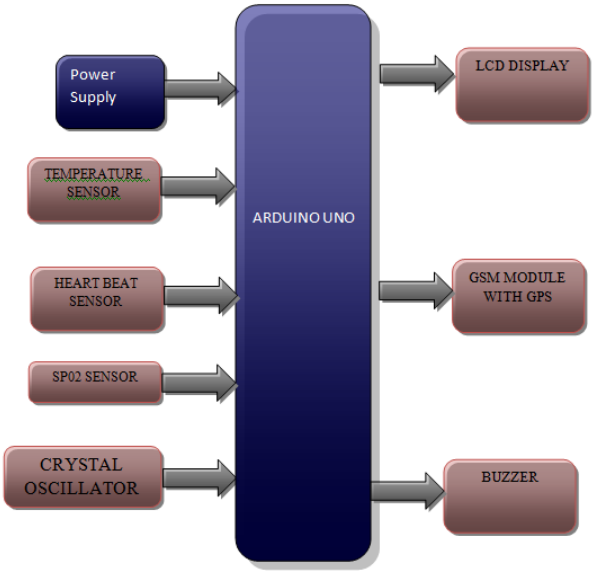

Fig.1. Block diagram.

Developing countries like Bangladesh has a centralized tendency of using facilities in technology, livelihood, healthcare etc. sectors. Due to lack of proper distribution of facilities throughout the country, people in the rural areas lack of proper health treatment. They don't find proper quality of treatment. Many people get the treatment after the disease or fever gets too critical. As of considering the cost of treatment as well many of the rural people cannot afford for it. So, to make the first step of treatment process easier this paper is planned. A common man cannot afford the expensive and daily check-up for his health. For this purpose, various systems which give easy and assured caring unit has been developed. This system reduces time with safely handled equipment. This contribution towards the society will be very worthy. Because people can detect the abnormal practice of the body before getting into any serious disease. The person who is worried more about any other loved person can take care and keep the track of his health by sitting in any corner of the world with the help of IoT.

Fig.2. H.B Sensor.

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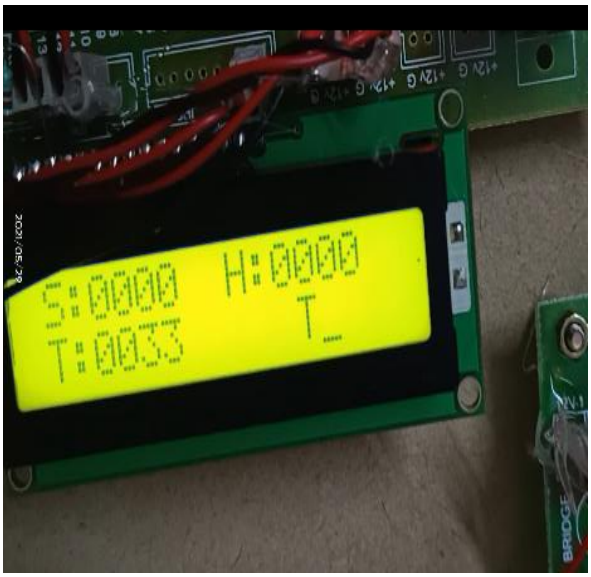

Fig.3. Spo2 and H.B values in LCD.

V. CONCLUSION

The prototype project is developed to monitor the patient health if any changes is occur in the sensor value the signal is send to controller, this controller give the signal to the user via Buzzer module. The use of the proposed system is measure the patient health in every seconds and the data is noted to the record, so the patient is no need to go to the hospital in more time. If the heart attack occur in the patient side the message is pass through the alerting to the doctor, and this is done though a comparison of sensor value and threshold value if any variation is occur to alert the user. Also the monitoring of the patient is available in everywhere so it is more helpful in rural areas user, and the proposed system is given the accurate value and faster operation of this system.

FUTURE SCOPE:

In future mostly CAMERA module or any wireless controlling techniques are using to information sent to authority peoples of patient health.

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