DESIGN OF SMART NEONATAL HEALTH CARE MONITORING SYSTEM USING IOT

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Abstract- Computerized wellbeing checking and ready framework improvement is a requesting research zone today. A large portion of the presently accessible checking and controlling restorative gadgets are wired which limits freeness of workplace. Remote sensor arranges (WSN) is a superior option in such a situation. The neonatal emergency unit used to deal with wiped out and untimely neonates. With Internet of Things medical profession list and technologist are trying to merge the various environments together to build a strong monitoring system. Connection of things to internet with standard protocols and suitable architectural changes facilitate unobtrusive health monitoring for all day and any place. Demand of contemporary era is to provide the quality care for infants of working parents. The energy efficient, scalable, secure, cost effective, easy to use and unobtrusive designs are in demand to handle the challenges in health care. This paper discussing the existing health monitoring system with special reference to neonatal care.Technology plays the major role in healthcare system, not only for recording parameters through sensory devices but also in communicating, recording and displaying the measured parameter. It is very important to monitor various medical parameters and post operational data. To access the neonates medical parameters in local and remote area, healthcare communication using Internet of Things (IoT) method is adapted. The main objective of this paper is to transmitting the neonatal health monitoring parameters through wireless communication. These input data are uploaded in cloud server and transmitted to the computer and mobile for doctor's reference. The data from microcontroller is transmitted to cloud server. In this paper, three parameter viz., heart beat rate, temperature and acceleration are monitored and transmitted. The healthcare system setup is simulated using software, and the parameters are viewed by web page and patient monitoring screen.

Keywords:-Micro controller, Internet of Things (IOT), sensor

I.INTRODUCTION

The traditional method for monitoring an infant's vital signs requires direct supervision from hospital staff or parents. Sometimes it is difficult to identify certain physiological changes which may be of concern. This health monitoring system provides real time indication of any changes in the infant's status. We can conveniently monitor the infant's situation in the NICU or at home while they go about their daily activities. Traditional monitoring techniques are difficult to wear for long periods of time and may cause discomfort to the infant. Wireless and wearable sensors provide more convenient and long term monitoring.Health is one of the global challenges for humanity. According to the constitutions of World Health Organization (WHO) the highest attainable standard of health is a fundamental right for an individual. Healthy individuals also reduce pressure on the already overwhelmed hospitals, clinics, and medical professionals and reduce workload on the public safety networks, charities, and governmental (or non-governmental) organizations. To keep individuals healthy an effective and readily accessible modern healthcare system is a prerequisite. A modernized healthcare system should provide better healthcare services to people at any time and from anywhere in an economic and patient friendly manner. Currently, the healthcare system is undergoing a cultural shift. As we seen in India both the parents need to work and look after their babies/infants, so more workload and stress is there on such families especially on female counterparts. If a system is developed which continuously gives updates about their infants during illness or during normal routine then it will be of great help to such members as they can work in stress less environment giving more fruitful output. Also urgent situation condition can be quickly be noticed and handled within less time. Usually, when a young baby cries, the cause is one of the following things i.e. they are hungry, tired, not feeling well or need their diaper changed. So we developed a prototype which can monitor the activities of the babies and/or infants along with finding one of the above causes and give this information to their parents.

II. LITERATURE REVIEW

The study of a Wireless Multimedia Sensor Network (WMSN) and Radio Frequency Identification (RFID) based u-Healthcare system. The system is capable of monitoring the patient's medical status by using RFID body sensor and wirelessly transmits the medical data to a local workstation (WMSN gateway) before transmitting it to the central database server. Due to the patient's movements, WMSN node's movements will be patterned with the functionality of the Mobile IPv6. Patients can be alerted in case of emergency through their wearable device and can also receive messages with their Smartphone's. The proposed system is designed to measure and monitor important physiological data of a patient in order to accurately describe the status of her or his health and fitness proposed a system is designed to measure and monitor important physiological data of a patient in order to accurately describe the status of her or his health and

fitness. The patient's temperature, heart beat rate, muscles, blood pressure, blood glucose level, and ECG data are monitored, displayed, and stored by their system. To ensure reliability and accuracy the proposed system has been field tested. The test results show that their system is able to measure the patient's physiological data with a very high accuracy. Proposed system comprises the design and implementation with subsystems. Information is sent via IP to a database server containing clinical data, which can be accessed on the smart phone and can also be shared with the physician anytime to seek medical advice when needed. Two wireless protocols were investigated: a Bluetooth (IEEE 802.15.1) ad-hoc network and a Wi-Fi (IEEE 802.11) ad-hoc network. To do so, two subsystems were designed: a sensor system and a display system. The sensor system consists of two thermometers and a wireless transmitter/receiver. The data will be communicated to the display system wirelessly.

III.PROPOSED METHOD

In the Proposed framework temperature sensor, MEMS sensor and heart rate estimation sensor are utilized to screen body temperature, speeding up because of body development and heart rate of neonates. The sensor information is put away in the cloud using Wi-Fi module. The wellbeing individual persistently screens and gets to this information through the cell phone utilizing an Android Application or web page for neonatal checking. The care taker or doctors can continuously monitor the status of the neonatal. The buzzer will help us to alert the persons in emergency situation. In this paper, the proposed method uses AT89S52 microcontroller as a gateway to communicate to the various sensors such as temperature sensor, heart beat sensor and MEMS sensor. The microcontroller picks up the sensor data and sends it to the network and hence provides real time monitoring of the health care parameters for doctors. The data can be accessed anytime by the doctors. The controller alerts the caretaker about variation in sensor output..

Block Diagram

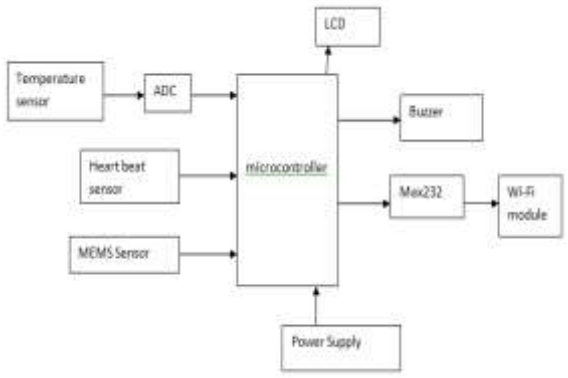

Fig.1.Block Diagram of Proposed Method

The signals detected by the sensors are passed through a signal conditioning circuit for further processing and convert the analog signals into digital values. The Analog-to-Digital convertor is defined by its bandwidth and signal-to-noise ratio.The microcontroller which is used is AT89s52 interfaced using an Arduino Uno kit.The system we are connecting with the PC via Bluetooth using RS232 serial communication modem. RS232 protocol is commonly used in embedded systems. In this, data is combined into a packet and sent bit by bit on a single wire between two communicating devices. This requires less maintenance and costly implementation. However, synchronization between communicating devices is necessary. Sometimes separate wires are required for two-way communication. This approach is widely used for long distance, high speed and reliable communication. This kind of communication can be used at home as well as in the hospitals for central monitoring systems.Piezo buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price. We have establishes an upper and lower threshold limits for which the buzzer is activated.The LCD which we are using is a 16x2 display. We use 8-bit mode to transfer data to the LCD display. In 8 bit mode, we first put data in the 8bit bus, then put command in the command bus and pulse the enable signal.

A. Heart Beat Sensor

The principle of heart beat sensor is based on the red and infrared light absorption characteristics of oxygenated and deoxygenated haemoglobin. Oxygenated haemoglobin absorbs more infrared light and allows more red lights to pass through. Deoxygenated (or reduced) haemoglobin absorbs more red light and allows more infrared light to pass through. Red light is in the 600-750 nm wavelength light band. Infrared light is in the 850-1000 nm wavelength light band.

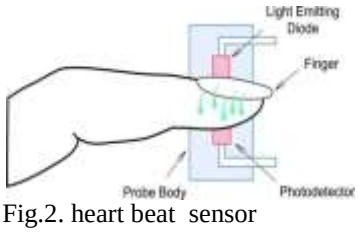

Fig.2. heart beat sensor

Heart beat sensor uses a light emitter with red and infrared LEDs that shines through a reasonably translucent site with good blood flow. Typical adult/pediatric sites are the finger, toe, pinna (top) or lobe of the ear. Infant sites are the foot or palm of the hand and the big toe or thumb. Opposite the emitter is a photo detector that receives the light that passes through the measuring site.

B. Temperature Sensor (LM35)

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly

proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range.

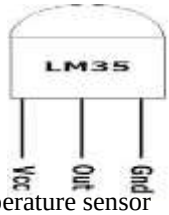

Fig.3.Temperature sensor

C. MEMS Sensor

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at our feet, or they could be dynamic - caused by moving or vibrating the accelerometer. By measuring the amount of static acceleration due to gravity, one can find out the angle the device is tilted at with respect to the earth. By sensing the amount of dynamic acceleration, one can analyze the way the device is moving. Accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which cause a voltage to be generated. The three axis accelerometer are basically used to identify the movements across the three axis i.e. x-axis, y-axis, z-axis. The accelerometer used in this system is ADXL335, [20] which is small low profile package, can measure minimum full scale range of +/- 3g as shown in Fig.4.In this way movement of an infant is monitored by placing accelerometer properly. It is positioned in the socks of an neonate so accurate motion will be detected.

Fig.4.MEMS sensor

D.LCD screen

In our prototype 16 X 2 LCD module is used. It has 2 rows and 16 column therefore total 32 characters are displayed. It has two operation modes, one uses all 8 pins and the other uses only 4 of them. The 4-bit mode was used to manage the LCD screen. All sensor output is displayed continuously as it is being measured. A liquid crystal display (LCD) is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light entering one filter to allow it to pass through the other. A program must interact with the outside world using input and output devices that communicate directly with a human being. One of the most common devices attached to an controller is an LCD display.

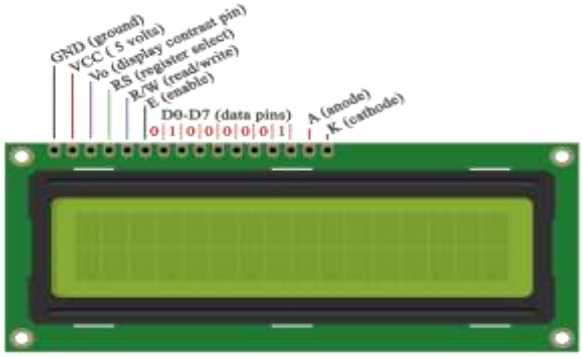

Fig.5. LCD display

E.Micro controller

The AT89s52 is an 8-bit microcontroller, which has an on-chip eight channel 10-bit Analog-to-Digital Converter(ADC).The amplified and conditioned sensor signals are fed to the microcontroller. The AT89S52 is a low-power, high-performance CMOS 8-bit micro controller with 8Kbytes of in-system programmable Flash memory.The device is manufactured Using Atmel's high-density nonvolatile memory technology and is compatible with the industry-standard 80C51 micro controller. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory programmer.By combining a versatile 8-bit CPU with in-system programmable flash one monolithic chip; the Atmel AT89S52 is a powerful micro controller, which provides a highly flexible and cost-effective solution to many embedded control applications.

IV.RESULTS

The system was tested carefully on a neonate, the results found to be same as the one's measured by standard instrument. While testing this system on a neonate parent's concern was considered. During the execution of the system snapshots of the display were taken. The system being a complete hardware design and the data available on LCD display have been captured. Test results of the system are given below, shows successful implementation of the system. It shows hardware module and the actual implemented system.Fig. shows a sample readings of neonate onto the LCD attached to the module on an infant's side. The reading were matched to the readings taken by standard instrument and found to be same. when some abnormal condition exists. The reconfigurable smart sensor interface for health care monitoring WSN in IoT environment was analyzed. The systems can collect sensor data intelligently. It is very suitable for real-time

and effective requirements of the high speed data acquisition system in IoT environment. Different types of sensors can be used as long as they are connected to the system. Finally, by taking real time monitoring of health care monitoring in IoT environment as an example, the system is verified and achieved good effects in simulation output.

Fig.6.LCD displaying Neonate's Pulse Rate value

Fig.7. LCD displaying Neonate's temperature value

V. CONCLUSION&FUTURE SCOPE

Proposed Monitoring System is an inexpensive and simple to use, which can improve the quality of neonate-doctor communication. The constant capturing of multiple biological parameters of the baby and analysis of the overall health helps to understand the internal status of the baby.In these monitoring systems, sensor connected to microcontroller through wired communication and data from microcontroller are transmitted to cloud server through wireless communication. In the simulation, the health monitoring parameter viz., heart beat rate, temperature and stress are continuously uploaded in cloud server. From the cloud server the data is accessed using computer from local area. The system is able to carry out a long-tem monitoring on patient's condition and is equipped with an emergency rescue mechanism . This system can be enhanced by acquiring other health parameter from the patient's body.

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