International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN: 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)
doi : https://doi.org/10.32628/IJSRSET229668

Remote Patient Monitoring System Using Wireless Communication

[1]Miss. Vrushali Pawar, [2] Mr. Syed Zaker Hussain
[1](M. Tech), Department of Electrical Engineering, Assistant Professor, Gramin Technical & Management Campus Nanded, Maharashtra, India
[2] Assistant Professor, Department of Electrical Engineering, Gramin Technical & Management Campus Nanded, Maharashtra, India

Article Info
Volume 9, Issue 6
Page Number : 371-377

Publication Issue :
November-December-2022

Article History
Accepted : 20 Dec 2022
Published: 31 Dec 2022

ABSTRACT

In today's world the health sector in the rural areas of our country are facing deplorable conditions. This scenario had worsen over the years. The age groups mostly affected are neonates because of their lower immunity are more prone to disease and infections. This has led to an increase in the neonatal mortality rate. Monitoring of vital parameters is essential in neonatal care. This paper, focuses on the development of a contactless measurement method for the body parameter of infants. The weight of the neonate is measured using load cell. The method proposed has been designed to verify the ability of the neonatal body parameters, to measure and correctly operate the process of weight on the neonate. The remote monitoring of the physiological parameter can be acquired by interfacing GSM (Global System for Mobile Communications) through LabVIEW to the primary health care hospital (Anganvadi). Patient monitoring systems measure either endlessly or at frequent intervals over time by the ASHA workers. So that they can travel to the particular site in consequential neonatal conditions and treat them efficiently without time straggle.

Keywords : Neonate, Weight, GSM, LabVIEW

I. INTRODUCTION

The development of Health Monitoring system for neonatal applications has been motivated by healthcare departments to mainly support the rural areas with bio-sensing devices, microelectronics and wireless communication techniques at their affordable costs [3]. Many neonatal incubator systems are available but majority of this system are specially designed for hospital setup and for urban families. There are also systems available for the infants like, Intelligent baby monitoring system. These systems monitors the physiological parameters, automatically sends out emergency signals, and have other functions. These systems for monitoring were mainly based on the home-care system, designed for infants which would substantially lighten parents' especially mother's burden [8]. The other systems like the incubator setup which are used in hospital, are of much specialized system with high response.

The proposed neonate patient monitoring system would be helpful for medical practitioners to do proper

and continuous treatment considering the rural wellbeing, also be useful for the fulfillment of remote patient monitoring system. The proposed system monitors from remote area (Home) and the data transferred to the primary health care hospital (Anganvadi).The study concentrates on the feasibility for patient monitoring with the help of GSM technology [1, 2].

Elsewhere, the caring methods for neonates in rural areas focused here are not the same. These systems don't need much complex systems. Because of its purpose of its service it must be also cost effective. Here they require totally different type of care because these people can't rely on their own. They need an expertise like the Village health nurse or ASHA worker to monitor them. Neonates also cannot give any feedback about their sudden discomfort. The mother also cannot properly respond to its sudden conditions. Hence they require a support to monitor at these extreme conditions.

In due of this requirement many researchers' studied the conditions with the intention of providing better healthcare solutions to take care of the neonate's mainly in rural areas. In accordance to this need the system is developed based on commercial GSM network [8]. In order to make the system not too complex like the modern incubators, this monitors only the weight of the neonate and transmits the message. This system comprises to monitor the parameters at frequent timing, then send the monitored readings at each monitoring time. The messages are obtained frequently whenever the system is ON. The ASHA worker monitors regularly, whenever there is a sudden or abrupt changes in the neonates weight. The worker immediately rushes to particular location, ensuring proper treatment to the neonate.

II. METHODOLOGY

When the neonate is put onto the incubator and its particular RF Tag is shown to the RF reader. The RF ID gets matched with RF tag ID. Then particular neonatal parameter and the RF Tag ID are sent to the primary health care hospital about the current status of the neonate's condition via the public GSM network. When in serious condition, ASHA workers team goes into particular remote place and treat them efficiently without time lag. With this, the risk that surgery involves has been considerably reduced since it is possible to detect the complications before they prone, dangerous as suitable measures can be taken in time.

2.1 SYSTEM ARCITECHTURE

The system consists of both hardware and software architecture. Block diagram as in Fig.1 and Fig.2, shows the hardware components at transmitter and receiver side. The system were assembled according to the block diagram. The system is coded using embedded C and burnt into the Microcontroller.

2.1.1 Hardware Development:

Patients End:

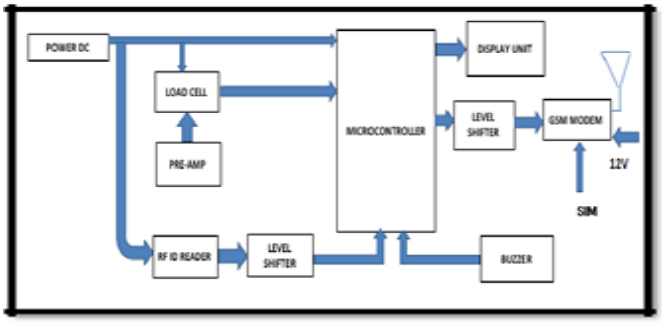

Fig. 1. Block Diagram of Transmitter Section

The following sections provide the details of the components used in our system at the transmitters end.

A. Load Cell:

A load cell is a measurement device for measuring the weight and display the electronic scale of weights in digits. However, load cell is not restricted to the amount of weight measurement.

It is a passive transducer which converts the applied force into electrical signals. It is also known as “Load transducers”.

B.RFID Reader:

An RFID reader is a device that provides, connection between the tag data and enterprise system and processed through the software that needs the information. The system communicates with the tags, within its operating field, performing number of tasks determined by the reader with simple continuous inventorying, filtering, encoding to selected tags. This device is also known as interrogator.

C. Controller

The controller used in this system is PIC 16f877A, it is a 10-bit microcontroller. It has an on-chip eight channel 10-bit Analog-to-Digital Converter (ADC).The conditioned and derived input sensor signals are fed to the microcontroller and processed.

D. LCD screen

In our system 16 X 2 LCD module is used. The 16X2 denotes that, has 2 rows and 16 columns.

Hence a total of 32 characters can be displayed. It operates on two modes, thee modes are the device can use full 8 pins and other use only 4 pins. The LCD can manage using 4 bit mode. The system output is displayed as it is being measured.

E. GSM Module

GSM (Global System for Mobile communication) is a digital mobile telecommunication system. The help of GSM module when interfaced with the system, can send short text messages to particular authority as per the designed application. This module requires a SIM which request the mobile service provider and send SMS. This technology endures the system as the wireless communication system with no particular range limits. This way provides safe range of transmitting the data. By this the vital parameter of an infant is monitored, then the programmed microcontroller produces an alarm at required time intervals to alert the parent. Then the programmed microcontroller sends an alert SMS to the concerned mobile number through the GSM wireless module [2].

The designed system provides a technological solution for the rural people in which the neonatal parameters, mentioned above were monitored with the help of a GSM modem. The GSM modem used here is SIM900A. It sends the Short Message Service (SMS) to the ASHA workers cellular phone and conveys the values of the required parameters namely weight. The GSM modem works on 3.3V - 5V TTL interfacing circuitry, which allows direct interface with the Microcontroller.

This modem will be enabled to send and Receive SMS, Connect to the web through GPRS through AT commands. These Application Terminal (AT) commands supported only by GSM modem, hence used for the present research work. Some required commands used are given below:

• AT+CMGF: To select SMS message format.
• AT+CMGS: To send a short message.
• AT+CMGD: To delete a short message from the GSM Module3.

Hospital end:

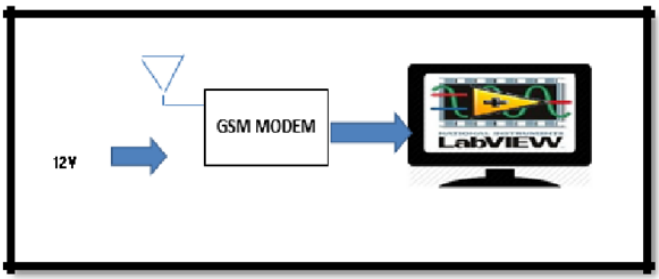

Fig.2.Block Diagram of Receiver Section

F: Computer for Monitor:

The data received on cellphone via SMS is viewable on computer also [5]. Instead of cellphone, we use another GSM module at receivers end, the computer. The GSM hardware module is interfaced through the COM port into the system. The LabVIEW software is used as a compatible tool to receive the data. The serial communication is done through VISA toolkit. The resource name is used as a control to obtain the port used for communication. The data received from the microcontroller is read out and displayed on the Front panel. These indicate the test conditions obtained from the Microcontroller.

2.1.2 Software Development Flow

PIC16F77A is used as a micro-controller in the proposed system. The MP lab was used to program compile and debug the source code developed for this system [1]. The sensors namely load cell are interfaced with analog channel of ADC of microcontroller. The values obtained from the load are programmed to display after every 2msec of delay in the LCD. The LCD module connections were defined. The function of PIC microcontroller resets all the values on Power on reset. It is used to initialize the microcontroller port pins as analogue inputs.

The UART in the microcontroller is configured to transmit the data at the baud rate of 9600. The Analog to Digital conversion starts, with setting of ADCON0 register. The digital data of each sensory input is stored in respective variables in their respective registers. The status of each parameters were sent by initializing and sending the data using GSM modem towards mobile end with the help of AT commands.

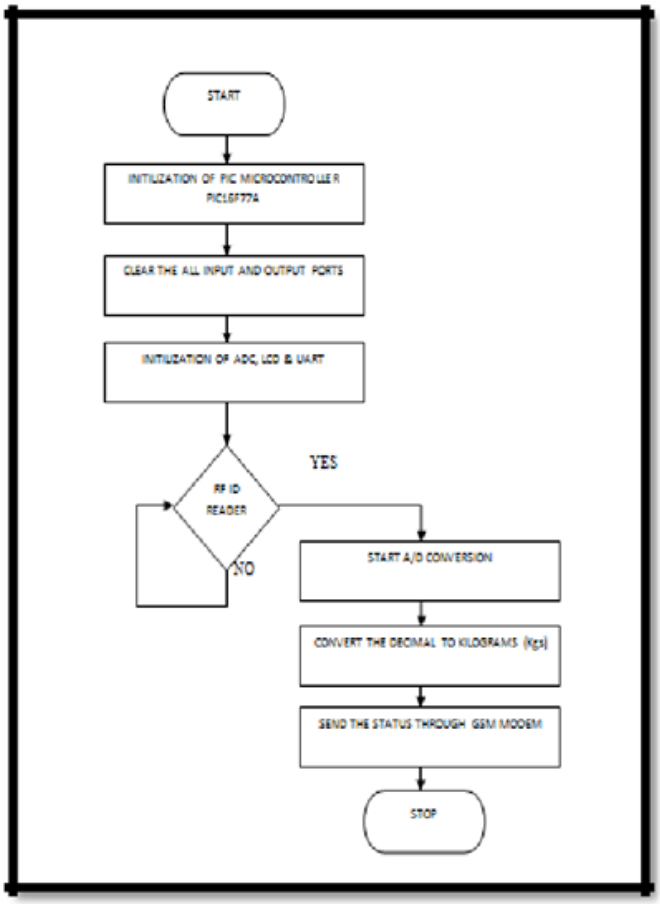

Fig.3.Flow chart for Transmitter section

There are also special function registers (SFR) in the PIC microcontroller. They are mostly used for serial communication purposes [6]. The initial set up of the Analogue to Digital Converters (ADC) and Universal Synchronous and Asynchronous Receiver Transmitter (USART) are as follows:

The USART was configured according to the full duplex system, which sets communication with Analog to digital converters (ADC), Digital to Analogue Converter (DAC), and Electrically Erasable Programmable Read Only Memories (EEPROM). The USART was initialized with the help of UART1_Init

(9600) instruction. The number 9600 indicates the baud rate for data transmission.

When the RFID is shown at the patients end at particular intervals per day. The controller takes the input signal and sends the interrupt signal to the sensor, where the weight is sensed. Weight of the neonate is obtained by microcontroller, the software is coded in such a way that weight of the neonate is obtained for sequential timings per day. Due to that whenever the input is read, message is send to Anganwadi center. The transmitted readings are obtained at the receivers end, basically operator's phone. Here because of the testing conditions, it is obtained through LabVIEW. They monitor the conditions and if any condition is not met, the ASHA worker checks the RFID tag and checks the area of the neonate and arrives there within time.

III. EXPERIMENTAL RESULTS

The system was made to be tested carefully, and the results were obtained. While running the system the system measures the parameters programmed, and the microcontroller runs the program, the message is transmitted and obtained via GSM and the data is displayed in LabVIEW. While the system is running the snapshot of the system were taken. The complete system at the transmitter end can be shown in Fig.4. The system which comprises of being both hardware and software path, the data at both transmitter and the receiver end can be seen though the LCD display in Fig.5. While the receiver end available can be seen in Fig.6. The LabVIEW data obtained have been captured and displayed in

Fig.7. Test results obtained below, shows successful implementation of the neonatal monitoring system.

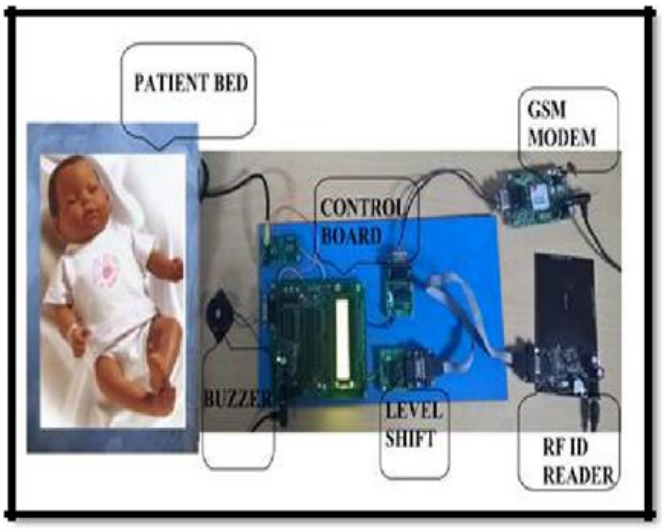

Fig. 4. Actual Implemented System in transmitter end

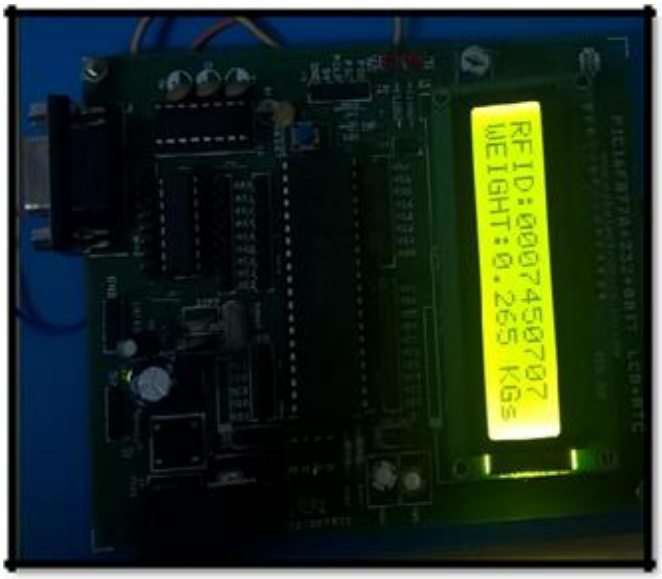

Fig.5. Displaying RFID and weight in LCD

Fig.6. Software system interface at receivers End

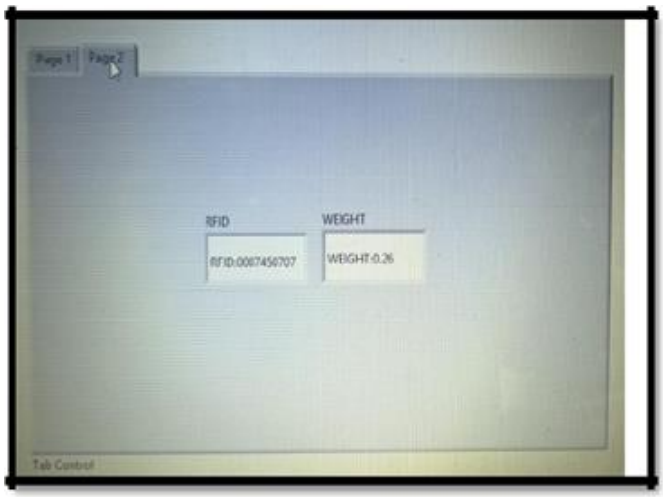

Fig.7. Message received on LabVIEW

IV. DISCUSSIONS AND CONCLUSION

Due to the increase in, neonatal mortality rate. The remote patient monitor is important in rural areas. Therefore, we can conclude that we are able to transmit the physiological parameters which can senses from remote patient in rural areas to the primary health center through GSM technologies

[7] and corresponding Patients RFID .In the hospital end physiological parameters are received and monitored through GSM and LABVIEW. The system we are providing maintains a real time and repetitive recordings of neonates parameter namely the weight. It analyses the weight of the neonates and provides regular update to the Anganwadi center through SMS [3]. The communication interface is provided by GSM (Global System for Mobile Communications). The device senses the weight and is being interfaced with a GSM. Usage of cellphones these days makes this device portable and easy use. The GSM sends readings to concerned Anganwadi center and then the ASHA worker can view data on computer and advise necessary actions to reach the necessary remote area [3]. The main objective of developing neonate patient monitoring system is to reduce the neonate's illness while at home or rural areas. In the future developing the non-contact physiological parameter monitor through GSM technologies.

V. REFERENCES

[1]. Asada, H.H., et al., Mobile monitoring with wearable biosensor photo plethysmography Biosensors. Engg. in Med and Bio Magazine.

[2]. Ming-Zher, P., N.C. Swenson, and R.W. Information Technology in Biomedicine science.

[3]. Patel, review of wearable sensors and systems with application in Rehabilitation. Journal of neuro-engg and rehabilitation.

[4]. Altini, M., J. Penders, and O. Amft. Personalizing energy expenditure estimation using a cardiorespiratory fitness predication. In Pervasive Computing Technologies for Healthcare.

[5]. Flow Sensors and wearable in Biomedical Engineering. Available from: http://vista.ir/article/258815.

[6]. Stuart, Tucker, Jessica Hanna, and Philipp Gutruf. "Wearable devices for continuous monitoring of biosignals: Challenges and opportunities." APL bioengineering 6.2 (2022).

[7]. Lin, Yuanjing, Mallika Bariya, and Ali Javey. "Wearable biosensors for body computing." Advanced Functional Materials (2021).

[8]. Kim, Jayoung, Alan S. Campbell, Berta Esteban-Fernández de Ávila, and Joseph Wang. "Wearable biosensors for healthcare monitoring." Nature biotechnology (2019). [4] Song, Yu, Daniel Mukasa, Haixia Zhang, and Wei Gao. "Self-powered wearable biosensors." Accounts of Materials Research (2021).

[9]. Yoon, Jinho, Hyeon-Yeol Cho, Minkyu Shin, Hye Kyu Choi, Taek Lee, and Jeong-Woo Choi. "Flexible electrochemical biosensors for healthcare monitoring." Journal of Materials Chemistry (2020).

[10]. Ma, Yuan, Rongfeng Li, Jiaxin Lei, Milin Zhang, and Lan Yin. "Design of a Wireless Compact Implantable Electrochemical Biosensor System for Health Monitoring Application." IEEE International Conference on Integrated Circuits, Technologies and Applications (ICTA), 2020.

Cite this article as :

Miss. Vrushali Pawar, Syed Zaker Hussain, "Remote Patient Monitoring System Using Wireless Communication", International Journal of Scientific Research in Science, Engineering and Technology (IJSRSET), Online ISSN : 2394-4099, Print ISSN : 2395-1990, Volume 9 Issue 6, pp. 371-377, November-December 2022.
Journal URL : https://ijsrset.com/IJSRSET2310282