International Journal of Engineering and Advanced Technology (IJEAT)
ISSN: 2249-8958 (Online), Volume-8 Issue-6, August 2019

Security And Health Monitoring System Of The Baby In Incubator

M.Subramanian, T.Sheela, K.Srividya, D.Arulselvam

ABSTRACT--- Safety is the most important parameter of the patient. The premature new-born babies do not have the capability to regulate their body temperatures on their own as normal new-born babies. Now-a-days as technology is advancing, the medical industries are reaching greater heights. By these advancements death rates of premature new-born babies are brought under control. Baby incubators plays a vital role in life saving of premature babies.. Here there is a need of health caregiver interactions due to certain conditions. These days the workload of the health caregiver has increased as the number of patients increased. The paper provides solution for the above mentioned problem by alerting the neonatal nurses so that preventive measures could be taken. It avoids the theft to be held in incubator rooms of the baby. The parameters such as heartbeat, temperature, blood pressure, wetness and movement of the baby. The power failure is also intimated within short span.

Keywords: NICU, Preterm, Incubators,Infants

I. INTRODUCTION

The term "**Neonatal**" comes from "**neo**" means '**new**' and natal means "**pertaining to birth or origin**". An Incubator is a box enclosure with requisite temperature, gases such as oxygen and carbondioxide with controlled pressure, humidity in which a pre-mature or an ill-infant is kept under observation and care. It also includes a heater which is used to maintain the temperature, it also maintains the humidity and oxygen content is maintained and accessing port for handling the baby.

Revised Manuscript Received on August 30, 2019.
* Correspondence Author
M.Subramanian*, Assistant Professor Department of Electronics and Instrumentation Engineering, Sri Sairam Engineering College, Chennai, Tamil Nadu, India.
(Email: subramanian.ei@sairam.edu.in)
T.Sheela, Associate Professor Department of ECE Vinayaka Mission's Kirupananda Variyar Engineering College, Salem, Tamil Nadu, India. (Email: sheelamuthu@gmail.com)
K.Srividya, Assistant Professor Department of Electronics and Instrumentation Engineering, Sri Sairam Engineering College, Chennai, Tamil Nadu, India.
(Email: s rividya.ei@sairam.edu.in)
D.Arulselvam, Assistant Professor Department of Electrical and Electronics Engineering, Sri Sairam Engineering College, Chennai-44, Tamil Nadu, India.
(Email: arulselvam.eee@sairam.edu.in)

II. HISTORY OF INCUBATOR

Before the medical intervention, Pre-mature and ill-babies were born and taken care at home. The first infant incubator was designed and developed using the chicken egg hatching process. Doctor Stephane is the father of the incubator, who first aimed to keep the pre-mature babies in the warm environment in incubator like as in the mother's womb. He also convinced the other physicians that incubators could reduce the mortality rates of the premature and ill new-born infants. By 1920's, the hospitals caring the premature new born infants in a separate area, called the "NEONATAL INTENSIVE CARE UNIT" (NICU). By 1970s, every hospital established NICU's as a necessary part in its area. By 1980's, atmost birth took place only in the hospitals. Now-a-days, transport incubators have become a major part, so that babies can be safely transformed from home to hospital and from hospital to home.

Literature Survey The majority available Homecare systems are specially designed for the aged people and patients. It monitors the patient's health status and automatically sends emergency signals and other functions. However, the same method cannot be carried for infants like the elderly people. Infants only express their discomfort by crying and that is different from elderly people. The home care system would substantially reduce the mother's burden designed for infants.

The most common parameters including temperature of the body using LM35, heart beat rate using IR sensor, pressure of the baby is being sensed and amplified and given to microcontroller. The data is stored on the server and parents are informed through SMS. Movement of the baby using vibration sensor is measured and monitored in lab view. Data is received using remote subsystem with GSM module and sent to server by USB port.

I. SYSTEM ARCHITECTURE

Hardware and Software is discussed in this system architecture. In this block diagram the hardware components are assembled. Using Embedded C the code is written and burnt into the micro controller. Parameters like heart rate, temperature of incubator and baby, gas pressure, movement of baby, level of medicine are measure and monitored. All parameters are interfaced in Lab view using relative sensors and output of these sensors are given to microcontroller and it is seen in Lab view Front panel using program control.

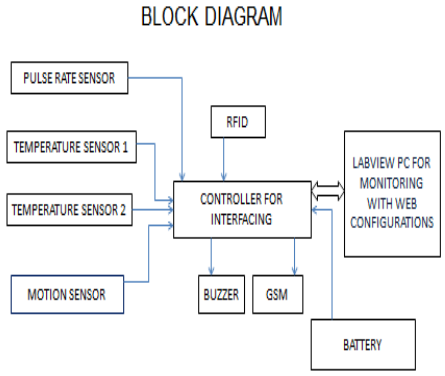

Figure1. Block diagram of Health Monitoring system of the baby Incubator

II. HARDWARE SPECIFICATION

1. Lab view Software

Lab view provides programming approach towards hardware configuration, Special measurement of data and debugging.

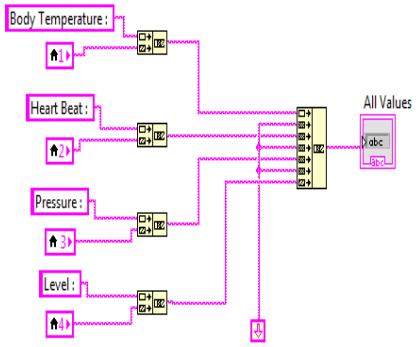

Figure2. Design of Lab view panel diagram which uses program control.

2. Heart Rate Sensor

In this sensor the finger is placed on it to produces a digital output. The LED blinks by sensing the heartbeat and the detector senses the flashing light from the led as heartbeat. This works on the principle in which the modulation of light takes place across the blood flow via finger at each pulse. The output is interfaced to the microcontroller which displays beats per minute (BPM). The sensor works at the operating voltage of positive five volts with operating current of 100mA.

Working

The LED used should be brighter as the light intensity should spread across the finger. The detector receives less light as the finger becomes more opaque.

The detector signal varies for each heart beat and it is converted into electrical pulse. The received signal is amplified and outputs to +5V logic level signal.

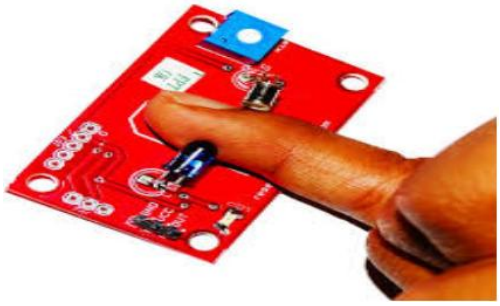

Figure3. Heart Rate sensor

Normal Heart Rate should be 72 beats per minute but the abnormalities should be indicated. When Heart Rate decreases beyond 50 and increases beyond 80 indications are given using lab view.

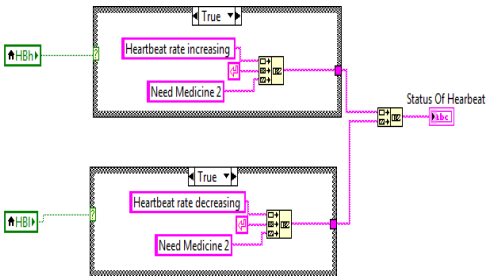

Figure3. Labview panel indicating heart rate

1. Temperature Sensor

Temperature sensor provides equivalent voltage correspondence to the surface on which it is mounted. LM35 is the type of temperature sensor used. It is calibrated in degree Celsius. It has very low output impedence only 0.1 ohm for 1mA load. It sense temperature in the wider range of -55 to 150 degree Celsius. In precise the output voltage varies linearly with temperature.

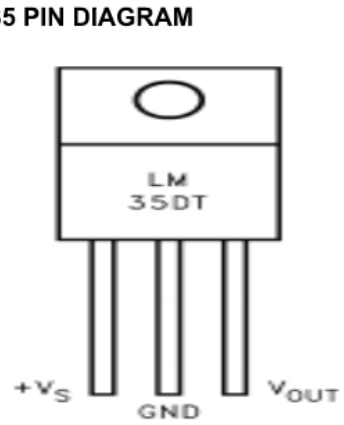

Figure4. Pin diagram of LM35

When the temperature goes beyond 40 ^{o} C then it will be indicated and notified.

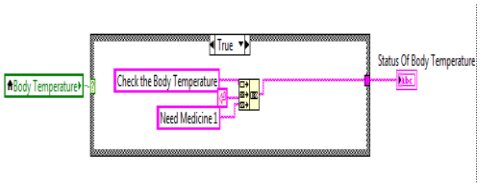

Figure5. Labview panel indicating body temperature

2. Pressure Sensor

Pressure sensor transduces the pressure and gives equivalent output voltage. Voltage varies linearly with applied pressure.

Working

A pressure sensor works as a transducer whose generated signal is a function of applied pressure. Pressure sensors also used to measure other variables such as fluid or gas, its flow, flowing speed, water level, and altitude.

MPX2050GSX is the Pressure Sensor used its temperature range varied from 0°C to +85°C with differential gauge option and radiometric supply voltage.

Figure 6. Pressure Sensor

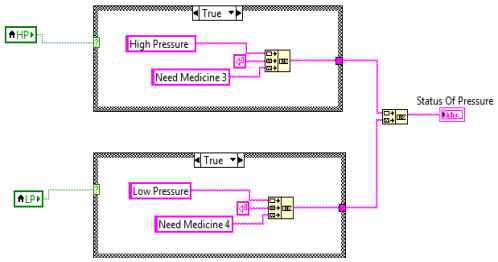

Figure7. Labview panel indicating State of Pressure

If the pressure goes beyond 140 or if it decreases below 70, information is passed to the physician and appropriate actions will be taken.

3. Arduino Microcontroller

Atmega328 is an Arduino Uno based microcontroller board. It is supplied with 14 I/O digital pins among those pins six pins can be used for pulse width modulated outputs, other six as analog inputs, one 16 MHz ceramic resonator.

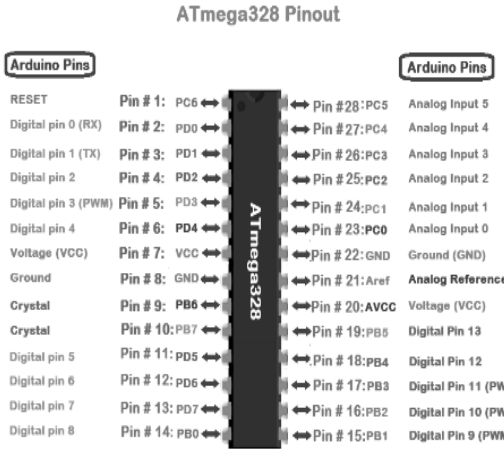

Figure 8. Pin configuration of ATMega 328 microcontroller.

4. Vibration Sensor

The changes in the real time vibration monitoring system are noticed as per changes in the equipment's low frequency vibration levels. This system alerts when the vibrations go beyond the normal range.

In vibration sensors more complex output can be transmitted via Vibration transmitters which can be used as sensors. When desired vibration levels are detected, It makes an arrangement using switches to make or break contact The sensor range can be determined by the maximum amplitude or range of the vibration being measured.

5. GSM Module

GSM is a mobile communication system module which stands for global System for Mobile Communication initially developed by BELL laboratories in 1970's.This system uses TDMA (Time Division Multiple Access) technique for communication purposes.

6. RFID Tag

Antenna, a transceiver and a transponder are the main components of the RFID tag. The RFID reader can be a permanently attached or portable device and it is network-connected. The RF waves are used to transmit signal that activates the tag. Once activated, the tag sends a wave back to the antenna, where it is translated into the data.

III. RESULTS

The theft of the baby is reduced by monitoring the heart beat rate of the infant by placing electrodes and the information is passed to the parents and hospital authorities.

If the temperature varies in the incubator, baby feels restless and this movement can be monitored using lab view. Movement of the baby can be obtained by the Vibration Sensor. Power cut is also intimated here within short span since baby cannot survive without certain amount of oxygen.

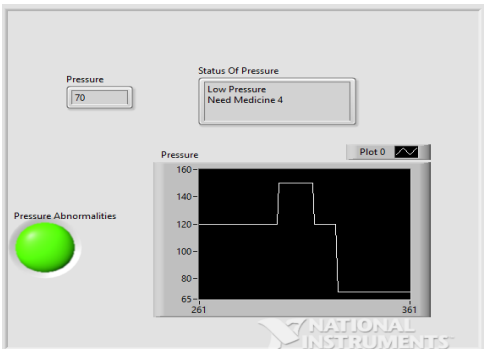

Figure 9. Pressure Variations

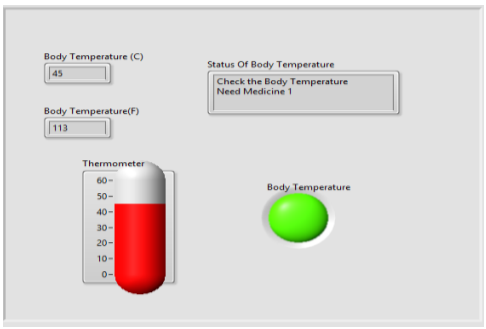

Figure 10.Temperature Abnormality indications

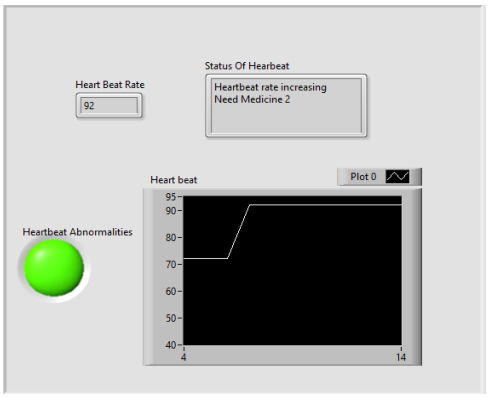

Figure 11.Heart beat Variations

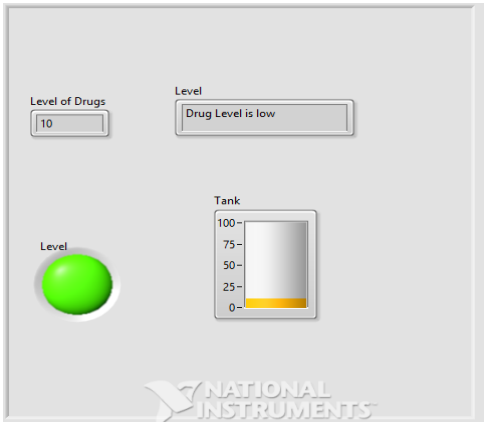

Figure 12. Level Indications

REFERENCES

1. B.Ashish,"Temperature Monitored IoT based smart Incubator" International Conference on IoT in Social, Mobile, Analytics and cloud pp.497-501, 2017.
2. Virat Plangsangmas, Surat Leeudomwong, Panisara Kongthaworn, "Sound Pressure level in an infant incubator" Journal of Meterology Society of India.Vol.27(4), pp.199-203, 2012.
3. Vittorio Fineschi, Steffano D Errico,Margherita Neri "Heat stroke in an incubator: an immune his to chemical study in a fatal case" International journal of legal medicine, Vol. 119, pp. 94-97, 2005.
4. M.Sruruthi and S.Suma, "Microcontroller Based Baby Incubator Using Sensors" International Journal of Innovative Research in Science, Engineering and Technology, Vol.4(12),pp.12038-12044, 2015.
5. Hittu Mittal, Lini Mathew and Ashish Gupta, "Design and Development of an Infant Incubator for Controlling Multiple Parameters" International Journal of Emerging trends in Electrical and Electronics, Vol.11(5),pp.65-73, 2015.