A SECURE IOT BASED BABY HEALTHCARE MONITORING AND MAINTENANCE SYSTEM IN CLOUD

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Abstract

In worldwide there are four million babies die in the first month of their birth, one million die on their first day. Now-a-days at least 25% of neonatal deaths happen because of preterm birth. An incubator is the one which is used in the hospitals to protect the premature babies, who are extra vulnerable and are at increased risk of complications from infection, noise and light. It may even provide humidified air to help very premature babies to maintain skin integrity. But this incubator is very costly. So the hospitals in rural areas can't have such facilities to protect the preemies. This system helps to prevent the death of such babies. The low cost baby health monitoring system helps to overcome the inhibitive cost of existing baby incubator. So everyone who is economically backward is benefitted by this. This project is used for monitoring the baby health parameters like temperature, pulse rate and moisture and also for storing the measured values in cloud with appropriate security. The major critical parameters are measured in real time. If any variation from the threshold level, it automatically sent an alert message to the caretaker and do the necessary action immediately to safeguard the children.

Index Terms-Arduino UNO, Temperature, Pulse, Moisture Sensor, Wifi module, Short message service.

I.INTRODUCTION

In today's world the development of technology, home healthcare and remote monitoring of physiological data are playing the major role. Implementation of home healthcare for patients is more important, particularly for premature babies.

An incubator is the one which is used in the hospitals to protect the premature babies, who are extra vulnerable and are at increased risk of complications from infection, noise and light. Basically an infant monitoring system includes sensors and a microcontroller.

One of the most important physiological data to monitor is body temperature, i.e. infant fever. Rapid increase in body temperature may cause a vital damage. So the body temperature of the babies should be continuously monitored using the sensor.

The maximum body temperature range for these babies should be 36-38oC. Another crucial parameter is pulse rate, so continuously monitoring of the infant's pulse rate using the sensor may be required. The pulse is the number of heart beats per minute.

The maximum pulse range for newborn babies should be 70 to 190 beats per minute and the pulse range for infants should be 80 to 160 beats per minute. The condition of the baby's bed should be monitor to check if it is in wet condition or not. So the moisture level of the bed should be continuously monitored. In this proposed system we sense the above mentioned parameters using appropriate sensors and the values are embedded into an Arduino UNO, which is microcontroller used to convert the analog to digital.

II. LITERATURE SURVEY

Mrudula Borkar, Neha Kenkre, Harshada Patke[1] stated that warmth is the important parameter for the infant in an incubator. The system mainly focused on monitoring the desired temperature of infant incubator. The

Arduino UNO is and the RF transmitter and receiver module were implemented and sends the data from micro-controller to the computer for better monitoring purpose. Mohit Kumar, Mrs. Suryakala[2] discussed a conventional approach to monitor the infant includes constant monitoring of infant using a web camera or keeping nurse for the baby or using audio monitoring. But, this system provided peace of mind to parents when they were away from their infant as they can obtain the updates of health of baby. The fundamental part was that the communication was done by using GSM interface in which Short Messaging Service (SMS).

Suruthi, S. Suma[3] implemented by monitoring the temperature and pulse rate using the appropriate sensors. Accelerometer was used as the motion sensor. The GSM Modem interfaced with the microcontroller sends an alert SMS to the parent's mobile number. Shijo Joseph Mathew, S.Mathankumar, S.Vaishnodevi[4] implemented that the single chip microcontroller read the surrounding temperature, humility, respiration along with the sensor. All the values were displayed on LCD. Single chip microcontroller was used to analyse all the three sensor data and any variation occurred, an alert was sent to parents automatically.

N.A.A Hadi, M.H.C. Hasan, N.M.Z. Hashim, N.R.Mohamad, A.S. Rahimi, K.A.M. Annuar[5] stated that the current recommended method of providing infant temperature regulation in resource settings was Kangaroo Mother Care (KMC), the practice of placing newborns, directly onto the mother's chest. KMC has demonstrated benefits in terms of improved weight gain for preterm infants.[6] used an Arduino Leonardo board in the system design along with a body temperature sensor, a sound detection sensor, a finger heartbeat detector, and a humidity sensor. Notification of alarm situations has been successfully provided via a vibrating smart watch, SMS, and LEDs (Light Emitting Diode) using Arduino board and android-based applications.

Faruk AKTAS, Emre KAVUS, Yunus KAVUS[7] discussed about the temperature and pulse rate and also describes the design of a very low-cost remote baby monitoring system which measures heart rate and body temperature of an infant and sends the data to a remote end where the data will be displayed and parents or caretakers will be able to examine him/her.

[8]stated that the system was to monitor the parameters Like Light, respiration, Audio/ voice of the baby that he/she was ok or crying. Door parameter to provide Intruder bell so that it provided an alarm/Led indication if any personal entered into the place /Room of baby by breaking the sensor.

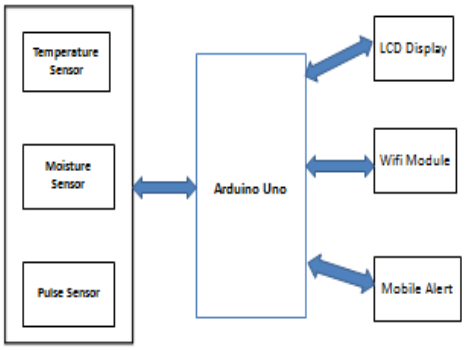
EXISTING SYSTEM:

The existing methodology mainly consists of sensors, hardware unit, cloud server and parent's application. They monitor the various parameters like the pulse rate and the oxygen level using the sensors and an Arduino is used as the microcontroller. The measured data are stored in the cloud server with lack of security. Security is the main factor for storing data.

PROPOSED SYSTEM:

In this paper, the proposed methodology, tries to overcome the limitations of the earlier system. The system will take the parameters like temperature, pulse rate and the wet condition of the baby's bed using moisture sensor. Arduino UNO is used as the microcontroller. It converts the values analog to digital. The values are measured and embedded into the Arduino using the appropriate sensors. The Wifi module is used which is a wireless internet access interface to any microcontroller based design on its simple connectivity through Serial Communication. If there is any deviation from the threshold values, an alter message is given to the care taker. The measured values are stored in the cloud and the values are secured by encrypting the datas using a security algorithm.

BLOCK DIAGRAM:



III. SYSTEM REQUIREMENTS

The system is implemented with the four main components namely Arduino UNO, Temperature sensor, Pulse sensor, Moisture sensor and Wifi module.

HARDWARE REQUIREMENTS

Arduino:

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

Figure 1: Arduino UNO

Temperature Sensor:

Human body needs special type of sensors for reliable readings which led to the choice of using the LM35 temperature sensors in our prototype [1, 6]. It operates at 3 to 5 V and can measure temperature in the range of -40 C to +125 C which is sufficient for the targeted body temperature range. The sensor's output is an analog DC voltage signal which is read by the microcontroller using an analog pin linked to an ADC. The ADC used has a resolution of l0-bits, 1024 levels, with a sample rate of 9600 Hz and input voltage range depending on the ground and Vee. The output voltage of the LM35 is analog and in the linear range of -1 V to 6 V with accuracy of ±0.5 °C can be converted from volts to degrees of Celsius and Fahrenheit.

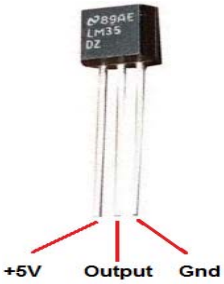


Figure 2: Temperature sensor (LM 35)

Pulse Sensor:

The Pulse Sensor is a plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart-rate data into the projects. It is an integrated optical amplifying circuit and noise eliminating circuit sensor.Working voltage: 5V &Working current: 4mA

Figure 3: Pulse sensor

MOISTURE SENSOR:

The moisture sensor is used to measure the wet condition of the baby's bed. It is fixed in the bed of the baby and measure the values. The probe can be powered with an DC supply or batteries in the range of **3.5 to 20** volts. The output is a voltage in the range of **0 to 3V**, so any multimeter can be used to measure the moisture level.

Figure 4: Moisture sensor

SYSTEM DESIGN:

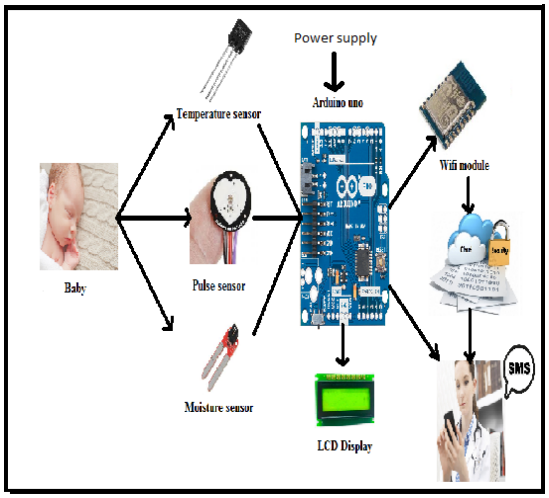


Figure 5: System design

FLOW CHART:

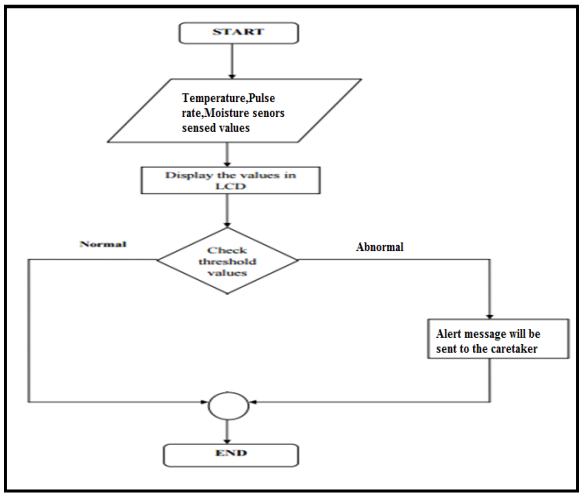
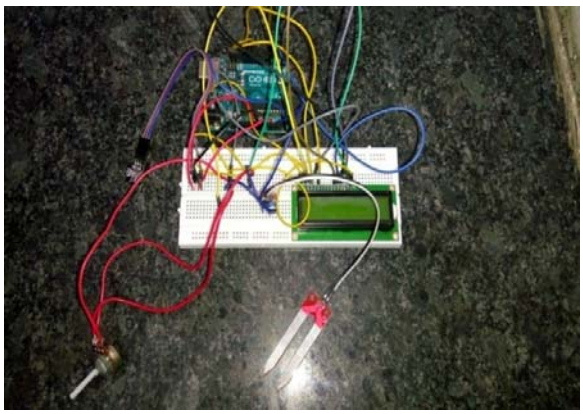
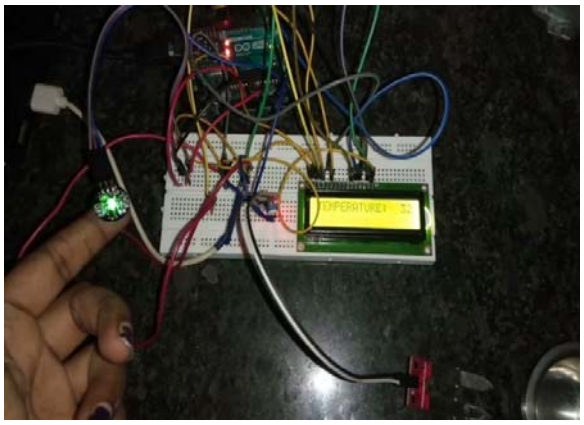


Figure 6: Flow chart

IV. IMPLEMENTATION





V.CONCLUSION AND FUTURE ENHANCEMENT

The project is developed mainly for the medical conditions available in rural areas. This Equipment can be effectively used by caretaker in a small health care Centre. It can be life saving machine for low birth weight infants. The component can be easily fixed. The chamber is sufficient enough to accommodate the baby comfortably. As the electronic part is separated from the compartment the baby is kept the baby can be assured safe. The Arduino Uno microcontroller used here is efficient in controlling the temperature, pulse of the system and also the wet condition of the baby's bed. In future, the size of the measured values are represented in graph.

VI. REFERENCES

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