Incubator Baby Parameter Sensing and Monitoring

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Abstract –The neonatal incubator is an apparatus that provides a closed and controlled environment for the sustenance of temperature babies. But recently, many premature babies have lost their lives due to lack of proper monitoring of the incubator that leads to accidents (leakage of gas and overheating causing short circuits and eventually, the bursting of incubators).This project deals with the cost- effective design of an embedded device that monitors certain parameters such as pulse rate of the baby, temperature, humidity, light inside the incubator. If any variations occurs in the corresponding parameters (pulse, temperature and humidity), than the parameters will control by using lights and fans inside the incubator. And the readings will continuously monitoring in LCD and sends the details to the corresponding doctor or nurse by using GSM and the baby will monitors continuously via webpage. The parents, doctors or nurse will monitor the baby from anywhere by using IOT. By continuously monitoring and controlling the parameters we will provide efficient and safe working of an incubator.
Key Words: Raspberry pi, Temperature sensor, Humidity sensor, Heart beat sensor, Webpage, Baby incubator

I. INTRODUCTION

The increase in neonatal deaths from premature birth and low birth-weight was found to be non-uniform across India such that the death rates were more in rural areas and poorer states but lesser in urban areas and in richer states. Moreover, premature births and low birth-weight babies may require more investments in incubators and intensive care units in order to provide appropriate neonatal care.[9] There have also been incidents of death of premature babies due to accidents which have been categorized as a technical fault in the incubators.The existing system proposes the use of a temperature sensor to sense the temperature of the incubator which isconnected to the Node MCU. Any increase in the temperature beyond the specified range turns the alarm on and the heater in the incubator gets turned off through the usage of a mobile app. The temperature readings can be continuously viewed by programming the Raspberry Pi. This enables the staff to receive notification during an emergency so that necessary preventive actions can be taken. This only ensures the maintenance of temperature inside the incubator. But there are other parameters which require being monitored and controlled to provide safety to the infant.So, the main objective of this project is to overcome the above-mentioned drawbacks and provide a safe and affordable mechanism for monitoring the incubator which will help in reducing the mortality rate of neonates. The proposed system involves the use of WIFI, integrated to various sensor units, such as pulse, temperature and humidity sensors.

This systems uses to collect the sensed data and send emergency notifications to the doctor or nurse. When there exist any variations in specified conditions. The readings of sensors are continuously monitoring with the help of iot, thereby providing efficient and safe working of an incubator.

II. PROPOSED METHOD

In incubator system we provides a homogeneous and stable temperature, relative humidity level and it continuously monitors the baby heart beat level and also alert the concern person with an alert message and provides live baby monitoring. The parents also monitor the baby live condition. The project "Incubator baby parameters controlling and monitoring" is a very innovative system which will help to keep the babies in warm condition. This system monitors the premature baby via webpage. And send all parameters information to the mobile by using GSM.
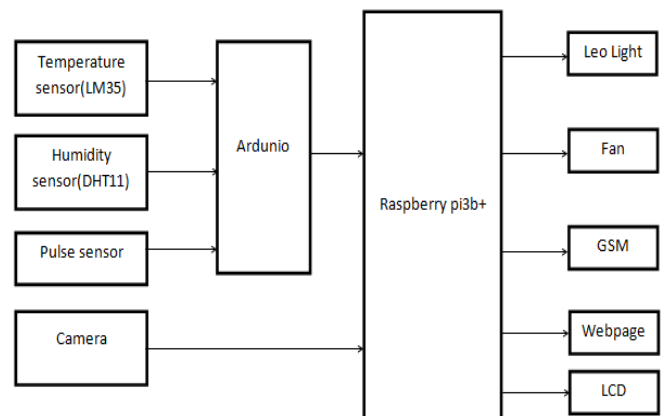

Figure.1. System Block Diagram

The system will be controlled automatically via sensors and microcontroller chips placed inside the incubator and with visual monitoring camera inside the box.

For instance, the incubator might be started in the heating mode to warm up till reached to a certain point, then switched off the heater automatically, in case the temperature raised over 98.6 F (37.0 C), the fan will be switched on to drag in the room temperature air inside the incubator till it hits the needed degree. In addition, Heart-Rate and Humidity measurements device nearby to in order to monitoring hemo dynamic status.We are using Wi-Fi as the wireless communication medium and as controller we are using ARDUINO UNO and Raspberry pi. Because, Raspberry pi doesn't have in built ADC for analog inputs.

So if we want to take analog inputs in raspberry pi , we have to connect external ADC with it. Raspberry pi is not made to take analog inputs. To take analog inputs we should use a ADC (analog to digital) converter. So, arduino is used for converting analog values to digital values.

First we will measure the temperature and humidity of the incubator and monitor the system using Wi-Fi module to webpage. If the data is above/below a set point then the controller will switching ON/OFF the fan and light. The readings will be shown on the LCD screen. The LM35, dht11and Pulse sensors will give continuous data and so we can know the temperature and humidity and heart-beat at any time. So using this model we can easily control the temperature, humidity and measure the infant's heartbeat. And the readings will send to mobile using GSM. By using camera which is connected to raspberry pi, will provide live monitoring of the baby in webpage.

2.1 System Setup and Configuration

The raspberry pi chips concerning illustration the polar single-board minicomputer. There are a couple extra segments you will require in front of we get began. So, a settling on your purchase, keep in mind that you'll compelling reason the emulating extras.

Raspberry p — there would six diverse models about raspberry pi. The pi 2 model b or Pi1 model B+ and pi 3 model b are perfect gas to novice activities in light they are the majority versant and more bring those widest extent of abilities. Those pi 3 model b need the included reward of an quad-core processor also 1 gb from claiming ram along these lines it helps heavier working systems, in Ubuntu and Microsoft 10.

2.2 Temperature sensor-LM35

LM35 device is a temperature sensor device. It is connected to Arduino. The device sensors variations in temperature across it. LM35 is a basic temperature sensor, which is used for experimental purpose. It gives the readings in centigrade (degree Celsius) since its output voltage is linearly proportional to temperature. If temperature increases, the voltage across diode increases at known rate (the voltage drop occurs across base-emitter junction of transistor).

2.3 Humidity sensor-DHT11

DHT11 measures relative humidity. Relative humidity is the amount of water vapor in air versus the saturation point of water vapor in air .DHT11 is a basic, ultra low cost digital humidity sensor. It uses a capacitive humidity sensor to measure the surrounding air and spits out. A digital signal on the data pin.

2.4 Pulse sensor –M212

1. It consists of a LED light that issued to measure the pulse rate. Based on the volume of blood in the capillaries, the light gets reflected as the sensor is placed on the body. So, the amount of reflection taking place during heartbeat will be less than that with no heartbeat. Also the volume of blood inside the capillaries decreases in between heart beats, which affects the transmission of light through the tissues.

This variation in transmission and reflection of light gives the analog pulse output from the sensor. **Working** The system consists of Raspberry pi which have inbuilt wi-fi. It is connected to the incubator. The system has various sensors like temperature, humidity and pulse are connected to Arduino and they will control by using controller. The controller will read and collects the data continuously and it will sends the information to the corresponding doctor using GSM. The temperature and humidity sensor (DHT11) senses the temperature of the surroundings and the humidity present in the surrounding environment of the neonate. The pulse sensor also continuously takes the readings of baby. If the temperature and humidity values exceed the specified range (36.5-37.2°C) or when the pulse rate varies, then the respective Sensors will senses the values and controller will reads the values from sensors and controls the temperature and humidity by turn on/off the light and fan. The controller will sends the message to concern person the system will provides live monitoring of baby via webpage from anywhere so, the parent or doctor will continuously monitor the baby actions in live monitoring.

III. RESULT AND CONCLUSION

The project "Incubator baby parameter sensing and monitoring" was designed by using sensors and IOT technology. And the status of the baby will be monitored by using webpage.
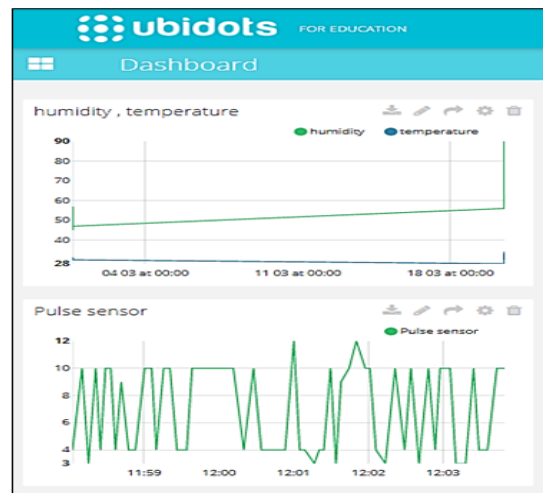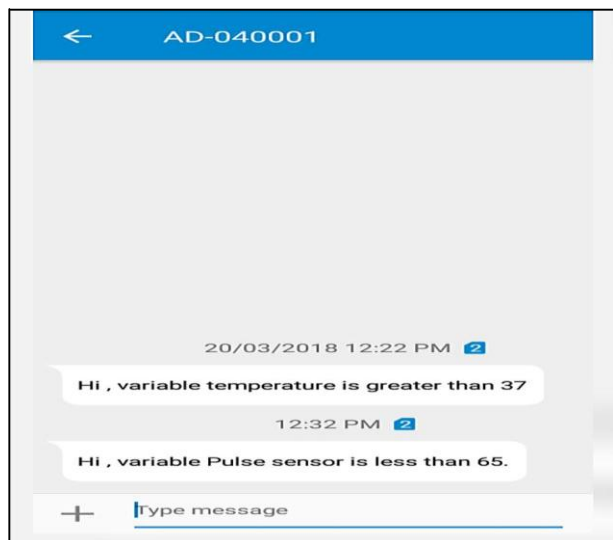
Fig -6: Messages received in mobile phone

IV. CONCLUSION

When the sensors are used such that they supplement the IoT in the necessary application, those engineering organization gets to be an outline of the all the more all population for cyber-physical systems, which additionally comprises from claiming innovations for example, keen grids, virtual control plants, keen homes, canny transportation and advanced mobile urban areas. Thus, IoT helps in sensing various objects, remote controlling of those objects and creates an ease in directly integrating the physical world into computer-based systems.

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