International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 06 | June 2020 www.irjet.net p-ISSN: 2395-0072

Development of integrated crib safety system against SIDS using IoT

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Abstract - According *to the improvement of the technology, a new system based on encryption has been found. This paper has been used encrypted data sharing has been used in medical field. To develop a safe crib care system helps to keep the infant safely and detect (or) intimate in case of emergency during the period of one month to one year. Despite of the improvement of education on safe sleep, infants are still bare to multiple risks for sudden infant death syndrome(SIDS). In this paper, the proposed model for a safe crib safety system uses parent to detect and take precautions by body analysis system. This paper aims to design a quick and most efficient system for keep the infant safe and intimate in case of emergency.*

Key Words: Arduino Mega 2560, IoT, Temperature Sensor, Pulse Sensor and Pressure Sensor.

1.INTRODUCTION

Our Project titled " Development of Integrated Crib Safety System Against SIDS Using IoT" has been undertaken to avoid infant death in the hospital. SIDS is a mysterious syndrome, since by its very definition the cause cannot be determined. But certain risk factors do exist. Every year around 3000 babies die in the hospital because of sudden infant death syndrome. The overheating while sleeping is the major factor that place the baby at higher risk of dying from SIDS. In this project, we can reduce the risk of dying of baby.

2.LITERATURE REVIEW

This research paper, "Toward health care and lifestyle applications based on ECG, EEG" was done by Frank Bouwens. The presented a system design research for wearable sensor devices used for health care and lifestyle applications based on ECG, EEG and activity monitoring. To meet the low power requirement of these applications, a dual-core signal processing system was designed that combines an ultra-low power Bio-medical Application Specific Instruction Set Processor (Bio-ASIP) and low power general purpose microcontroller (MSP430) small wearable health monitors which enables future remote services needed to be energy efficient and reliable for long autonomous procedure. This Bio-ASIP is event-driven processor which maximizes energy efficient advanced processing of applications developed around ECG, EEG and activity monitoring. The measurement result showed that Bio Asip consumes 11 µW power for ECG R-peak detection application.

This research paper, "concept to measure ECG, temperature of a patient and wireless ZigBee data transmission" was done by Remya Ravindran and Pradeep Kumar Jaisal. This wireless sensor belt is used to measure ECG, respiratory 20 rate and skin temperature. In this mode, 8051 microcontroller and a ZigBee transceiver that supports IEEE 802.15.4 standard for the transmission of data were employed. It employs ZigBee technology that is very well suitable for the transmission of small amounts of data like sampled values of ECG signals. The advantages of ZigBee are low cost, less delay, low current consumption and capability to support huge number of nodes virtually. ZigBee is superior technology when compared to Bluetooth and WLAN.

This research paper, "Design of Wi-Fi sensor network" was done by Reza S.Dilmaghani. The design of Wi-Fi sensor network that is capable of monitoring patient's chronic diseases at their home itself via a remote monitoring system. In present days, all types of monitoring systems transfer information regarding a patient to the hospital with the help of PCs located at patient's home. By using a remote monitoring wireless system and network nodes, usage of PC can be avoided. These nodes are connected to a central node via internet connection which is located at the hospital. The nodes of proposed wireless sensor networks are constructed using ECG sensors, MSP430 microcontroller, a CC2500 radio terminal and a simple network protocol. The captured signals are transmitted to an access point through wireless network which operates on 2.4 GHz frequency. The access point is also a small device connected to internet via asynchronous digital subscriber line (ADSL). With the help of ADSL, the data is transmitted to the hospital through internet for real time analysis and storage.

3.EXISTING SYSTEM

In the existing system, they monitor the baby through the camera and sound detection sensor and intimate the doctor or parent through the buzzer in the cradle.

3.1 DISADVANTAGES

- The baby cry if it is hungry.
- The system alert only of the baby in the cradle.
- Water and electricity risks. The existing system is not more reliable.

4. PROPOSED SYSTEM

In the proposed system, we are overcoming the drawbacks of the existing system. Here we are using two sensors – Temperature sensor and Pulse sensor. Temperature sensor is to measure the infant body temperature continuously, simultaneously pulse sensor measure the pulse and send to Arduino Mega. From the Arduino the data is stored in the cloud and comparing with the threshold value. If the actual value exceeds the threshold value then an alarm will be activated and also the alert message will send to the hospital and parent through the mail. If the actual value is not beyond the threshold value, it will continuously measure the data and store it in the cloud.

4.BLOCK DIAGRAM

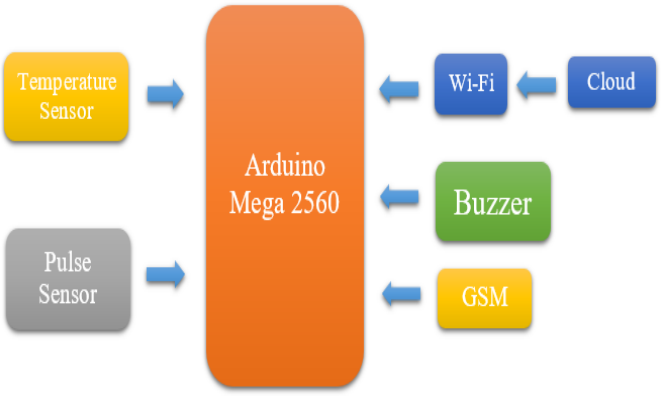


Fig -1: Block diagram of Proposed System

5. METHODOLOGY

The step-by-step procedure of the proposed system.

- Measuring the temperature by temperature sensor
- Storing in the database
- Measuring the heartbeat by pulse sensor
- Storing in the database
- Checking with the threshold value
- If any mismatch, send alert message to hospital trigger alarm.

6. HARDRWARE DESCRIPTION

5.1 Arduino Mega 2560

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, 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. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila. The Arduino Mega2560 can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

Fig – 2: Arduino Mega 2560

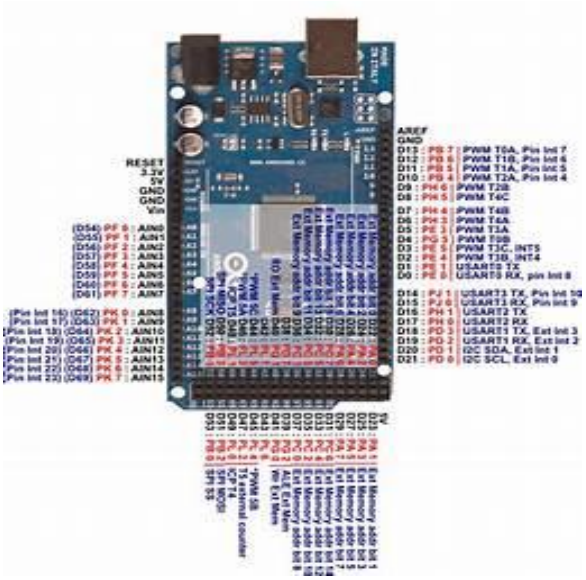


Fig – 3: Pin Configuration of Arduino Mega 2560

The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

The power pins are as follows:

- VIN. The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V. The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- 3V. A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND. Ground pins.

5.2 TEMPERATURE SENSOR

Temperature is a difficult concept to define. Ordinarily, temperature is a qualitative measure for classifying how matter appears to be hot or cold. More specifically, matter is made up of moving particles (molecules), each molecule has its own motion speed, the kinetic energy. Temperature is a physical parameter that describes the average kinetic energy of molecules, it is not a measure of energy itself, but it is proportional to the average kinetic energy of molecules. That means that the hotter molecules are, the more they move and the higher is the temperature. By contrast, when molecules do not move at all, i.e., their kinetic energy is zero, so the temperature is 0ºK (absolute zero, -273.15ºC)

A thermometer is an instrument that measures temperature. However, it is impossible to measure the kinetic state of molecules directly, instead, thermometers measure parameters that vary proportionally with the kinetic state of molecules, called the thermometric variables; thus, there are several different techniques to measure temperature depending on the thermometric variable. The most commonly used temperature sensors in oceanography are the Resistance Temperature Detectors (RTDs) and the Thermistors.

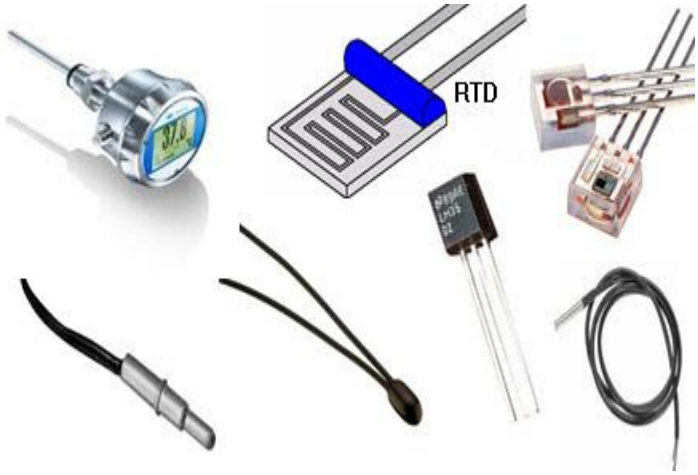


Fig – 4: Types of temperature sensor

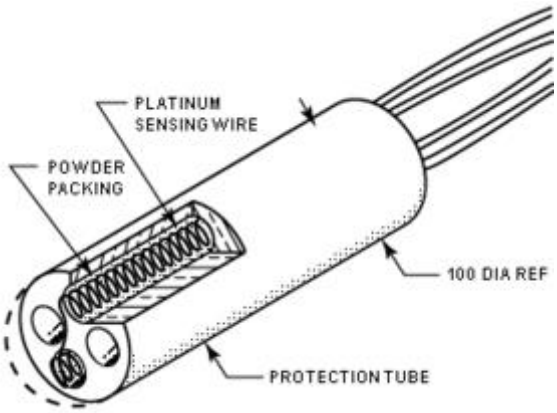


Fig- 5: Resistance Temperature Detector(RTD)

Temperature scales are based on “temperature standard points”, points at which a phenomenon occurs at constant temperature. Fahrenheit scale was developed by Daniel Gabriel Fahrenheit (in 1724) supposedly based on the lowest temperature achieved at the time (0ºF) and using 180 degrees between the freezing and the boiling point of water, 32 ºF and 212 ºF, respectively. As seen above, kelvin scale (K) is based on the absolute zero with 100 degrees between the freezing and the boiling point of water. The zero value of the Celsius scale is based on the freezing point of water and the degree range is the same as in Kelvin. SI units are represented in Kelvin (K), while the most commonly used scale is Celsius.

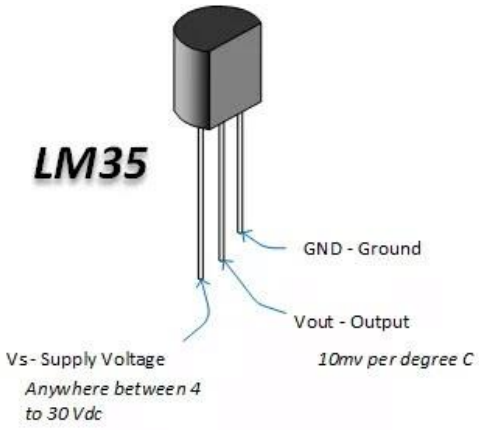


Fig – 6 : LM35 Pin Configuration

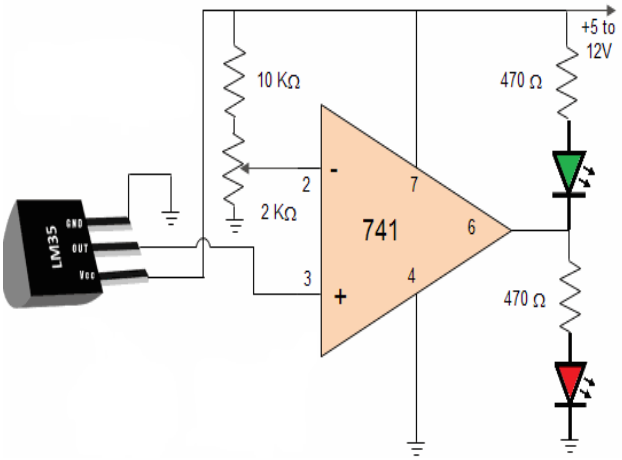


Fig – 7 : LM35 Pin Diagram

5.3.Pulse Sensor

Pulse Sensor is a simple sensor which is used in many places. The basic sensor has three pins namely, ground, Vcc and the input signal. The heart rate can be seen by LIVE and detects the accurate value of heart beat which is ranges from 70 to 80 beats per minute. Generally, the beat of the heart can be felt in any artery that lies close to the skin is the pulse. In this sensor, the heart beat can be measured based on the variation as light is scattered or absorbed during its path through the blood as the heart beat changes. The timing of the pulse is important to measure the heart beat

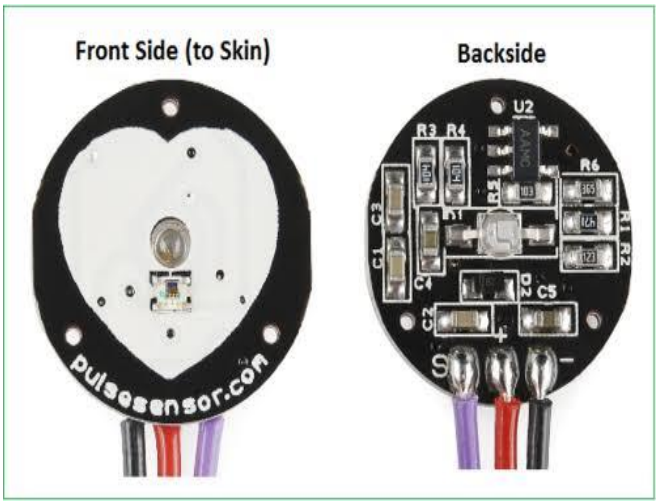


Fig – 8 : Pulse sensor

5.4. GSM MODEM

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

5.5. NODEMCU

NodeMCU is an open source LUA based firmware developed for ESP8266 wifi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board.

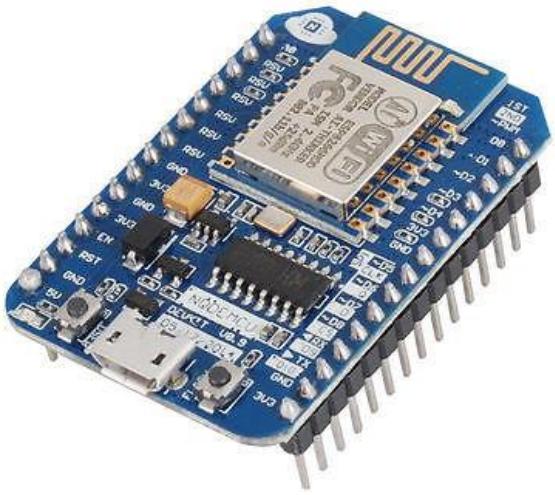


Fig – 9: NodeMCU Development Board/kit v0.9 (Version1)

Since NodeMCU is open source platform, their hardware design is open for edit/modify/build. NodeMCU is an open source development board and firmware based in the widely used ESP8266 -12E WiFi module. It allows you to program the ESP8266 WiFi module with the simple and powerful LUA programming language or Arduino IDE.

With just a few lines of code you can establish a WiFi connection and define input/output pins according to your needs exactly like arduino, turning your ESP8266 into a web server and a lot more. It is the WiFi equivalent of ethernet module. Now you have internet of things (iot) real tool.

With its USB-TTL , the nodeMCU Dev board supports directly flashing from USB port. It combines features of WIFI accesspoint and station + microcontroller. These features make the NodeMCU extremely powerful tool for Wifi networking. It can be used as access point and/or station, host a webserver or connect to internet to fetch or upload data.

NodeMCU Dev Kit/board consist of ESP8266 wifi enabled chip. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 WiFi Module.

There is Version2 (V2) available for NodeMCU Dev Kit i.e. NodeMCU Development Board v1.0 (Version2), which usually comes in black colored PCB.

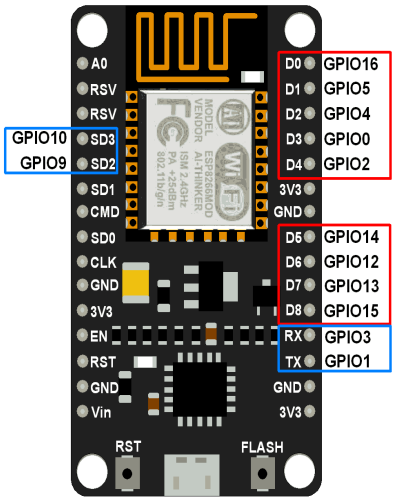


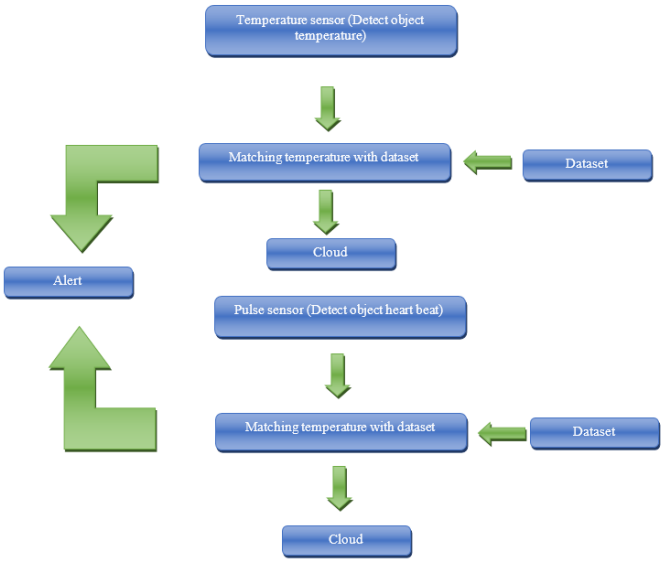
Fig - 10: NodeMCU Development Board/kit v1.0 (Version2)

6. SYSTEM DESIGN

In this paper we make a Development of Integrated Crib Safety System Against SIDS Using IoT, you can monitor the infant with their body temperature and heartbeat sensor. Temperature sensor is to measure the infant body temperature continuously, simultaneously pulse sensor measure the pulse and send to Arduino Mega. From the Arduino the data is stored in the cloud and comparing with the threshold value. If the actual value exceeds the threshold value then an alarm will be activated and also the alert message will send to the hospital and parent through the mail. If the actual value is not beyond the threshold value, it will continuously measure the data and store it in the cloud. Our project consists of four major hardware components.

- Temperature sensor
- Heartbeat sensor
- GSM
- NodeMCU

7. FLOW CHART



8. CONCLUSION

The proposed system used Temperature sensor and Pulse sensor. The temperature sensor helps to measure the temperature and pulse sensor helps to measure the heart rate. The measured data is stored in the cloud. If the temperature or heart beat increases gradually, the message will send to the hospital and parent. If the temperature or heart beat increases suddenly and beyond the threshold the alert mail will send and the alarm get activated. The threshold value is based on the room temperature. It is help to reduce the risk of dying of infant in the hospital. This system is more reliable and easy to monitor the baby.

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