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Solar based Smart Infant Incubator

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***Abstract*:- As there is tremendous growth, due to low birth weight new born are facing at the risk.In such cases there is necessity of developing an environment which is healthy to new born babies which suits to their body temperature. A Premature infant requires an incubator, which is a device where an infant is placed to provide similar environment as in the mother's womb. Nowadays we are adopting the technological and engineering inventions for getting advantages and benefits in terms of safety issues of thebabies. In this era, A solar based smart infant incubator is designed by using Raspberry pi and sensors which is very much needed in remote villages, because premature infants die due to lack of medical care.**

Keyword: Incubator, sensors,Raspberry pi, solar.

1.INTRODUCTION

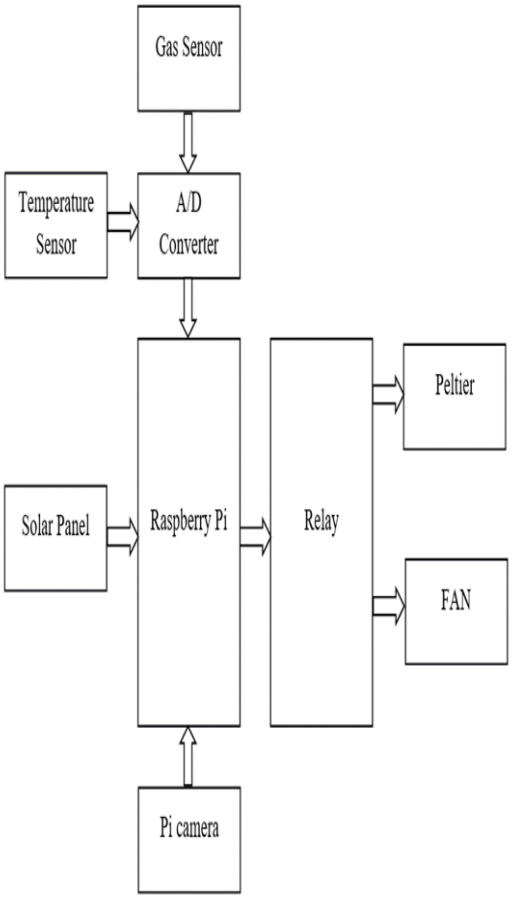
According to the World Health Organization,more than 1 million among 15 million preterm do not survive due to prematurity.

This Paper will help us to monitor the premature infants who are born before 37 weeks of gestation period. It is an innovative, smart & protective Infant Incubator System to maintain the temperature and CO2 level in an incubator in an efficient way. This system considers the details required for the maintaining & regulating the temperature in the incubator. The design of smartness & innovation comes with the use of technologies which include Cloud Application (Modules like Raspberry Pi, CO2 level & Temperature sensing, pi camera). In order to detect the atmospheric condition inside the incubator, different Sensors/Modules are attached to the incubator: CO2 level & Temperature Sensing Module. A Pi Camera on top of the incubator for live image footage & Solar based power supply is given to the Raspberry Pi. All the data which is been taken from the sensors/modules will be stored in Cloud & analyze at regular intervals. A Healthy Algorithm is applied to these data sets to get information about the baby conditions which is helpful as any change or abnormality inside the incubator can be identified easily. Infant incubator is not a monitoring system, but to control on the temperature and adapt the temperature inside the implemented incubator according to the reference temperature.

2.EXISTING SYSTEM

In the existing System, the temperature sensor, the humidity sensor, the co2 gas sensor and the water level sensors are used which senses the wetness, temperature, gas and the water level, this data gets stored in the microcontroller and gets processed. In addition, the heater and fan is used for control and maintain the temperature inside the incubator when the relay is switched on along with which the LCD provides the sensor values.An additional support like the buzzer unit gets activated and give an alarm when the sensed data on comparing with the stored data gets abnormal.

3.PROPOSED SYSTEM



4.HARDWARE USED

4.1RASPBERRY PI

Raspberry Pi is a series of computers. The Raspberry Pi 3 Model B is the second generation Raspberry Pi.

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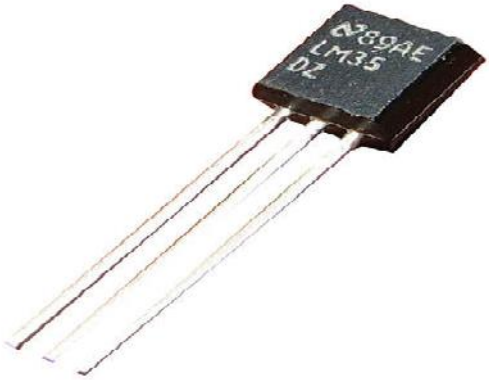
Technical Specifications:

- It has a Broadcom BCM2837
- Processor which is powered by a Single Board
- Computer running at 900MHz
- It consists of 1GB RAM
- It has a 40pin extended GPIO
- It contains 4 x USB 2 ports
- It has a 4 pole Stereo output and Composite video port
- It contains a Full size HDMI
- It has a CSI camera port for connecting theRaspberry Pi camera
- It also has Micro SD port for loading your operating system and storing data
- It is powered by a Micro USB power source[4] a 14 pin layout design.

4.2 TEMPERATURE SENSOR

An **Ultrasonic Sensor** is an electronic device that measure the distance of a target object by emitting ultrasonic sound wave, and convert the reflected sound into an electrical signal. Ultrasonic waves travel faster than the speed of audible sound. The visually impaired have to face many challenges in their daily life. The problem get worse when there is an obstacle in front of them. Ultrasonic sensor are used to calculate the distance of the obstacles around the blind person to guide the user towards the available path.



4.3 CO2 SENSOR

Gas Sensor used to detect the level of CO2 inside incubator.So, it's give the information about percent level of CO2 gas which can use it inform about oxygen level, just as CO2 level increase that will be indicator for decreasing in the oxygen level, which specified by having a fast response, stable, long life and simple drive circuit

4.4 SOLAR PANEL

Solar panels are devices that convert light into electricity. A solar panel is a collection of solar cells. Lot of small solar cells spread over a large area can work together to provide enough power to be useful. The more light that hit a cell, the more electricity produces. PV solar panel generate direct current(DC) electricity.

4.5 RELAY

A relay is an electromechanical switch which is activated by an electric current. A two relay board arrangement contains driver circuit, power supply circuit and isolation circuit. A relay is assembled with that circuit. The driver circuit contains transistors for switching operations. The transistor is use for switching the relay. An isolation circuit prevents reverse voltage from the relay which protects the controller and transistor from damage. The input pulse for switching the transistor is given from the microcontroller unit. It is used for switching of a two devices.

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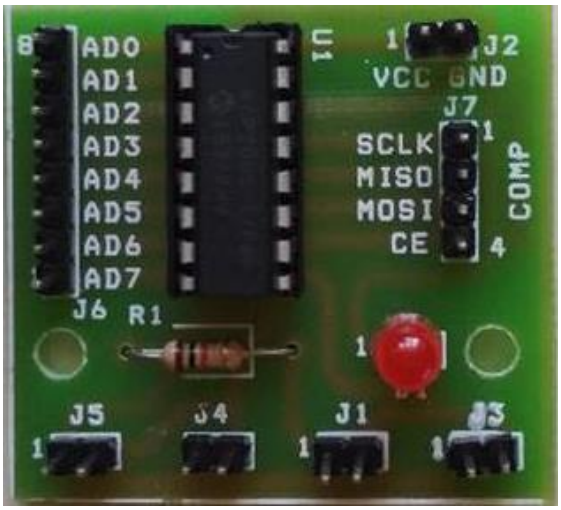
4.6 A/D CONVERTER

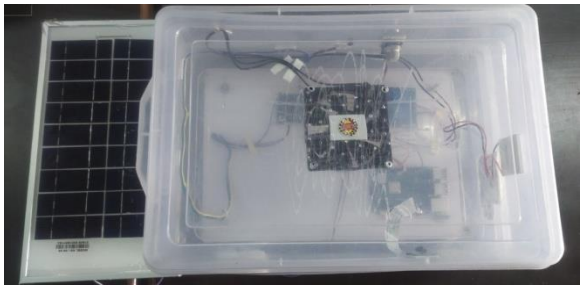
MCP3008 breakout board is super easy to use and you can find extensive library for interfacing MCP3008 ADC to raspberry PI. Now no need of using breadboard and complicate the wiring just use this MCP3008 Prototype board instead. All eight analog inputs have been provided with Vcc& Ground pin thus making it easier to interface with sensors. Six pin connector has been provided for providing power and easy interfacing to Raspberry Pi, arduino or any other Micro-controller.



5.WORKING

The Solar panel is connected to Raspberry pi to provide power supply. Sensors have been interfaced with Raspberry pi. A/D converter is used to convert sensor's analog values into digital data and is fed as input to Raspberry pi and fetches to Relay. Relay is switched on when the temperature exceeds the reference temperature and is connected to peltier module and fan. Peltier module is used for cooling or maintaining the specific temperature Fan is used to circulate the air inside the incubator when the air circulation goes below the set reference value. Temperature and Gas values sensed by the sensors are stored in cloud application.

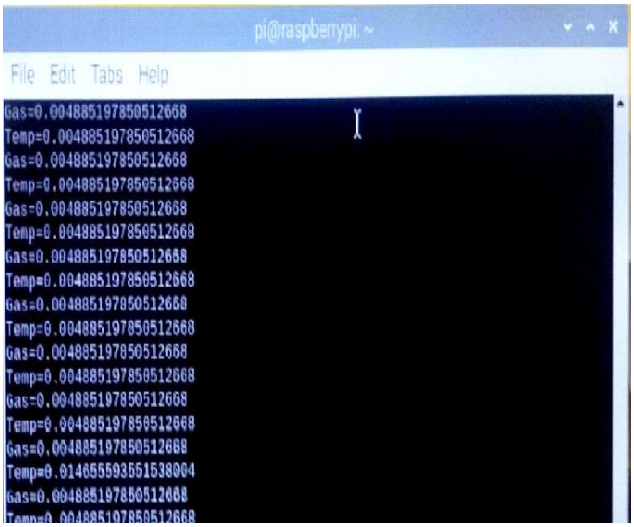
HARWARE



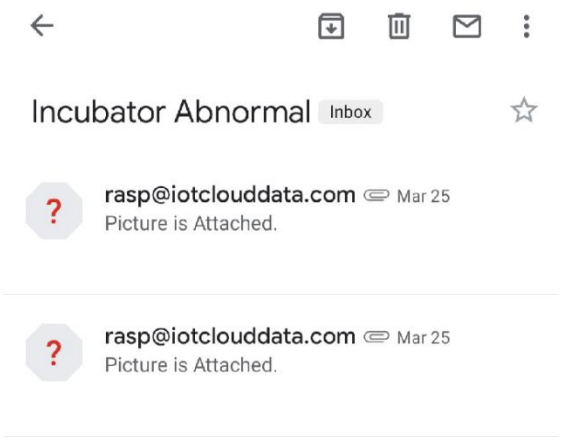
SOFTWARE

The software is design to read temperature and CO2 level inside the incubator and depending on comparison of the reading values with offset temperature then ON signal will send to peltier.As well as CO2 is measured inside incubator to and depending on comparison the decision will take to send ON signal to fan or not. In abnormal condition image is received in users mail. The code is written in python language and is uploaded into the raspberry pi.

NORMAL CONDITION



ABNORMAL CONDITION



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6.CONCULSION AND FUTURE SCOPE

Solar energy system can utilized very effectively to minimize the neonatal deaths in developing counties like India and those remote areas where conventional power is unavailable.

The main advantage of this incubator is, it can be moveable to remote areas. It has an expected battery backup of 32 hrs.This system is simple and efficient in maintaining the temperature of the chamber irrespective of outside temperature.Future work is design of components for solar energy systems of conventional power.

7. REFERENCES

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