



# SMART INCUBATOR

*An Embedded-Control system for Smart Monitoring*

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**Abstract :** The man-machine relationship has become inevitable over time. From necessity to luxury, the birth of a human-computer relationship happened which is drastically developing with modern era. Our idea deals with affordable design of an embedded - control system, for Real-time monitoring of new born babies through mobiles. Neonatal data is being analyzed and stored in cloud and then accessed over the internet and IOT. The small dys-function or change in biological parameters can be closely monitored using this system. Sensors, Arduino and Cloud computing concepts to implement this overall mechanism. Doctors can supervise the babies easily so that we can eliminate health-issues in pre-mature babies. This papers deals with the costworthy design of an embedded device for real time monitoring of newborn babies in the incubator. In smart incubator a child's medical data can be checked through mobile phones or computers by the doctors or nurses from the place where they are accessing by the cloud storage through the internet. The smart Incubator is a one which monitors the newborn baby continuously and which sends the medical data directly to the cloud storage and the data's are stored. The medical data can be viewed from mobile phones and computer systems from the place where they are and from they can take actions. The change in health parameters can be closely monitored using this method. The accurate values are displayed so that the doctors can check the baby's health easily and they can avoid babies having health problems.

**KEYWORDS:** IOT, Incubator, Sensors, Arduino UNO,GSM.

## INTRODUCTION

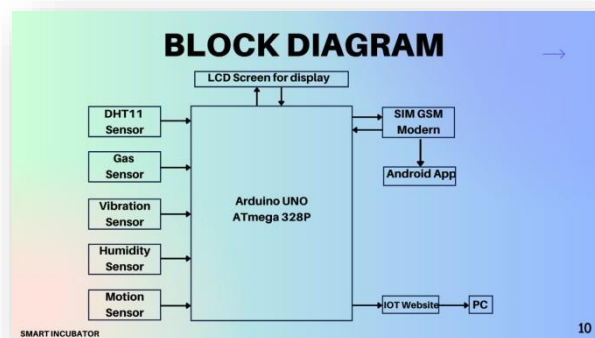
An Incubator is an apparatus used to monitor the neonatal babies. They can prevent the baby affecting from and maintain environmental conditions suitable problems for a newborn baby. It is used in preterm births or for some ill-full term babies. The baby's health conditions are maintained properly.

### • EXISTING SYSTEM AND PROPOSED WORK:

The existing systems in the incubators are they monitor and control the health parameters of a new born child. The blood pressure monitor is a machine that's connected to a small cuff which wrapped around the arm or leg of the patient. This cuff automatically takes the blood pressure and displays the data for review by providers. The Oxygen hood is a clear box that fits over the baby's head and supplies oxygen. This is used for babies who can still breathe but need some respiratory support. Ventilator is a breathing machine that delivers air to the lungs. Babies who are severely ill will receive this intervention. Typically, the ventilator takes the role of the lungs while treatment is administered to improve lung and circulatory function. In smart incubator, we use sensors and data transfer devices which stores the data and transfers it to the cloud storage .The medical data can be viewed from mobile phones and computer systems from the place where they are and from they can take actions. If there is any problem with the medical data and short circuit monitors oxygen supplementation and pressure levels. It also monitors temperature, radiation pulse activity and air humidity, gas around the environment.

## BLOCK DIAGRAM

This layout of block diagram explains the connections between sensors and Arduino-UNO board, while interfacing the GSM Module through apps. The connectivity is done by analyzing the mechanisms of sensors and software part. This diagram represents then clear connectivity of sensors with help of jumper cables.



## METHODOLOGY: :

Step 1: DHT11 Temperature Sensor (+)PIN is connected to PIN 5V of Arduino UNO.

Step 2: (-)PIN of sensor is connected to GND of Arduino UNO.

Step 3: OUT PIN of sensor is connected to Digital PIN 5 of Arduino UNO.

Step 4: Surrounding Temperature will be shown in the display.

Step 5: PIN 12V of Arduino UNO is connected to VCC of GSM Module.

Step 6: PIN TX of Arduino UNO is connected to RX of GSM Module.

Step 7: PIN RX of Arduino UNO is connected to TX of GSM Module.

Step 8: TX pin represents the Transmitter.

Step 9: RX pin represents the Receiver.

Step 10: The Interface is compiled using C-programming.

Step 11: Arduino UNO is connected to the GSM Module SIM800A.

Step 12: Arduino UNO is connected via USB cable to PC.

Step 13: Power supplied to GSM module through 12V DC Pin.

## COMPONENTS USED:

- Arduino UNO - ATMEGA 328p
- Temperature Sensor – DHT11
- PIR Sensor – Motion Detection
- Vibration Sensor – Abnormal Vibrations
- Gas Sensor – MG811
- GSM Module – SIM800A

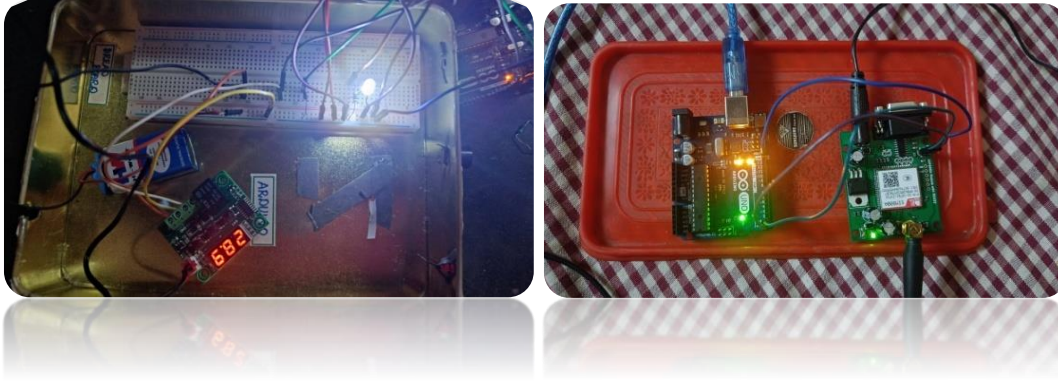
## THINGSPEAK IOT – PLATFORM

ThingSpeak is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval and logging of data by providing an API to both the devices and social network websites. It is an IOT analytics platform which aggregates, process raw data into a diagnosable information. It helps to identifies the values of the sensors through channels. Numerous channels can be integrated and computed using IOT.

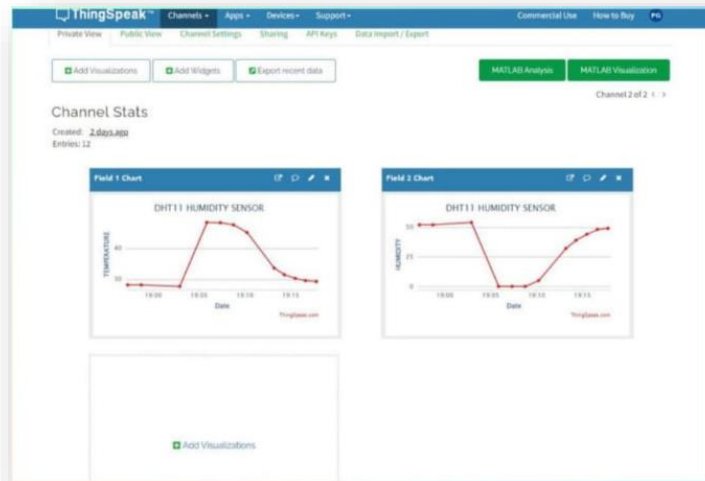
## OUR PROPOSED SYSTEM

Temperature is inversely proportional to Humidity, when temperature increases humidity decreases. Real time monitoring of temperature and humidity will help doctors to identify diseases in the infants at an earlier stage. The main target of the proposed system is to monitor the pre-mature babies through mobile interface. This system supports temperature, gas and humidity control to enhance the environment for pre-mature babies. Also, by interconnecting clinicians and babies through internet has a greater advantage.

Our system reduces the physical assistance in neonatal ICUs. Every time, doctors will get alert of the babies condition.



## RESULTS & DISCUSSION



## FUTURE WORKS AND CONCLUSION

In future, it has a great scope and it will have greater impact in medical society and the new born babies will be under the control of doctors & nurses. Gained lot of knowledge in IOT & Electronics in technical & academic terms. Arduino UNO MC board was used as the control unit in this work. The embedded program was written using python language which is more effective and simple. The overall construction of this system in a real time manner, provides a very good solution to aid parents and guardians in taking care and monitoring their kids through apps or website. In future medical technology, this system can monitor temperature and relative humidity of the incubator. It is also capable of monitoring the heart rate of the baby inside it. Temperature and relative humidity monitoring is done in order to keep the environment suitable for the neonates. It also helps to detect many other diseases like infections, common cold, and pneumonia. Continuous heart beat monitoring helps to detect any kind of cardiovascular disorders like arrhythmia or irregular heartbeats. When the measured temperature value drops below the set value, the heating pad is turned on and when the temperature increases and reaches to the set point the heating-pad turns-off. In future, we can measure blood pressure and organ functions of a premature baby inside this smart incubator.

## REFERENCES

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