Development of Cloud Based Light Intensity Monitoring System Using Raspberry Pi

SUBMITTED BY

DALVI IFTEKHAR
GUPTA RAHUL
PATEL MOINUDDIN
SHAIKH SALMAN

B.E INELECTRONICS AND
TELECOMMUNICATIONENGINEERING

UNDER THE GUIDANCE OF

PROF. AFZAL SHAIKH

ANJUMAN-I-ISLAM KALSEKAR TECHNICAL CAMPUS

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PROJECT REPORT APPROVEL FOR B.E.

This project entitled "***Development of Cloud Based Light Intensity Monitoring System Using Raspberry Pi***" by ***Dalvi Iftekhar, Gupta Rahul, Patel Moinuddin, Shaikh Salman*** is approved for degree of ***Bachelor of Engineering.***

EXAMINER

SUPERVISOR

(ASST .PROF. AFZAL SHAIKH)

H.O.D

(ASST .PROF. MUJIB TAMBOLI)

DATE:

PLACE: NEW PANVEL

DECLARATION

We hereby declare that the project entitled "**Development of Cloud Based Light Intensity Monitoring System Using Raspberry Pi**" submitted for the B.E Degree is our original work and the project has not formed the basis for the award of any degree, associate ship, fellowship or any other similar titles.

(DALVI IFTEKHAR 13ET17)

(GUPTA RAHUL 13ET20)

(PATEL MOINUDDIN 13ET34)

(SHAIKH SALMAN 13ET54)

DATE:

PLACE: NEW PANVEL

CERTIFICATE

This is to certify that the dissertation titled

"**Development of Cloud Based Light Intensity Monitoring System Using Raspberry Pi**"

Is the bonafide work carried out by

DALVI IFTEKHAR (13ET17)

GUPTA RAHUL (13ET20)

PATEL MOINUDDIN (13ET34)

SHAIKH SALMAN (13ET54)

And is submitted in the partial fulfillment of requirement for the

Degree of

Bachelor of Engineering

In

Electronics and Telecommunication Engineering

To the

University of Mumbai

PROJECT GUIDE PROJECT CO-ORDINATOR

H.O.D EXTERNAL EXAMINER

ACKNOWLEDGEMENT

We Are Pleased To Offer You A Report On Title "***Development Of Cloud Based Light Intensity Monitoring System Using Raspberry Pi***". It Has Been Made As A Part Of Electronics And Telecommunication As Stated By The University Of Mumbai For Students

B.E. Of Engineering and Technology. We Are Sure That This Report Will Provide Complete Information Regarding The Topic.

We Are Thankful To Prof. *Afzal Shaikh* For Explaining Us All The Details Of Making A Report. We Are Also Thankful To The University For Including This In Syllabus Which Will Surely Help Us In Future. We Also Thank Our Electronics And Telecommunication Department, For Helping Us Every Time Whenever We Faced Many Problems.

We Are Also Thankful To Our Family Member And Friends For Their Patience And Encouragement.

ABSTRACT

Accurate and quantifiable measurement of light is essential in creating desired outcomes in practical day to day applications as well as unique applications such as Traffic lighting system, Poultry Industry, Gardening, Museum lighting system, at emergency exits etc. Hence, Light measurement and analysis is an important step in ensuring efficiency and safety. Many of the industries are burdened with limited

number of resources and real shortage of experts on their fields; real time remote monitoring presents an effective solution that minimizes their efforts and expenditures to achieve the desired results within time. This paper introduces real time remote Light intensity monitoring system using Raspberry Pi which enables the user to track the lighting system remotely. Raspberry pi is a low cost ARM powered Linux based computer which acts as a server, and it communicates with clients with LAN or external Wi-Fi module. The key feature of this system is light intensity being monitored instantaneously and data stored in the database for future use, and shown in the form of dynamic charts to the user according to the user requirement in a terminal device like Tablet or Smart Phone or any internet enabled device. This empowers experts to make right decisions at right time to get desired results.

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INTRODUCTION

1.1 INTRODUCTION

There are many applications for Light Meters such as measuring and maintaining adequate light levels in schools, hospitals, production areas, laboratories, passageways and more. Adequate light levels in the work place ensure a healthier and safer environment for people. Some of important locations and light intensity is shown in TABLE I.

Location	**Illuminance (Lux)**
Baby Incubator	15
Warehouse, Homes, Theatre, Archives	150
Library (reading Area)	200
Classroom	300
Laboratory	500

TABLE I. OPTIMUM AVERAGE LIGHT'S INTENSITY AT VARIOUS LOCATIONS

About half of the worldwide total or 1.8 million babies each year, die for lack of a consistent heat. This project helps to prevent the death of such babies. The Raspberry pi based baby incubator helps to all peoples, the cost this project is very less than today's baby incubator which are used in big hospital. So, everyone which belongs to economical backward also use of it. This project not only used for monitoring and controlling the temperature but also provides number of advantages such as controlling and monitoring the humidity, weight, etc. Thermoregulation is a critical physiological function that is closely associated with the baby's survival. Extremely low birth weight baby has inefficient thermoregulation due to immaturity; baby may exhibit cold body temperatures after birth and during their first 12 hours of life. Thermoregulation plays a unique and crucial role in the nurturing and development of baby. The temperature inside the mother's womb is 38°C (100.4°F). Leaving the warmth of the womb at birth, the wet new born finds itself in much colder environment and immediately starts losing heat thus the thermal protection is important. Heat loss can occur in infants with extremely low birth weight in following ways:

a) Conduction: -The transfer of energy from the molecules of a body to the molecules of a solid object in contact with the body, resulting in heat loss.

b) Convection: - The similar loss of thermal energy to an adjacent gas.

c) Evaporation: - Evaporative heat loss is the total heat transfer by energy carrying water molecules from the skin and respiratory tract to the drier environment.

d) Radiation: - Radiant loss is the net rate of heat loss from the body to environmental surfaces not in contact with body.

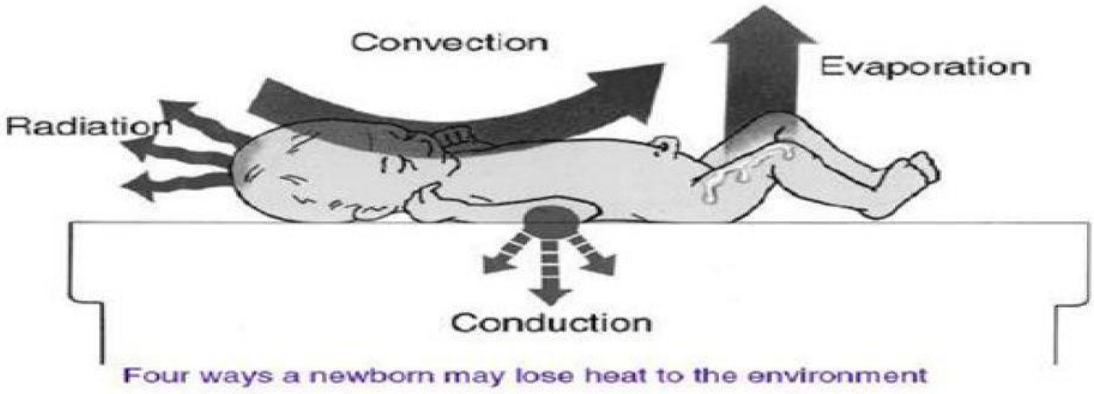

Figure:- Heat losses in new born baby

An apparatus for maintaining an infant, especially one that is ill or born before the usual gestation period is called as Incubator. Baby Incubator is an enclosed apparatus providing a controlled environment for the care of premature babies. Until recently, there was just little attention for the care of newly born babies in developing countries. People are used to the fact that a low birth baby would easily dye. Presumable, as a result of the great number of health workers out the western world who went to those countries; there is now also more attention for newborn care in the developing countries. This project will be helpful for real time monitoring of infants. The components include relative sensors, fans, bulbs, heater and Raspberry pi. For implementation, a software program has been developed in C which comprises a code editor. The system can control the temperature range from 28^{o}C to 34^{o}C. At the same time the incubator is free of health hazard. It can be used commercially in the hospitals.

Traffic Lighting System

To ensure safety on the road, traffic lights need to be clearly visible for road users. The light intensity has to be sufficient under every (weather) condition, which set in legal standards. Over the course of time, the luminous intensity of traffic lights slowly decreases. Possible reasons are pollution of lenses or reflectors, aging of the light source or individual LED failure. Remote monitoring enables the road authority to carry out timely services, in such a way that traffic lights keep satisfying the statutory rules for optimal traffic safety.

Poultry Industry

Light Intensity is an important management factor in poultry industry to obtain optimal production. The intensity depends upon the age and type of housing being used, and type of chicken, be it broiler, breeder or layer. With blackout housing both male and female can be exposed to 3.5 fc from day one to day six and then placed on 1 fc to 19 or 20 weeks. After 19 - 20 weeks the broiler breeders can be exposed to about 3.0 to 5.0 fc during the entire production period. Layers should be exposed to about .5 to 1.5 fc (One foot-candle = 10.76 lux) for better production.

Plants Growth

Deficient light intensities tend to reduce plant growth, development and yield. This is because low amount of solar energy restricts the rate of photosynthesis. Below a minimum intensity, the plant falls below the compensation point. Compensation point is the metabolic point at which the rates of photosynthesis and respiration are equal so that leaves do not gain or lose dry matter. Photosynthesis significantly slows down or ceases while respiration continues. Likewise, excessive light intensity should be avoided

CHAPTER 2

LITERATURE SURVEY

2.1 LITERATURE SURVEY

The literature survey for this purpose was done with the intention to get the theoretical and statistical data about the project and to plan the execution of the project with success. The technical paper and research material were read and the relevant data and concepts were used in our project. The important research paper was listed below:

- **PIC MICROCONTROLLER BASED EFFICIENT BABY INCUBATOR**

This paper was issued in the year 2 febuary2015. It is certified organization of IJAREEIE. The author of this paper is Hashed Joshi and Dattu Shined. This paper describe about the monitoring and controlling temperature, humidity, heartbeat, voice of baby, oxygen level, weight, etc. It helps to prevent the death of babies which can die due to lack of consistent heat. It is simple and efficient in maintaining the temperature of the chamber.

- **DESIGN OF EMBEDDED DEVICE FOR INCUBATOR FOR THE MONITORING OF INFANTS**

This paper was issued on 11 November 2013. It is research paper, author of this paper is Prof.Kranti Dive and Prof.Gitanjali Kulkarni, Department of comp engg, MIT college of engg and technology, India. This paper describes about all the parameter that is continuously monitored by system & will display the status on LEDs or gives alarm.

- **DESIGN AND IMPLEMENTATION OF A PROTOTYPE FOR NEONATAL INTENSIVE CARE INCUBATOR WITH FUZZY CONTROLLER**

This paper was issue in the year August 2013.The author of this paper is Augustin Soto Otalora, Carlos Andrés Quintero Molano and Oscar Mauricio Losada Tovar. This paper describe the implementation of a pulse oximetry module in an incubator centralizes much invasive monitoring of vital parameters for a patient premature.

2.2 PROBLEM SATEMENT

Thermoregulation plays a unique and crucial role in the nurturing and development of baby. The temperature inside the mother's womb is 38°C (100.4°F). Leaving the warmth of the womb at birth, new born finds itself in much colder environment and immediately starts losing heat thus the thermal protection of newborns is very important. This problem mostly arises in the cold country where temperature is low thus baby does not get proper thermoregulation environment which is essential for nurturing and development of baby due to which new-born are at the greatest risk, so millions of baby dies due to lack of consistent heat.

This project also helps to reduce the death of infant and the cost of this project is less compared to infant incubator that use in big hospital, due to which it will helpful in rural area where EBC people can also use it. Not only the temperature is monitor and controlled but also intensity of light along with humidity is maintained insides the incubator. Thus, the life of infant can save through our project.

CHAPTER 3

PROJECT DEVELOPMENT

The project development is the brief idea of the project that shown the project is basically divided into three sub parts:

- Mechanical designed
- Hardware designed
- Software designed

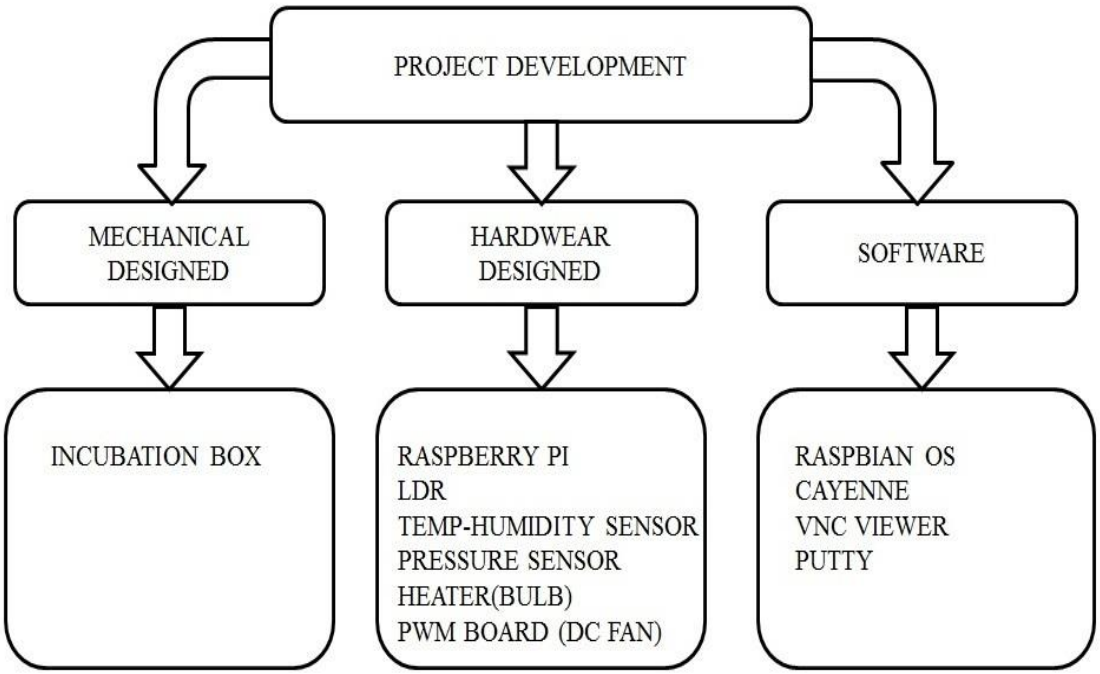

Fig 1. PROJECT DEVELOPMENT

3.1 MECHANICAL DESIGNED

3.1.1 INCUBATION BOX

The mechanical designed is the incubator box which is made up of transparent acrylic sheet.
Cast acrylic sheet is a material with unique physical properties and performance characteristics. It weighs half as much as the finest optical glass yet is equal to it in clarity and is up to 17 times more impact resistant. Cast acrylic sheet is made in over 250 colors and can transmit ultraviolet light or filter it out as required. For inserting the wire in incubator we drilled hole in incubator box (15mm), and used the aluminum slide as slider of the box.

The dimension of the box is as follows:
Length=9 inch
Height=7 inch
Length=7 inch
Thickness= 3mm or 4 mm

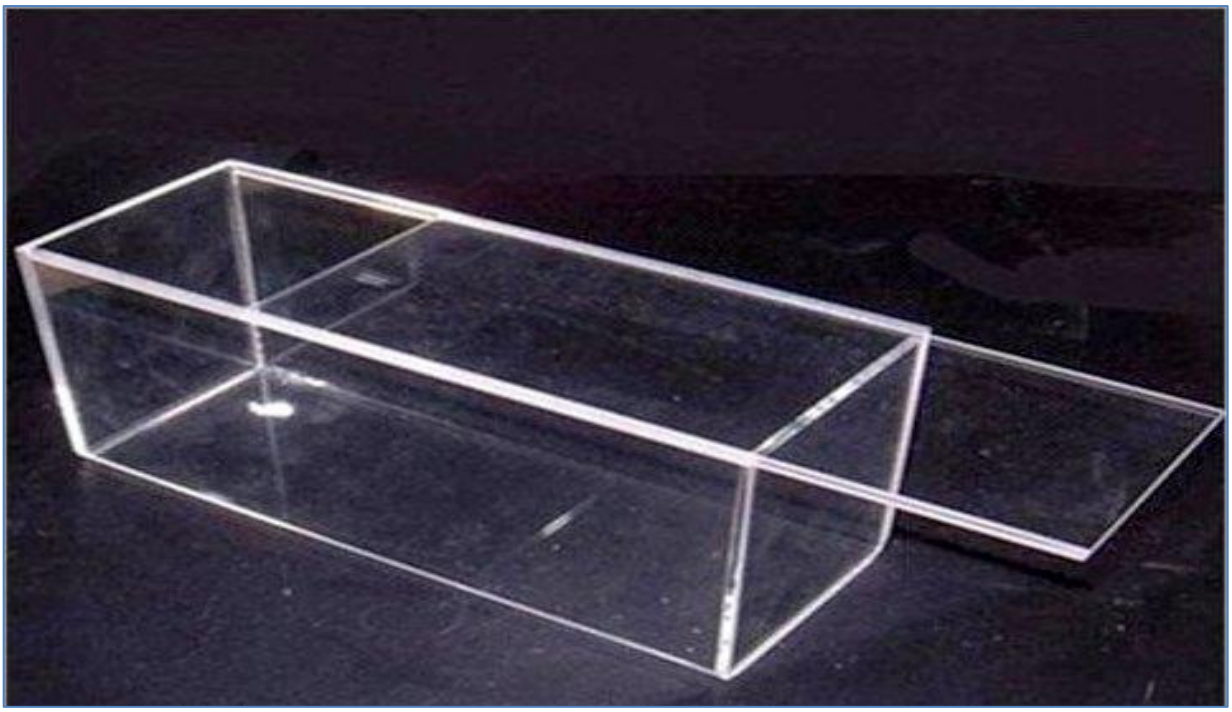

FIG 2: INCUBATOR BOX

3.2 HARDWARE DESIGN

3.2.1 HARDWARE ARCHITECTURE

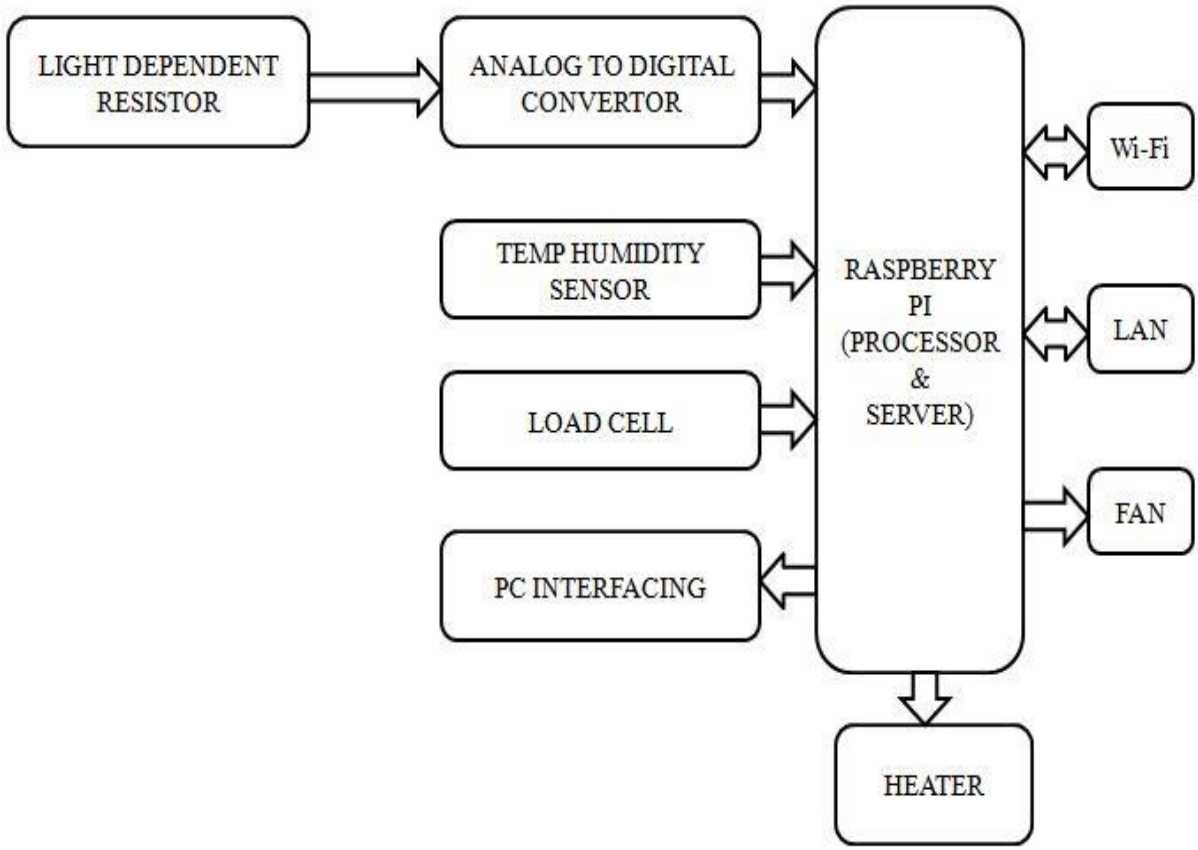

FIG 3: HARDWARE ARCHITECTURE

3.2.1a: DEVELOPMENT BOARD

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

Raspberry Pi 3 - Model B Technical Specification

- Broadcom BCM2387 chipset
- 1.2GHz Quad-Core ARM Cortex-A53
- 802.11 b/g/n Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LE)
- 1GB RAM & 64 Bit CPU
- 4 x USB ports
- 4 pole Stereo output and Composite video port
- Full size HDMI
- 10/100 Base T Ethernet socket
- CSI camera port for connecting the Raspberry Pi camera
- DSI display port for connecting the Raspberry Pi touch screen display
- Micro SD port for loading your operating system and storing data
- Micro USB power source

Raspberry Pi 3 - Model B Features

- Now **10x Faster** - Broadcom BCM2387 ARM Cortex-A53 Quad Core Processor powered Single Board Computer running at 1.2GHz!
- 1GB RAM so you can now run bigger and more powerful applications
- Fully HAT compatible
- 40pin extended GPIO to enhance your “real world” projects.
- Connect a Raspberry Pi camera and touch screen display (each sold separately)
- Stream and watch Hi-definition video output at 1080

- Micro SD slot for storing information and loading your operating systems.
- 10/100 Base T Ethernet socket to quickly connect the Raspberry Pi to the Internet

S.O.C	BCM2837
CPU	Quad Cortex A53 @ 1.2GHz
Instruction Set	ARMv8.A
GPU	400MHz Video Core 1V
RAM	1GB SDRAM
Storage	Micro-SD
Ethernet	10/100
Wireless	802.11n/Bluetooth 4.0
Video Output	HDMI/Composite
Audio Output	HDMI/Headphone
GPIO	40

TABLE2: TABULAR REPRESENTATION OF PI 3

3.2.1b: LIGHT DEPENDENT RESISTOR & ANALOG TO DIGITAL CONVERTOR

A LDR (Light Dependent Resistor) is variable resistor, the resistance of the LDR is inversely proportional to the light intensity, and it exhibits maximum resistance in the absence of light and minimum resistance in the presence of light. LDR produces analog output voltage with respect to incident light. The Raspberry Pi computer does not understand the analog inputs. It is a digital-only computer. Compared to the Arduino, AVR or PIC microcontrollers that often have 6 or more analog inputs. Analog inputs are handy because many sensors are analog outputs, so we need a way to make the Pi analog-friendly. We can do that by wiring up an external ADC (Analog to Digital Converter) MCP 3208.

The MCP 3208 acts as a bridge between digital and analog. It is a 12 bit 8 channel Analog to Digital converter. It uses the SPI bus protocol which is supported by the pi's GPIO header. Analog-to-digital conversion is an electronic process in which a continuously variable (analog) signal is changed, without altering its essential content, into a multi-level (digital) signal. Digital signals propagate more efficiently than analog signals, largely because digital impulses, which are well-defined and orderly, are easier for electronic circuits to distinguish from noise, which is chaotic. This is the chief advantage of digital modes in communications.

3.2.1c: HEATER

Electric heating is a process in which electrical energy is converted to heat. An electric heater is an electrical device that converts electric current to heat. The heating element inside every electric heater is an electrical resistor, and works on the principle of Joule heating, an electric current passing through a resistor will convert that electrical energy into heat energy. In an Incubator we used blub as the heater which is made up of tungsten filament the heater is used to increase the temperature if it has exceeded the specified value and bring it up to the normal value, hence protecting the baby. The heater used in our project is demonstrated in the form of a bulb. A relay circuit is used for the switching mechanism of the heater it is connected on the GPIO 17 of the Pi.

2.2.1d: TEMPERATURE SENSOR (DHT11)

This module integrates DHT11 sensor and other required components on a small PCB. The DHT11 sensor includes a resistive-type humidity measurement component, an NTC temperature measurement component and a high-performance 8-bit microcontroller inside, and provides calibrated digital signal output. Its small size, low power consumption and up-to-20 meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package. It is convenient to connect and special packages can be provided according to users' request. It's connected at GPIO 27 of pi. When heater gets on that moment it get start its work and note down the temperature of incubator box and shown on the dashboard of cayenne. A humidity sensor senses, measures and regularly reports the relative humidity in the air. It measures both moisture and air temperature. Relative humidity, expressed as a percent, is the ratio of actual moisture in the air to the highest amount of moisture air at that temperature can hold. The warmer the air is, the more moisture it can hold, so relative humidity changes with fluctuations in temperature.

Humidity sensors detect the relative humidity of the immediate environments in which they are placed. They measure both the moisture and temperature in the air and express relative humidity as a percentage of the ratio of moisture in the air to the maximum amount that can be held in the air at the current temperature. As air becomes hotter, it holds more moisture, so the relative humidity changes with the temperature. Most humidity sensors use capacitive measurement to determine the amount of moisture in the air. This type of measurement relies on two electrical conductors with a non-conductive polymer film lying between them to create an electrical field between them. Moisture from the air collects on the film and causes changes in the voltage levels between the two plates. This change is then converted into a digital measurement of the air relative humidity after taking the air temperature into account

3.2.1e: MOTOR DRIVER & POWER SUPPLY

The L298N Driver is a high voltage, high current dual full bridge driver designed to accept standard TTL logic levels and drive inductive loads such relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the input signals. The emitters of the lower transistors of each bridge are connected together the corresponding external terminal can be used for the connection of an external sensing resistor. 12 Volts power supply is given to motor driver module (L298N), The L298N is a high voltage, high current, dual full-bridge motor driver designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping motors. It is connected on the GPIO Header of the Pi.

- Operating supply voltage of up to 46V
- 4.5-7VDC logic supply voltage
- Total DC current of up to 4A
- Low saturation voltage
- Over-temperature protection

3.2.1f: DC MOTOR

A DC motor is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor. DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. Small DC motors are used in tools, toys and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances.

The most obvious difference between AC cooling fans and DC cooling fans is the type of electricity that they use. DC cooling fans use direct current (DC) electrical flows. This type of electrical flow can only move in one direction. The use of DC or AC current might seem insignificant, but it can produce very different results. Most DC cooling fans operate at low voltage. You can generally find 5V, 12V and 24V versions; and in larger sizes from 119mm to 172mm, in 48V. As we know all types of computer equipment rely on DC cooling fans to prevent them from overheating. Similarly, we have use the DC fan in our incubator to maintain the temperature of incubator at moderate level and protect the infants from death. The advantage of DC cooling fans is that they create less electromagnetic interference. This enables them to maintain the incubator systems without disturbing processes with electromagnetic interference.

Both DC and AC currents can cause serious damage to humans when delivered in powerful doses. Even though most modern home electrical systems will not deliver a deadly jolt, a slight slip could still cause significant pain or even tissue damage.

3.2.1g: PRESSURE SENSOR

Pressure sensing is the capacity for some system to sense the force exerted on a surface per unit area and express that force in the strength of an electric signal. For example, Pressure sensors can be used to measure force, and in some cases, to determine the contour of an applied force.

The BMP180 is the next-generation of sensors this board is 5V compliant - a 3.3V regulator and a i2c level shifter circuit is included so you can use this sensor safely with 5V logic and power, its used to measure the pressure or weight of the baby, it is interface with pi using pin no 2(SDA) and pin no 3(SLC). The BMP180

is the next-generation of sensors from Bosch, and replaces the BMP085. The good news is that it is completely identical to the BMP085 in terms of firmware/software you can use our BMP085 tutorial and any example code/libraries as a drop-in replacement. The XCLR pin is not physically present on the BMP180 so if you need to know that data is ready you will need to query the I2C bus.

3.3: Additional Hardware utilized Compatible to Raspberry Pi

For the project use of Raspberry Pi is not enough. For input and connectivity some other devices are required.

I. Wi-Fi Adapter

Wireless USB connectors are required for associating raspberry Pi and wireless desktop and web. For the task EDUP-EP-n85317 remote 80211n nano usb-adapter is utilized. It is World's smallest, has green force sparing mode and backings WPS, WPA2, 802.11b/g/n with information rates up to 150 Mbps.

II. SD card

The SD card is installed with Raspberry Pi's operating system "Raspbian wheezy". Here SANDISK SD 16GB CLASS 10 MEMORY CARD (the class indicates how fast the card is) is used. Class 10 or high precision memory cards are used to install the OS. Raspberry pi's performance will depend on the SD card.

III. Monitor

For visual display, here we are connecting to a monitor or a TV with raspberry pi. The raspberry pi has a HDMI port which you can plug directly into a monitor or TV with an HDMI cable.

IV. HDMI to VGA converter

For monitors with VGA only, you can use an HDMI to VGA adapter. We suggest using only powered HDMI to VGA adapters (with an external power source). Using an unpowered adapter may damage your Pi and therefore is not advised.

V. Mouse and Keyboard

Wireless keyboard or USB keyboard and mouse are used as raspberry pi inputs. After pairing these to raspberry pi only it will work

3.4 SOFTWARE

3.4.1 RASPBIAN OS

FIG 4: RASPBIAN OS

Raspbian is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi.

The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still under active development with an emphasis on improving the stability and performance of as many Debian packages as possible. Raspbian is not affiliated with the Raspberry Pi Foundation. Raspbian was created by a small, dedicated team of developers that are fans of the Raspberry Pi hardware, the educational goals of the Raspberry Pi Foundation and, of course, the Debian Project.

Debian is a Unix-like computer operating system that is composed entirely of free software, most of which is under the GNU General Public License and packaged by a group of individuals participating in the Debian Project. The Debian Project was first announced in 1993 by Ian Murdock, Debian 0.01 was released on September 15, 1993, and the first stable release was made in 1996.

The Debian stable release branch is one of the most popular for personal computers and network servers, and has been used as a base for many other distributions. The project's work is carried out over the Internet by a team of volunteers guided by the Debian Project Leader and three foundational documents: the Debian Social Contract, the Debian Constitution, and the Debian Free Software Guidelines. New distributions are updated continually, and the next candidate is released after a time-based freeze. As one of the earliest Operating

Systems based on the Linux kernel, it was decided that Debian was to be developed openly and freely distributed in the spirit of the GNU Project. This decision drew the attention and support of the Free Software Foundation, which sponsored the project for one year from November 1994 to November 1995.Upon the ending of the sponsorship, the Debian Project formed the non-profit organization Software in the Public Interest.

Procedure to Install Raspbian OS

- To start with step is to download Raspberry pi Supported Raspbian OS.
- Introduce “Win32Disk Imager” application on your windows framework.
- Insert SD card connector into your framework.
- Burn OS into SD card utilizing Win32 Disk Imager.

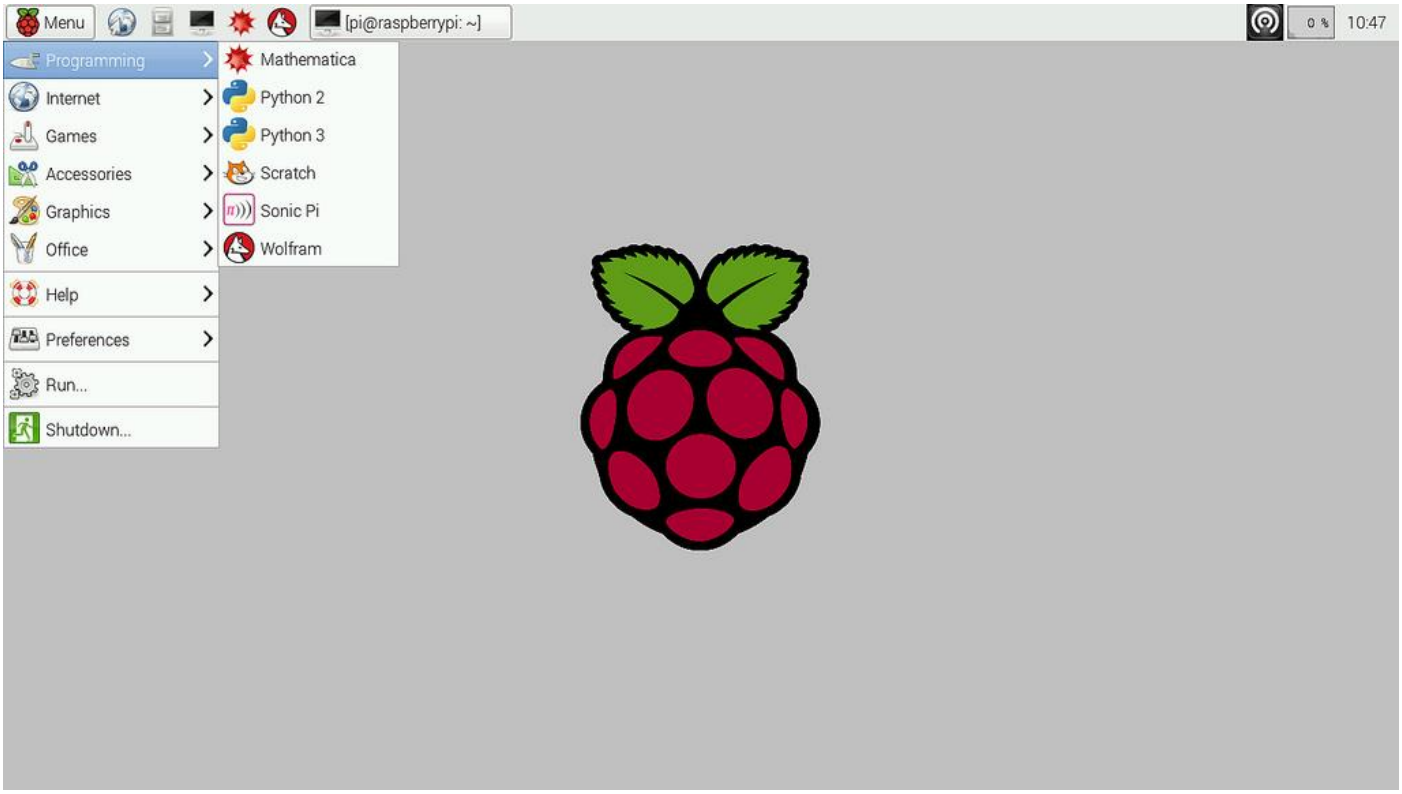

FIGURE 5: RASPBIAN O.S

- Installation of RPi. GPIO: To do this enters the following command into LX Terminal: “sudo apt-get install python-rpi. gpio”
- Installation of I2C-tools: Then enter the following command in LX terminal
- “sudo apt-get install i2c-tools” The figure 4 shows the installation of I2C tools

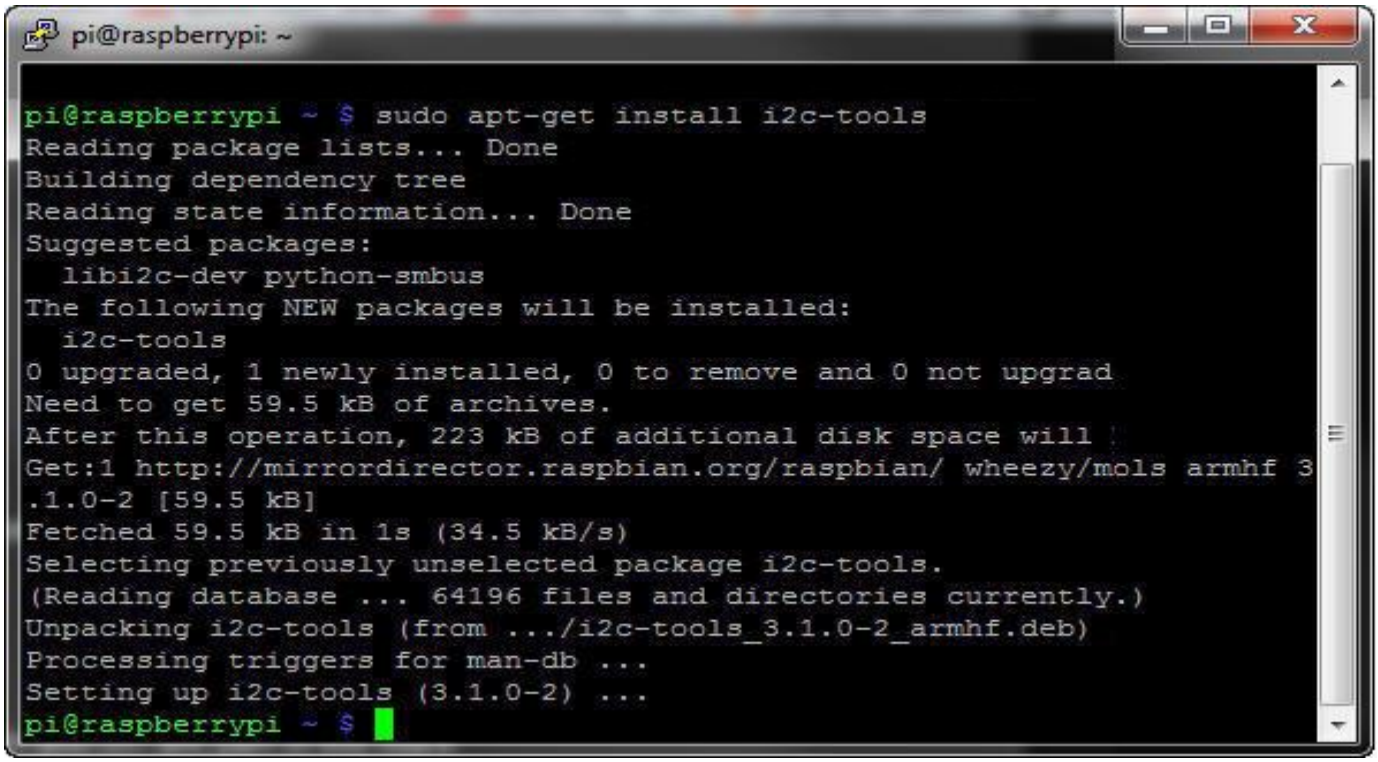

FIG 6: INSTALLATION OF I2C-TOOLS

- Installation of python-smbus module: Then enter the following command in LX terminal:“sudo apt-get install python-smbus”

3.4.2 PUTTY

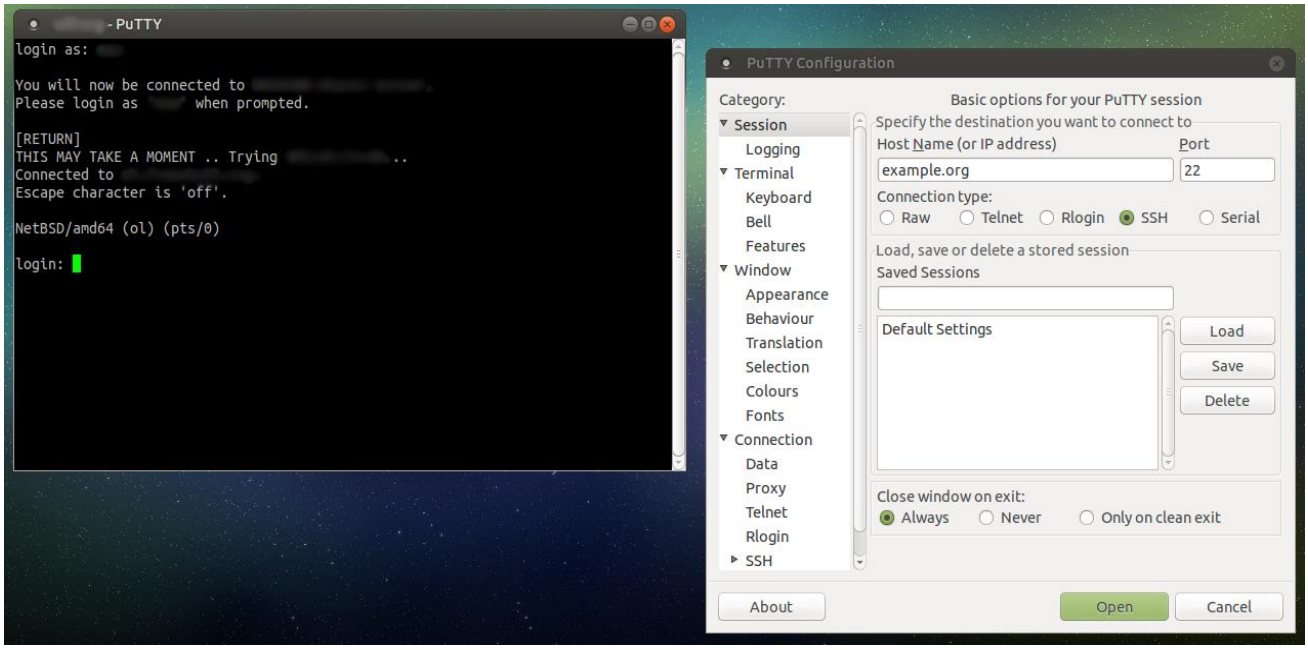

FIG 7: PUTTY CONFIGURATIONS

The Putty is the SSH sever which access through windows O.S for remote login the Raspberry pi by using the IP address of the Raspberry pi, after enter the IP address of Raspberry pi user can login the pi using name and password of the device. Putty is a free and open-source terminal emulator, serial console and network file transfer application. It supports several network protocols, including SCP, SSH, Telnet, rlogin, and raw socket connection. It can also connect to a serial port. The name "Putty" has no definitive meaning. Putty was originally written for Microsoft Windows, but it has been ported to various other operating systems. Official ports are available for some Unix-like platforms, with work in progress ports to Classic Mac OS and MacOS, and unofficial ports have been contributed to platforms such as Symbian, Windows Mobile and Windows Phone.

Putty was written and is maintained primarily by Simon Tatham.Putty supports many variations on the secure remote terminal, and provides user control over the SSH encryption key and protocol version, alternate ciphers such as 3DES, Arcfour, Blowfish, DES, and Public-key authentication. It also can emulate control sequences and allows local, remote, or dynamic port forwarding with SSH. The network communication layer supports IPv6, and the SSH protocol supports the zlib@openssh.com delayed compression scheme. It can also be used with local serial port connections. Putty comes bundled with command line SCP and SFTP clients, called "pscp" and "psftp" respectively, and plink, a command-line connection tool, used for non-interactive sessions.

3.3.3 VNC VIEWER

In computing, Virtual Network Computing (VNC) is a graphical desktop sharing system that uses the Remote Frame Buffer protocol (RFB) to remotely control another computer. It transmits the keyboard and mouse events from one computer to another, relaying the graphical screen updates back in the other direction, over a network. VNC is platform-independent there are clients and servers for many GUI-based operating systems and for Java. Multiple clients may connect to a VNC server at the same time. Popular uses for this technology include remote technical support and accessing files on one's work computer from one's home computer or vice versa. VNC was originally developed at the Olivetti & Oracle Research Lab in Cambridge, United Kingdom. The original VNC source code and many modern derivatives are open source under the GNU General Public License. There are a number of variants of VNC which offer their own particular functionality; e.g., some optimized for Microsoft Windows, or offering file transfer etc. Many are compatible with VNC proper in the sense that a viewer of one flavor can connect with a server of another; others are based on VNC code but not compatible with standard VNC. For access the VNC viewer user must install the VNC server on pi or SSH terminal by using the command as sudo apt-get update, sudo apt-get install xfce4 xfce4-goodies tight vncserver, after the installation type command as vncsever for access the

VNC viewer, after opening the viewer user must configure the viewer such as IP address of device and port no example 192.168.43.93:5901

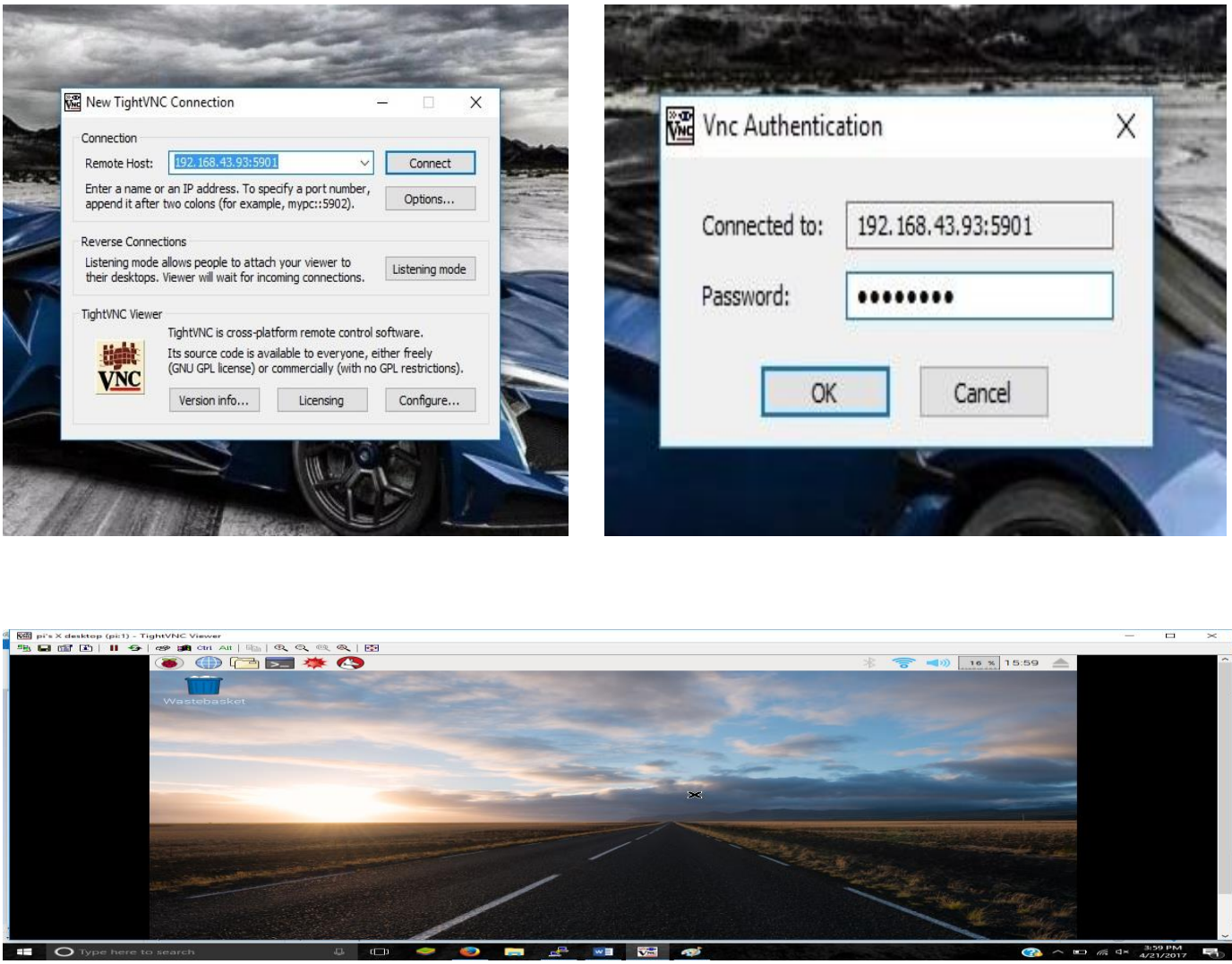

FIG 8: REMOTE ACCESS FOR PI WHIT LAPTOP

3.3.4 THING SPEAK

Thing Speak is an open source Internet of Things (IOT) application and API to store and retrieve data from things using the HTTP protocol over the Internet or via a Local Area Network. Thing Speak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status update. Thing Speak was originally launched by ioBridge in 2010 as a service in support of IOT applications. Thing Speak has integrated support from the numerical computing software MATLAB from Math Works. Allowing Thing Speak users to analyze and visualize uploaded data using Matlab without requiring the purchase of a Matlab license from Mathworks. Thing Speak has a close relationship with Math works, Inc. In fact, all of the Thing Speak documentation is incorporated into the Math

works Matlab documentation site and even enabling registered Mathworks user accounts as valid login credentials on the Thing Speak website.

Thing Speak is a platform providing various services exclusively targeted for building IOT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plug INS and apps for collaborating with web services, social network and other APIs. We will consider each of these features in detail below. The core element of Thing Speak is a 'Thing Speak Channel'. A channel stores the data that we send to Thing Speak and comprises of the below elements:

- 8 fields for storing data of any type - These can be used to store the data from a sensor or from an embedded device.
- 3 location fields - Can be used to store the latitude, longitude and the elevation. These are very useful for tracking a moving device.
- 1 status field - A short message to describe the data stored in the channel.

To use Thing Speak, we need to sign up and create a channel. Once we have a channel, we can send the data, allow Thing Speak to process it and also retrieve the same. Thing Speak provides apps that allow us for an easier integration with the web services, social networks and other APIs. Below are some of the apps provided by Thing Speak.

- Thing Tweet - This allows you to post messages to twitter via Thing Speak. In essence, this is a Twitter Proxy which re-directs your posts to twitter.
- ThingHTTP - This allows you to connect to web services and supports GET, PUT, POST and DELETE methods of HTTP.
- Tweet Control - Using this, you can monitor your Twitter feeds for a specific key word and then process the request. Once the specific keyword is found in the twitter feed, you can then use ThingHTTP to connect to a different web service or execute a specific action.
- React - Send a tweet or trigger a ThingHTTP request when the Channel meets a certain condition.
- Talkback - Use this app to queue up commands and then allow a device to act upon these queued commands.
- Time control - Using this app, we can do a Thing Tweet, ThingHTTP or a Talkback at a specified time in the future. We can also use this to allow these actions to happen at a specified time throughout the week.

3.3.5 HOW TO Talk To Thing Speak with Python

Here we have some instructions about the communication between Python and Thing Speak data logging web service. Uploading data from devices, sensors, computers can be allowed by Thing Speak by web services. It can visualize that data in the form beautiful charts and having some API key, which features real-time updates. Using the Thing Speak Charts API we can send our computer's available memory and CPU usage with the help of python code. With the credentials of the API key, Pi can login to thing speak and update the sensor information automatically to thing speak.

CHAPTER 4

SYSTEM DESIGN

The proposed system is reading, and sending the DHT 11 sensor information utilizing Raspberry Pi. The objective is to design and implement the system to visualize the sensor information as charts. This will be a straight forward undertaking to associate the Internet of things (IOT) in the structure Thing Speak. In this Device the DHT 11 sensor is used to sense Humidity and temperature.

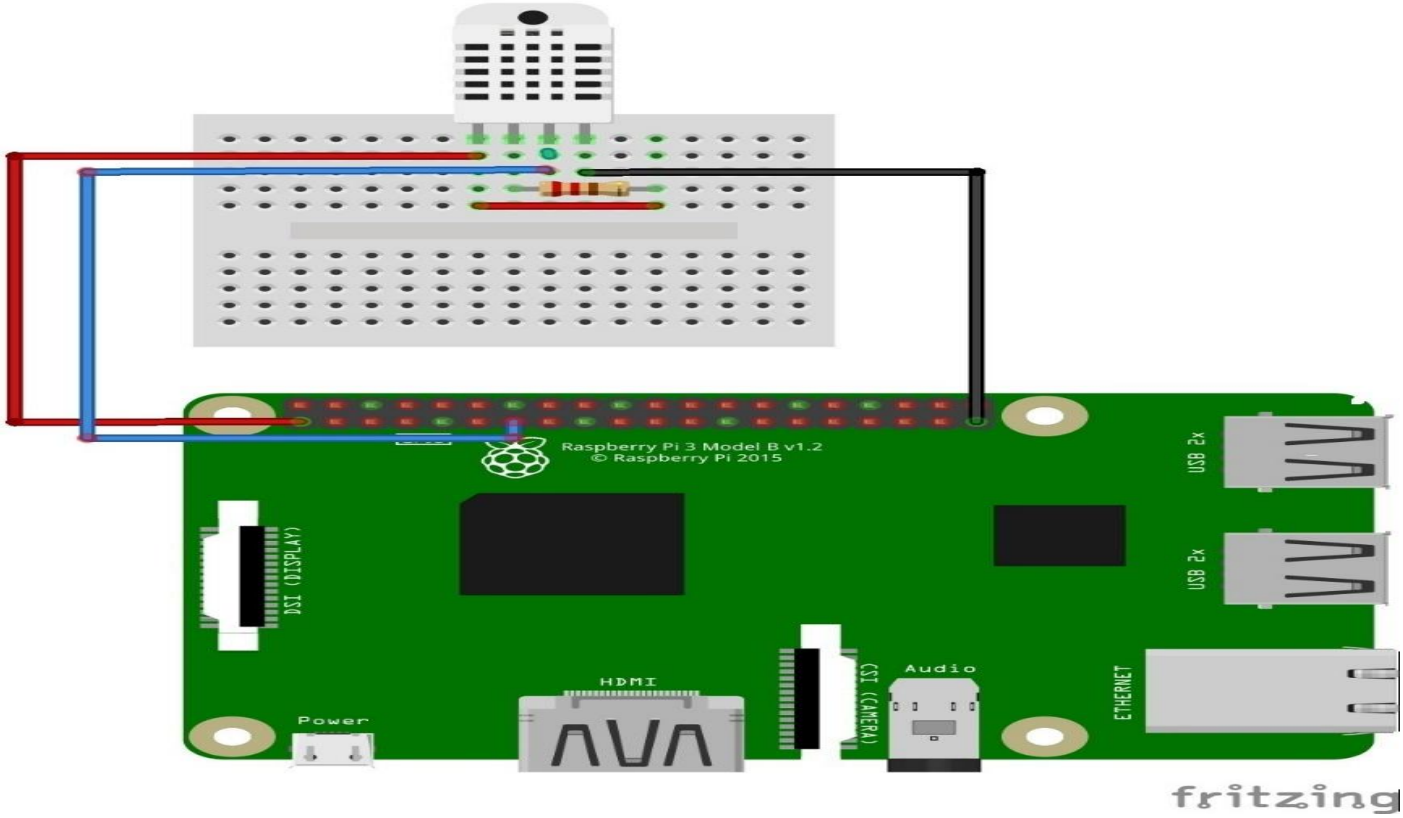

FIG 9: FRITZING DIAGRAM OF THE SYSTEM

Google APIs use the OAuth 2.0 protocol for authentication and authorization. Google supports common OAuth 2.0 scenarios such as those for web server, installed and client side application. It can log the DHT11 data in the spread sheet.

BLOCK DIAGRAM:

FIG 10: BLOCK DIAGRAM OF THE PROPOSED SYSTEM

- The sensor real time data is visualized as graphs in Things Speak.

Flow chart of proposed system:

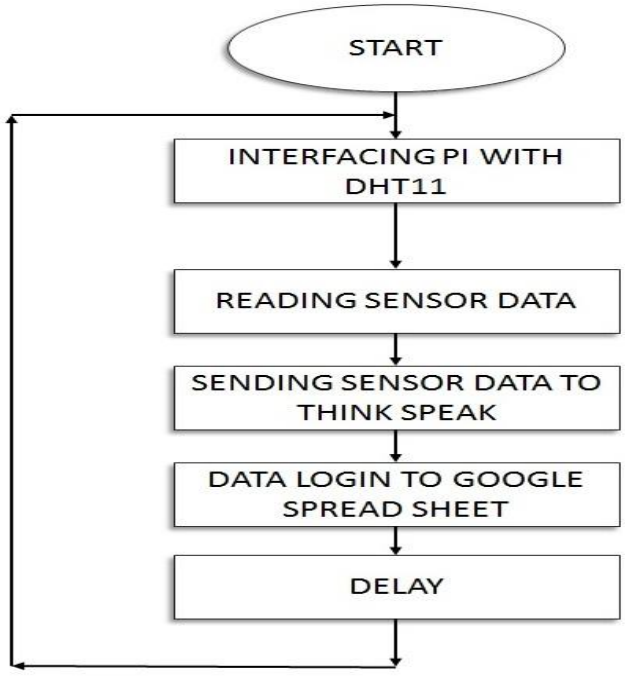

FIG 11: FLOW CHART OF PROPOSED SYSTEM

CHAPTER 5

RESULT

5.1 RESULT:

After the execution of the code the results can be seen through the web service Things Speak as shown below:

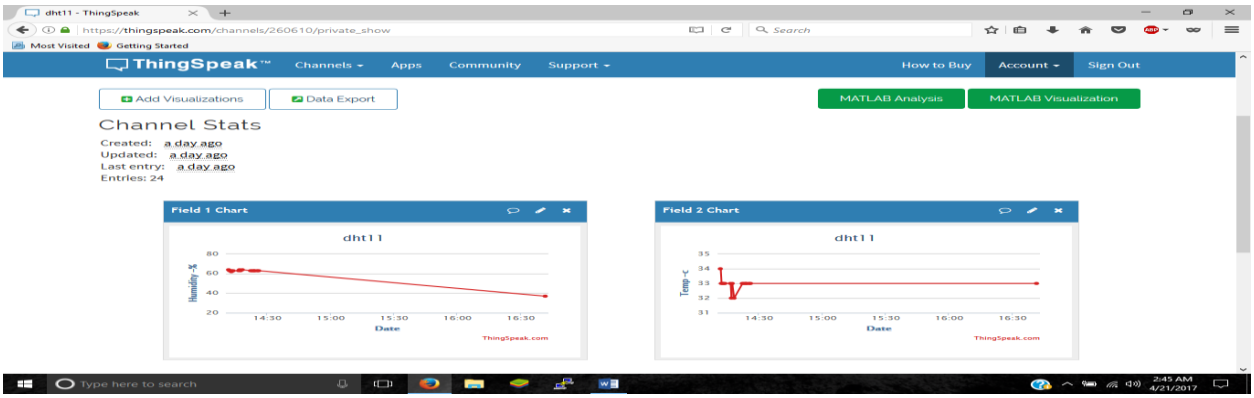

FIG12: GRAPH OF HUMIDITY AND TEMPERATURE ON THINGS PEAK

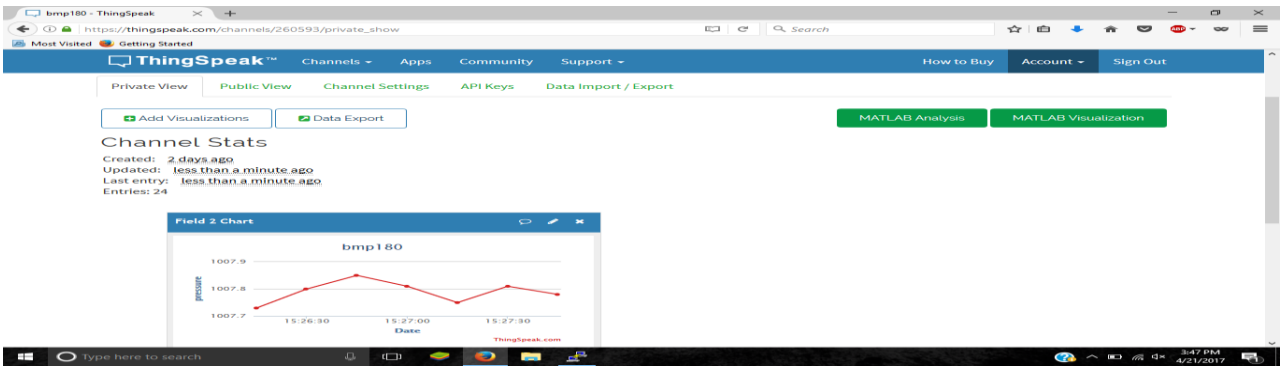

FIG13: GRAPH OF BMP180 FOR AIR PRESSURE ON THINGS SPEAK

5.2 RESULT TABLE:

created_at(DATE & TIME)	entry_id	HUMIDITY %	TEMPERATURE in C
2017-04-19 08:41:51 UTC	1	64	34
2017-04-19 08:42:15 UTC	2	63	33
2017-04-19 08:42:37 UTC	3	63	33
2017-04-19 08:42:59 UTC	4	63	33
2017-04-19 08:43:21 UTC	5	62	33
2017-04-19 08:43:42 UTC	6	63	33
2017-04-19 08:44:04 UTC	7	63	33
2017-04-19 08:46:33 UTC	8	63	33
2017-04-19 08:46:57 UTC	9	64	32
2017-04-19 08:47:19 UTC	10	63	33
2017-04-19 08:48:13 UTC	11	64	32
2017-04-19 08:52:11 UTC	12	63	33
2017-04-19 08:52:37 UTC	13	63	33
2017-04-19 08:53:04 UTC	14	63	33
2017-04-19 08:53:30 UTC	15	63	33
2017-04-19 08:53:56 UTC	16	63	33
2017-04-19 08:54:11 UTC	17	63	33
2017-04-19 08:54:36 UTC	18	63	33
2017-04-19 08:55:17 UTC	19	63	33
2017-04-19 08:55:36 UTC	20	63	33
2017-04-19 08:55:57 UTC	21	63	33
2017-04-19 11:04:57 UTC	22	None	None
2017-04-19 11:05:39 UTC	23	None	None
2017-04-19 11:11:34 UTC	24	37	33

CHAPTER 6

APPLICATIONS

6.1 APPLICATION

- Monitoring the light intensity inside baby incubator
- Monitoring traffic light system easily
- Monitoring poultry farm thus the bread of eggs growth is rapid and efficient
- Monitoring in greenhouse thus plant growth is more efficient
- Due to monitoring in museum with good light intensity the artifact's and painting are save and life span efficiency is more

CHAPTER 7

CONCLUSION & FUTURE SCOPE

7.1 CONCLUSION

The project is designed keeping in mind the medical conditions available in rural areas. This Equipment can be effectively used by technicians in a small health care center. It can be a lifesaving machine for low birth weight infants. The components can be easily fixed. The chamber is sufficient enough to accommodate the baby comfortably. As the electronic part is separated from the Baby's compartment baby can be assured safe. The temperature of the system can be understood. This project is simple and efficient in maintaining the temperature of the chamber irrespective of the outside temperature and is designed at a low cost. The results obtained from the Raspberry PI interfaced with temperature sensors and humidity sensors, The Cayenne Dashboard is used as monitor the sensor readings. The Bulb is also connected for identification of the sensor working properly. If the temperature in incubator increased above 35^{o}C then cooling unit take part in operation, similarly if temperature decreases then heating unit take part in operation.

7.2 FUTURE SCOPE

We can incorporate the idea of Peltier effect to control the temperature of the chamber. They can be used either for heating or for cooling (refrigeration), although in practice the main application is cooling. It can also be used as a temperature controller that either heats or cools. But Peltier elements are costly and shows poor power efficiency. Many researchers and companies are trying to develop Peltier coolers that are both cheap and efficient. If such type of Peltier elements are developed we can also introduce it in Infant incubators. For Infants affected with Jaundice bile lights can be introduced in to the chamber. Apnea monitoring can also be introduced for infants affected with Respiratory disorders.

CHAPTER 8

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