A
Project Report
On

Modern Baby Incubator with Security System using IoT

Submitted for partial fulfilment of the requirements for the Award of the

BACHELOR OF TECHNOLOGY
Degree
In
Electronics & Communication Engineering

Submitted by

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Ruchi Prajapati (1905250310085)

Rajendra Chaudhary (2005250319007)

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Under the Supervision of

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BUDDHA INSTITUTE OF TECHNOLOGY, GORAKHPUR, U.P., INDIA

Affiliated to

Dr A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW, U.P.

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CERTIFICATE

This is to certify that Project Report entitled 'Modern Baby Incubator with Security System using IoT' is submitted by Saumya Mishra, Ruchi, Rajendra, Abhichandan in partial fulfilment of the requirement for the award of degree B. Tech. in Department of Electronics and Communication Engineering of Dr. A.P.J. Abdul Kalam Technical University, Lucknow is a record of the candidates own work carried out by them under my supervision. The matter embodied in this report is original and has not been submitted for the award of any other degree.

Mr. Ghanshyam Mishra
(SUPERVISOR)
Assistant Professor

Mr. Anil Kumar Chaudhary
(HOD, Department of ECE)

Dr. Arvind Kumar Pandey
(Director, BIT Gorakhpur)

(External Examiner)

DECLARATION

We hereby declare that this submission is our own work and that to the best of our knowledge and belief, it contains no material previously published or written by another person or material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

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We also don't wish to miss the chance to acknowledge the contribution of all faculty members of the department for his or her kind assistance and cooperation during the event of our project. Last but not the smallest amount, we acknowledge our friends for their contribution within the completion of the project.

Signature: - Date: -

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ABSTRACT

In the recent years, the technological progress is increasing rapidly. This technology is increasing in all the fields like agriculture, robotics, industrial purpose, etc. Newly born babies are very sensitive to rough environments. Due to these issues, a baby incubator is made that can provide the same temperature and environmental conditions as a mother's womb does. Our main goal is to make a baby incubator that can maintain parameters in case anything goes wrong, the system can trip itself so that the con ditions can return to a normal state. It is a very efficient system that can maintain the temperature, humidity and oxygen level of the incubator, beeping alarm when any unrecognized person came near incubator. Providing an app that can control the home appliances from anywhere.

TABLE OF CONTENTS

List of Tables:

LIST OF FIGURES

ABBREVIATION AND ACRONYMS

SL. NO	ACRONYM	EXPANSION
1.	IOT	Internet of Things
2.	ADC	Analog to Digital Converter
3.	NodeMCU	Node Micro Controller Unit
4.	Wi-Fi	Wireless Fidelity
5.	SSL	Secure Socket Layer
6.	GPIO	General Purpose Input/Output
7.	NFC	Near Field Communication
8.	LAN	Local Area Network
9.	Lora WAN	Low Power Wide Area Network
10.	DIP	Dual In-line Package
11.	UBW	Ultra-Wide Band
12.	PIR	Passive Infrared Sensor
13.	UID	Unique Identifier
14.	HAS	Home Automation System
15.	TCP	Transmission Control Protocol
16.	SSH	Secure Socket Shell
17.	IIOT	Industrial Internet of Things
18.	GSM	Global System for Mobile
19.	BLE	Bluetooth Low Energy
20.	SoC	System on a Chip
21.	USB	Universal Serial Bus
22.	LDR	Light Dependent Resistor
23.	HMI	Human Machine Interaction
24.	MQTT	Message Queue Telemetry Transport
25.	WSN	Wireless Sensor Network
26.	NLP	Natural Language Processing
27.	PCB	Printed Circuit Board

List of Appendices

CHAPTER 1
INCUBATOR - INTRODUCTION

1.1 Introduction

The Franco-Prussian war in 1870-1871, along with a concomitant famine, had contributed to a significant population decline in France. To increase the growth rate, the French needed to start having more babies, as quickly as possible. But one obstetrician realized that if he could find a way to reduce infant mortality, then the population growth rate problem could be solved far sooner.

That French obstetrician was Dr. Étienne Stéphane Tarnier, who, having observed the benefits of warming chambers for poultry at the Paris Zoo, had similar chambers constructed for premature infants under his care. These warm air incubators, introduced at Hospital Paris Maternity in 1880, were the first of their kind. Dr. Pierre Budin began publishing reports of the successes of these incubators in 1888. His incubators had solved the deadly problem of thermoregulation that many premature babies faced.

Dr. Budin wanted to share his innovation with the world, but few in the stubborn medical establishment would listen. Many doctors viewed the practice as pseudo-scientific and outside the realm of standard care. But Dr. Budin was convinced that the Tarnier incubators would save so many lives that he enlisted the help of an associate, Dr. Martin Couney, in exhibiting the new incubators at the World Exposition in Berlin in 1896.

Apparently blessed with skills in showmanship as well as medicine, Dr. Couney took the assignment perhaps a step farther than what Dr. Budin has originally anticipated; Couney asked the Berlin Charity Hospital to borrow some premature babies for this experiment, and they granted his request, thinking that the children had little chance of survival anyway. When he managed to hire a cadre of nurses to fully demonstrate the capabilities of the incubators, he was ready to take the show on the road.

Nestled between exhibits of the Congo Village and the Tyrolean Yodelers, "Couney's Kinderbrutanstalt," or 'Child Hatchery,' became a wild success. Remarkably, all six babies in the Tarnier incubators survived. From there, Couney took his entourage to the United States where he went on to share his show at virtually every large exhibition and at the World's Fair.

He ultimately settled at New York City's Coney Island amusement park and connected parents eager to save the lives of their premature new-borns with circus sideshow visitors willing to pay 25¢ to view the uncannily tiny babies. It was an odd connection indeed, but a brilliant one that kept the warming glow of the incubator lights on for over 40 years, and saved thousands of babies in the process.

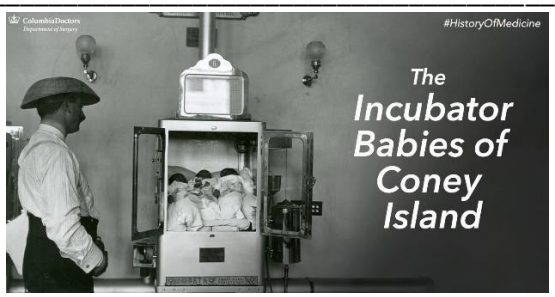


Figure 1.1 – Baby Incubator of Coney Island [25]

1.2 What is Incubator?

Incubators are attracting interest from the medical profession. They are glass or fiber cases heated to certain Humidity, Temperature and Oxygen level, into which enough air is admitted to maintaining life. Until such time as an infant is strong enough for Humidity, Temperature of the room. In the baby incubator, Humidity, Temperature and Oxygen level control is very important. And therefore, we are controlling all these according to our requirements. We have used Node MCU in our project, which is very advanced microcontroller for Humidity, Temperature and Oxygen level of the Baby Incubator. Along with maintaining the necessary parameters inside the incubator, we will be able to monitor and control everything in our home. Also, five sensors and a two-channel relay module are mainly used for this system. Therefore, we can monitor and control everything in the house such as temperature, humidity, amount of leaking gas, amount of water in the water tank, home security, and control of electrical appliances. [20].

1.3 Parameters need to maintain inside incubator

TEMPERATURE:

The infants have very low thermal regulation and temperature regulation is one of the most Important factors which affect the preterm. One of the major problems that new-born's face is improper of the womb at birth, the wet new born finds itself in a much colder environment and immediately starts losing heat. If heat loss is not prevented and is allowed to continue, the baby will develop hypothermia and is at increased risk of developing health problems and of death [6]. Avoiding hypothermia (rectal temperature less than 36.5°C or 96.8°F) is important for new-born health outcomes because hypothermia increases morbidity and mortality. A baby can lose one degree of body temperature per minute when wet, even in a room that is not obviously cold. To prevent heat loss, it is necessary to dry up the baby and wrap the baby in a clean, dry cloth.

HUMIDITY:

Low relative humidity of a servo-controlled incubator increases the temperature of the incubator itself and the oxygen consumption of premature infants accordingly. This causes an increase in the insensible water losses. In addition, premature infants with small weight or illness susceptible to unfavourable incidents such as apneuses. However, insensible water losses under radiant warmers are higher than conventional incubators. Apparently, small variations in relative humidity inside incubators with skin servo control does not influence the insensible water loss; however significant fluctuations in relative humidity would vary the amount of insensible water losses. Few investigations have shown that the bodyweight and insensible water loss is inversely proportional to the water loss. The humidity of the shell environment can negatively affect the patient if it is not at a healthy level. Infants can lose moisture and heat by evaporation if humidity is too low, while higher levels of humidity increase the likelihood for germs and bacteria to be present.

OXYGENATION:

Oxygenation is a therapeutic process in which oxygen is administered directly to facilitate breathing. If a baby born more than two months early, her breathing difficulties can cause serious health problems because other immature organs in her body may not get enough oxygen. Ventilation is necessary to provide the patient with fresh air and sufficient oxygen. Flowing air is also necessary to provide sufficient transfer of heat from the heat source to the shell environment and the patient. The ventilation needs to be carefully managed so that there is enough fresh air and convective heat transfer over the heated changer, but the flow is not so fast that it makes the patient uncomfortable and causes an increase in heat loss of the incubation system to the outside environment [26]. Incubator oxygen treatments have been used to prevent new-born respiratory distress.

1.4 WHAT IS PROJECT

A project is a completed information regarding inventory of material component required machines such as sensors. Tools, appliance headed that procurement. Thus, the project is systematically consideration discussed and prepared a particular subject.

MEANING OF PROJECT

The project is the word which consists of seven letters of English alphabets. The word project consists of the PROJECT each having own meaning which are given below-

P-PLANNING:

Planning is the word which deals with idea which is supported before anything of construction.

R-RESOURCES:

It means which guides to promote the function of the planned ideas. The letter R stands for 'resource'. How to find out the capital out lay of proposed venture from an essential Part of project.

O- OPERATION:

The letter 'O' stands for "reparation". The technical know is the like breath of any industry. Operation of the different type of things to work which comes in the construction.

J- JUNCTION:

The letter 'J' stands for the joint effect unless the entire staff employed in our factory work in a coordinate manner like team in sport ground. No ventures can prove successfully.

E- ENGINEER:

This letter stand for engineering function well trained engineer who can guide the technical operation and is able enough then remove faults in a machine as and when they occur always.

C- COMMUNICATION:

This letter stands good prompt and efficient communication system considerably promotes the overall efficiency and productivity not only that there should be proper mode of commit between the different sections engaged in the different operation but also telecom link with distant station.

T- TRACK:

The letter stands for 'TRACK OF WORKING' must stands up on the business fact displayed by the high microprocessor coordinal relation with staff and lab our unions make the functioning of the industry very smooth which is turns lead to more profit are shared with staff the success of venture is assured.

1.5 Literature Survey

Infants born prematurely are more likely to suffer from illness or death than infants born normal. One of the procedures to make premature infants still alive is put them into the incubator, the period premature infants in the incubator according to soundness, durability, and system of organs of them. The incubator is one of the tools to help premature infants to adjust with the outside world because the condition in the womb is very different with the outside world, especially condition of temperature. The temperature in the womb is approximately 36-37°C but in the outside world is approximately 27°C–28°C [3-4]. The incubator discovered in 1880 triggered dramatic, popular and professional excitement about the prospect of reducing premature infant mortality. But, technology in the incubator develops slowly, which illustrates that the history of technology involves more than discovery.

The invention of the incubator itself is less significant than the development of a system to support the devices that are in it. In this way, a new type of infant incubator must be studied that can independently adapt the environment based on a series of sensors and monitor in real time vital signs for the infant [5-7]. Advances in technology today following increases in the use of electromagnetic waves in everyday life. One example is the infant incubator. Monitoring the infant incubator is essential to keep the infant has a temperature corresponding to the environment at the newly born. Not many parents realize that the size of the head circumference that also reflects the brain volume is also an important thing that should always be monitored growth to see whether the infant's brain grow and develop normally or not. Generally, doctors or midwives use a separate measuring instrument. The use of separate measuring instruments requires considerable time and a partially manual and part digital measuring instrument. This research aims to make a tool in one system that there are three measurement parameters including weight, temperature and head circumference that can record automatically. Facilitate the performance of paramedics to automatically measure the infant's weight, temperature, and head circumference to determine the condition of the infant. The tool is operated through IOT (internet of things) which can facilitate paramedic to monitor the infant's situation wherever and whenever using internet network that can be accessed via web or Android. The three parameters are controlled directly with the NodeMCU ESP8266 module using two ultrasonic sensors to determine the circumference of the infant's head, the weight sensor using load cell, while the temperature sensor uses an SHT31 temperature sensor. Head circumference measurements use two ultrasonic sensors. The data will be processed directly with NodeMCU module ESP8266 displayed through web and Android with internet network. So that the instrument will get three measurements automatically in one system. Making this instrumentation through three stages including, making hardware, software manufacture, and testing instrumentation system. Test results infant incubator is a tool used to monitor the circumference of the infant's head circumference, the infant's weight and the temperature in the infant. Incubator Infant incubator shown in Figure 1 is one of the medical support devices used to maintain the temperature conditions of new-borns, both born normally and prematurely. Temperature is one of the most important factors to be taken care of for new-borns, because of the condition of new-borns who are unstable and cannot yet do their own heat production to warm their bodies and produce heat to maintain their body stability [8]. Monitoring the infant incubator is essential to keep the infant has a temperature corresponding to the environment at the newly born. Not many parents realize that the size of the head circumference that also reflects the brain volume is also an important thing that should always be monitored growth to see whether the infant's brain grow and develop normally or not. Survey data indicates that 30% of infants those who are born at gestation of 25-28 weeks. More than 45% of infants who are born at the gestation before 25 weeks will face serious nosocomial infection while in NICU. To reduce morbidity and mortality detection and intervention is expected to be done. For a premature baby there is need to maintain hygiene by keeping people

away from incubator. So, to maintain it, the buzzer beeps when any person come near to the incubator (less than 5 meter). Public hospitals have vulnerable spaces where there are no effective ways to monitor access to new-born babies. It also helps the baby to prevent from any unrecognized person. Along with the protection inside the incubator, it can also help to maintain light, temperature and acts as a fire alarm. Our main aim of the project is to design a "dual device" which is beneficial for lodging, home, hospitals, etc.

1.6 Problem Statement:

Our project is a "multi-purpose device" which is beneficial for lodging, home, hospitals, etc.
Our project is mainly based on IoT technology. Therefore, we can control and monitor all factors through the internet. The Blynk app has been used for that. It proves to be a low-cost incubator for the hospitals and security system for home. Efficient and attracting. We can use remotely by sitting at our home or from any place via our mobile phone.
We can control more parameters like oxygen level, humidity along with it we can measure respiration rate and pulse rate also. We can send this data to a remote location using mobile or internet. We can able to extract the information again and again after a particular time (like after every two hours) by changing the code of Node MCU.

1.7 Proposed Objective of Baby Incubator with Security System:

1.The main objective of our project Modern Baby Incubator with Ultra Security System using Node MCU is to design a very efficient system that can maintain the temperature, humidity and oxygen level of the incubator to provide a protective system to premature baby infants and newly born baby.
2.For a premature baby there is need to maintain hygiene by keeping people away from incubator. So to maintain it, the buzzer beeps when any person come near to the incubator (less than 5 meter). It also helps the baby to prevent from any unrecognized person.
3.Along with the protection inside the incubator, it can also helps to maintain light, temperature and acts as a fire alarm.
4.Our main aim of the project is to design a "dual device" which is beneficial for lodging, home, hospitals, etc.

1.8 Methodology of Baby Incubator with Security System:

1.For a premature baby there is need to maintain hygiene by keeping people away from incubator. So, to maintain it, the buzzer beeps when any person come near to the incubator (less than 5 meter).

2.Our project Modern Baby Incubator with Security System using Node MCU is to design a very efficient system that can maintain the temperature, humidity and oxygen level of the incubator to provide a protective system to premature baby infants and newly born baby.

3.For a premature baby there is need to maintain hygiene by keeping people away from incubator. So to maintain it, the buzzer beeps when any person come near to the incubator (less than 5

meter).

4.It also helps the baby to prevent from any unrecognized person. Along with the protection inside the incubator, it can also helps to maintain light, temperature and acts as a fire alarm.

Chapter 2
Design of Proposed Modern baby incubator

2.1 Introduction

Incubators are attracting interest from the medical profession. They are glass or fiber cases heated to certain Humidity, Temperature and Oxygen level, into which enough air is admitted to maintaining life. Until such time as an infant is strong enough for Humidity, Temperature of the room. In the baby incubator , Humidity, Temperature and Oxygen level control is very important. And therefore, we are controlling all these according to our requirements. We have used Node MCU in our project, which is very advanced microcontroller for Humidity , Temperature and Oxygen level of the Baby Incubator. Along with maintaining the necessary parameters inside the incubator, we will be able to monitor and control everything in our home. Also, five sensors and a two-channel relay module are mainly used for this system. Therefore, we can monitor and control everything in the house such as temperature, humidity, amount of leaking gas, amount of water in the water tank, home security, and control of electrical appliances. Also, this system is mainly based on IoT technology. Therefore, we can control and monitor all factors through the internet. The Blynk app has been used for that.

2.2 Major hardware parts of the Projects:

The major components of the project are: -

- ESP8266(Node MCU)
- Relay Module
- Ultrasonic Sensor
- Buzzer
- DHT11 Sensor
- PIR Sensor
- MQ2 Sensor
- LCD & I2C
-

2.3 Components Description:

1.ESP8266(Node MCU):

Node MCU is an open-source based firmware and development board specially targeted for IoT based applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espresso Systems, and hardware which is based on the ESP-12 module. It is mainly used for communication and sending data over cloud. It can be programmed using Arduino IDE. The pin configuration is shown below figure 2.1 [18].

Specifications and features:

- Microcontroller: Ten silica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O pins(DIO): 16
- Analog Input Pins (ADC):1

- UARTs: 1
- Flash memory: 4MB
- SRAM: 64KB
- PCB Antenna
- Small Sized module to fit smartly inside your IoT projects.

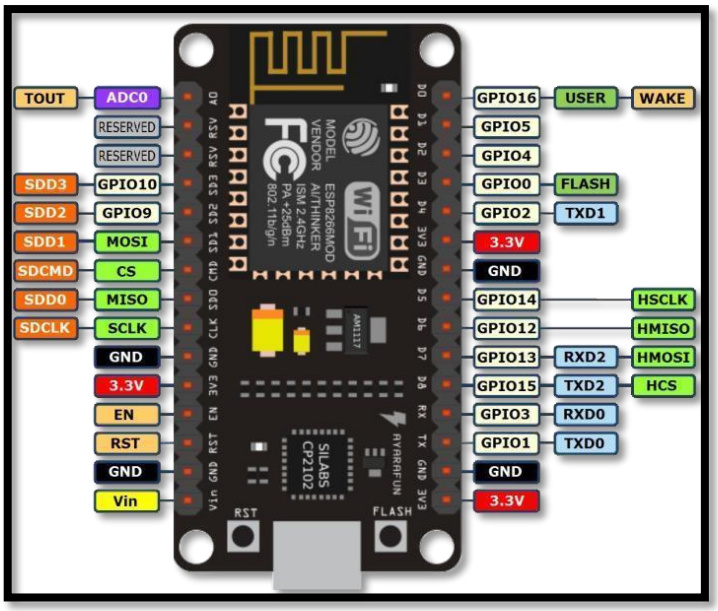


Figure 2.1 Pin description of Node MCU (ESP8266)

1. Relay Module:

Relay modules (or power relay modules) are ubiquitous electronic components. They are an exceedingly significant component of any non-mannual project. To control motors or lighting circuits we require relay module for low voltage microcontroller. A relay is an electrically operated switch that can be turned on or off, letting the current go through or not, and can be controlled with low voltages, like the 5V provided by the Arduino pins. Controlling a relay module with the Arduino is as simple as controlling any other output as we'll see later on.

Specification and Features:

- Supply voltage – 3.75V to 6V
- Quiescent Current – 2mA
- Current when the relay is active – 70mA
- Relay Maximum contact voltage – 250VAC to 30VDC
- Relay maximum Current – 10A

Figure 2.2- Relay Module

2. Ultrasonic Sensor:

The working principle of this sensor looks like ultrasonic radar. Ultrasonic waves are radiated then received back by the ultrasonic receiver. The distance between the transmitter and receiver time is a representation of the object distance. These sensors are suitable for electronics applications that require detection distance including for sensors on the robot.

Figure 2.3 – Ultrasonic Sensor

How Does an Ultrasonic Sensor Work?

Ultrasonic sensors work by emitting sound waves at a frequency too high for humans to hear. They then wait for the sound to be reflected back, calculating distance based on the time required. This is similar to how radar measures the time it takes a radio wave to return after hitting an object.

While some sensors use a separate sound emitter and receiver, it's also possible to combine these into one package device, having an ultrasonic element alternate between emitting and receiving signals. This type of

sensor can be manufactured in a smaller package than with separate elements, which is convenient for applications where size is at a premium.
While radar and ultrasonic sensors can be used for some of the same purposes, sound-based sensors are readily available—they can be had for just a couple dollars in some cases—and in certain situations, they may detect objects more effectively than radar.

3.Buzzer

An audio signalling device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren. The pin configuration of the buzzer is shown below. It includes two pins namely positive and negative. The positive terminal of this is represented with the '+' symbol or a longer terminal. This terminal is powered through 6Volts whereas the negative terminal is represented with the '-'symbol or short terminal and it is connected to the GND terminal.

The **specifications of the buzzer** include the following.

- Colour is black
- The frequency range is 3,300Hz
- Operating Temperature ranges from – 20° C to +60°C
- Operating voltage ranges from 3V to 24V DC
- The sound pressure level is 85dBA or 10cm
- The supply current is below 15mA

Working Principle:

The working principle of a buzzer depends on the theory that, once the voltage is given across a piezoelectric material, then a pressure difference is produced. A piezo type includes piezo crystals among two conductors.

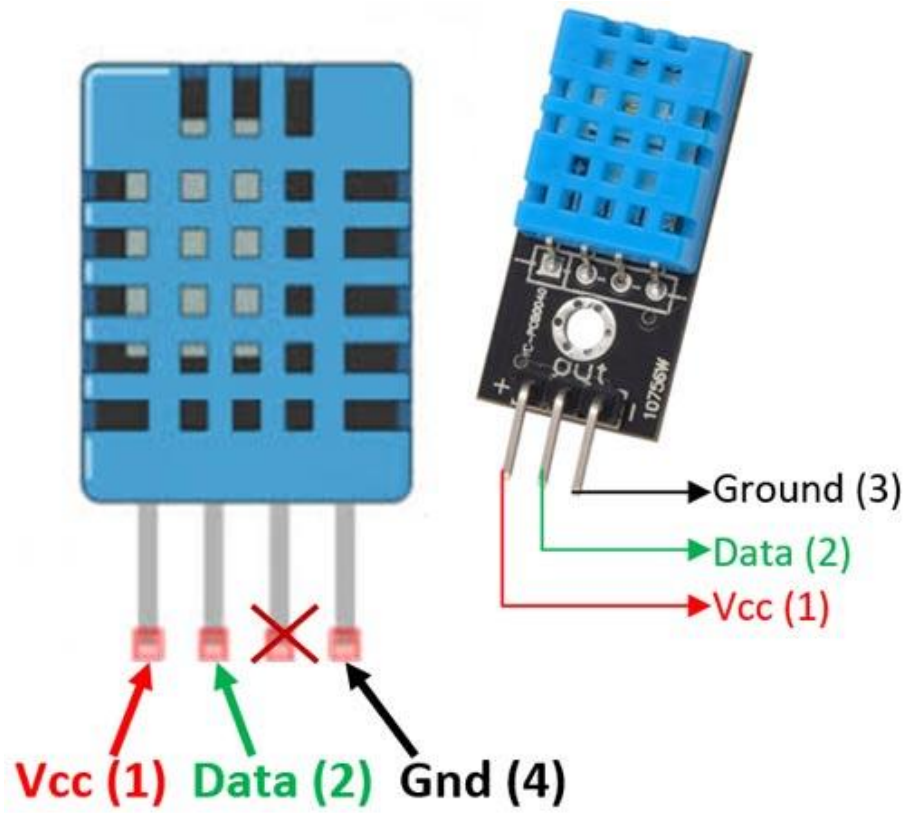
Once a potential disparity is given across these crystals, then they thrust one conductor & drag the additional conductor through their internal property. So this continuous action will produce a sharp sound signal.

5. MQ2 Sensor

MQ2 gas sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke and carbon monoxide.MQ2 gas sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it comes in contact with the gas. This change in the value of resistance is used for the detection of gas. MQ2 is a metal oxide semiconductor type gas sensor. Concentrations of gas in the gas is measured using a voltage divider network present in the sensor. This sensor works on 5V DC voltage. It can detect gases in the concentration of range 200 to 10000ppm.

6. DHT11 Sensor:

The DHT11 is a commonly used Temperature and humidity sensor that comes with a dedicated NTC to measure temperature and an 8-bit microcontroller to output the values of temperature and humidity as serial data. [18].



DHT11 Pinout Configuration

No:	Pin Name	Description
For DHT11 Sensor		
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	NC	No Connection and hence not used
4	Ground	Connected to the ground of the circuit

DHT11 Specifications

- Operating Voltage: 3.5V to 5.5V

- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%

6. PIR Sensor

A **passive infrared sensor** (**PIR sensor**) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. PIR sensors are commonly used in security alarms and automatic lighting applications.

PIR sensors detect general movement, but do not give information on who or what moved. For that purpose, an imaging IR sensor is required.

PIR sensors are commonly called simply "PIR", or sometimes "PID", for "passive infrared detector". The term *passive* refers to the fact that PIR devices do not radiate energy for detection purposes. They work entirely by detecting infrared radiation (radiant heat) emitted by or reflected from objects.[18].

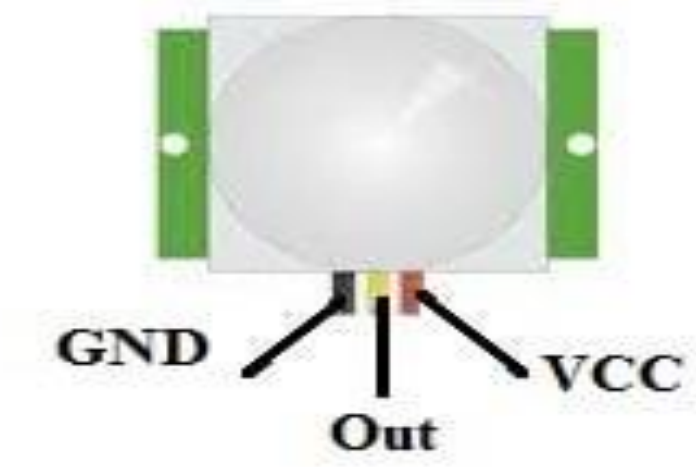
Operating principles

All objects with a temperature above absolute zero emit heat energy in the form of electromagnetic radiation. Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose. A PIR-based motion detector is used to sense movement of people, animals, or other objects. They are commonly used in burglar alarms and automatically activated lighting systems.

Pin Configuration

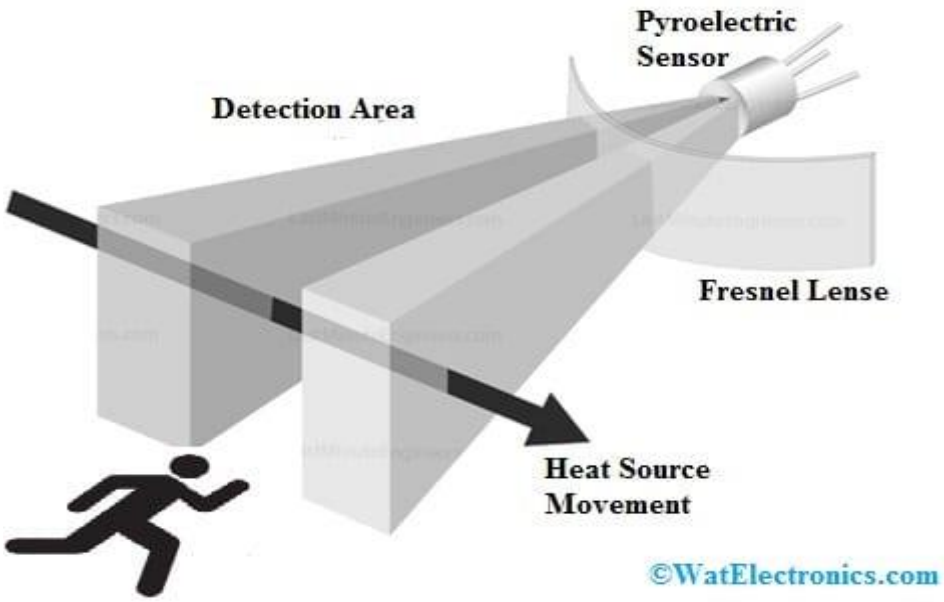
The typical PIR sensor pin configuration is shown below which includes three pins where each pin and its functionality are discussed below.

Pin1 (VCC): This is a source terminal of the device which is connected to the 5V DC supply.
Pin2 (OUT): This is the o/p pin of the sensor.
Pin3 (GND): This is a ground pin.



Working Principle

A PIR sensor includes two main parts like pyroelectric sensor and fresnel lens. In the following diagram, the sensor is a round metal including a rectangular crystal within the center. A fresnel lens is a special lens that focuses the IR signals on the pyroelectric sensor. Here, the pyroelectric sensor is capable of detecting different infrared radiation levels.



2.4 Software Requirements:

1. Blynk App

Blynk is an Internet of things (IoT) company which provides a platform for building mobile (IOS and Android) applications that can connect electronic devices to the Internet and remotely monitor and control these devices. With Blynk, you can create smartphone applications that allow you to easily interact with microcontrollers or even full computers such as the Raspberry Pi.The main focus of the Blynk platform is to make it super-easy to develop the mobile phone application. As you will see in this course, developing a mobile app that can talk to your Arduino is as easy as dragging a widget and configuring a pin. With Blynk, you can control an LED or a motor from your mobile phone with literally zero programming.

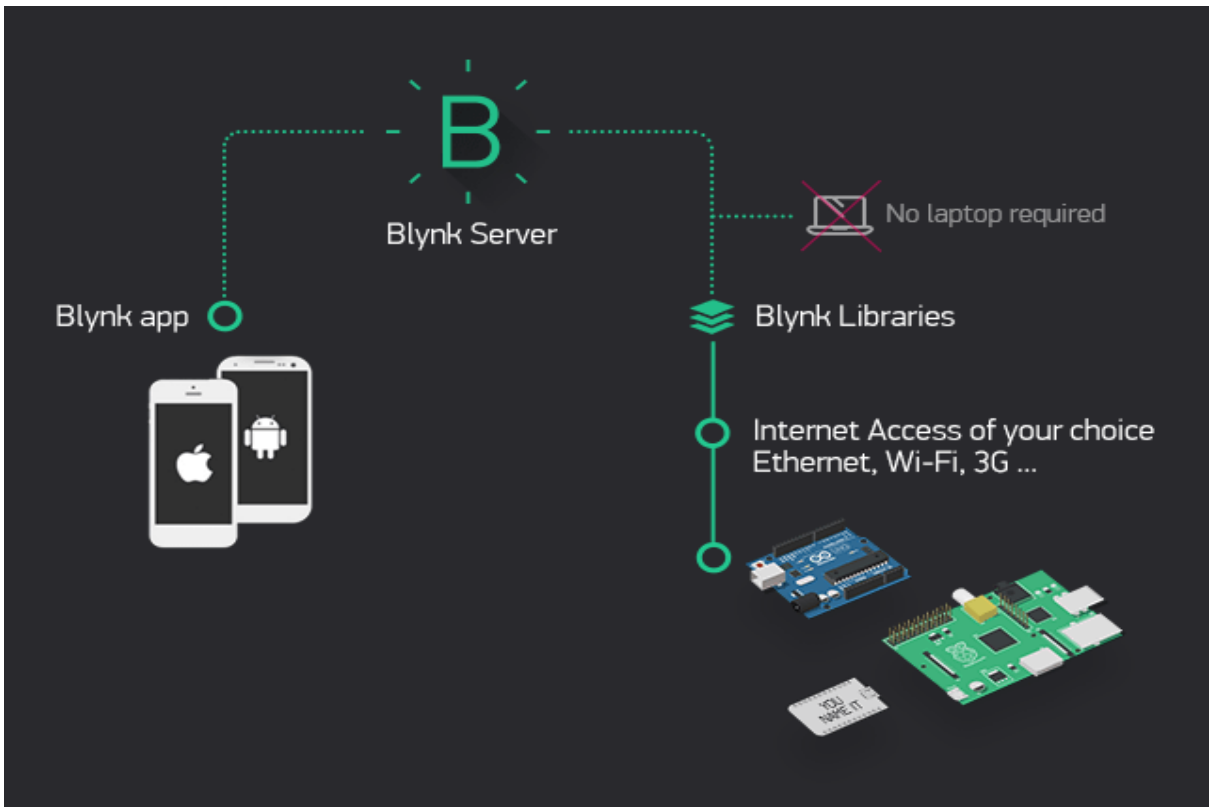
2.5 Component Costing:

Serial No.	Components	Cost (in Rs)	Reason
1.	Arduino UNO	500	To run the system.
2.	NodeMCU	400	To run the robot.
3.	Servo motor	600	For
4.	Motor(4 Quantity)	800	To move the robot
5.	Motor Driver	150	To supply constant voltage and power.
6.	Jumper Wires	100	For connecting the components
7.	Relay	150	To sense the moisture of soil

8.	**Wheels**	**120**	To move in different directions.
9.	**Bluetooth Module**	**150**	To move the seed sowing and ploughing system.
	Total	**2820**	

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.
There are three major components in the platform:

- **Blynk App** - allows to you create amazing interfaces for your projects using various widgets we provide.
- **Blynk Server** - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.
- **Blynk Libraries** - for all the popular hardware platforms - enable communication with the server and process all the incoming and outcoming commands.

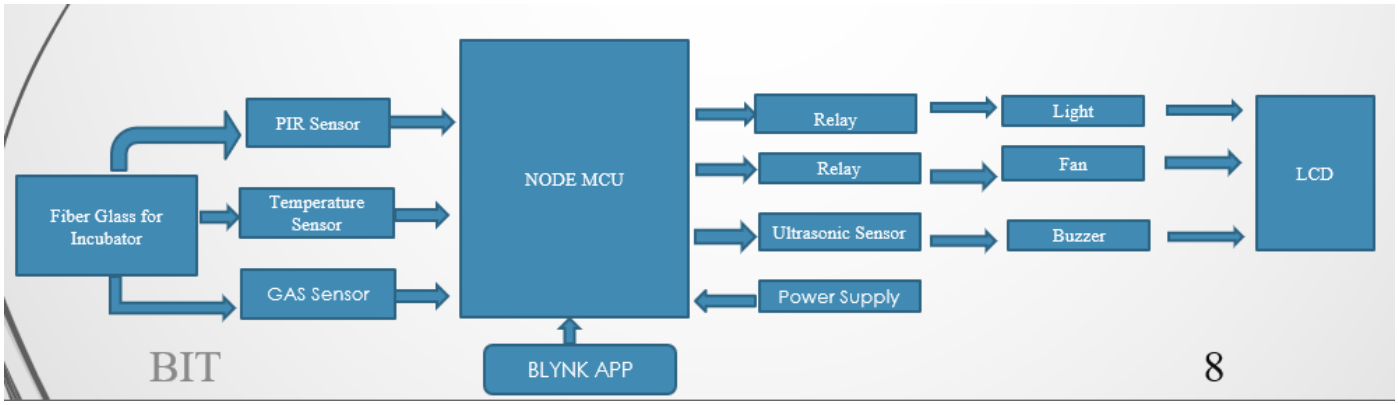


CHAPTER 3
WORKING MODEL

3.1 Working Model:

For a premature baby there is need to maintain hygiene by keeping people away from incubator. So, to maintain it, the buzzer beeps when any person come near to the incubator (less than 5 meter). Our project Modern Baby Incubator with Security System using Node MCU is to design a very efficient system that can maintain the temperature, humidity and oxygen level of the incubator to provide a protective system to premature baby infants and newly born baby.For a premature baby there is need to maintain hygiene by keeping people away from incubator. So to maintain it, the buzzer beeps when any person come near to the incubator (less than 5 meter). It also helps the baby to prevent from any unrecognized person. Along with the protection inside the incubator, it can also helps to maintain light, temperature and acts as a fire alarm.

Figure 3.1 – Block Diagram of proposed system



3.2 Flow Chart

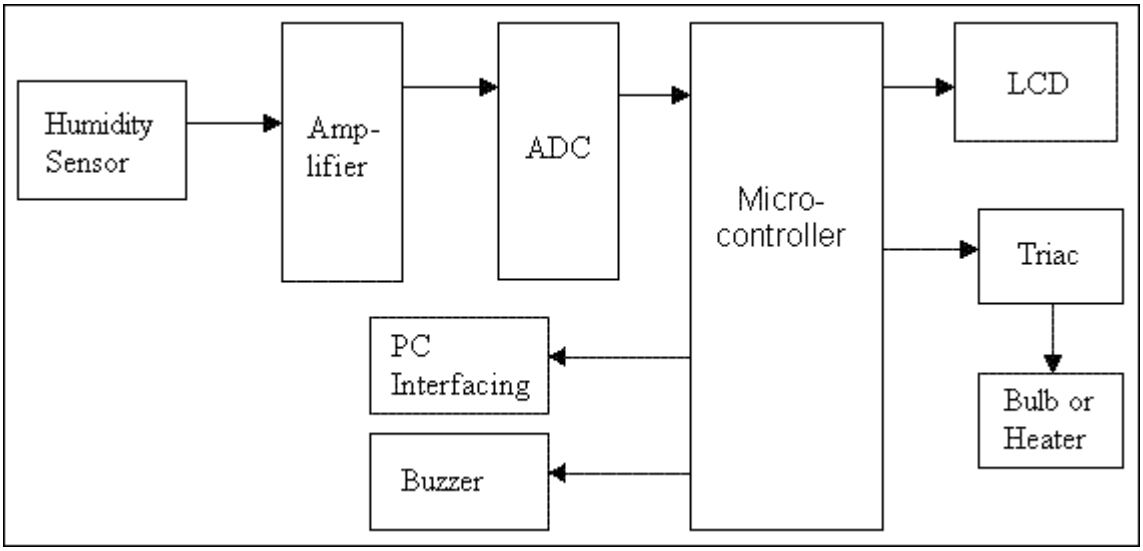


Figure 3.2 – Flowchart of the project

CHAPTER 4
RESULT AND DISCUSSION

4.1 Result

This project can be used in Hospitals. Our project is used for warming babies. It is used for warming premature babies and weak babies. As the number of children stealing increases day by day, this device helps to protect the babies from child stealer in Hospitals by beeping the buzzer as soon as something happens in and around the babies. This project can be used to control various lodging appliances. Faster operation and efficient. We can control device from a long distance; thus, it gives ease of access.
The main advantage of our project Modern Baby Incubator with ultra security system using IOT is that it is a low cost device, having dual work like security to home and hospital and protection to the babies also. No need to carry separate remote or any other controlling unit. It can help to maintain the temperature and humidity inside the incubator with the help of fan and bulb that we desire. The buzzer used in our project beeps when the distance between the incubator and any other person is less than 5 meter which can help to maintain the hygiene inside the incubator and security both outside and inside the incubator.

Figure – Hardware system of the project

Figure – Connection of the project

4.2 Outcomes and Social benefits:

The main advantage of our project Modern Baby Incubator with ultra security system using IOT is that it is a low cost device, having dual work like security to home and hospital and protection to the babies also. No need to carry separate remote or any other controlling unit. It can help to maintain the temperature and humidity inside the incubator with the help of fan and bulb that we desire. The buzzer used in our project beeps when the distance between the incubator and any other person is less than 5 meter which can help to maintain the hygiene inside the incubator and security both outside and inside the incubator.For a premature baby there is need to maintain hygiene by keeping people away from incubator. So to maintain it, the buzzer beeps when any person come near to the incubator (less than 5 meter). It also helps the baby to prevent from any unrecognized person

4.3 Advantages:

•No need to carry separate remote or any other controlling unit.

•It can help to maintain the temperature and humidity inside the incubator with the help of fan and bulb that we desire.

•The buzzer used in our project beeps when the distance between the incubator and any other person is less than 5 meter which can help to maintain the hygiene inside the incubator and security both outside and inside the incubator

CHAPTER 5
CONCLUSION AND FUTURE SCOPE

5.1 Conclusion:

- In the baby incubator, Humidity, Temperature and Oxygen level control is very important. And therefore, we are controlling all these according to our requirements.
- We have used Node MCU in our project, which is very advanced microcontroller for Humidity, Temperature and Oxygen level of the Baby Incubator.
- Along with maintaining the necessary parameters inside the incubator, we will be able to monitor and control everything in our home. Also, five sensors and a two-channel relay module are mainly used for this system. Therefore, we can monitor and control everything in the house such as temperature, humidity, amount of leaking gas, amount of water in the water tank, home security, and control of electrical appliances.
- Also, this system is mainly based on IoT technology. Therefore, we can control and monitor all factors through the internet. The Blynk app has been used for that.

5.2 Future Scope:

- We can control more parameters like oxygen level, humidity along with it we can measure respiration rate and pulse rate also.
- We can send this data to a remote location using mobile or internet.
- We can able to extract the information again and again after a particular time (like after every two hours) by changing the code of Node MCU.
- Any work, whatsoever precise it may be, has always some scope of improvement. On the same lines
- The author envisages that there is lot of scope of improvement in the present work. Some of the future
- Aspects of the work in terms of its improvements are the parameters such as pulse measurement can
- Also be introduced for close monitoring and the response of the project can further improved by using
- The different tuning techniques used forPIDcontrollers.The GSM technique canals be used to reduce
- The noise created by the alarms in the close monitoring.

5.3 References:

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Appendix – 1

```
#include <Wire.h>
#include <MPU6050.h>
MPU6050 mpu;
//////////////////
#include <U8g2lib.h>
U8G2_SSD1306_128X64_NONAME_F_HW_I2C u8g2(U8G2_R0, /* reset=*/ U8X8_PIN_NONE);
#include "MAX30100_PulseOximeter.h"
PulseOximeter pox;

void onBeatDetected()
{
    Serial.println("Beat!");
    u8g2.setCursor(75, 42);
    u8g2.print("Beat!");

}
/////////////////
void setup()
{
  Serial.begin(115200);
  //////////////////
  u8g2.begin();
  //////////////////
  Serial.println("Initialize MPU6050");

  while(!mpu.begin(MPU6050_SCALE_2000DPS, MPU6050_RANGE_2G))
  {
    Serial.println("Could not find a valid MPU6050 sensor, check wiring!");
    delay(500);
  }
 if (!pox.begin()) {
        Serial.println("FAILED");
        for(;;);
    } else {
        Serial.println("SUCCESS");
    }


    // pox.setIRLedCurrent(MAX30100_LED_CURR_7_6MA);


    pox. setOnBeatDetectedCallback(onBeatDetected);
}

void loop()
{
  // Read normalized values
  Vector normAccel = mpu.readNormalizeAccel();

  // Calculate Pitch & Roll
  int pitch = -(atan2(normAccel.XAxis, sqrt(normAccel.YAxis*normAccel.YAxis + normAccel.ZAxis*normAccel.ZAxis))
*180.0)/molarity_PI;
  int roll = (atan2(normAccel.YAxis, normAccel.ZAxis)*180.0)/M_PI;
```

```
 pox. Update();

 u8g2.clearBuffer();
 u8g2.firstPage();
 do {
   u8g2.setFont(u8g2_font_pxplusibmvga9_tf);
   u8g2.setCursor(0, 12);
   u8g2.print("x=");
   u8g2.print(roll);
   u8g2.print(char(176));

   u8g2.setCursor(0, 26);
   u8g2.print("y=");
   u8g2.print(pitch);
   u8g2.print(char(176));

   u8g2.setCursor(0, 42);
   u8g2.print("T=");
   u8g2.print(mpu. readTemperature());
   u8g2.print(char(176));
   u8g2.print("c");

   u8g2.drawVLine(64, 4, 25);

   u8g2.setCursor(66, 12);
   u8g2.print("H=");
   u8g2.print(pox.getHeartRate());
   u8g2.print("Bps");

   u8g2.setCursor(66, 27);
   u8g2.print("O2=");
   u8g2.print(pox. getSpO2());
   u8g2.print("%");
   pox.update();

   u8g2.drawRFrame(2,47,122,12,6);
   u8g2.drawFilledEllipse(map(pitch, -100, 100, 0, 122), 52, 7, 5, U8G2_DRAW_ALL);

   if (pitch==0) {

     u8g2.setFont(u8g2_font_pxplusibmvga9_tf);
     u8g2.setCursor(59,63);
     u8g2.print("flat");

   }
 }
 while ( u8g2.nextPage() );
   pox.update();
}
```

Appendix- 2

Figure : The setup of Blynk application .

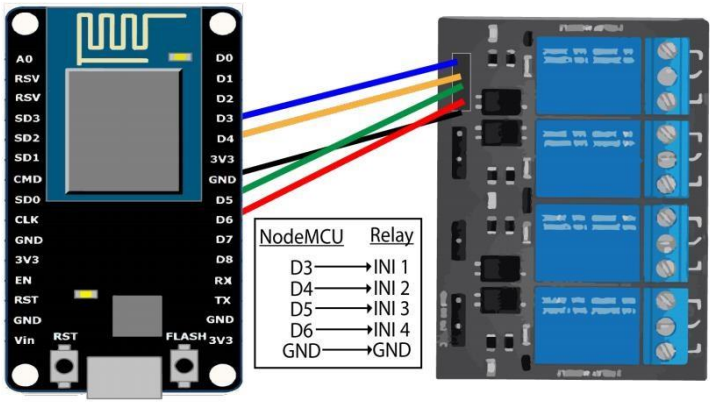

Figure: Node MCU & 4 channel relay connection.

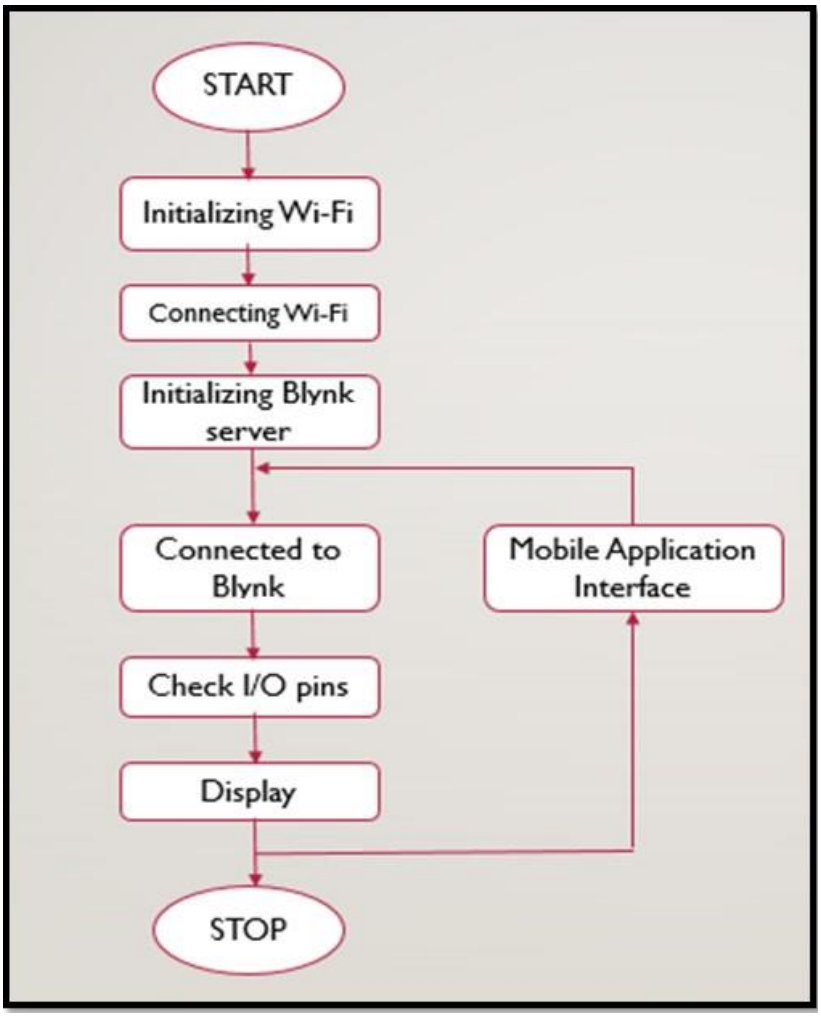

Figure: Flow chart of prototype function

This flow chart shows the working of the project. The process starts be initializing the Wi-Fi, the network name and password are written in the code and uploaded to Node MCU. The android device is connected to Node MCU over Wi-Fi. The Blynk server is set up and connection is made, the devices is identified in the Blynk server using the generated authentication token. The command for controlling the load is given to the application, and this command, over Wi-Fi network is sent to the Node MCU.

Curriculum-Vitae

SAUMYA MISHRA
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Career Objective:

Educational Qualifications:

Course	Board/ University	School/ College	Year of Passing	(%)
B. Tech (ECE)	AKTU	Buddha Institute of Technology	2023	87.78(till 6th semester)
Intermediate	CBSE	Laxmi Prasad Memorial Public School	2019	85.80
High School	CBSE	Don Bosco Senior Secondary School	2017	95.00

Professional Skills:

- Have excellent verbal and written communication skills.
- Excellent leadership skills with ability to lead teams.

Project Undergoing:

- **Title -**Baby Incubator with Security System
- **Technology used** -Arduino Programming
- **Duration** -Two months
- **Team Size** -Four
- **Role**: Programming

Project Done:

1)

- **Title -**Guessing Word Game
- **Technology used** -Python Programming

2)

- **Title -**Stress Meter
- **Technology used** -Integrated circuit and Soldering
- **Duration** -Two months

- **Team Size** -Four
- **Role**: Circuit Debugging

3)

- **Title -**Robotic Hand
- **Technology used** -Arduino Programming
- **Duration** -Two months
- **Team Size** -Four
- **Role**: Circuit Debugging and programming

Positions of Responsibility:

- Departmental placement coordinator at college.
- Active member of Entrepreneur club at college.

Trainings:

- Python Intern Shala Training (six weeks)
- Cisco Certified Network Associate training (six weeks)
- SQL Course
- Agile Methodology Virtual Experience Program (Cognizant)

Awards & Achievements:

- NEO 6.0 Qualifier
- Buddha Star Award 2021
- Intern Shala Student Partner-19

Skills and Endorsements:

- C programming language(basic)
- Python programming language
- SQL
- Computer Networking
- Pandas
- NumPy
- Learning Machine Learning

Personal Information:

- **Father's Name:** Mr Jagannath Mishra
- **Date of Birth:** 16\05\2001
- **Gender:** Female
- **Marital Status:** Unmarried
- **Nationality:** Indian
- **Hobby:** Dancing
- **Languages Known**: English, Hindi

References:

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Mr. Prabha Kant Dwivedi
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Declaration:

I hereby declare that the above details and information are true to the best of my knowledge.

Date-10\05\2022 Saumya Mishra
Place-Gorakhpur

Curriculum-Vitae

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Contact No.: 6393963993

Career Objective:

As per fresher, my priority is to learn new skills, in a globally competitive environment and getting an oppo rtunity to prove my technical skills and utilize my knowledge in growth of organization.

Educational Qualifications

Course	Board/ University	School/ College	
B.Tech. (ECE)	AKTU	Buddha Institute of Technology	
B.Sc. (Physics & Math)	S. U. Kapilvastu, Siddharth Nagar (U.P.)	P. D. S. Mahavidyalaya, Khalilabad	
Intermediate	UP BOARD	Marwar Inter College, Gorakhpur	
High School	UP BOARD	Marwar Inter College, Gorakhpur	

Technical Skills:

- **C Language**
- **CCNA**

Project Done

1. Title: Range Finder using Ultrasonic Sensor & Arduino Uno.

- **Technology**: Internet of Things
- **Platform**: Arduino Uno
- **Role & Responsibility**: Team leader and developer

2. Title: Bluetooth based Home Automation using Arduino.

- **Technology**: Internet of Things
- **Platform**: Arduino UNO
- **Role & Responsibility**: Team leader and developer

Trainings

- Training on "CCNA" in "Buddha Institute of Technology Gorakhpur.

Seminar / Workshops

- Three days workshop on PLC & SCADA.

Awards & Achievements

- Passed High School with 1st Rank of college from Marwar Inter College, Gorakhpur.
- Passed Intermediate with 2nd Rank of college from Marwar Inter College, Gorakhpur.

Personal Information

- Father's Name: Rajesh Kumar Pandey
- Date of Birth: 22/05/1998
- Gender: Male
- Marital Status: Unmarried
- Nationality: Indian
- Hobbies: Listening new ideas and playing cricket.
- Languages Known: English and Hindi

References

Name of Dept. Placement Name of Department	Mr. Prabha Kant Dwivedi Training & Placement Officer
Official: email id +91-Mob No.:	tp@bit.ac.in +919838280284

Declaration

I hereby declare that the above information is true and correct to the best of my knowledge. I bear the responsibility for the correctness of the mentioned particulars.

Date:
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Abhichandan Pandey

Curriculum-Vitae

Name:RUCHI PRAJAPATI
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Contact No.: 8957502160

Career Objective:

As a fresher, my priority is to learn new skills, in a globally competitive environment and getting an opportunity to prove my technical skills and utilize my knowledge in growth of organization.

Educational Qualifications

Course	Board/ University	School/ College	Year of Passing	
B.Tech (ECE)	AKTU	Buddha Institute of Technology	2023	9.11CG
Intermediate	UP BOARD	Rambholi Kanya Intercollege	2019	75.00%
High School	UP BOARD	Carmel Inter College	2017	91.13%

Technical Skills:

- **C Language**
- **CCNA (Cisco Certified Network Associate)**
- **HTML**
- **CSS**
- **BOOTSTRAP**
- **JavaScript**

Project Done

1. Title: Baby Incubator with Security System Using NODE MCU.

- **Platform:** NODE MCU
- **Role & Responsibility**: Team leader and developer

2. Title: Robotic Hand

- **Technology**: Internet of Things
- **Platform**: Arduino uno
- **Role & Responsibility**: Team leader and developer

3. Title: Stress Meter

- **Platform**: Resistance Based
- **Role & Responsibility**: Team leader and developer

Trainings

- Training on "CCNA" in "Buddha Institute of Technology Gorakhpur.

Seminar / Workshops

- Three days workshop on PLC & SCADA.

Personal Information

a. Father's Name: Mr. Nagendra Prajapati
b. Date of Birth: 17/07/2002
c. Gender: Female
d. Marital Status: Unmarried
e. Nationality: Indian
f. Hobbies: Morning Exercise & Watching Serial.
g. Languages Known: English and Hindi

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RUCHI PRAJAPATI

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Career Objective:

As per fresher, my priority is to learn new skills, in a globally competitive environment and getting an opportunity to prove my technical skills and utilize my knowledge in growth of organization.

Educational Qualifications

Course	Board/ University	School/ College	
B.Tech(ECE)	AKTU	Buddha Institute of Technology	
Diploma(Civil)	UPBTE	Lucknow polytechnic lucknow	
Intermediate	UP BOARD	Maa Gayatri inter college Basti	
High School	UP BOARD	Shri N S Vidya Dailapur Basti	

Technical Skills:

- **C Language**
- **CCNA**

Project Undergoing

Project Done

1. Title: Robotic Hand

- **Technology**: Internet of Things
- **Platform**:Arduino uno ,
- **Role & Responsibility**: Team leader and developer

2. Title: Bluetooth based Home Automation using Arduino.

- **Technology**: : Internet of Things
- **Platform**:Arduino UNO
- **Role & Responsibility**:Team leader and developer

Trainings

- Training on "CCNA" in Buddha Institute of Technology Gorakhpur.

Seminar / Workshops

- Three days workshop on PLC & SCADA.

Awards & Achievements

- Gold medalist in discuss throw at ZONAL.

Personal Information

- Father's Name: Satyram Chaudhary
- Date of Birth: 05/02/1999
- Gender: Male
- Marital Status:Unmarried
- Nationality: Indian
- Hobbies: Morning Exercise & Watching and playing cricket.
- Languages Known: English and Hindi

References

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Name of Department	Training & Placement Officer
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+91-Mob No.:	+91-9838280284

Declaration

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CHAUDHARY

RAJENDRA