INTERNSHIP REPORT

By Vishishta Innovators pvt ltd

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ABSTRACT

This report provides a comprehensive overview of my internship experience at a dynamic start-up company specializing in embedded systems & IoT, research and development. The internship program aimed to provide practical exposure and professional growth opportunities in the field of advanced technologies. This abstract presents a summary of the problem statements addressed in the projects undertaken during the internship, the solutions developed by our team, an introduction to the organization, an overview of the internship program, and key highlights from my internship.

Overall, this internship at the start-up company provided a comprehensive and enriching experience in the fields of embedded systems, circuit design, and sensing technologies. The projects addressed significant challenges, and the report showcases the skills acquired, the valuable experience gained, and the contributions made during the internship.

1. Introduction

This report provides a comprehensive overview of my internship experience at a dynamic start-up company specializing in embedded systems, research and development, and optoelectronics. The internship program offered an opportunity to work on cutting-edge projects and develop innovative solutions to complex challenges within the field. This introduction serves to provide context and background information about the internship, including the objectives, scope, and significance of the projects undertaken, as well as an overview of the organization and the internship program. Embedded systems play a crucial role in various industries, enabling the integration of hardware and software to create intelligent and efficient systems. These systems often require customized solutions to meet specific requirements, making research and development in this field critical.

The internship program at the start-up company focused on providing practical exposure and professional growth opportunities in embedded systems, circuit design, and optoelectronics. The internship program aimed to equip interns with practical skills and knowledge in advanced technologies, fostering creativity and innovation in problem-solving. Throughout the program, I had the privilege of working on three significant projects, each addressing a specific problem statement within the domain of embedded systems.

Objectives of the Internship -

- Gain practical experience in designing and developing embedded systems and optoelectronic solutions.
- Foster innovation and creativity by exploring cutting-edge technologies and methodologies. - Develop technical skills in circuit design, voltage division, and sensor-based systems.
- Bridge the gap between theoretical knowledge and real-world application
- Enhance problem-solving abilities through tackling complex problem statements.
- Gain industry exposure and insights into the latest advancements in the field.

2. Organization Information

Our organization is dedicated to empowering students with future technologies and bridging the gap between theory and practice. Our mission is to foster a culture of curiosity and continuous learning, preparing students for successful careers in emerging fields and driving the advancement of society. At our company, we recognize that students often learn various programming languages during their schooling, but they typically only get exposure to the world of technology during their technical courses spanning four to five years. We believe that it is essential to provide students with an innovative ecosystem where they can engage with the technological world, learn from experienced professionals, and become an integral part of our team.

Our approach is centered around creating an environment that enables students to work alongside experienced professionals who specialize in specific fields. This collaborative setting allows students to gain hands-on experience, explore new technologies, and foster innovation. We offer a unique opportunity for students to learn, explore, and innovate simultaneously. By working with our team of experts, students are exposed to real-world projects and challenges, allowing them to develop practical skills and a deeper understanding of their chosen field.

We strive to provide a nurturing and supportive environment that encourages students to push their boundaries, think critically, and contribute meaningfully to the development of cutting-edge technologies. Our organization is committed to nurturing young minds and preparing them for the upcoming technological world, where they can make significant contributions and drive progress. Through our internship program, students have the chance to engage in research and development activities, participate in training sessions, and benefit from mentorship programs. We believe that by immersing students in such a dynamic and stimulating environment, we can unleash their full potential and help them shape successful careers in the ever-evolving world of technology.

Overall, our organization is dedicated to creating an innovative ecosystem that empowers students, nurtures their talent, and prepares them for a future where technology plays a vital role. We are passionate about fostering curiosity, continuous learning, and the pursuit of excellence, ensuring that our interns gain valuable experiences and develop the necessary skills to thrive in the fast-paced technological landscape.

3. Gear to IoT Kit

Unleash the potential of embedded systems and IoT with our all-in-one development kit. Designed for student training and research, this kit enables 50+ projects and research on Nodemcu and IoT. Featuring cloud, server, and mobile interfaces, along with WiFi connectivity and low power consumption, it includes DHT11, IR, LDR, and ultrasonic sensors, as well as an inbuilt RGB LED and buzzer. Ignite innovation and explore the future of technology with our comprehensive development kit.

Fig: Gear to IoT Kit

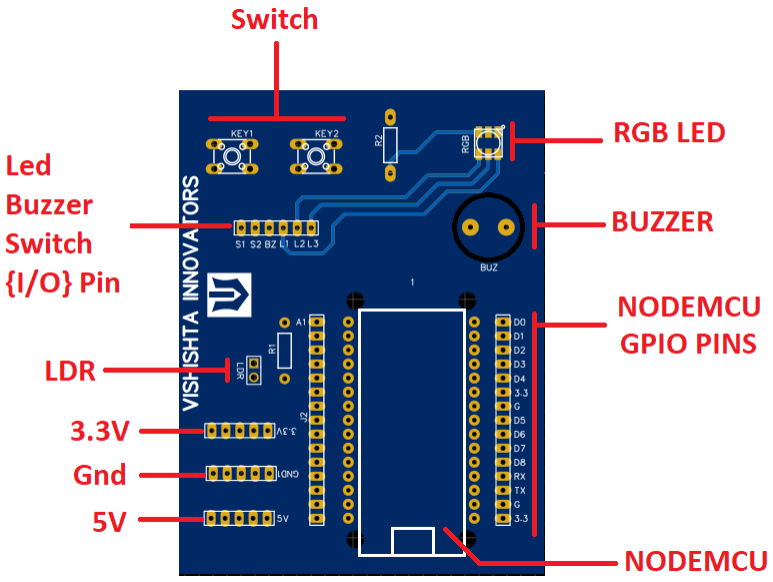


Fig: Gear to IoT Layout

4. List of Components included in the Kit

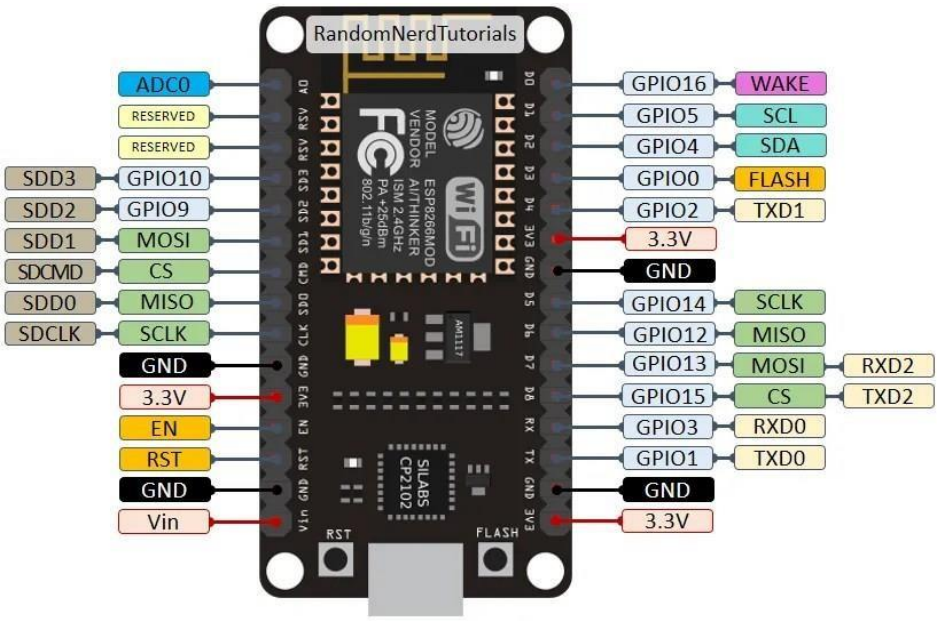
- NodeMCU
- LDR Sensor.
- IR Sensor.
- DHT11 Sensor.
- Ultrasonic Sensor.
- Jumper Wires.
- USB Cable.

LDR Sensor:

The resistance of Light Sensitive Photoresistor LDR changes with the change in the ambient light exposed on the surface of the sensor. As the light on the sensor increases then the resistance across the two leads decreases. Light Dependent Resistor is a type of photocell which finds excellent use in light sensing device application, whether it is automatic outdoor light ON/OFF switch or indoor automatic light switch; moreover, the 12mm LDR or photoresistor sensor works best in both light and dark regions. The photo-resistor is a staple of electronics. If you need a way to sense the level of ambient light, then there is no easier way to do it without an LDR/photo-resistor.

Fig: **LDR**

NodeMCU:

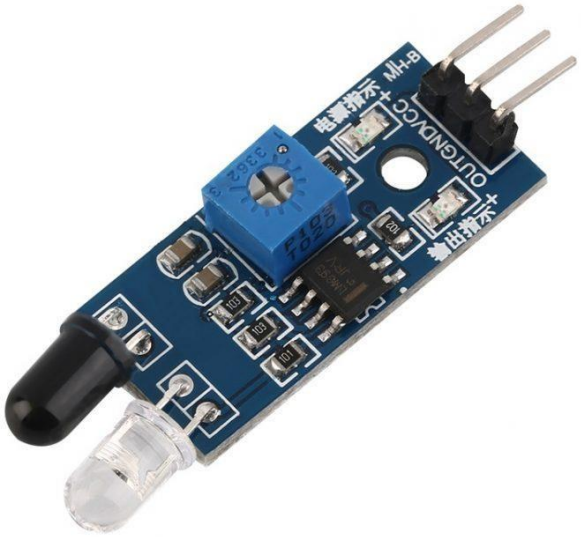


NodeMCU: Ai Thinker NodeMCU-ESP8266 is an open-source firmware and development kit that helps you to prototype or builds IoT products. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif for ESP8266.

Features:

1. WIFI module: ESP-12S/ESP-12F
2. Processor: ESP8266
3. CP2102 Chip
4. Built-in Flash: 32Mbit
5. Antenna: Onboard PCB antenna
6. Peripheral interface: UART/SPI/I2C/SDIO/GPIO/ADC/PWM
7. WiFi protocol: IEEE 802.11 b/g/n
8. Frequency range: 2.4G ~ 2.5G (2400M ~ 2483.5M)
9. WIFI mode: Station / SoftAP / SoftAP+Station
10. Power supply: 5V
11. Logic level: 3.3V

IR Sensor:



IR sensor is an electronic device, that emits the light in order to sense some object of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. Usually, in the infrared spectrum, all the objects radiate some form of thermal radiation. These types of radiations are invisible to our eyes, but infrared sensor can detect these radiations.

The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode. Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received.

There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's of specific wavelength used as infrared sources.

The three main types of media used for infrared transmission are vacuum, atmosphere and optical fibers. Optical components are used to focus the infrared radiation or to limit the spectral response.

Ultrasonic:

An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity.

Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Our ultrasonic sensors, like many others, use a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

The working principle of this module is simple. It sends an ultrasonic pulse out at 40kHz which travels through the air and if there is an obstacle or object, it will bounce back to the sensor. By calculating the travel time and the speed of sound, the distance can be calculated.

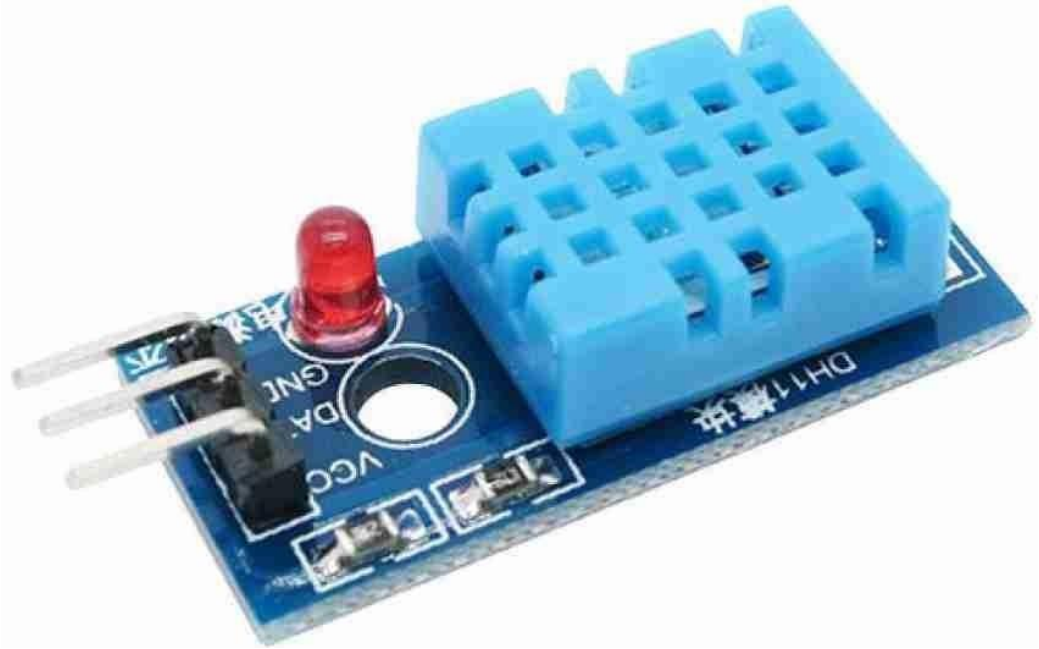
Pin1 (Vcc): This pin provides a +5V power supply to the sensor.

Pin2 (Trigger): This is an input pin, used to initialize measurement by transmitting ultrasonic waves by keeping this pin high for 10us.

Pin3 (Echo): This is an output pin, which goes high for a specific time period and it will be equivalent to the duration of the time for the wave to return back to the sensor.

Pin4 (Ground): This is a GND pin used to connect to the GND of the system

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/32bit microcontroller to output the values of temperature and humidity as serial data. The sensor can measure temperature from 0°C to 50°C and humidity from 20% to 90% with an accuracy of ±1°C and ±1%. So if you are looking to measure in this range then this sensor might be the right choice for you.

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

5.Software and Installation Guide

The Arduino IDE, known as Arduino Integrated Development Environment, provides all the software support needed to complete an Arduino project. It is programming software specifically designed for Arduino, provided by the Arduino team that allows us to write programs and upload them to the Arduino board.

The Arduino IDE 2.0 is an open-source project. It is a big step from its sturdy predecessor, Arduino IDE 1.x, and comes with revamped UI, improved board & library manager, debugger, auto complete feature and much more.

In this tutorial, we will show how to download and install the Arduino IDE 2.0 on your Windows, Mac, or Linux computer.

Requirements

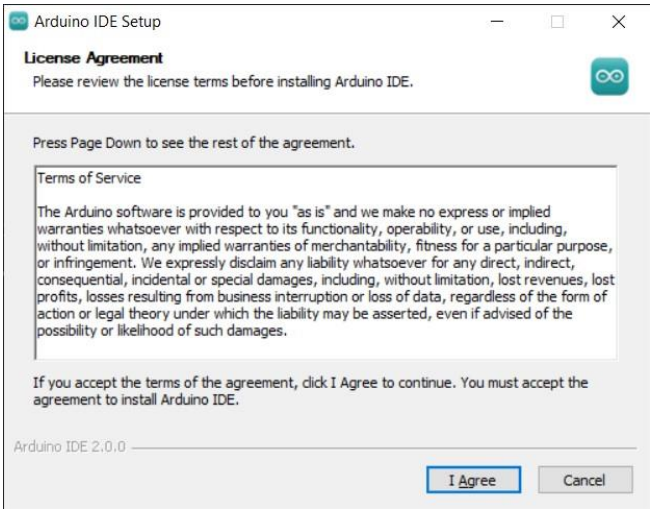
- Windows - Win 10 and newer, 64 bits
- Linux - 64 bits
- Mac OS X - Version 10.14: “Mojave” or newer, 64 bits

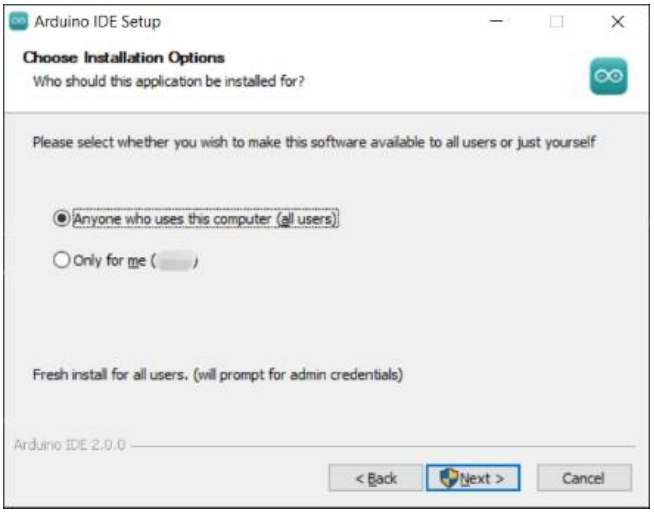
Download the Arduino IDE 2.0

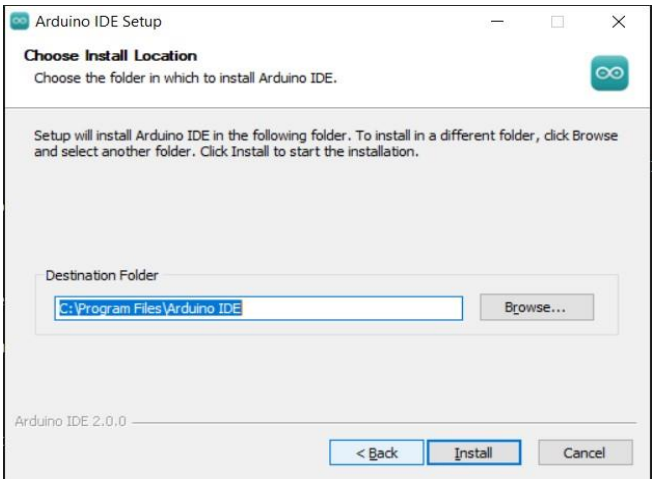
1. Vist Arduino IDE 2.0.0 Page.
   Download the IDE for your OS version.

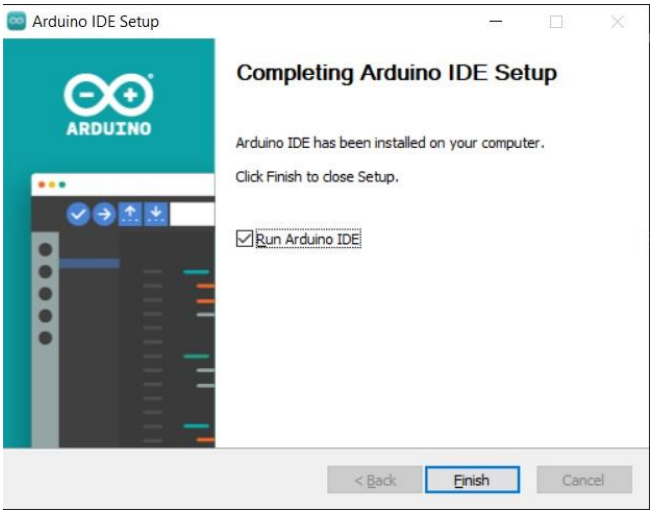
Installation Windows

1. Double click the `arduino-ide_xxxx.exe` file to run the downloaded file.
2. Read the License Agreement and agree it.



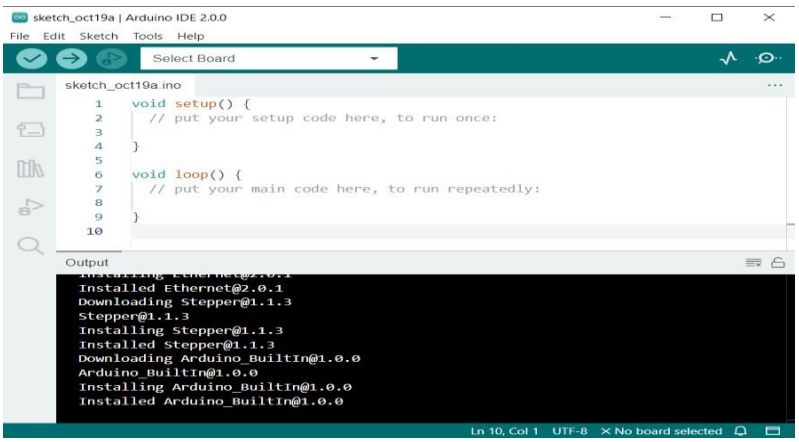




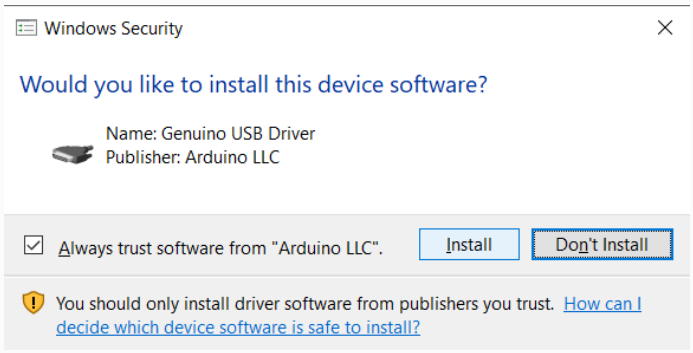


Open the IDE

1. When you first open Arduino IDE 2.0, it automatically installs the Arduino AVR Boards, built-in libraries, and other required files.



In addition, your firewall or security center may pop up a few times asking you if you want to install some device driver. Please install all of them.



Now your Arduino IDE is ready

Procedure to develop the project:

1) Connect the components to the Gear to IoT devolepment board as shown in the circuit diagram.
2) Upload the code.
3) Check for the result.

PROJECT 1:

Problem statement: (**Develop a circuit that can accurately detect the movement of an object or a person**)

Solution:

Using IR sensor we can provide the solution to the above problem. The project utilizes embedded C code to interface with the IR sensor and accurately shows the movement. The system focuses on hardware design, including circuitry and microcontroller integration. The acquired data is processed to detect motion.

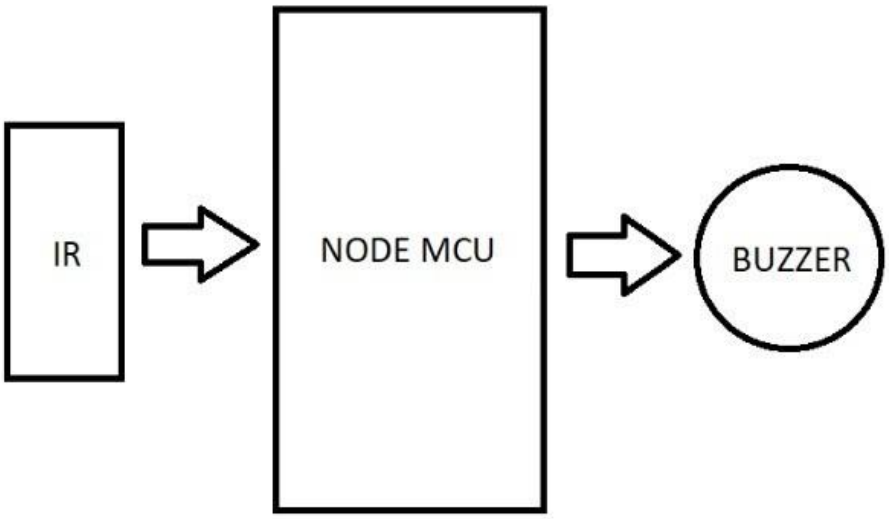
Tools:

- Gear to IoT board
- Ir sensor
- Jumper wires
- Buzzer

Detailed explanation on tools:

- IR sensor:
- **Infrared Obstacle Avoidance IR Sensor Module (Active Low)** has a pair of infrared transmitting and receiving tubes. When the transmitted light waves are reflected back, the reflected IR waves will be received by the receiver tube. The onboard comparator circuitry does the processing and the green indicator LED comes to life.
- Buzzer:
- It is a Small PCB Mountable 5V Active Electromagnetic Buzzer. It is great to add Audio Alert to electronic designs. It operates on 5V supply, uses a coil element to generate an audible tone.
- Jumper wires:
- These Flexible Breadboard Jumper Wires are Ideal for creating circuits between your micro-controller and the breadboard on the bots Reusable for fast build a prototype of an electronic circuit. Soldering is not required.

Circuit Diagram:



Circuit Diagram:

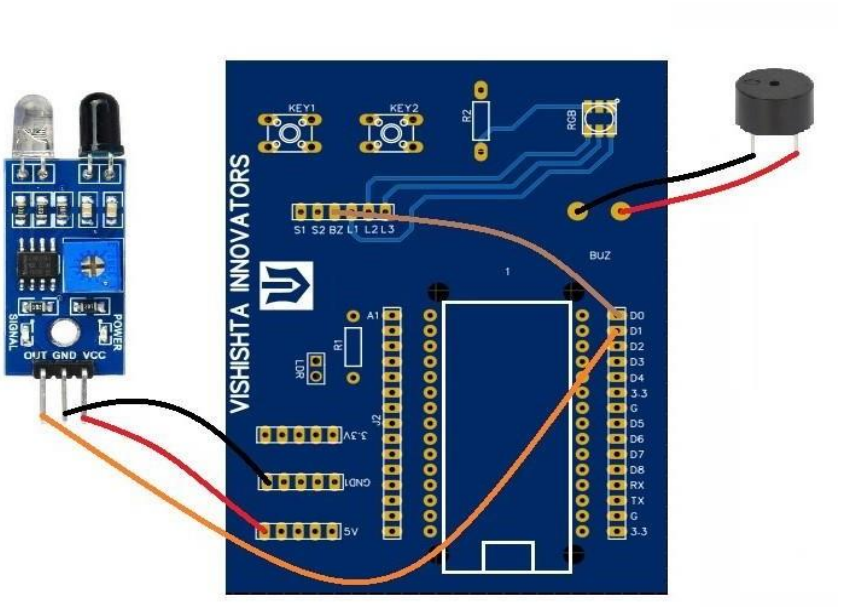


Fig: **Circuit Diagram**

Code:

```
#define ir D1
#define buz D0
int data;
void setup() {
pinMode(ir,INPUT);
pinMode(buz,OUTPUT);
Serial.begin(9600);
}
void loop() {
data=digitalRead(ir);
Serial.println(data);
delay(1000);
if(data==0)
 {
digitalWrite(buz,1);
delay(4000);
 }
 else
 {
digitalWrite(buz,0);
 }
}
```

PROJECT-2:

Problem statement: **Design and implement a circuit that can accurately measure and record the resistance values of the LDR under different light intensities.**

Solution:

The solution involves designing a system using anGear to IoT kit, LDR, LED, and jumper wires. The LDR is connected in a voltage divider circuit with a resistor. The embedded C code reads the analog voltage values from the LDR using the Node MCU in development board. A calibration procedure establishes a correlation between resistance readings and light intensities. The code logs and analyses the data, allowing for further investigation of the relationship between light intensity and resistance. Thorough testing and optimization ensure accurate measurements. Potential applications and recommendations can be explored based on the findings.

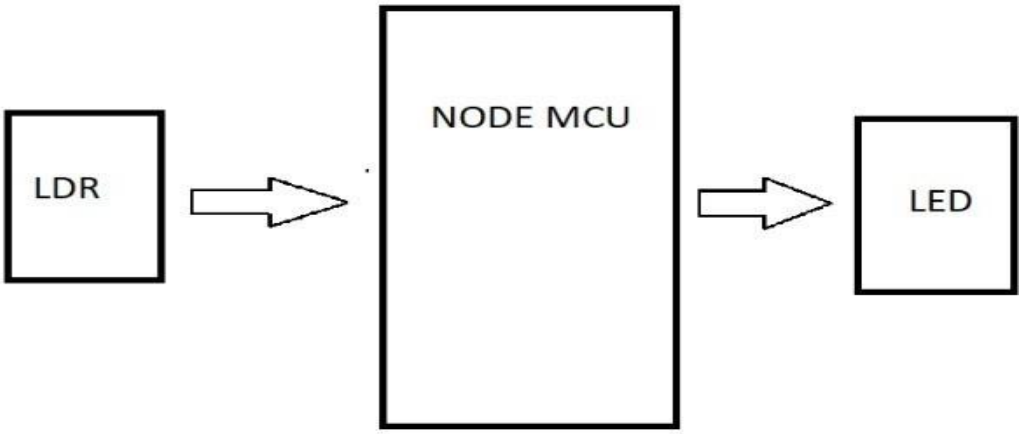
Tools and technologies required:

- Gear to IoT kit
- LDR sensor
- LED
- Jumper wires

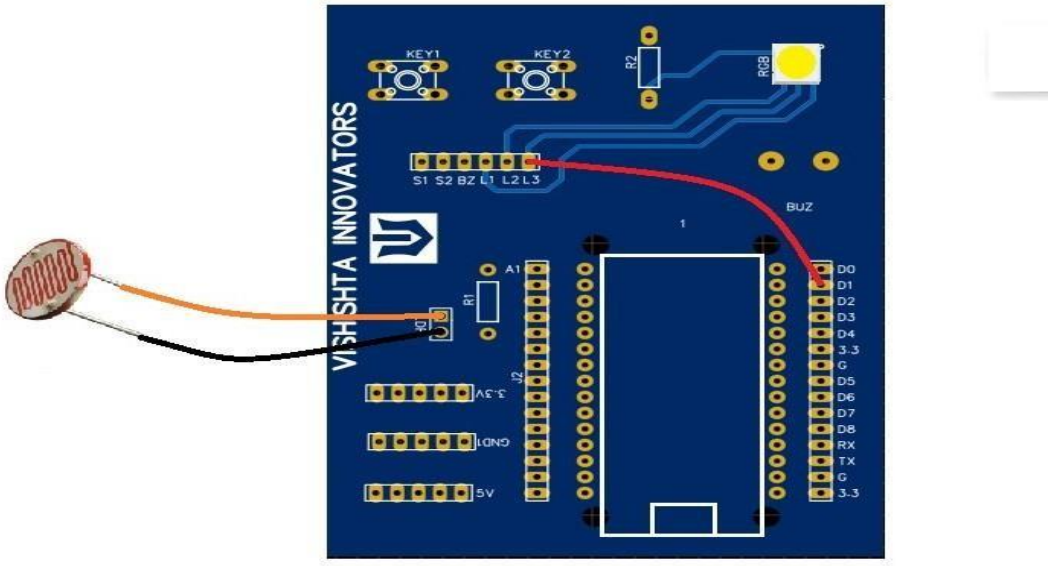
Procedure to develop the project:

1) Connect the components to the Gear to IoT devolepment board as shown in the circuit diagram.
2) Upload the code.
3) Check for the result.

Block Diagram:



Circuit diagram:



Code:

```
#define ldr A0
#define led D1
int data;
void setup()
{
pinMode(ldr,INPUT);
pinMode(led,OUTPUT);
Serial.begin(9600);
}
void loop()
{
 data= analogRead(ldr);
Serial.println(data);
delay(1000);
if(data<=100)
analogWrite(led,255);
 else if(data>100 && data<=250)
analogWrite(led,175);
 else if(data>250 && data<=400)
analogWrite(led,100);
 else if(data>400 && data<=600)
analogWrite(led,30);
 else
analogWrite(led,0);
}
```

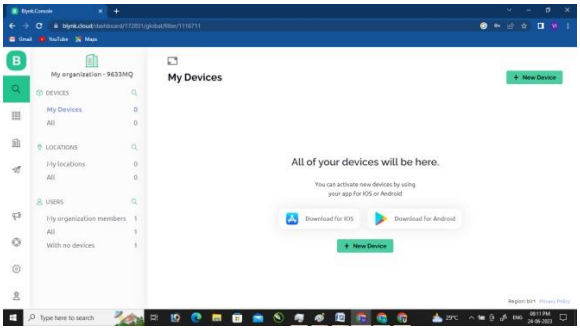
6. Blynk IoT Cloud Platform

Blynk is an IoT platform for i Android smart phones that is used to control Arduino and NodeMCU via the Internet. This application is used to create a graphical interface or human machine interface (HMI) by compiling and providing the appropriate address on the available widgets.

- **Blynk App:** – It allows you to create amazing interfaces for your projects using various widgets which are provided.
- **Blynk Server:** – It is responsible for all the communications between the smartphone and hardware.
- You can use the 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:** – It enables communication, for all the popular hardware platforms, with the server and process all the incoming and out coming commands.

Procedure to open blynk software:

1) Go to browser and search for blynk cloud
2) Click on blynk login
3) Click on create account
4) After creating your account<<login
5) After logging in click on new device at right side top corner
6) Select the name and after that select the board that er are using(ESP8266).
7) Now click on select data streams.
8) Click on new datastream and select virtual pin
9) Give any name to the pin virtual pin and select the pin number from V0 to V255. Anyone.
10) Select the data type.
11) Give minimum maximum and default value to your data
12) Now go to web dashboard.
13) On the left side there will be a widget box.select one to represent your data.
14) On the right side top corner save button will be there save your work.
15) Run the code by changing the credentials with the blynk templates.
16) Check for the results.
17) Choose the template according to your project name
18) Give the name for that template
19) Template ID, Device Name, and AuthToken will be displayed.
20) Copy them and paste it in your code.
21) Now check for the result.



PROJECT-3:

Problem statement: Develop a to accurately measure and monitor temperature and humidity levels in a specified environment.

Solution: The solution for this project is to use DHT11 sensor. It measures the temperature and humidity accurately. The project utilizes embedded C code to interface with the DHT11 sensor and accurately shows the movement. The system focuses on hardware design, including circuitry and microcontroller integration.

Tools and technologies used:

- DHT 11 sensor
- Gear to IoT kit
- Jumper wires

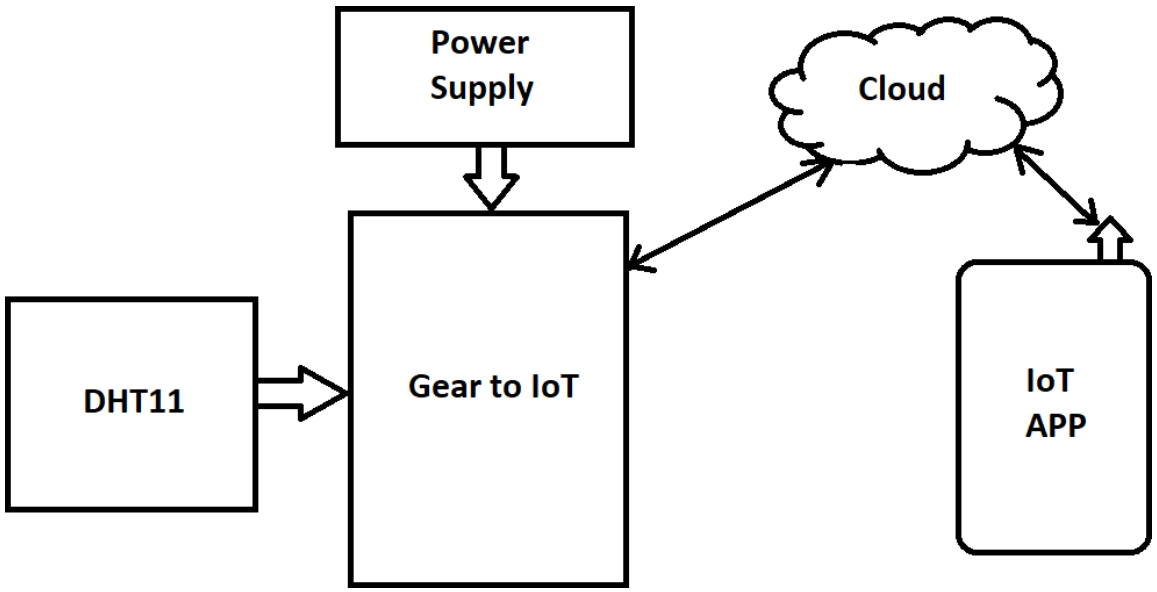
Technology used:

BLYNk IoT platform

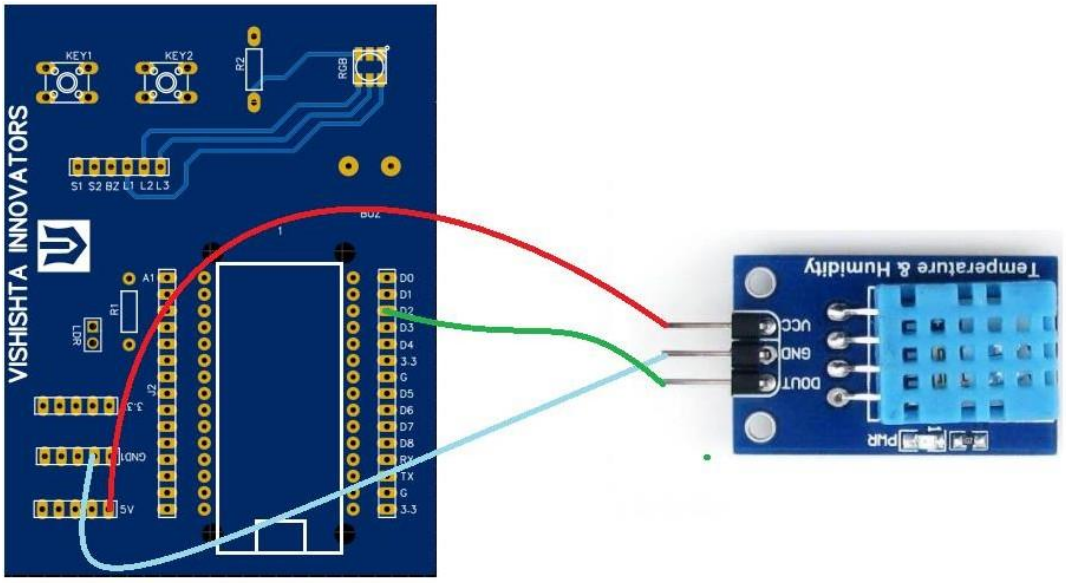
Procedure to develop the project:

- Connect the components to the Gear to IoT development board as shown in the circuit diagram.
- Upload the code.
- Check for the result

Block Diagram:



Circuit Diagram:



Code:

```
#define BLYNK_TEMPLATE_ID "TMPL3K291VkZ5"
#define BLYNK_TEMPLATE_NAME "dht 11"
#define BLYNK_AUTH_TOKEN "CYazXquaNAZlBSNysYVp9Stjn7j8RthN"
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <DHT.h>
char ssid[] = "VISHISHTA";
char pass[] = "VIPVTLTD@";
#define DHTPIN D2          // What digital pin we're connected to
#define DHTTYPE DHT11     // DHT 11
DHT dht(DHTPIN, DHTTYPE);
void setup()
{
  Serial.begin(9600);
```

```
  Blynk.begin(BLYNK_AUTH_TOKEN, ssid, pass);
  dht.begin();
}

void loop()
{
  Blynk.run();
  float h = dht.readHumidity();
  float t = dht.readTemperature();
  Blynk.virtualWrite(V1, h);
  Blynk.virtualWrite(V0, t);
  delay(1000);
}
```

10. Conclusion

Summary of the Internship Experience The internship experience at our company was highly rewarding, offering real-world projects, collaborative teamwork, and mentorship from experienced professionals. Interns developed practical skills, gained technical proficiency, and nurtured personal growth. The program emphasized hands-on learning, fostered creativity, and provided networking opportunities. Overall, it was a valuable stepping stone towards a successful career, instilling a passion for continuous learning and innovation.

Lessons Learned

During the internship, valuable lessons were learned that will guide future endeavours. Some key lessons include the importance of effective communication and collaboration within a team, the significance of

Adaptability in a dynamic work environment, and the need for continuous learning and self-improvement. Additionally, the internship taught the value of perseverance in overcoming challenges and the significance of seeking feedback for personal and professional growth. These lessons will serve as a solid foundation for future endeavours and contribute to long-term success

Recommendations

Future Enhancements and Iterations Based on the internship experience, several future enhancements and iterations can be proposed. These include:

1. Integration of advanced technologies: Explore the incorporation of emerging technologies such as machine learning, artificial intelligence, or Internet of Things (IoT) to enhance the capabilities and functionality of the developed systems.

2. Scalability and robustness: Further refine the system to ensure scalability and robustness, enabling it to handle larger datasets, increased user traffic, and diverse environments.

3. User interface and experience: Focus on improving the user interface and experience to make the system more intuitive, user-friendly, and accessible to a wider range of users.

4. Security and privacy: Implement robust security measures to protect sensitive data, ensure user 37 privacy, and guard against potential cyber threats.

5. Performance optimization: Continuously optimize the system's performance by refining algorithms, reducing response times, and minimizing resource utilization.

6. Feedback and user engagement: Establish mechanisms for gathering user feedback and actively involve users in the iterative development process to address their evolving needs and preferences.