Toc H INSTITUTE OF SCIENCE & TECHNOLOGY TIST
Arakkunnam, Ernakulam. Tel: 0484 2748388, email: mail@tistcochin.edu.in, website: tistcochin.edu.in

Department of Electronics

IoT and Embedded Systems Projects for 4th Semester B Tech ECE & RA

PROJECT REPORT

Project Title : **IoT based Smart City Management**

Team Number : **3**

Team Members : **1.ABIJITH SIVAN**

2.ALWIN BABU

3.ASHMI A N

4.ASLAM K A

5.JUHANA NAJEEB

Branch : **ELECTRONICS AND COMMUNICATION (S4)**

Project Summary :

INTRODUCTION

In an increasingly urbanized world, efficient management of public spaces is crucial for ensuring smooth traffic flow, environmental sustainability, and cleanliness. To address these challenges, we present a comprehensive mobile app and microcontroller-based system designed to monitor and manage key parameters such as temperature, humidity, traffic density, and waste accumulation in a smart city environment. By integrating sensors, microcontrollers, and motor control mechanisms, our system offers real-time data visualization, intelligent alerts, and automated control

functionalities. This project aims to enhance urban infrastructure management, promote sustainable practices, and improve the overall quality of life in modern cities.

OBJECTIVE

Looking ahead, our project aims to expand its capabilities through cloud integration for data storage and analysis, enabling predictive analytics to anticipate and address urban challenges proactively. By empowering cities with smart technologies, we envision a future where urban management is not just efficient but also sustainable and citizen-centric.

COMPONENTS

Microcontroller: ESP32

Temperature and Humidity Sensor(combined)

Traffic Density Sensor: Proximity sensor

Trash Can Sensor: Ultrasonic sensor

DC Motor

Motor Driver IC: L298N

IMPLEMENTATION

Hardware Setup: ESP32 board is connected to temperature and humidity sensor for sensing the temperature and humidity, ultrasonic sensor for trash level, proximity sensor for traffic, DC motor with L298N motor driver with the help of bread board jumper wires and cell.

Sensor Data Acquisition: ESP32 reads sensor data at regular intervals to capture temperature, humidity, traffic density, and trash level.

Wi-Fi Communication: in built Wi-Fi connection in EAP32 facilitates communication between ESP32 and the mobile app, enabling data exchange and control commands.

Mobile app: We have used Blynk mobile app to display real-time data (temperature, humidity, traffic density), send notifications when trash is full, and control the boom gate.

Integration and Control Logic: Firmware on ESP32 processes sensor data, triggers alerts when trash is full, and controls the motor direction based on app commands.

Testing and Debugging: Thorough testing ensures system functionality, with debugging conducted to resolve any issues encountered during development.

AIMS AND APPLICATIONS

1. Urban Planning and Infrastructure Development: City planners can utilize real-time data on temperature, humidity, and traffic density to inform decisions about infrastructure development, zoning regulations, and transportation networks. This helps optimize resource allocation and enhance the overall livability of the city.

2. Environmental Monitoring and Management: The project enables continuous monitoring of environmental parameters such as air quality, noise levels, and waste management. Authorities can use this data to implement pollution control measures, mitigate environmental hazards, and promote sustainability initiatives.

3. Traffic Management and Mobility Solutions: By analyzing traffic patterns and congestion levels in real-time, transportation agencies can optimize traffic flow, reduce congestion, and improve overall mobility in the city. This can be achieved through dynamic traffic signal control, smart parking systems, and intelligent transportation systems.

4. Public Safety and Security: Smart city management systems enhance public safety by enabling quick responses to emergencies, accidents, and natural

disasters. Authorities can use the data collected to identify high-risk areas, deploy resources effectively, and improve emergency response times.

5. Waste Management and Sanitation: The project facilitates efficient waste management by monitoring trash can fill levels and optimizing waste collection routes. This helps reduce littering, prevent overflow, and improve overall sanitation in the city.

6. Community Engagement and Governance: Citizens can actively participate in urban governance processes by accessing real-time data through mobile applications. This fosters transparency, accountability, and collaboration between residents and local authorities, leading to more inclusive and responsive city governance.

CONCLUSION

Our smart urban infrastructure management system provides real-time monitoring of key parameters, alerts for waste management, and control over boom gate access. The integration of sensors, microcontroller, and mobile app enhances urban infrastructure efficiency and sustainability.

CODE

```
#define BLYNK_TEMPLATE_ID “TMPL3JPEKLiwr”

#define BLYNK_TEMPLATE_NAME “project”

#define BLYNK_AUTH_TOKEN “DKpfZCFRtbvyYjwOdTt130aKP0xOefVh”

#include <WiFi.h>

#include <WiFiClient.h>

#include <BlynkSimpleEsp32.h>

#include <DHT.h>
```

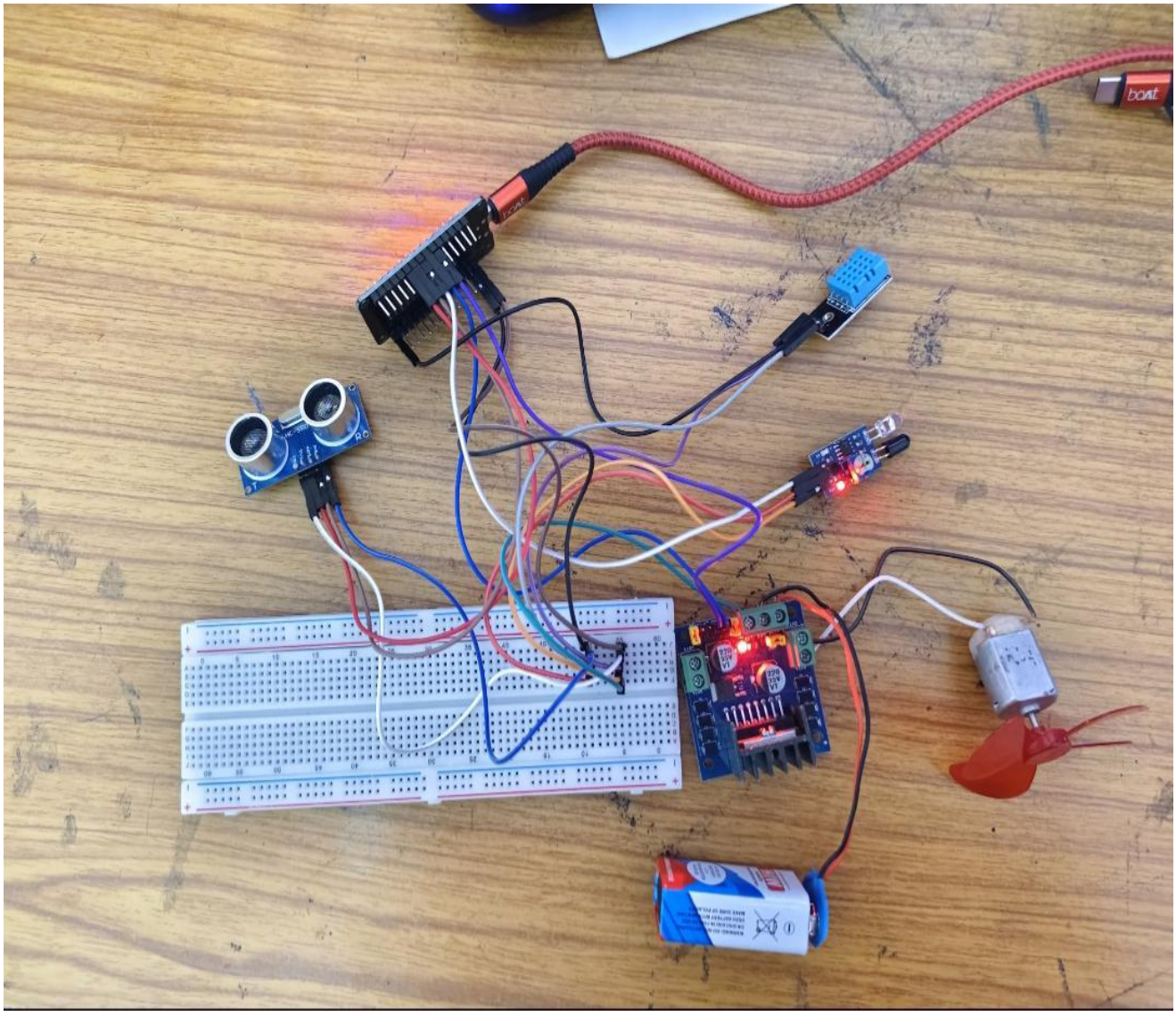
```
#define DHTPIN 23
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);

#define TRIG_PIN 32
#define ECHO_PIN 33
#define IR_PIN 25
Int IN1 = 26;
Int IN2 = 27;

Char auth[] = “DKpfZCFRtbvyYjwOdTt130aKP0xOefVh”;
Char ssid[] = “Hi”;
Char pass[] = “12345678”;

Void setup() {
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);

  Dht.begin();
  pinMode(TRIG_PIN, OUTPUT);
  pinMode(ECHO_PIN, INPUT);
  pinMode(IR_PIN, INPUT);
  pinMode(IN1, OUTPUT);
  pinMode(IN2, OUTPUT);
}

Void loop() {
  Blynk.run();
```

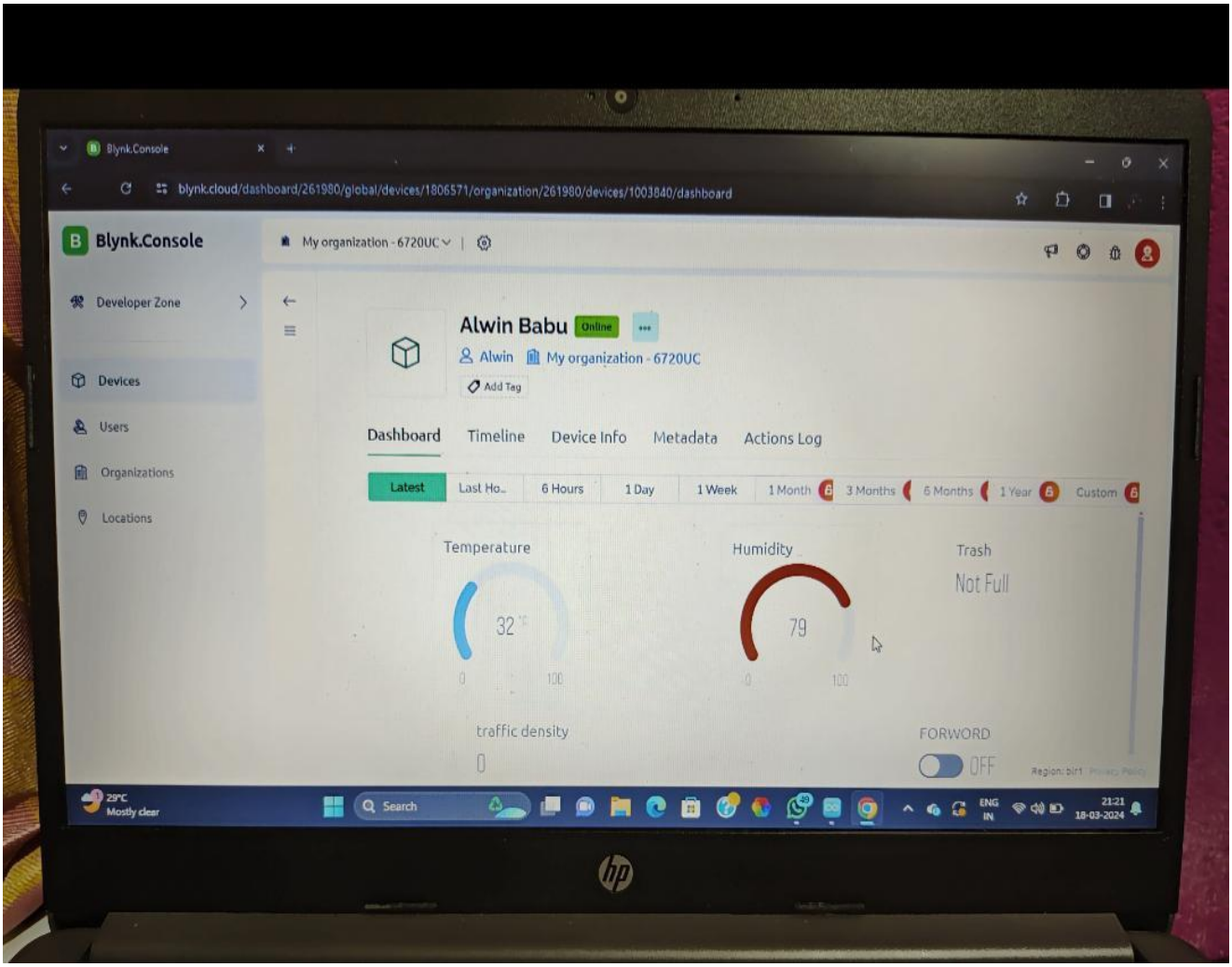
```
  Float humidity = dht.readHumidity();
  Float temp = dht.readTemperature();

  If (isnan(humidity) || isnan(temp)) {
    Serial.println("Failed to read from DHT sensor!");
    Return;
  }
  Blynk.virtualWrite(V1, temp);
  Blynk.virtualWrite(V2, humidity);

  measureTrashlevel();
  countVehicles();
  delay(1000); // Adjust based on your needs
}
Void  measureTrashlevel() {
  Long duration, distance;
  digitalWrite(TRIG_PIN, LOW);
  delayMicroseconds(2);
  digitalWrite(TRIG_PIN, HIGH);
  delayMicroseconds(10);
  digitalWrite(TRIG_PIN, LOW);
  duration = pulseIn(ECHO_PIN, HIGH);
  distance = (duration/2) / 29.1;

  if (distance < 5) { // Assuming 10 cm as the threshold for "full"
    Blynk.virtualWrite(V3, "Full");
  } else {
```

```
    Blynk.virtualWrite(V3, “Not Full”);
  }

  Delay(1000); // Check every second
}




Void countVehicles() {
  Static unsigned long lastMillis = 0;
  Static int vehicleCount = 0;

  If (digitalRead(IR_PIN) == LOW) { // Assuming the IR sensor goes LOW when a vehicle passes
    vehicleCount++;
    delay(200); // Debounce delay
  }

  If (millis() – lastMillis > 60000) { // Reset count every minute
    Blynk.virtualWrite(V4, vehicleCount);
    vehicleCount = 0;
    lastMillis = millis();
  }
}
BLYNK_WRITE(V5) { //move forward
  digitalWrite(IN2, param.asInt());

}
```

```
BLYNK_WRITE(V6) { //move backward
  digitalWrite(IN1, param.asInt());

}
```

OUTPUT




Blynk.Console
blynk.cloud/dashboard/261980/global/devices/1806571/organization/261980/devices/1003840/dashboard
Blynk.Console
My organization - 6720UC
Developer Zone
Devices
Users
Organizations
Locations
Alwin Babu
Online
Alwin
My organization - 6720UC
Add Tag
Dashboard
Timeline
Device Info
Metadata
Actions Log
Latest
Last Ho...
6 Hours
1 Day
1 Week
1 Month
3 Months
6 Months
1 Year
Custom
Temperature
32
Humidity
79
Trash
Not Full
traffic density
0
FORWORD
OFF
29°C
Mostly clear
Search
ENG
IN
21:21
18-03-2024

CIRCUIT DIAGRAM