

Integrated Electric Vehicle and Charging Station Management System

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Abstract: In recent years, research and development of electric vehicles have been promoted in India as new technologies. The provision of charging station (CS) infrastructure for electric vehicle (EV) is essential to ensure flexibility. Managing the EV Charging Station is challenged due to communicating several brands into the central system. With the growing number of electric vehicles (EV), charging points getting a shortage. Our scalable feature-based system priorities the total vehicle which is in queue for charging. Those who have less charging giving highest priority for the charge. Another important feature is when there is no EV station nearby then we can transfer the charging between two vehicles as emergency. One more feature is added which is related to the safety of human. Whenever any part of body is getting out of windows of the car, car will giving beep signal to the drivers.

Keywords: Battery Management System, Priority to Charging Station, Emergency Charging, Human Safety

I. INTRODUCTION

In recent years, research and development of electric vehicles have been promoted in India as new technologies. The provision of charging station (CS) infrastructure for electric vehicle (EV) is essential to ensure flexibility. Managing the EV Charging Station is challenged due to communicating several brands into the central system. With the growing number of electric vehicles (EV), charging points getting a shortage.

Our scalable feature-based system priorities the total vehicle which is in queue for charging. Those who have less charging giving highest priority for the charge. Another important feature is when there is no EV station nearby then we can transfer the charging between two vehicles as emergency. One more feature is added which is related to the safety of human. Whenever any part of body is getting out of windows of the car, car will giving beep signal to the drivers.

In this project we work on a three concepts:-

1. Priority to the charging station
2. Emergency Charging
3. Detection of human body part outside the window

A. Priority to Charging Station

In this concept we implement a system which will transmit the data of charging percentage with vehicle number to the charging station server. Depends on the charging percentage the server will give the token number to the each vehicle in the queue. As Transmitting system we have use RF transmitter to exchange the data and it is very effective for short wave communication. The driver of the vehicle can check whether there is the slot is available on that charging station .

B. Emergency Charging Sharing

Whenever the charging of first vehicle is completely exhausted at Remote location,where there is no charging station in near by area ,then that first vehicle can charge its battery from the second(another) vehicle's battery by using dc to dc boost converter.

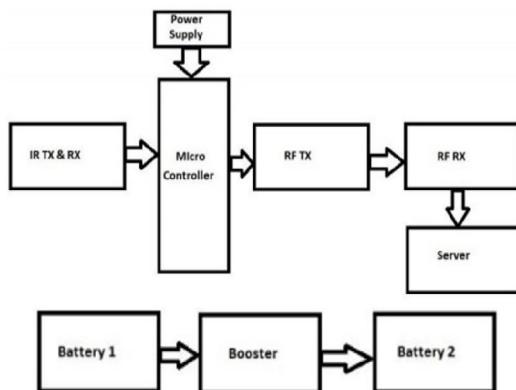
C. Detection of Human Body Part Outside the Window

This concept is implemented for safety purpose. We have use IR sensor to detect the Human body part outside the window.If body part coming outside the window, then IR sensor will detect it and give a alarm to the driver,to avoid accident and also aware the other people in the vehicle.

II. MATERIALS

1. IR Obstacle Sensor: An infrared (IR) sensor a proximity sensor, or a ‘nearness’ sensor that senses whether there is an object near it or not. The IR stands for Infrared sensor. Infrared is the light out of our visible spectrum.
2. DC to DC Boost Converter: DC-to-DC boost converter circuit is a circuit that can convert a DC voltage into a larger DC voltage
3. 12v Rechargeable Battery: To share charging between vehicles
4. Buzzer: It is a simple device which can generate beeps .
5. Push Button: By pressing the push button charging of vehicle will start.
6. Arduino Uno: The Arduino Uno is a microcontroller board based on the ATmega328. Using arduino we can operate hardware by creating code.
7. Transmitter and Receiver: It is used to transmit and receive radio signals between two devices. The application of the RF module is an embedded system to communicate with another device wirelessly.
8. Battery Level Indicator: To Indicate the level of battery percentage.
9. Light-emitting diode : It is a semiconductor light source which emits light when current flows through it. Electrons in the semiconductor recombine with electron holes, releasing energy in the form of photons
10. DC Jack conector : It allows a steady power source to be plugged in.
11. Buck converter : To decrease the voltage level
12. Encoder : This encoder encode a 12-bit and send it out through the output pin.
13. Decoder : *This decoder decode* informations that consist of N bits of address and 12-N bits of data.

III. BLOCK DIAGRAM



IV. METHODOLOGY

4.1 Priority to the Charging Station

In this system we have used RF module. There is transmitter and Receiver Transmitter will transmitt the data of charging percentage with vehicle number to the receiver which is connected at the charging station. Suppose the battery percentage of first vehicle V1 is 25% and battery percentage of second vehicle V2 is 50% then this data is transmitted to charging station .We modified code and uploaded it on the sever and when we are charging the vehicle that changing percentage will be shown on that server. also we uploaded data on thingspeak server to Check is there any slot is available on that charging station or not. This site will show the current information of charging station.

4.2 Emergency Charging

There are two 12V batteries in our project and between these two batteries we have connected boost converter circuit. The boost converter will increase the voltage level of battery of the vehicle Means suppose someones vehicle's battery is completely exhausted and there is not any charging station nearby. Then That person can charge his vehicle by connecting boost converter between his vehicle and charged vehicle of another person.

4.3 Detection of Human Body Part Outside the Window

We have used IR sensor for the detection of object or human part. In that IR LED is one kind of transmitter that emits IR radiations. This LED looks similar to a standard LED and the radiation which is generated by this is not visible to the human eye. Infrared receivers mainly detect the radiation using an infrared transmitter. Once the infrared transmitter generates emission, then it arrives at the human body part or object and some of the emission will reflect back toward the infrared receiver. When human body part of coming outside the window then horn will blow.

V. WORKING OF SYSTEM

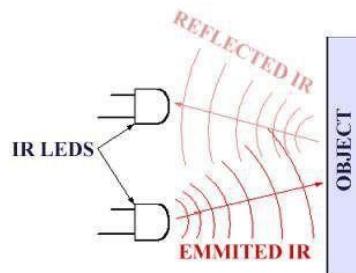
1) Priority to charging station

In this concept we implement a system which will transmit the data of charging percentage with vehicle number to the charging station server. Depends on the charging percentage the server will give the token number to the each vehicle in the queue. As Transmitting system we have use RF transmitter to exchange the data and it is very effective for short wave communication. The driver of the vehicle can check whether there is the slot is available on that charging station .

2)Emergency Charging

This DC-DC switching boost converter capacity is a **4A load** with excellent line an load regulation. The main switching component XL6009 IC is available in fixed output voltages of 3.3 V, 5V, 12V, 24V, 40V, and an adjustable output version. It is an efficient switching regulator and the output efficiency is significantly higher in comparison with the popular boost regulators. At higher input voltages, the regulator operates at a 400KHZ switching frequency thus allowing the overall The XL6009 module is a DC to DC BUCK-BOOST converter module it operates at 400KHz switching frequency . It provides smaller-sized filter components compared with low frequency switching regulators.

3) Detection of Human Body Part Outside the Window



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VI. ADVANTAGES

1. The boost converter is portable to bring in vehicle and we can use it whenever required.
2. Because of priority charging station system we can maintain discipline at the charging station and charging of every vehicle will be smoothly conducted
3. This is very helpful for the driver of electric vehicle to check whether there is slot is available on that charging station or not
4. We can avoid accident as we used here IR sensor which is connected at the window of electric vehicle.

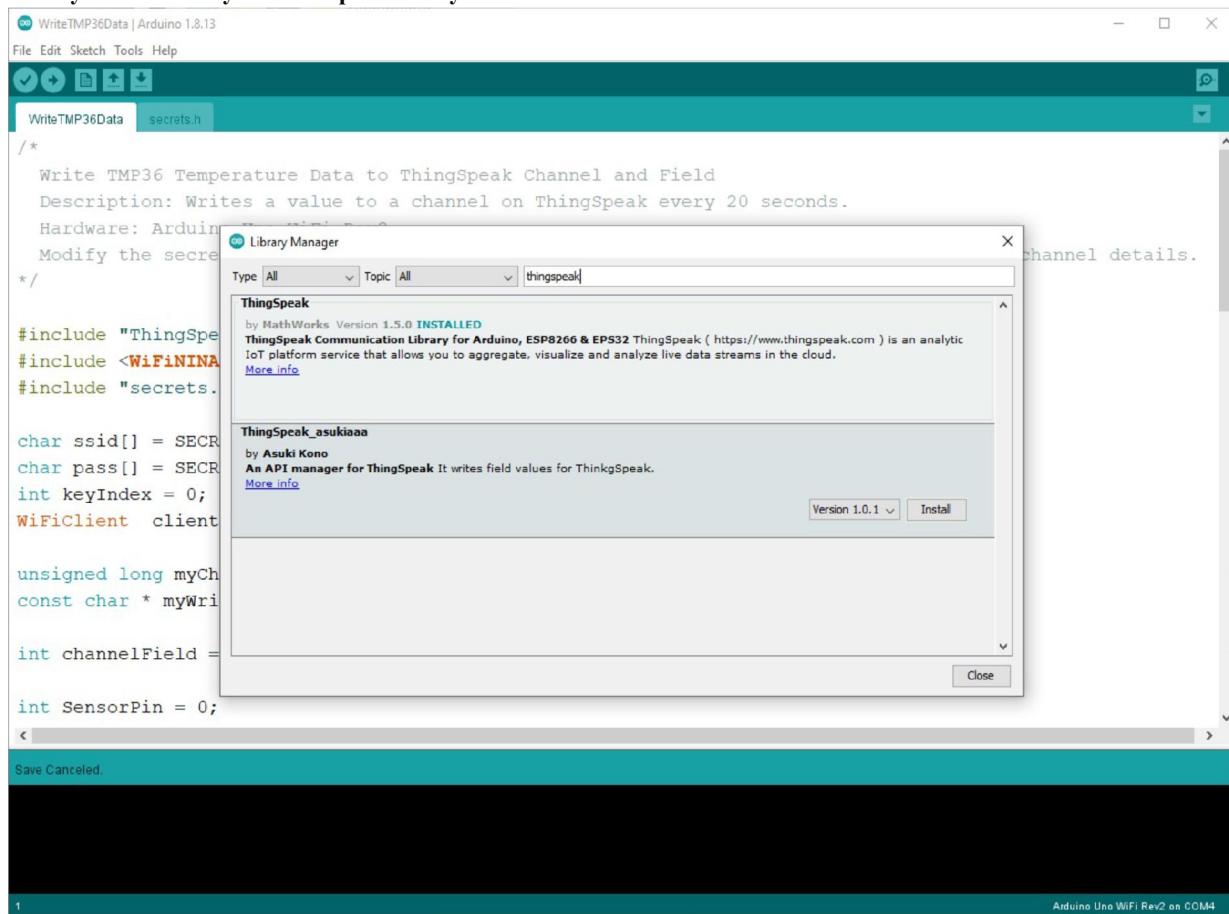
VII. RESULT**7.1 Procedure**

ThingSpeak + Arduino

- Install the “thingspeak“ Arduino Library using the Library

Manager in your Arduino IDE

- Use e.g., the built-in example "WriteSingleField" as a starting point.
- This example is available for different boards and configuration, such as Arduino WiFi rev2 board, Arduino WiFi shield, etc.

Then you can modify the example to suit your needs


The screenshot shows the Arduino IDE interface. The top menu bar includes File, Edit, Sketch, Tools, Help, and a toolbar with various icons. A central text editor window displays the code for 'WriteTMP36Data' using the 'secret.h' header. The code is as follows:

```

/*
 * Write TMP36 Temperature Data to ThingSpeak Channel and Field
 * Description: Writes a value to a channel on ThingSpeak every 20 seconds.
 * Hardware: Arduino Uno WiFi Rev2
 * Modify the secrets.h file to match your WiFi network details.
 */

#include "ThingSpeak.h"
#include <WiFiNINA>
#include "secrets.h"

char ssid[] = SECRET_SSID;
char pass[] = SECRET_PASSWORD;
int keyIndex = 0;
WiFiClient client;

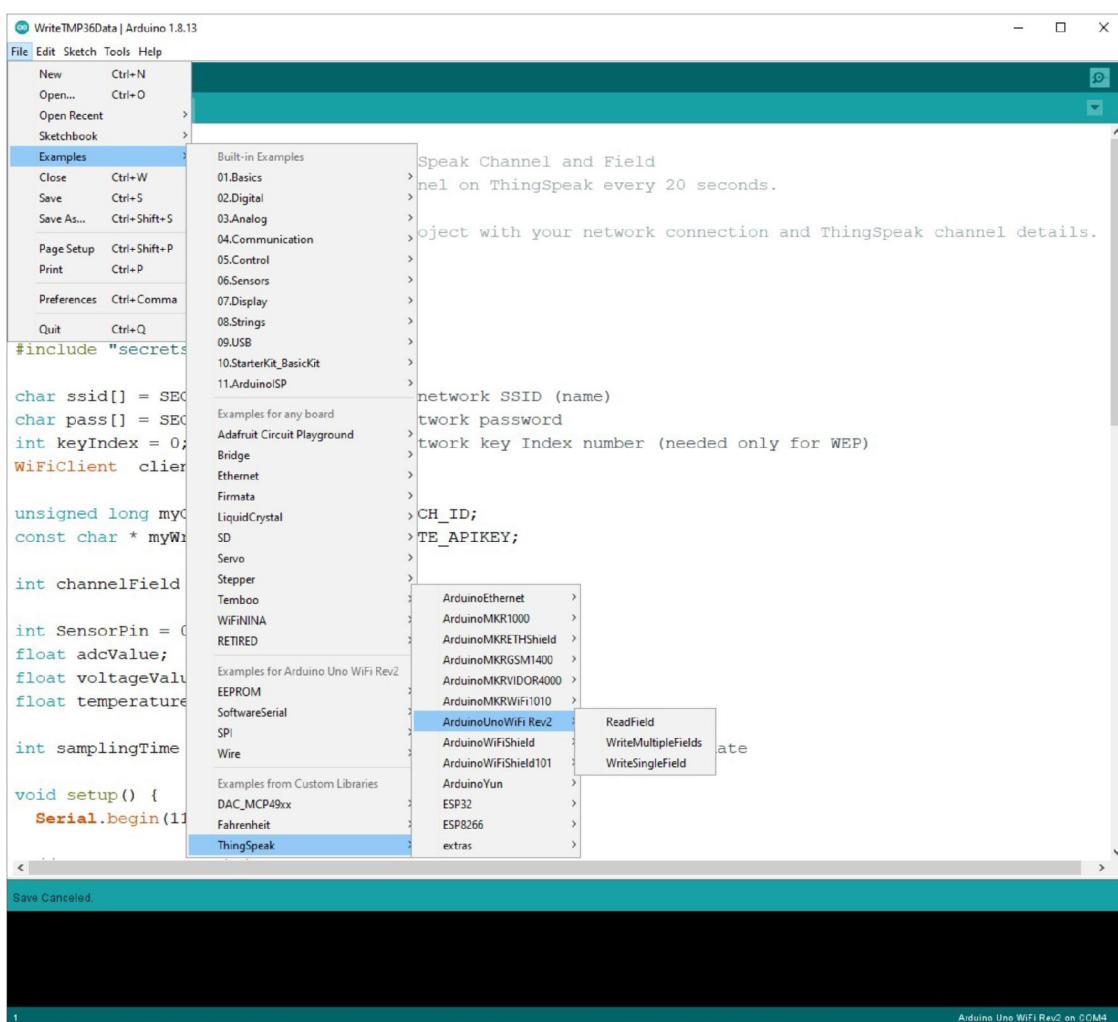
unsigned long myChannel;
const char * myWriteKey;

int channelField = 1;
int SensorPin = 0;

```

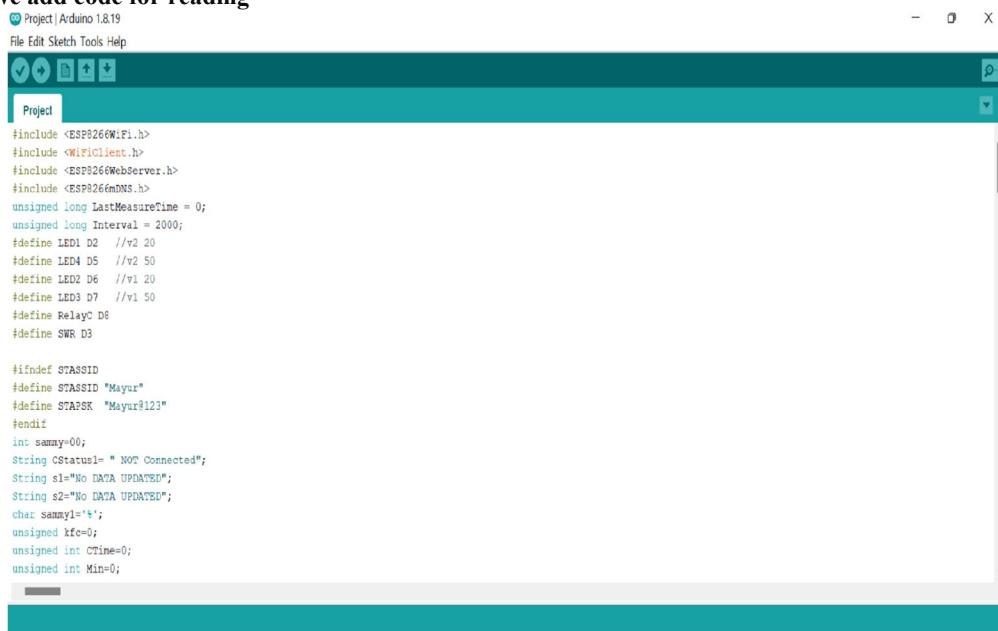
Below the code, a status bar indicates 'Save Canceled.' and '1'. A bottom status bar shows 'Arduino Uno WiFi Rev2 on COM4'. A modal dialog box titled 'Library Manager' is open, with the search bar set to 'thingspeak'. It lists two results:

- ThingSpeak** by MathWorks, Version 1.5.0 **INSTALLED**. Description: ThingSpeak Communication Library for Arduino, ESP8266 & ESP32 ThingSpeak (<https://www.thingspeak.com>) is an analytic IoT platform service that allows you to aggregate, visualize and analyze live data streams in the cloud. [More info](#)
- ThingSpeak_asukiaaa** by Asuki Kono, Version 1.0.1. Description: An API manager for ThingSpeak It writes field values for ThingSpeak. [More info](#) [Install](#)



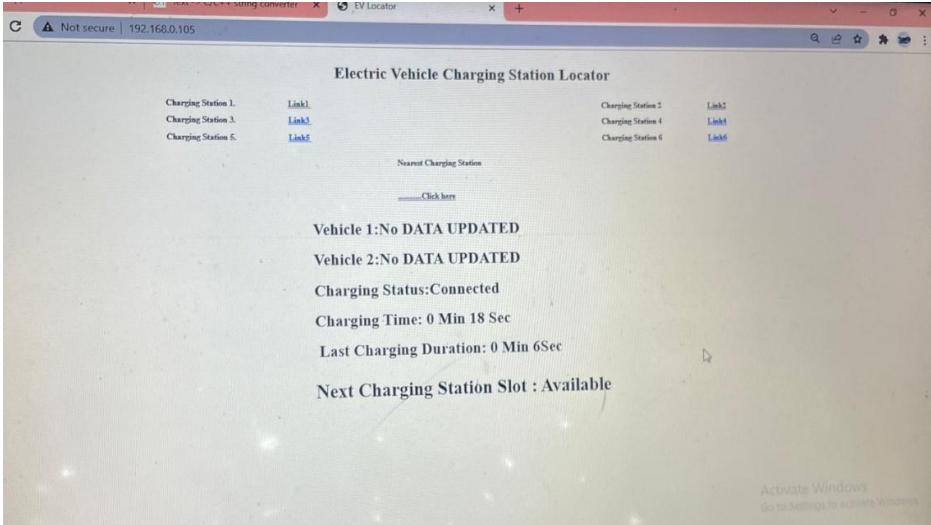
We use the the “WriteSingleField” Example as a starting point. We just need to change WiFi information, like Password, etc. Then we change ThingSpeak Information.

Finally, we add code for reading



```
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
#include <ESP8266WebServer.h>
#include <ESP8266DNS.h>
unsigned long LastMeasureTime = 0;
unsigned long Interval = 2000;
#define LED1 D2 //v2 20
#define LED4 D5 //v2 50
#define LED2 D6 //v1 20
#define LED3 D7 //v1 50
#define RelayC D8
#define SWR D3

#ifndef STASSID
#define STASSID "Mayur"
#define STAPSK "Mayuri123"
#endif
int sammy=0;
String Cstatus1= " NOT Connected";
String s1="No DATA UPDATED";
String s2="No DATA UPDATED";
char sammy1='%';
unsigned kfc=0;
unsigned int CTime=0;
unsigned int Min=0;
```

The screenshot shows a web browser window titled "Electric Vehicle Charging Station Locator". It lists six charging stations with their respective links:

- Charging Station 1: [Link1](#)
- Charging Station 3: [Link3](#)
- Charging Station 5: [Link5](#)
- Charging Station 2: [Link2](#)
- Charging Station 4: [Link4](#)
- Charging Station 6: [Link6](#)

Below the station list, there is a "Nearest Charging Station" section with a "Click here" button. The page also displays vehicle status information:

- Vehicle 1: No DATA UPDATED
- Vehicle 2: No DATA UPDATED
- Charging Status: Connected
- Charging Time: 0 Min 18 Sec
- Last Charging Duration: 0 Min 6Sec
- Next Charging Station Slot : Available

VIII. CONCLUSION

By installing priority system, It transmitted the data of charging percentage with vehicle number to the charging station server. Depends on the charging percentage the server given the token number to the each vehicle in the queue. That is shown on model. We Using boost converter we shared charging between two electric vehicles and IR sensor connected at the window using it we can detect the human body part is coming outside the window to avoid accident

REFERENCES

- [1]. Leo louis, Working principle of arduino and using it as a tool for study and research, 2016
- [2]. Noaima Bari, Priority Based Power Delivery System for Electric Vehicle Charging, 2021
- [3]. Jose M, Wireless Power Transfer for Electric Vehicles: Foundations and Design Approach, 2019