

Self Power Generation in Electric Vehicle Using Driving Wheels

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Abstract -- Self-power generating electric vehicles using driving wheels represents a cutting-edge innovation that harnesses kinetic energy from the wheels to generate electricity, thereby enhancing vehicle efficiency and range. By integrating advanced energy-harvesting technologies, such as sophisticated piezoelectric materials or highly efficient regenerative braking systems, into the driving wheels, these vehicles can potentially recharge their batteries while in motion. This approach not only promises to increase driving ranges and reduce charging times but also contributes to improved energy efficiency and sustainability. As research and development in this area continue to advance, the prospect of more practical, eco-friendly, and self-sufficient electric vehicles becomes increasingly viable, paving the way for a future where transportation is both efficient and environmentally conscious.

I. INTRODUCTION

Electric vehicles are transforming the various aspects of the transportation sector, carbon emission, repair cost and driving habits. Compared to gasoline vehicles and electric vehicles (EVs) are more fuel efficient due to the optimization, hydrogen production, storage and technical limitations of fuel. Traditional transportation sector is using fossil fuel with massive air pollutants and greenhouse gas emissions and it creates a terrible impact on the environment. The electric drive system is an eco-environment friendly system, generates very low carbon emission and removes the barrier of traditional transport sectors. The global Electric vehicle (EV) has taken a very popular and a huge leap ahead in the past decades. This sector has an exceptional boom in the number of EVs worldwide and industry predictions to fulfill the desire of the recent development of EVs. Global plug-in vehicle deliveries in 2019 reached 2264400 units, which are 9% higher than for 2018. This is a clear departure from the growth rates of the last 5 years between 45% to 70% near

about. The automobile sectors continued to work on innovation and recent advancement of EV technologies and its associated components such as motors, energy storage systems, power conversion technologies. At the end of 2018, there were approximately 5.2 million chargers for light-duty EVs of which closer to 540000 were public charging stations. The advancement of the EV technology will be focused on different aspects such as vehicle range, cost, batter

II. METHODOLOGY

The ESP8266 microcontroller starts by setting up its internal systems, including the I²C bus (for communication with devices like LCDs), the ADC (which reads analog voltages), and GPIO pins (used to control devices like relays). Once everything is ready, it enters a loop that runs again and again, usually every 500 milliseconds to 1 second. In each loop, the ESP8266 first measures the battery voltage. It does this by reading the voltage from a divider circuit connected to its ADC pin. Since this voltage is scaled down, the ESP8266 uses a formula in the code to convert it back to the real battery voltage. It checks this voltage to make sure it's not too high (overcharged) or too low (deep discharge), both of which can damage the battery. Next, the ESP8266 reads the temperature from a sensor like the LM35 or DS18B20. To get a more stable value, it may average several readings together. This temperature value is then used for both display and control. The ESP8266 updates an I²C LCD to show the latest battery voltage and temperature, such as displaying "Batt: 12.6 V" and "Temp: 36.4 °C". Then it checks if the temperature is too high. If it is (for example, above 40 °C), it turns on a fan by activating a relay. If the temperature drops below a safe level (like 35 °C), it turns the fan off. This

on/off control uses hysteresis, meaning the fan doesn't keep switching on and off when the temperature is near the threshold.

Optionally, the ESP8266 can also send this information over Wi-Fi. It packages the battery and temperature data into a small JSON message and sends it to a remote server using HTTP or MQTT. If the Wi-Fi is not working, it tries again later using a smart retry system. This way, the ESP8266 helps monitor and control the environment automatically and can report data remotely.

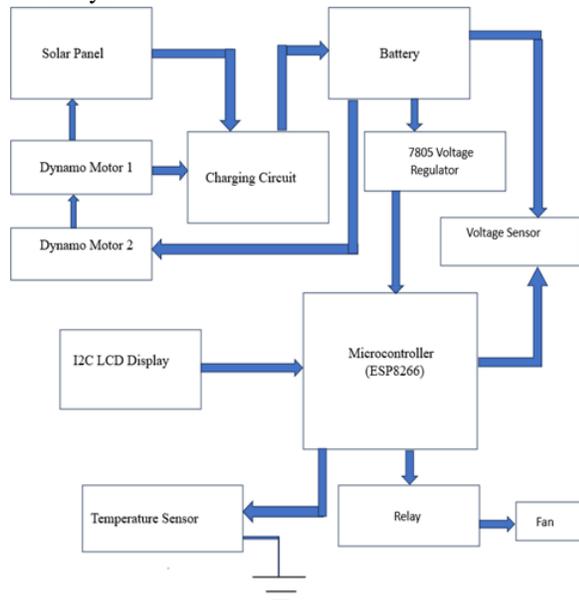


Fig .1 Block Diagram

Solar Panel : Solar panels can be integrated with self-power generating electric vehicles using driving wheels to provide additional renewable energy and enhance sustainability. By harnessing solar energy, electric vehicles can reduce their reliance on non-renewable energy sources, decrease emissions, and become even more environmentally friendly.



Figure 2. Solar panel

Battery : A lithium-ion (Li-ion) battery is a type of

rechargeable battery that uses lithium ions to store electrical energy. It consists of a positive cathode, a negative anode, and an electrolyte that facilitates the flow of ions between the electrodes.



Figure 3 Lithium Ion Battery

Dynamo Motor : A dynamo motor is an electrical machine that combines the functions of a dynamo (electric generator) and a motor. It can efficiently convert mechanical energy into electrical energy and vice versa, making it a versatile component in electric vehicles and renewable energy systems. By integrating both generator and motor functions, the dynamo motor offers a compact and space-saving solution, optimizing energy efficiency and performance in various applications.



Figure 4 .Dynamo motor

Charging Circuit :A charging circuit is an electronic circuit that safely and efficiently charges rechargeable batteries, such as lithium-ion batteries. It regulates voltage and current, monitors the battery's state of charge and temperature, and controls the charging process to prevent overcharging or damage. The circuit typically includes components like voltage regulators, current limiters, and charge controllers, which work together to optimize battery performance and lifespan.

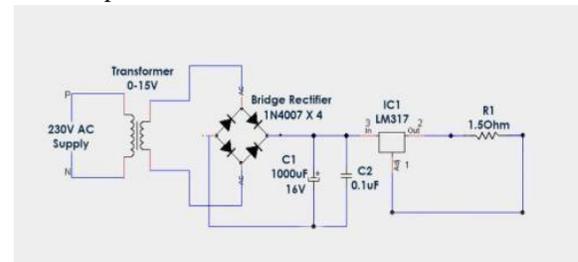


Figure 5.Charging Circuit

7805 Voltage Regulator:The 7805 voltage regulator is

a popular linear voltage regulator that outputs a constant voltage of 5V. It's commonly used in electronic circuits to provide a stable 5V supply, especially for micro controllers, sensors, and other low-power digital circuits. From an information theory perspective, the main role of a voltage regulator like the 7805 is to ensure that the electrical energy supplied to a circuit is consistent and predictable, which can be thought of as providing "stable information" to the circuit.

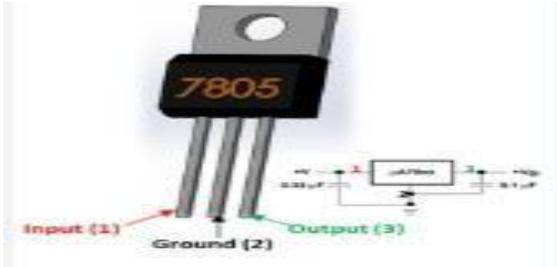


Figure 6. Voltage Regulator

Voltage Sensor :The Arduino analog input is limited to a 5 VDC input. If you wish to measure higher voltages, you will need to resort to another means. One way is to use a voltage divider. The one discussed here is found all over Amazon and eBay. It is fundamentally a 5:1 voltage divider using a 30K and a 7.5K Ohm resistor.

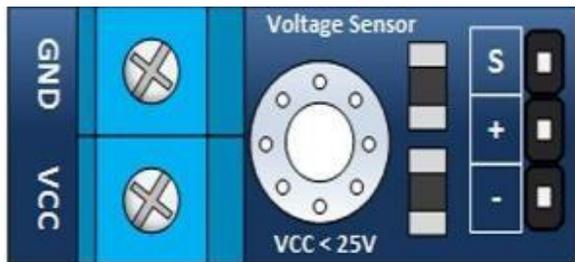


Figure 7. Voltage Sensor

I2C LCD display: This is I2C interface 16x2 LCD display module, a high-quality 2 line 16 character LCD module with on-board contrast control adjustment, backlight and I2C communication interface. For Arduino beginners, no more cumbersome and complex LCD driver circuit connection. The real significance advantages of this I2C Serial LCD module will simplify the circuit connection, save some I/O pins on Arduino board.



Figure 8 .I2C LCD Display

Microcontroller (ESP8266) : The ESP8266 is a low-cost, Wi-Fi enabled microcontroller that's widely used for IoT projects. It allows for wireless communication and internet connectivity, making it perfect for home automation, wireless sensor networks, and other interactive projects. With its ability to run small programs.

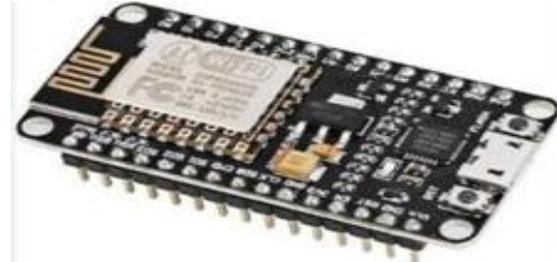


Figure 9 .Microcontroller (ESP8266)

Temperature Sensor: DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response.

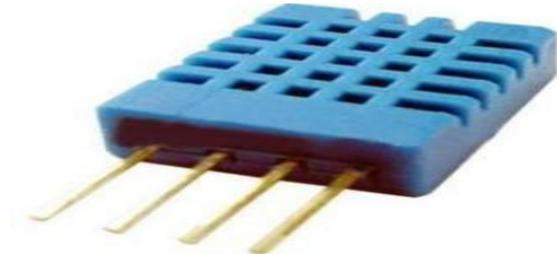


Fig 10. Temperature Sensor

Relay :A relay is an essential component in many electrical and electronic systems, acting as a bridge

between low-power control circuits and high-power operating circuits. It operates by using a small input current to magnetically activate a switch mechanism, enabling or disabling the flow of a much larger current in another part of the system. There are different types of relays, including electromechanical relays, which physically move internal contacts, and solid-state relays, which use semiconductor devices for switching without moving parts.



Fig 11. Songle Relay

Fan : A cooling fan is a device used to reduce heat by moving air across a surface or through a system, helping maintain an optimal operating temperature for electronic components or mechanical systems. It works by drawing cooler air into the system and expelling warmer air, thus preventing overheating and ensuring the equipment operates efficiently and safely. Cooling fans are commonly found in computers, power supplies, automobiles, and industrial machines.



Figure 12. Fan

III. SOFTWARE REQUIREMENT

Program

```
#define BLYNK_TEMPLATE_ID
"TMPL3A7KSLxy-
#define BLYNK_TEMPLATE_NAME "BATTERY
```

```
MONITORING"
#define BLYNK_AUTH_TOKEN
"sGzXmKgsidHFVER1MGw5JnD_-b9hk_mn"
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <Wire.h>
#include <DHT.h> #define DHTPIN D5
#define DHTTYPE DHT11 DHT dht(DHTPIN,
DHTTYPE);
#include <Wire.h>
#include <LiquidCrystal_I2C.h> LiquidCrystal_I2C
lcd(0x27, 16, 2);
char auth[] = BLYNK_AUTH_TOKEN; char ssid[] =
"IOT";
char pass[] = "12345678"; BlynkTimer timer;
// Battery monitoring parameters const int analogPin
= A0;
int relay=D0; // ADC pin for battery voltage
const float voltageDividerRatio = 2.5; // Adjust based
on your voltage divider const float maxBatteryVoltage
= 6.5; // Fully charged voltage const float
minBatteryVoltage = 2.3; // Minimum safe voltage
// Variables
float batteryVoltage = 0.0; float batterySOC = 0.0;
void setup()
{ Serial.begin(9600); pinMode(relay,OUTPUT);
digitalWrite(relay,LOW); lcd.init();
lcd.backlight();
Serial.println("initialisation is done "); delay(100);
Blynk.begin(auth, ssid, pass);
Serial.println("connected"); lcd.setCursor(0,0);
lcd.print("Battery Monitor"); delay(2000);
lcd.clear(); timer.setInterval(5000,voltcheck);
}
void loop()
{
Blynk.run ();
timer.run();
}
void voltcheck() {
int adcValue = analogRead(analogPin);
batteryVoltage = (adcValue * 3.3 / 550.0)
* voltageDividerRatio; if (batteryVoltage >=
maxBatteryVoltage) {
batterySOC = 100.0;
} else if (batteryVoltage <= minBatteryVoltage) {
batterySOC = 0.0;
} else {
batterySOC = ((batteryVoltage -
```

```

minBatteryVoltage) / (maxBatteryVoltage -
minBatteryVoltage)) * 100.0;
}
Blynk.virtualWrite(V0, batteryVoltage); float t =
dht.readTemperature(); Blynk.virtualWrite(V1,
t);
Serial.println("the temperature is : "+String(t));
//Print to Serial Monitor (for debugging)
Serial.print("Battery,Voltage:");
Serial.print(batteryVoltage, 2);
Serial.print(" V ");
// Display on LCD lcd.setCursor(0, 0);
lcd.print("Voltage: "); lcd.print(batteryVoltage,
2); lcd.print(" V");
lcd.setCursor(0, 1); lcd.print("Temp: ");
lcd.print(t, 2); lcd.print(" degree"); if(t>34)
{
digitalWrite(relay,HIGH);
}
else
{
digitalWrite(relay,LOW);
}
delay(1000);
}

```

IV. ADVANTAGES

1. One of the main advantages of the system is that it eliminates the need for repeated charging of the car.
2. The technology provides extra mileage for the vehicle and prevents the battery from draining completely.
3. The system helps to increase the efficiency of the car by avoiding overload, which reduces the external charging cycle of batteries.
4. The project's eco-friendly and reliable approach provides an economical solution to the challenges faced in electric vehicles.

The system compensates the burden on a single battery, reducing heat losses. Finally, the battery is utilized to store the generated power, optimizing the technology's energy utilization

V. FUTURE SCOPE

The future scope of self-power generation in electric vehicles using driving wheels is vast and exciting, with potential applications extending beyond just improving

range and efficiency. Some potential future developments include. The integration of self-power generation with other sustainable technologies, such as solar panels or wind turbines, to create hybrid energy systems that can power electric vehicles and feed energy back into the grid. Additionally, advancements in materials science and nanotechnology could lead to the development of more efficient and compact self-power generation systems, enabling wider adoption in various industries.

VI .CONCLUSION

Self-power generation in electric vehicles using driving wheels is a revolutionary technology that can transform the transportation sector by improving range, efficiency, and sustainability. By harnessing kinetic energy, electric vehicles can reduce emissions, increase efficiency, and promote clean energy. As research and development continue, this technology is poised to play a key role in shaping the future of sustainable energy and transportation, offering numerous benefits and contributing to a more sustainable future. With its potential to reduce reliance on fossil fuels and mitigate climate change, self-power generation using driving wheels is an exciting and promising area of research and development that can have a lasting impact on the environment and society.

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