1. ABSTRACT

This project presents a **wireless electric vehicle charging using RFID** designed to address the growing demand for electric vehicle (EV) infrastructure The system uses IR sensors in each parking slot to detect vehicle presence and display available slots on an LCD. When a vehicle parks, the slot is marked as occupied. Wireless charging is activated through an RFID-based authorization process, where a transmitter coil embedded in the parking slot transfers power to the receiver coil installed in the vehicle, charging the battery without physical connections.

The system ensures enhanced battery safety by incorporating a temperature sensor to monitor heat levels and a fire detection sensor to detect potential hazards. In case of fire or high temperature, a buzzer alarm alerts the user. A voltage sensor keeps track of the battery's charge level, ensuring efficient monitoring.

The Blynk mobile app allows users to control and monitor the robotic car remotely, adding flexibility. At the heart of the project is the ESP8266 microcontroller, which handles communication between the sensors, display, and application. This project demonstrates an innovative approach to parking management while offering seamless wireless EV charging and safety monitoring features.

2. INTODUCTION

The transition to electric vehicles (EVs) has led to a growing need for wireless charging solutions. Conventional parking spaces often require manual monitoring of slot availability, and wired charging stations are cumbersome and prone to wear and tear. This project aims to design wireless electric vehicle charging using RFID that not only automates parking slot detection but also provides a seamless, contactless charging experience for EV users.

The system uses infrared (IR) sensors installed in each parking slot to detect the presence of vehicles. When a slot is occupied, the system marks it as unavailable and displays the number of free slots on an LCD screen for easy navigation. To initiate wireless charging, the vehicle owner must use an RFID card to authorize the charging process. Once authorized, a transmitter coil embedded in the parking slot activates and transfers power to a receiver coil installed in the vehicle. This eliminates the need for physical cables and ensures a convenient charging experience.

To ensure battery safety, the system is equipped with multiple sensors, including a temperature sensor and a fire detection sensor. These sensors monitor the battery in real-time, and if abnormal heat levels or fire are detected, a buzzer alert is triggered to warn the user. Additionally, a voltage sensor tracks the battery's charge level to prevent overcharging and optimize battery life.The robotic car is controlled via the Blynk mobile app, allowing users to maneuver the vehicle remotely, enhancing user convenience. The ESP8266 microcontroller serves as the brain of the system, facilitating communication between sensors, the LCD, and the mobile application.

3.LITERATURE SURVEY

W. Lee, L. Xiang, R. Schober, and **V. W. Wong**. "Electric vehicle charging stations with renewable power generators". IEEETrans SmartGrid, 6:608-617,2015. As the number of Electric Vehicles (EVs) on the road rises, charging stations in parking garages and local service centres will increase. The customer, EV distributors, and store operators will all need to be satisfied by these stations. With the growing importance of EVs, this advanced charging system is acquiring a significant role in meeting the needs of the local distribution centre and of the EV users. EVs give an eco-friendly environment in the advanced smart city. However, there are numerous obstacles, such as path planning, smart charging, and information distribution, for the use of EVs in the smart city. Therefore, advanced methods and outputs are required to enhance the effectiveness of the current EV charging system. Considering these, this research proposes an innovative method for wireless charging battery operated vehicles using RFID tags and shortest path planning to achieve the lowest possible charging cost.

Zhou, B. Zhang, W. Xiao, D. Qiu, "Smart electric vehicle charging station using RFID", Electric vehicles (EVs) have gained popularity in recent years due to their environmental friendliness and low operating costs. However, the inconvenience of traditional EV charging methods has been a major barrier to widespread adoption. In this paper, we propose a smart wireless EV charging system that uses the integration of Internet of Things (IoT) and Radio Frequency Identification (RFID) technologies to improve the convenience and efficiency of EV charging. The system allows for automatic charging without the need for physical contact between the charging pad and the EV, thanks to the use of wireless power transfer technology. The system is also equipped with real-time monitoring and control capabilities, allowing users to check the status of their EVs and charging sessions via a mobile app. Additionally, RFID technology is used to enable secure and seamless authentication of the EV and the user. The proposed system has been simulated and evaluated in terms of its performance and energy efficiency, and the results show promising performance. This paper presents a step towards a smarter and more sustainable transportation system.

4. PROBLEM STSEMENT

The growing adoption of electric vehicles (EVs) requires not only efficient parking systems but also reliable and convenient charging infrastructure. Traditional parking systems often suffer from manual slot management, leading to inefficiencies such as wasted time searching for available spaces. Similarly, wired charging stations for EVs can be inconvenient, prone to damage, and require frequent maintenance due to wear and tear.

Moreover, electric vehicle batteries are vulnerable to thermal issues and fire hazards, especially if not properly monitored during charging. Current systems lack an integrated approach for monitoring battery temperature, fire risks, and voltage levels to ensure safe charging. As EV adoption grows, there is a pressing need for automated parking management combined with wireless power transmission and real-time safety monitoring.

The challenge is to develop a smart parking system that not only detects and displays available slots but also provides seamless wireless charging for EVs. Additionally, the system must ensure battery safety through continuous monitoring and alert mechanisms to prevent accidents or damage during charging. Remote control and monitoring via mobile applications can further enhance the user experience, making it easier to park and manage the vehicle efficiently.

5. BLOCK DIAGRAM

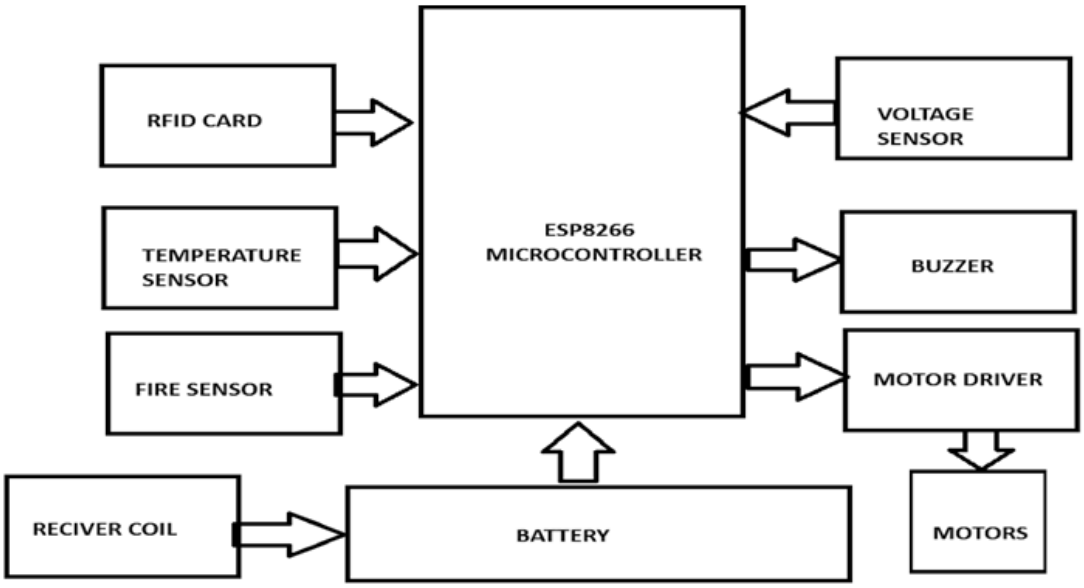

Fig.1 Car system

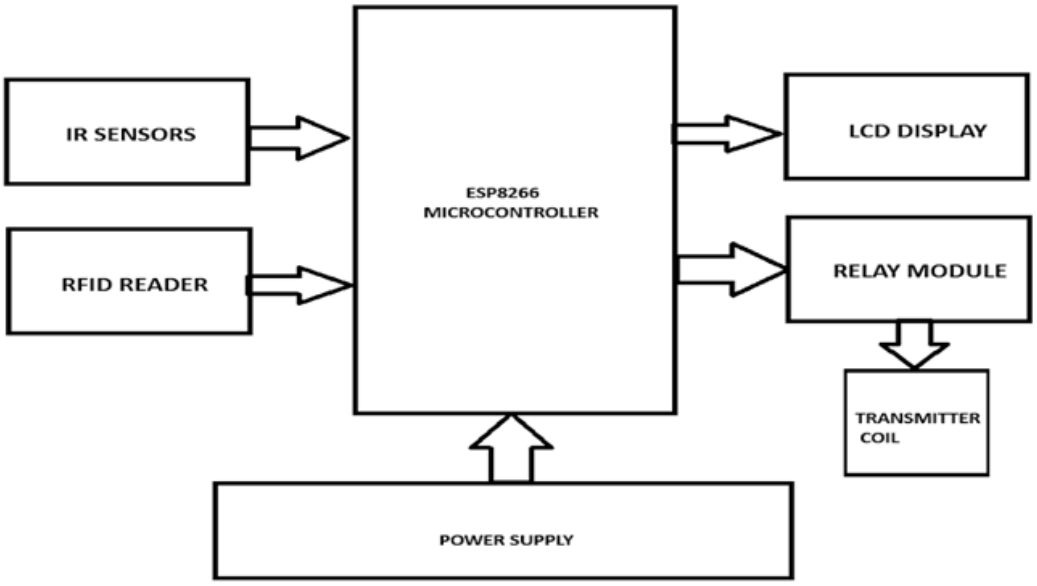

Fig.2 Station system

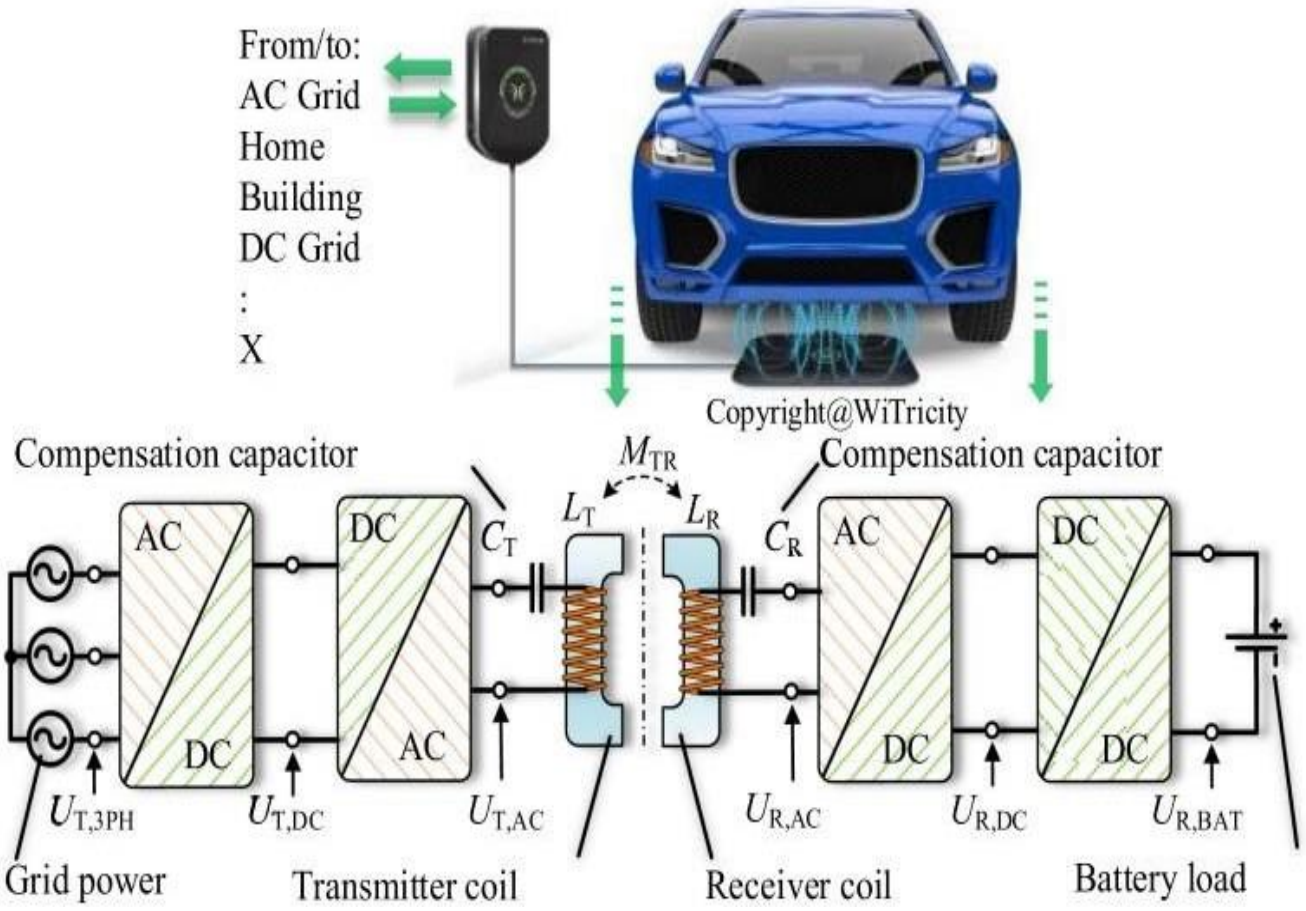

Fig.3 System work flow

6. DESIGN METHODOLOGY

The design of the **wireless electric vehicle charging using RFID** follows a modular approach, integrating hardware components and software logic to achieve seamless parking management, wireless charging, and safety monitoring. The system can be divided into multiple stages.

1. Hardware Design

1. ESP8266 Microcontroller Setup:
    - Acts as the brain of the system, handling inputs from sensors, controlling the display, and communicating with the Blynk app.
    - Connects with various sensors, RFID module, IR sensors, and LCD.

2. Parking Slot Detection Using IR Sensors**:**
    - Each parking slot has an IR sensor to detect vehicle presence.
    - When a car is parked, the sensor sends a signal to the ESP8266 to update the slot status.
    - LCD Display shows the number of available and occupied slots.

3. Wireless Charging System**:**
    - RFID Module is used to authorize charging. When an authorized RFID card is scanned, the transmitter coil in the parking slot activates.
    - The receiver coil in the vehicle receives the transmitted power, wirelessly charging the battery.

4. Battery Safety Monitoring**:**
    - Temperature Sensor continuously monitors the battery's temperature.
    - Fire Detection Sensor detects any potential fire in the battery compartment.
    - Buzzer alerts the user in case of high temperature or fire.
    - Voltage Sensor tracks the battery level and ensures optimal charging.

2. Software and Communication Design

1. Blynk Mobile App Integration**:**
    - The Blynk app allows users to remotely control the robotic vehicle and monitor the system’s status.
    - Commands are sent from the app to the ESP8266 microcontroller for car movement and status updates.

2. Wireless Communication Protocol**:**

- The ESP8266 microcontroller communicates wirelessly with the Blynk server to exchange data in real time.
- Sensor data and alerts (temperature, fire, voltage levels) are transmitted to the user's mobile app.

3. Data Flow and Logic Control**:**
   - Upon vehicle detection, the system updates the LCD display and sends parking information to the microcontroller.
   - When an RFID card is scanned, the microcontroller activates the transmitter coil for wireless charging.
   - In case of safety issues (e.g., high temperature or fire), the system triggers the buzzer and notifies the user.

3. System Workflow

1. The car arrives and parks in an available slot detected by the IR sensor.
2. The ESP8266 microcontroller updates the status on the LCD and blocks the slot.
3. The driver authorizes wireless charging via the RFID module, activating the transmitter coil.
4. The receiver coil in the car battery receives power for wireless charging.
5. Temperature, fire, and voltage sensors monitor battery health throughout the charging process.
6. If any abnormal conditions are detected, the buzzer triggers, and the user is notified through the Blynk app.

7. The driver can remotely control the vehicle using the Blynk app for smooth parking and Exit operations.

7. OBJECTIVES

1. Automate Parking Management**:**
    - Detect the presence of vehicles in each slot using IR sensors.
    - Display available and occupied parking slots on an LCD screen.

2. Implement Wireless Charging**:**
    - Provide seamless, contactless charging through resonant wireless power transmission.
    - Activate the transmitter coil upon successful RFID-based authorization.

3. Ensure Battery Safety**:**
    - Monitor battery temperature in real-time using a temperature sensor.
    - Detect potential fire hazards using a fire detection sensor.
    - Alert users with a buzzer in case of high temperature or fire risk.

4. Monitor Battery Health:
    - Track the battery voltage to prevent overcharging and ensure optimal battery performance.

5. Enable Remote Control**:**
    - Use the Blynk mobile app to remotely control the robotic vehicle for parking and management.

6. Facilitate Efficient Parking Solutions**:**
    - Eliminate the need for manual parking slot management, reducing user effort and time.

7. Enhance User Convenience**:**
    - Provide a fully automated, user-friendly system for both parking and charging.

8. Integrate with IoT Technology**:**
    - Use the ESP8266 microcontroller to manage communication between sensors, displays, and the mobile app.

9. Promote Sustainability**:**
    - Support the growing adoption of electric vehicles by offering a robust charging infrastructure.

10. Minimize Maintenance Needs**:**
    - Replace traditional wired charging with wireless transmission, reducing wear and tear.

8.HARDWARE/SOFTWARE REQUIREMENTS

Hardware Requirements

1. ESP8266 Microcontroller
    - Acts as the central control unit for the system, facilitating communication between sensors, displays, and the Blynk app.

2. IR Sensors
    - Installed in each parking slot to detect vehicle presence and update slot status.

3. LCD Display
    - Shows the number of available and occupied parking slots to users.

4. RFID Module
    - Used for authorizing wireless charging and accessing the parking slot.

5. Wireless Charging System
    - Transmitter Coil: Installed in the parking slot to transfer power.
    - Receiver Coil: Installed in the vehicle to receive power and charge the battery.

6. Temperature Sensor
    - Monitors the battery temperature to ensure safe charging.

7. Fire Detection Sensor
    - Detects any potential fire in the vehicle's battery compartment.

8. Voltage Sensor
    - Monitors the battery's voltage level to prevent overcharging.

9. Buzzer
    - Alerts users in case of high temperature or fire detection.

10. Power Supply
    - Provides power to all components, ensuring stable operation.

11. Connecting Wires and Breadboard

    - For prototyping and connecting components

Software Requirements

1. Arduino IDE
    - Development environment for programming the ESP8266 microcontroller.

2. Blynk Mobile App
    - Used for remote control and monitoring of the robotic vehicle, as well as displaying the system's status.

3. Libraries for ESP8266
    - Necessary libraries to facilitate communication with the Blynk app and sensor integration (e.g., Blynk, IR, and temperature sensor libraries).

4. Wi-Fi Connection
    - For ESP8266 to communicate with the Blynk server and enable remote access.

5. Cloud Server (Blynk Cloud)
    - Provides the backend support for data storage and communication between the app and the microcontroller.