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Detection System for Vehicles, using Counterfeit Number Plates

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Abstract: *Automatic Number Plate Recognition (ANPR) systems are widely used in intelligent transportation and security monitoring applications. This work presents a system for detecting fraudulent or stolen vehicle or counterfeit number plates using image processing, deep learning, and Optical Character Recognition (OCR) techniques. The system first captures the vehicle image and applies preprocessing techniques to extract the license plate region. A deep learning–based detection model identifies the number plate, and OCR is used to recognize the characters. The extracted number is then compared with a registered vehicle database to verify its authenticity. If the number plate is identified as fake or stolen, the system generates an alert for security monitoring. Based on the verification result, a security operator can manually control the opening or closing of the entry gate. This approach improves vehicle identification, enhances security, and assists in preventing unauthorized vehicle access in restricted areas*

Keywords: *Automatic Number Plate Recognition*

I. INTRODUCTION

Criminals frequently employ forged or cloned license plates to mask the movement of stolen vehicles and circumvent automated toll collection systems.

The system assigns a unique "digital fingerprint" to each vehicle that communicates wirelessly with the checkpoint, ensuring the vehicle's identity is verified through internal hardware rather than just a visual plate.

If the observed physical plate does not match the encrypted hidden ID, the system instantly flags the data mismatch as a high-priority security anomaly.

Rather than automated containment, the system alerts a monitoring operator who must then utilize the manual control keys to actuate the security gate.

II. LITERATURE SURVEY

Recent research in vehicle security highlights a shift from manual monitoring to automated, multi-modal verification systems. Early studies (Liu et al., 2010) focused on basic GPS and GSM tracking, but these were often reactive, occurring after a theft had already happened. Modern literature (Sridhar, 2024) emphasizes the "Preventative" approach, suggesting that RFID and IoT are the most cost-effective tools for real-time authentication at checkpoints. Experts in the field of Smart Cities have demonstrated that traditional License Plate Recognition (LPR) via cameras can be fooled by dirt, weather, or high-quality fake plates. Therefore, the current trend in engineering literature supports "Hybrid Systems"—where a physical ID is backed by an electronic chip. By integrating a NodeMCU, this project builds upon existing research to provide a decentralized, low-cost solution that allows property owners and law enforcement to monitor security gates remotely through smartphone applications, filling a critical gap in current urban security infrastructure.

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III. PROPOSED SYSTEM

The proposed system introduces an automated, high-security approach to identifying counterfeit license plates using a combination of RFID technology and the Internet of Things (IoT). Instead of relying solely on visual number plates, which are easily cloned or stolen, every vehicle is equipped with a unique RFID tag that acts as a secure "digital fingerprint." When a vehicle approaches the entry point, an IR sensor triggers the system, and the RC522 RFID reader scans the hidden ID. This data is processed by the NodeMCU (ESP8266), which compares the chip's ID with the registered plate number in its database. If the IDs match, a Servo Motor automatically lifts the security gate; however, if a mismatch is detected, the system immediately locks the gate, sounds a loud alarm via a 555 timer-controlled buzzer, and sends a real-time notification to a Wi-Fi-connected mobile app. This dual-layer verification ensures that even if a criminal swaps a physical plate, the electronic identity remains untampered.

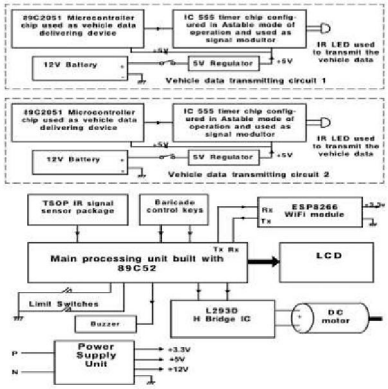


Fig. 01: Block Diagram of Detection System for Vehicles using Counterfeit Number Plates

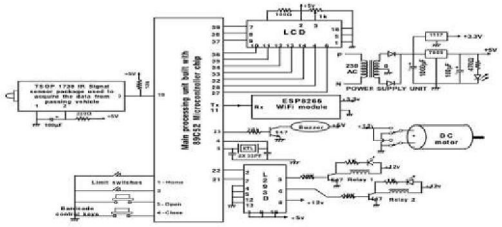


Fig. 02: Circuit Layout of Detection System for Vehicles using Counterfeit Number Plates

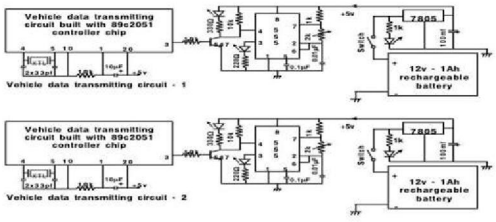
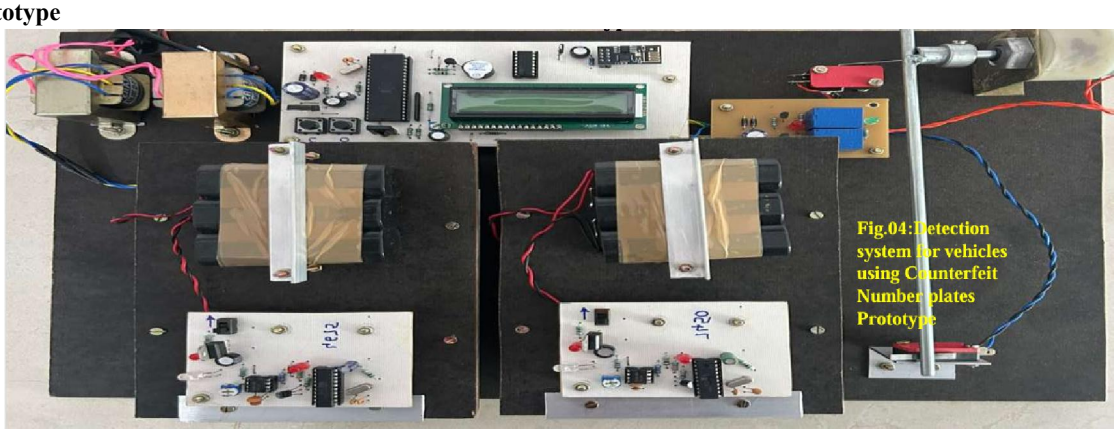


Fig. 03: Circuit Layout of Detection System for Vehicles using Counterfeit Number Plates

Prototype



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IV. RESULTS AND DISCUSSION

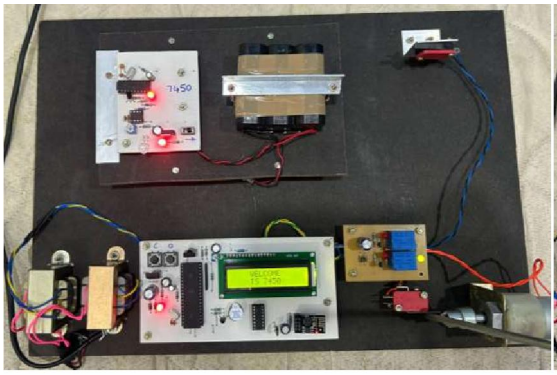

Fig. 05: Genuine Vehicle

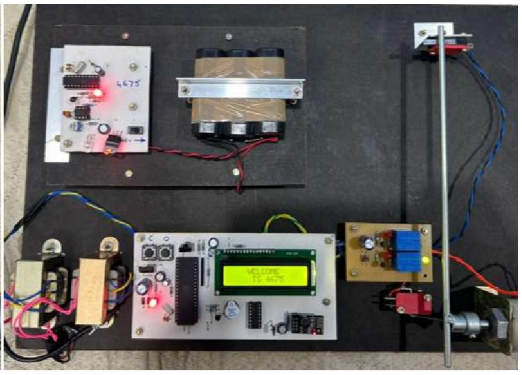

Fig. 06: Counterfeit vehicle detected

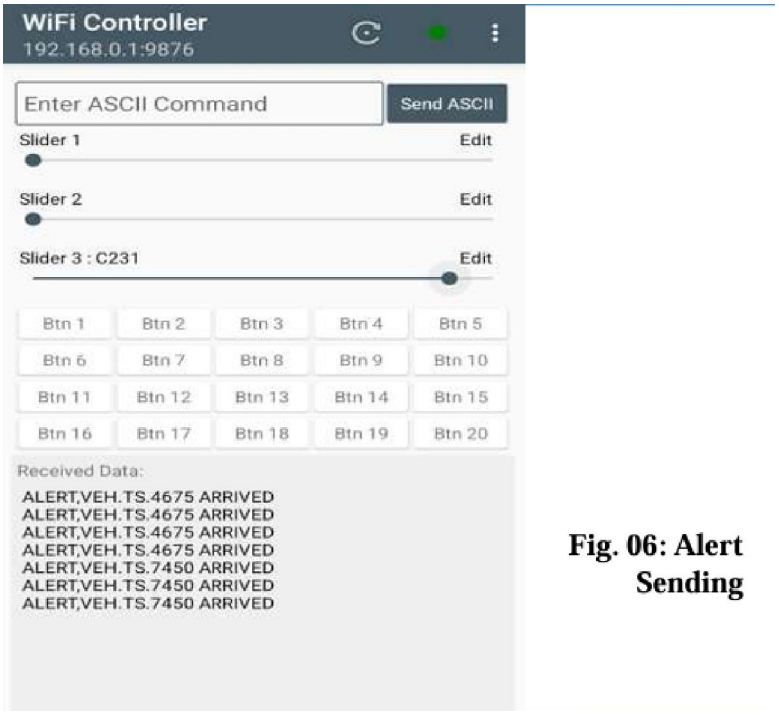

Fig. 06: Alert Sending

The prototype system successfully demonstrates the operation of a wireless renewable energy powered public transport system. The solar panel effectively charges the battery which powers the wireless charging transmitter. Wireless power transfer was successfully achieved when the tram stopped at the designated station position. The voltage readings confirmed that energy transfer occurred between the transmitter and receiver coils. The obstacle detection system successfully stopped the tram when an object was placed on the track. The automatic door system and countdown display also operated correctly. The results confirm that renewable energy powered wireless transportation systems can be implemented for smart city transportation with improved energy efficiency and automation.

V. CONCLUSION

This project demonstrates a prototype wireless renewable energy powered public transport system that integrates solar energy, wireless power transfer, and automated vehicle control. The system successfully operates as a driverless tram

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moving between stations while charging wirelessly using renewable energy. Safety features such as obstacle detection, automatic door operation, and alarm alerts improve system reliability. The results demonstrate the feasibility of implementing eco-friendly, automated transportation systems for future smart cities.

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