

# RFID Based Vehicle Registration Details and Theft Control System

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## ABSTRACT

Vehicle theft and conventional vehicle-registration verification are important challenges in modern transportation systems. Manual verification of registration documents is time-consuming and may be affected by errors, while conventional methods of identifying stolen vehicles often depend on complaints, visual inspection, and surveillance footage. This paper presents an RFID-based vehicle registration details and theft control system using an Arduino controller. Each vehicle is associated with an RFID tag containing a unique identification code linked with its registration information. During normal verification, an RFID reader detects the tag and allows the corresponding vehicle information to be displayed through a computer. When a vehicle is reported stolen, its RFID information can be registered in the monitoring system. If the identified stolen vehicle subsequently passes through the RFID monitoring point, the controller detects its RFID information and activates the theft-control mechanism. A motor-driver-controlled gate is used to restrict the movement of the identified vehicle. The developed system demonstrates the applicability of RFID technology for automated vehicle identification, registration verification, and theft detection.

**Keywords**— RFID, Vehicle Registration, Vehicle Theft Detection, Arduino, RFID Reader, RFID Tag, L298 Motor Driver, Vehicle Security.

## INTRODUCTION

Radio Frequency Identification (RFID) is an automatic identification technology that enables information stored in RFID tags to be retrieved wirelessly through radio-frequency signals. An RFID system mainly consists of an RFID tag and RFID reader. The tag provides a unique identity that can be associated with an object or vehicle, while the reader detects the tag whenever it enters the required reading range. RFID technology therefore provides an effective method for automatic vehicle identification without requiring continuous manual verification.

Traditional vehicle checking generally requires authorities to stop vehicles and verify registration documents manually. Such procedures consume considerable time and may result in inconvenience during road checking. RFID technology provides an alternative approach in which a unique RFID tag can be assigned to each registered vehicle.

The tag identity can be associated with information such as the vehicle registration number, owner details, and vehicle specifications. When the vehicle approaches an RFID reader, its identity can be automatically acquired and matched with the available registration information.

The same infrastructure can also be employed for vehicle theft detection. When a vehicle is reported stolen, its RFID identification can be marked accordingly in the monitoring system. RFID readers installed at strategic checkpoints can identify the stolen vehicle whenever its RFID tag enters the reading range. The information is processed by the controller, which can subsequently activate an alert and vehicle-control mechanism. The proposed system therefore combines vehicle registration verification and theft detection into a common RFID-based platform.

## LITERATURE SURVEY

Pavan Kumar *et al.* [1] presented a portable vehicle theft and number-plate detection approach intended to distinguish genuine vehicles from vehicles using duplicate registration plates. The work highlighted limitations associated with conventional image-processing-based number-plate verification and proposed RFID technology for faster retrieval of vehicle information. RFID-based identification allows traffic authorities to obtain vehicle details using the unique RFID identity, reducing the time required for conventional verification. Nayyar and Singh [2] considered RFID-based vehicle theft control, demonstrating the usefulness of unique electronic identification for improving vehicle security and facilitating identification of stolen vehicles.

RFID technology has also been investigated for vehicle registration, traffic management, tracking, and anti-theft applications. Al-Kashoash [3] discussed RFID-based vehicle registration and management, while Pandey and Dangi [4] investigated RFID vehicle identification and registration for traffic-management applications. Sahoo *et al.* [5] considered vehicle tracking using RFID and GSM technologies. Zong and Hong [6] developed an RFID-based vehicle anti-theft system emphasizing vehicle identification, real-time monitoring, and improved security. Tejwani *et al.* [7] studied RFID-based vehicle identification and access control. These studies demonstrate that RFID provides a suitable platform for rapid vehicle identification and can be combined with controllers, databases, communication systems, and physical access-control mechanisms.

## PROBLEM STATEMENT

The existing vehicle registration and verification process largely depends on manual documentation, making it time-consuming and susceptible to human errors. In addition, the increasing incidence of vehicle theft creates difficulties for vehicle owners and law-enforcement authorities in quickly identifying and recovering stolen vehicles. Therefore, an RFID-based system is proposed to automate vehicle identification and registration verification while providing an effective theft-control mechanism for detecting stolen vehicles at monitoring checkpoints.

## OBJECTIVES

1. To develop an RFID-based vehicle registration system that automatically identifies vehicles using unique RFID tags and enables quick and accurate retrieval of vehicle registration and ownership details.
2. To develop an RFID-based vehicle theft detection and control system that identifies a reported stolen vehicle at an RFID checkpoint and activates the control mechanism to restrict the vehicle, thereby assisting authorities in its recovery.

## PROPOSED SYSTEM

The proposed system consists primarily of RFID tags, an RFID reader, an Arduino controller, an L298 motor driver, a gate-control motor, a regulated power supply, and a computer-based vehicle-information interface. An RFID tag is associated with each vehicle and provides a unique identification code. When the vehicle approaches the monitoring point, the RFID reader detects the tag and transfers the identification information to the controller.

For vehicle registration verification, the detected RFID identity is processed so that the corresponding registration information can be displayed on a computer. For theft control, information relating to a stolen vehicle is registered in the monitoring system. When the RFID reader detects the corresponding stolen-vehicle tag, the Arduino processes the RFID information and generates the required control command. The L298 motor driver subsequently operates the motor associated with the gate mechanism so that the vehicle can be restricted at the checkpoint.

## BLOCK DIAGRAM

**Fig. 1** shows the RFID-based vehicle registration monitoring system, where the RFID reader detects the tag fitted inside the vehicle and sends its information to the Arduino controller. The processed vehicle registration details are then displayed through the PC interface.

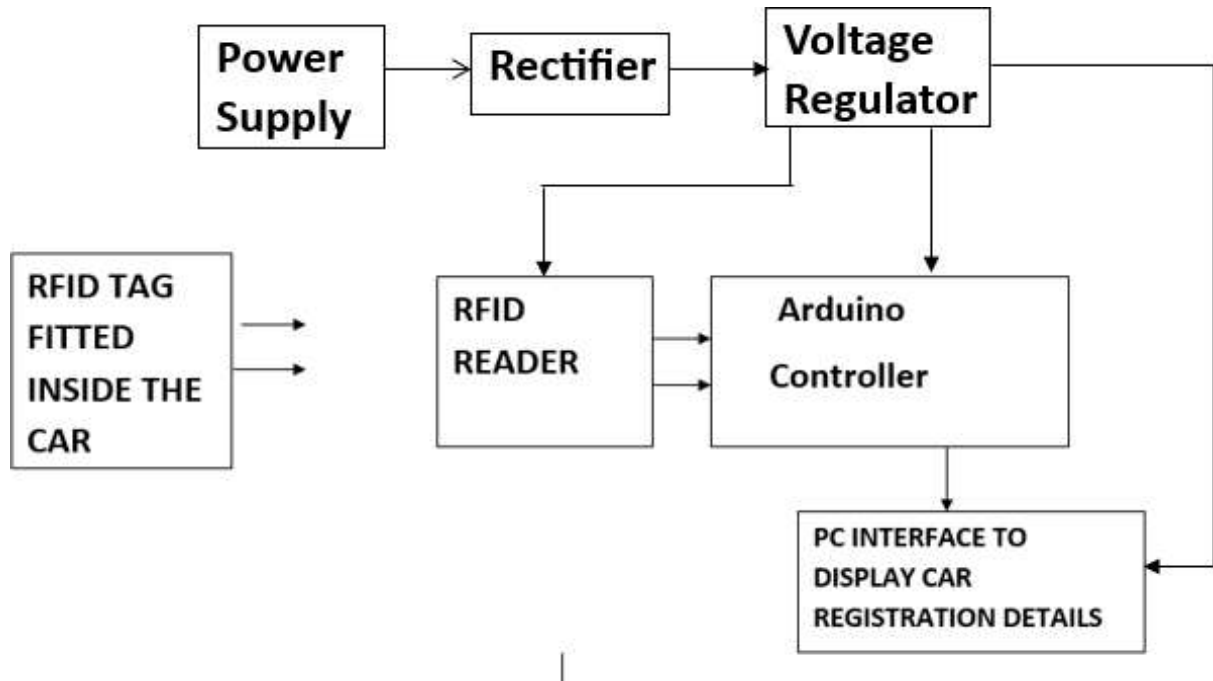


Fig 1 Registration detail monitoring block

**Fig. 2** shows the RFID-based vehicle theft control system, in which the microcontroller identifies the RFID tag of a stolen vehicle and activates the motor-driving system. The motor operates the monitoring or toll-gate mechanism to close the gate and restrict the stolen vehicle from passing through.

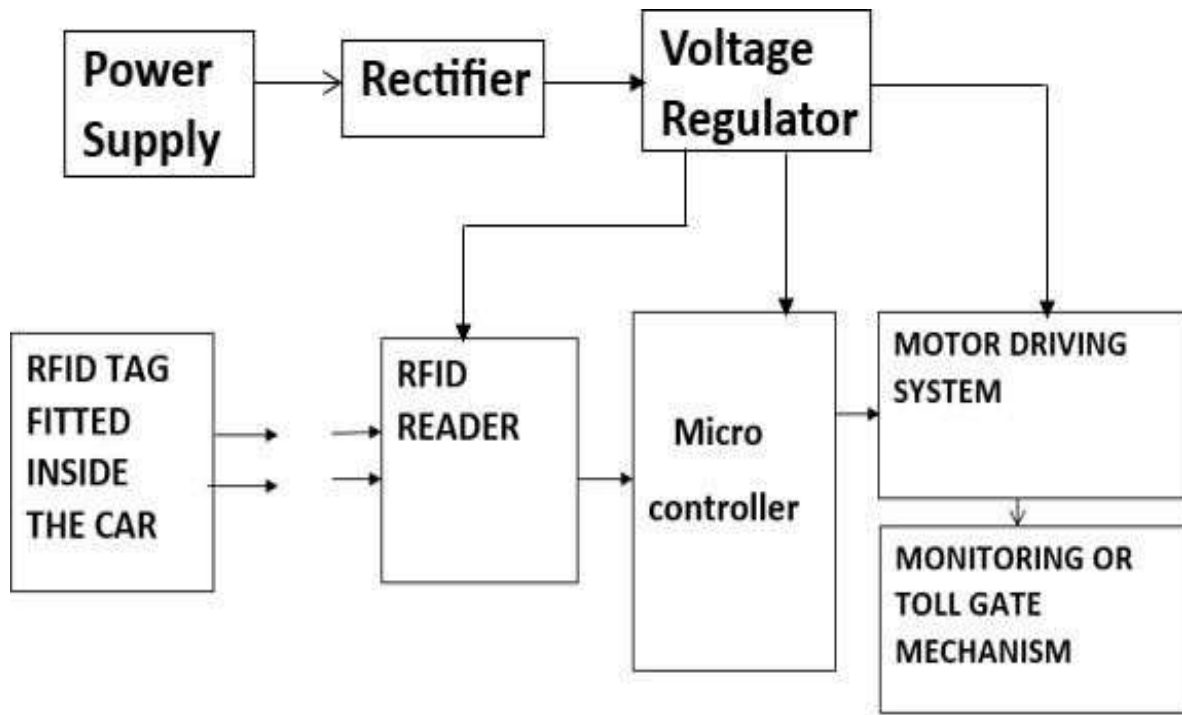


Fig 2 Vehicle theft control system

## CIRCUIT DIAGRAM

**Fig. 3** shows the circuit diagram of the RFID-based vehicle registration and theft control system, integrating Arduino Uno controllers, RFID readers, RFID tags, and the L298 motor driver. The RFID information is processed by the controller, which activates the motor driver to operate the gate mechanism when a stolen vehicle is detected.

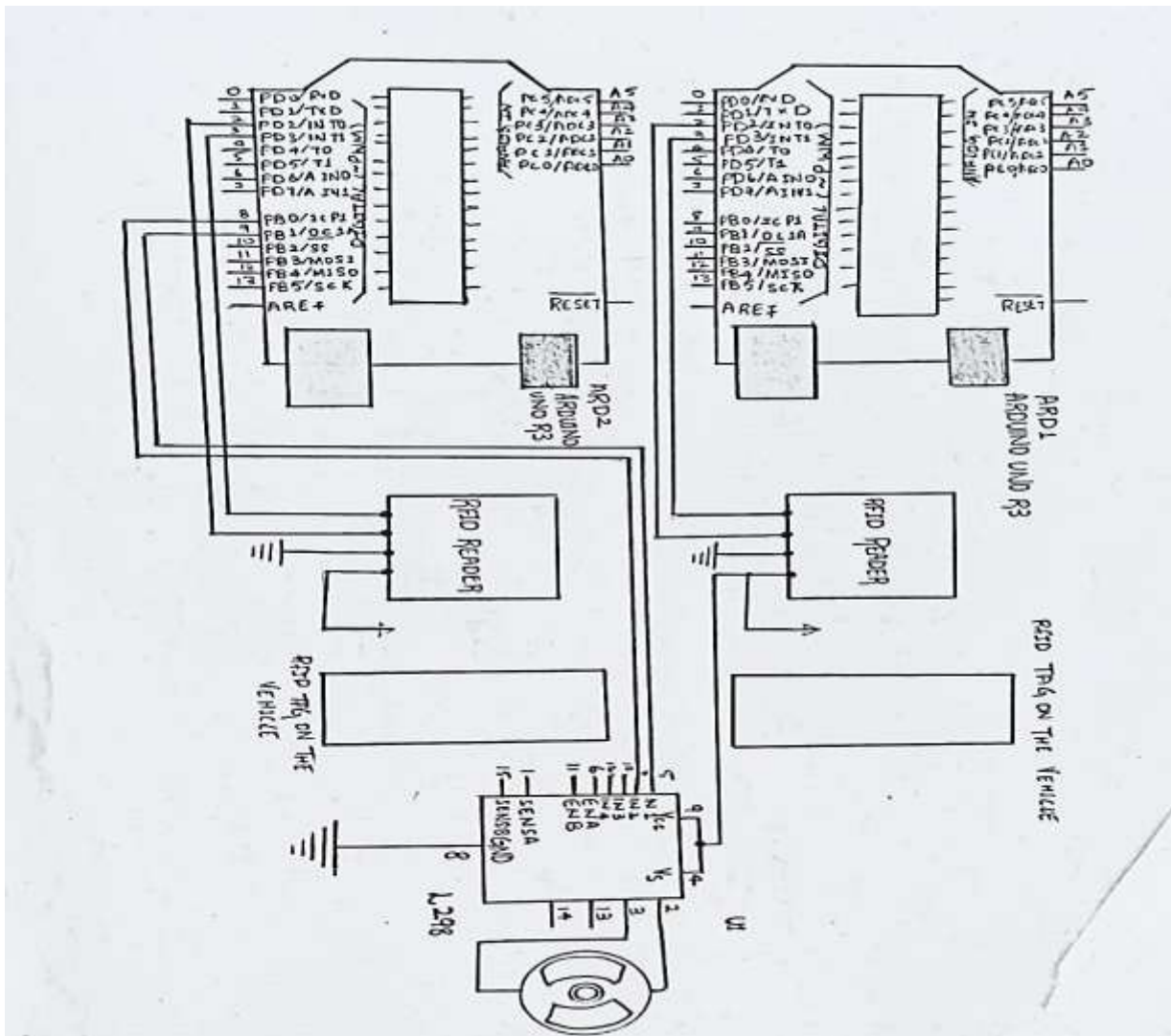


Fig 3 Circuit diagram

## METHODOLOGY

Initially, a unique RFID tag is associated with the corresponding vehicle registration information. The RFID reader continuously monitors its reading region for the presence of an RFID tag. When a vehicle carrying a tag approaches the reader, its unique RFID information is captured and supplied to the Arduino controller. For registration verification, the detected identity is processed and the associated vehicle information can be presented through the computer interface. This enables authorities to obtain registration information without relying exclusively on manual examination of physical documents.

For theft-control operation, the RFID identity of a reported stolen vehicle is stored or marked in the monitoring system. When that vehicle passes through an RFID-enabled checkpoint, its tag is automatically detected. The Arduino compares the received RFID information with the stored information and identifies the vehicle as stolen. It then activates the theft-control output. Through the L298 motor driver, the bidirectional motor operates the physical gate mechanism, closing the gate and preventing the identified vehicle from passing through the checkpoint. This sequence provides automatic identification followed by immediate physical control.

## RESULTS AND DISCUSSION

The Fig. 4 developed prototype demonstrates the practical implementation of RFID-based vehicle registration verification and theft control. The RFID reader detects the tag fitted to the vehicle, and the controller processes the received information to display registration and insurance details on the connected computer. This automated

identification process minimizes manual document verification and enables faster and more efficient retrieval of vehicle information.

During the theft-control demonstration, the same RFID identification principle is employed to detect a vehicle whose information has already been registered as stolen. When the corresponding RFID tag is detected, the controller recognizes the stolen-vehicle condition and activates the bidirectional motor through the motor driver. The motor operates the gate mechanism to close the passage, thereby restricting the vehicle. The implemented model consequently demonstrates the feasibility of combining RFID vehicle identification with an automatic physical theft-control mechanism.

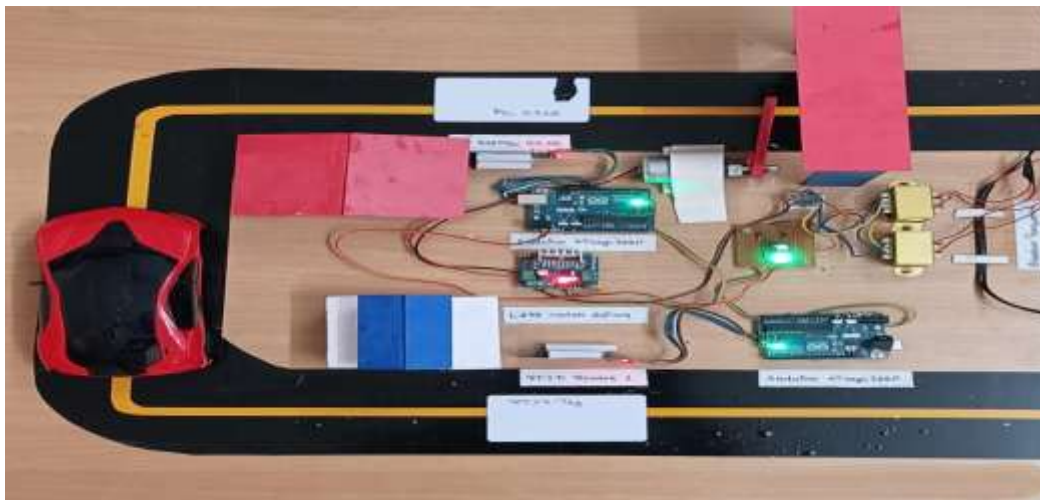


Fig 4 Hardware Setup

## CONCLUSION

An RFID-based vehicle registration details and theft control system has been presented for improving vehicle identification, registration verification, and theft detection. RFID tags provide unique vehicle identities, while the RFID reader and Arduino controller enable automatic acquisition and processing of vehicle information. During normal operation, registration details can be retrieved and displayed through the computer interface. When a vehicle previously identified as stolen passes through the RFID monitoring point, the controller detects its RFID identity and activates the L298 motor-driver-based gate-control mechanism. The developed prototype demonstrates that RFID technology can provide a simple and effective platform for combining vehicle registration monitoring with theft-control functionality. Further integration with GPS, IoT, centralized databases, and communication technologies can improve the scalability and effectiveness of the system.

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