Autonomous Smartguard: Sustainable Vehicle Management System Using RFID

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***Abstract*—A rapid growth of transportation has become a crucial factor in the development of country, leading to an increased demand for vehicles. This surge in the number of vehicles on the roads has escalated traffic related issues, particularly road crashes. One of the primary contributors to this accident is excessive speeding. This project not only mitigates the risk of accidents but also supports sustainable urban development.**

***Keywords*—growth of transportation, increased demand for vehicles, supports sustainable urban development.**

I. INTRODUCTION

Transportation plays a vital role in economic growth and societal connectivity, but increasing vehicular demand has led to challenges like congestion and road accidents. Excessive speeding is a major contributor to road crashes, resulting in significant loss of life and property, making it essential to implement effective solutions. This project introduces an RFID-based system to discreetly monitor vehicle speeds and detect violations in real time, transmitting data to traffic authorities for action. This system enhances road safety while allowing future integration with smart transportation initiatives like adaptive traffic control and autonomous vehicles, contributing to a more sustainable and intelligent transportation infrastructure.

II. LITERATURE SURVEY

"Conceptualization of smart system based on RFID technologies for controlling vehicle speed" by Evan Asfoura, Mohammed Samir Abdel Haq in volume 10, February 2021. This paper proposes a smart system designed enhance safety using RFID technology.

"Automatic speed control of vehicle by using RFID technology" by Dakshata Ramesh Dhote, Pragati Ramesh Lakde in volume4, July 2021. This paper proposes a method for automatically controlling vehicle speed in designated zones using RFID technology.

"Alert of high speed vehicles highways using RFID and GSM" by G.B Shivarani, M supraja, K Mounika, N Ramanna in volume 6 march 2018. This paper proposes The system uses RFID technology to track vehicles by reading RFID tags attached to them and GSM technology to send real time alerts to authorities.

"RFID based traffic violation detection and traffic flow analysis system" by Sarita M, Rajalakshmi S, Angel Deborah, Milton R S in volume 118 november 2018. This paper proposes a system that uses radio frequency identification technology to detect traffic violations and analyse traffic flow.

"IoT enabled vehicle speed monitoring system" by Shafi Ullah Khan, Noor Alam, Sana Ullah jan in February 2021. .

This paper proposes an internet of things based system for monitoring and managing vehicle speed to enhance road safety.

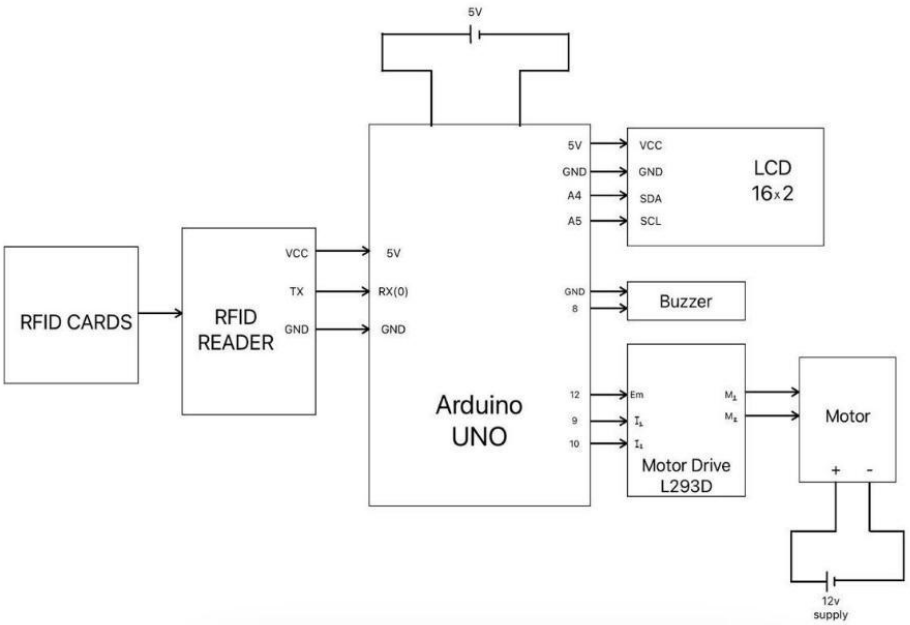
Common Template: All Journals (Mention Journal Name, Month & Year of Publication)

III. METHODOLOGY

The methodology of this project begins with identifying the limitations of traditional vehicle access systems, such as manual logging, inefficiencies, and environmental impact. The objective is to develop an autonomous, RFID-based

vehicle management system that enhances security, automates entry/exit operations, and promotes sustainability. The system is designed to include RFID tags installed in vehicles, RFID readers at entry and exit points, a microcontroller (such as Arduino or Raspberry Pi) to process tag data, and a server-side application for data logging and access control. The hardware is integrated with a power supply, ideally supported by solar energy to reduce carbon footprint. On the software side, firmware is developed to control the gate mechanism and authenticate RFID tags, while a web-based interface allows administrators to monitor vehicle movements, generate reports, and manage user data. RFID tags are registered and linked to a central database where all access logs are securely stored.

IV. BLOCK DIAGRAM



V. WORKING FLOW CHART

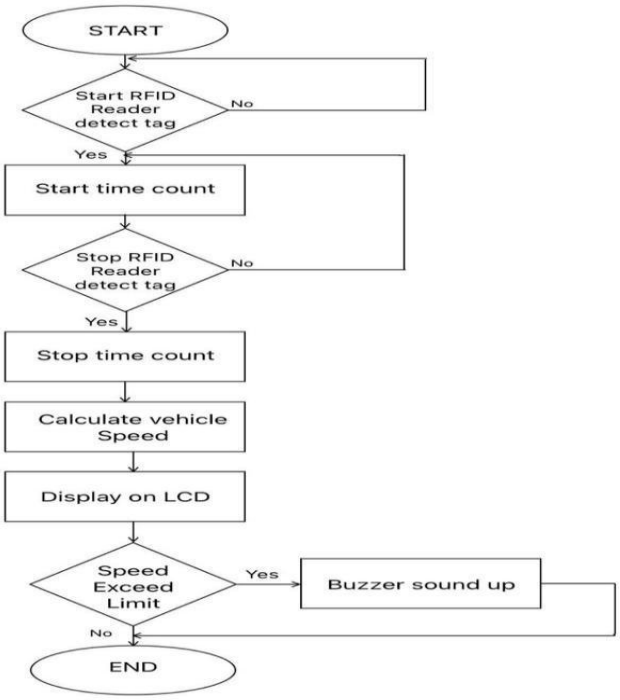
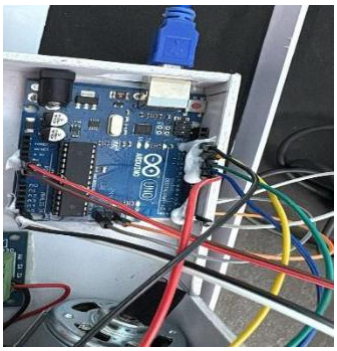


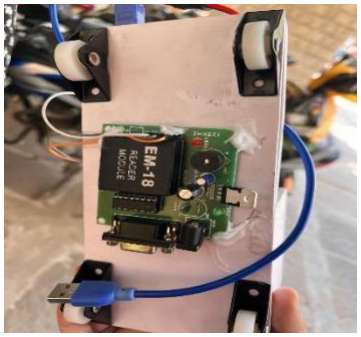
Fig. 1 Detection and Monitoring (a) Block diagram (b) Working Flowchart

VI. EXPERIMENTAL RESULTS

- Connection between the two RFID readers and Arduino Uno is established.
- The speed of the vehicle in order to check violations is determined.
- The driver is alerted by buzzer sound .

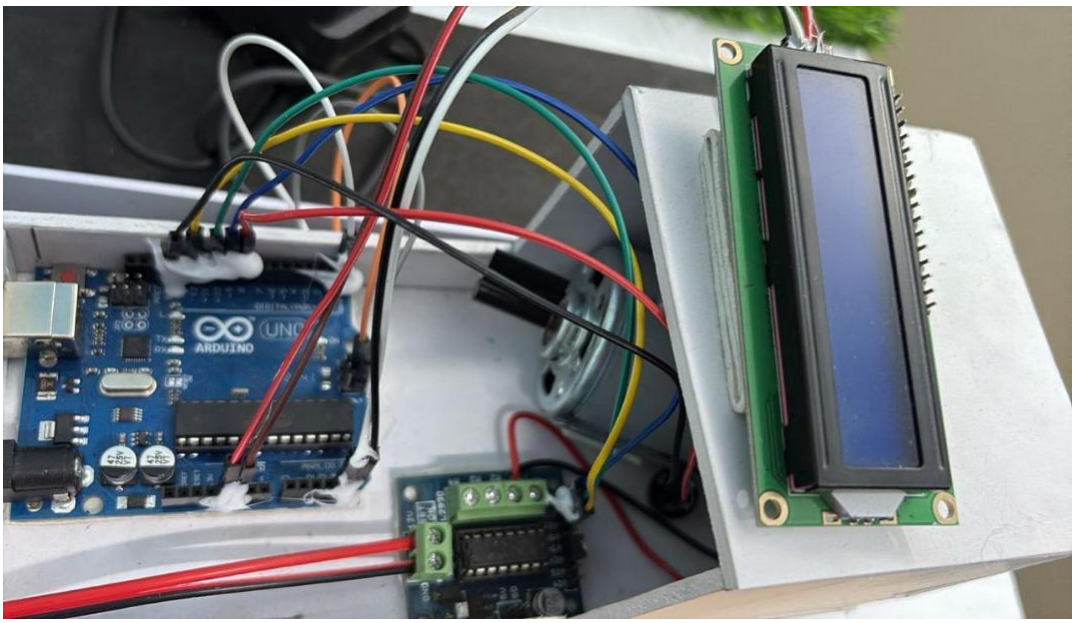


a.



b.

Fig. 2. Text Detection and monitoring (a) Arduino Uno (b) EM18 module



a.

Fig. 3 Detection and Monitoring (a) Circuit Connection

VII. CONCLUSION

At the end of this project, a working full prototype system was developed. The two RFID readers can scan the vehicle every time it pass through the RFID readers. The RFID readers can scan the vehicle only if the vehicle pass from the start RFID reader to the stop RFID reader. There is impossible for a vehicle to move in an opposite direction on the road. The full prototype system is able to calculate the time difference for the vehicle to pass through the two consecutive RFID readers and able to calculate the speed based on the time difference. Finally, a buzzer will sound up to alert the driver if the vehicle exceeds the speed limit. Although this project is proven to be difficult but the project objectives are able convert into deliverables such as calculate the vehicle speed using RFID technology, which cause the driver hard to recognize the enforcement zone and the driver will reduce the vehicle speed to avoid being fined.

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