ABSTRACT

The goal of this project is to design a system that can control the speed of a vehicle based on the speed limit signs using an RFID module and an Arduino Uno microcontroller. The system uses an RFID module to detect the presence of a speed limit sign, and then uses the Arduino Uno to adjust the speed of the vehicle accordingly. The system also incorporates an L298N motor driver and a 60 kmph speed limit sign to enhance its functionality.

This project aims to provide a solution to the problem of vehicles exceeding speed limits, which is a major cause of road accidents. By controlling the speed of the vehicle based on the speed limit signs, the system ensures that the vehicle is always traveling at a safe speed. The use of an RFID module provides a reliable and efficient means of detecting speed limit signs, while the Arduino Uno microcontroller provides a flexible and programmable platform for controlling the vehicle speed.

The project includes a detailed description of the hardware components, software design, and implementation of the system. The system has been tested and evaluated under various conditions, and the results show that it is effective in controlling the speed of the vehicle based on the speed limit signs.

Overall, this project demonstrates the feasibility and effectiveness of using an RFID module and an Arduino Uno microcontroller to control the speed of a vehicle based on the speed limit signs, and provides a platform for future development and improvement of the system.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATION

RFID	Radio Frequency Identification
LCD	Liquid Crystal Display
ACC	Adaptive Cruise Control
I2C	Inter-Intergrated Controller
NHTSA	National Highway Traffic Safety Administration
ITS	Intelligient Transport System
GPS	Global Positioning System
GND	Ground

CHAPTER 1
INTRODUCTION

Speed limit signs are crucial in regulating traffic on roads and highways to ensure the safety of drivers and passengers. However, many drivers exceed the speed limit, which can lead to accidents and other traffic-related incidents. To address this issue, we propose a system that can control the speed of a vehicle whenever it encounters a speed limit signboard.

The proposed system is designed to use Radio Frequency Identification (RFID) technology to detect speed limit signboards and adjust the vehicle speed accordingly. The system consists of an RFID reader, an Arduino Uno microcontroller, two motors, and an LCD display I2C. When the RFID reader detects an RFID tag on a speed limit signboard, it sends a signal to the Arduino Uno, which triggers the speed control system. The motors are used to control the vehicle's speed, and the LCD display shows the status of the speed change.

The main objective of this project is to develop a system that can regulate the speed of a vehicle in real-time based on the speed limit indicated on the signboard. The system aims to reduce the number of accidents and other traffic-related incidents caused by speeding, thereby improving road safety. Additionally, the proposed system can be integrated with existing traffic management systems, making it a valuable addition to any smart city project.

This report will provide a detailed description of the proposed system, including the hardware and software design, implementation, testing, and results. The report will also include a literature review of existing speed control systems and technologies used on roads and highways, as well as an overview of the limitations and drawbacks of these systems.

Overall, the proposed system has the potential to significantly improve road safety and reduce the number of accidents caused by speeding. By developing a system that can regulate the speed of a vehicle in real-time, we can help ensure the safety of drivers and passengers on our roads and highways.

1.1 BACKGROUND AND MOTIVATION FOR THE PROJECT

Speeding is a major problem on roads and highways, and it can lead to serious accidents and other traffic-related incidents. According to the National Highway Traffic Safety Administration (NHTSA), speeding was a factor in 26% of all traffic fatalities in 2019. Additionally, speeding can also result in higher fuel consumption, increased emissions, and reduced vehicle lifespan. Therefore, there is a need to develop systems that can regulate the speed of vehicles on roads and highways.

To address this issue, we propose a system that can regulate the speed of a vehicle based on the speed limit indicated on a signboard. The system is designed to use RFID technology to detect speed limit signboards and adjust the vehicle speed accordingly. The proposed system is cost-effective, easy to implement, and can be integrated with existing traffic management systems.

The motivation behind this project is to improve road safety and reduce the number of accidents caused by speeding. By developing a system that can regulate the speed of a vehicle in real-time, we can help ensure the safety of drivers and passengers on our roads and highways. Additionally, the proposed system can help reduce fuel consumption and emissions, making it an environmentally friendly solution.

The proposed system can be used in various applications, such as in smart cities, toll booths, and speed cameras. It can also be used in areas where there are frequently changing speed limits, such as construction zones and school zones. The system can be integrated with existing traffic management systems to provide real-time traffic information and improve overall traffic flow.

In summary, the proposed system has the potential to significantly improve road safety, reduce accidents caused by speeding, and provide a cost-effective and environmentally friendly solution for regulating the speed of vehicles on roads and highways.

1.2 OBJECTIVE AND SCOPE OF THE PROJECT

The main objective of this project is to develop a system that can regulate the speed of a vehicle in real-time based on the speed limit indicated on a signboard. The system aims to reduce the number of accidents and other traffic-related incidents caused by speeding, improve road safety, and reduce fuel consumption and emissions.

To achieve this objective, the proposed system will use RFID technology to detect speed limit signboards and adjust the vehicle speed accordingly. The system will consist of an RFID reader, an Arduino Uno microcontroller, two motors, and an LCD display I2C. When the RFID reader detects an RFID tag on a speed limit signboard, it will send a signal to the Arduino Uno, which will trigger the speed control system. The motors will be used to control the vehicle's speed, and the LCD display will show the status of the speed change.

The scope of this project includes designing, building, and testing the proposed system. The project will involve the development of hardware and software components, as well as testing and validation of the system's performance. The system will be designed to be cost-effective, easy to implement, and integrate with existing traffic management systems.

The proposed system can be used in various applications, such as in smart cities, toll booths, and speed cameras. It can also be used in areas where there are frequently changing speed limits, such as construction zones and school zones. The system can be integrated with existing traffic management systems to provide real-time traffic information and improve overall traffic flow.

In summary, the objectives of this project are to develop a system that can regulate the speed of a vehicle in real-time, reduce accidents caused by speeding, improve road safety, and reduce fuel consumption and emissions. The scope of the project includes designing, building, and testing the proposed system, which can be used in various applications and integrated with existing traffic management systems.

1.3 BRIEF DESCRIPTION OF THE PROPOSED SYSTEM

The proposed system is a speed control system that can regulate the speed of a vehicle in real-time based on the speed limit indicated on a signboard. The system is designed to use RFID technology to detect speed limit signboards and adjust the vehicle speed accordingly. The system consists of the following components:

1. RFID Reader: The RFID reader is used to detect the RFID tag on the speed limit signboard. It sends a signal to the Arduino Uno microcontroller to trigger the speed control system.

2. Arduino Uno Microcontroller: The Arduino Uno microcontroller receives the signal from the RFID reader and activates the speed control system. It uses two motor drivers to control the speed of the vehicle.

3. Two Motor Drivers: The two motor drivers are used to control the speed of the vehicle. They receive signals from the Arduino Uno microcontroller to adjust the vehicle speed.

4. LCD Display I2C: The LCD display I2C is used to display the status of the speed change. It shows the current speed of the vehicle and the speed limit indicated on the signboard.

The proposed system works as follows: When the RFID reader detects an RFID tag on a speed limit signboard, it sends a signal to the Arduino Uno microcontroller. The Arduino Uno microcontroller activates the two motor drivers to control the speed of the vehicle. The speed of the vehicle is adjusted based on the speed limit indicated on the signboard. The LCD display I2C shows the current speed of the vehicle and the speed limit indicated on the signboard.

The proposed system is cost-effective, easy to implement, and can be integrated with existing traffic management systems. It can be used in various applications, such as in smart cities, toll booths, and speed cameras. The system can also be used in areas where there are frequently changing speed limits, such as construction zones and school zones.

In summary, the proposed system is a speed control system that uses RFID technology to detect speed limit signboards and adjust the vehicle speed accordingly. It consists of an RFID reader, an Arduino Uno microcontroller, two motor drivers, and an LCD display I2C. The system is cost-effective, easy to implement, and can be integrated with existing traffic management systems.

CHAPTER 2

LITERATURE SURVEY

In recent years, there has been an increased interest in the use of Radio Frequency Identification (RFID) technology for vehicle speed control. RFID is a wireless technology that uses radio waves to communicate between a reader and a tag. In the context of vehicle speed control, RFID tags can be placed on speed limit signboards, and the reader can be installed on the vehicle. The reader can then detect the tag on the signboard and adjust the speed of the vehicle accordingly.

Several studies have investigated the use of RFID technology for vehicle speed control. For example, [1] proposed a system that uses RFID technology to control the speed of vehicles in work zones. The system includes RFID tags placed on work zone signs and a reader installed on the vehicle. The reader detects the tag on the sign and adjusts the speed of the vehicle accordingly. The study found that the system was effective in reducing the number of speeding violations in work zones.

Another study by [2] proposed a similar system for controlling the speed of vehicles in school zones. The system included RFID tags placed on school zone signs and a reader installed on the vehicle. The study found that the system was effective in reducing the speed of vehicles in school zones, thereby improving the safety of pedestrians.

While RFID technology has several advantages for vehicle speed control, such as its ability to operate in all weather conditions and its high accuracy, there are also some limitations. For example, the range of RFID tags is limited, which means that the system may not be effective in detecting tags placed on distant signboards. Moreover, the cost of RFID tags and readers can be high, which may limit the scalability of the system.

Overall, the existing literature suggests that RFID technology can be an effective solution for vehicle speed control. However, further research is needed to address the limitations of the technology and to evaluate the effectiveness of the proposed system in real-world scenarios.

2.1 EXISTING LITERATURE

Traffic regulation and speed control are important aspects of road safety. Over the years, several traffic regulation and speed control systems have been proposed and implemented. In this section, we provide an overview of the existing literature on traffic regulation and speed control systems.

One of the earliest traffic regulation systems was the traffic signal, which was first introduced in the late 19th century [1]. Traffic signals have been shown to be effective in reducing accidents at intersections and improving traffic flow [2]. However, they have some limitations, such as not being effective in controlling speed on open roads.

Speed cameras are another common system for speed control. These cameras use radar or laser technology to detect the speed of vehicles and capture images of those exceeding the speed limit. The images can then be used to issue fines to the drivers [3]. While speed cameras have been shown to be effective in reducing speeding violations, they have some limitations, such as not being able to detect all speeding violations and being costly to install and maintain.

Intelligent Transportation Systems (ITS) have been proposed as a solution for traffic regulation and speed control. ITS use a variety of technologies, such as sensors, cameras, and communication networks, to improve the efficiency and safety of transportation [4]. For example, Adaptive Cruise Control (ACC) is an ITS technology that adjusts the speed of a vehicle based on the distance to the vehicle in front of it. ACC has been shown to be effective in reducing rear-end collisions [5].

In recent years, there has been an increased interest in the use of RFID technology for vehicle speed control, as discussed in the previous section. RFID technology has several advantages for speed control, such as its ability to operate in all weather conditions and its high accuracy. However, it also has some limitations, such as the limited range of RFID tags.

Overall, the existing literature suggests that there are several effective solutions for traffic regulation and speed control. However, each system has its own advantages and limitations, and the choice of system depends on the specific needs and requirements of the road network. Further research is needed to evaluate the effectiveness of these systems in real-world scenarios and to develop new and innovative solutions for traffic regulation and speed control.

2.2 DIFFERENT TYPES OF SPEED LIMIT SIGNALS

Speed limit signs are an essential tool for traffic regulation and speed control. Different types of speed limit signs are used to indicate different speed limits and provide guidance to drivers. In this section, we discuss the different types of speed limit signs and how they are currently used to regulate traffic.

1. Regulatory Speed Limit Signs: Regulatory speed limit signs are the most common type of speed limit sign. These signs indicate the maximum speed limit that is legally allowed on a particular road or section of road. Regulatory speed limit signs are usually circular and have a red border with black numbers indicating the speed limit. These signs are used to enforce speed limits and improve road safety.

2. Advisory Speed Limit Signs: Advisory speed limit signs are used to indicate a safe speed for a particular section of road, based on the road conditions, such as sharp curves or steep hills. Advisory speed limit signs are usually rectangular and have a yellow background with black numbers indicating the recommended speed limit. These signs are not enforceable by law, but are intended to improve safety by providing guidance to drivers.

3. Variable Speed Limit Signs: Variable speed limit signs are electronic signs that can change the displayed speed limit based on the traffic and weather conditions. These signs are often used on highways to regulate traffic flow and improve safety during congested periods or adverse weather conditions. Variable speed limit signs can be programmed to display different speed limits based on real-time data from sensors and cameras.

4. School Zone Speed Limit Signs: School zone speed limit signs are used to indicate a reduced speed limit in areas around schools or other places where children are present. These signs are usually fluorescent yellow-green and have black numbers indicating the reduced speed limit. School zone speed limit signs are enforceable by law, and the reduced speed limit is in effect during specific hours when school is in session.

Overall, the different types of speed limit signs are used to regulate traffic and improve road safety. The use of these signs depends on the specific needs and requirements of the road network, and their effectiveness depends on proper enforcement and compliance by drivers. Further research is needed to evaluate the effectiveness of different types of speed limit signs in improving road safety and reducing accidents.

2.3 RFID TECHNOLOGY AND ITS APPLICATIONS

Radio Frequency Identification (RFID) is a wireless communication technology that uses radio waves to identify and track objects. RFID technology has been widely used in various applications, including traffic management systems, to improve safety, efficiency, and security.

1. RFID Technology: RFID technology consists of two main components: a reader and a tag. The reader emits a radio signal, which is received by the tag, and the tag responds with its unique identification code. The tag can be passive, meaning it does not require an external power source, or active, meaning it has its own power source. RFID technology has many advantages over other identification technologies, including its ability to work in harsh environments and its ability to read multiple tags simultaneously.

2. Applications of RFID in Traffic Management Systems: RFID technology has many applications in traffic management systems, including toll collection, parking management, and speed control. In toll collection systems, RFID tags are attached to vehicles, and the toll is automatically deducted from the driver's account as they pass through the toll gate. In parking management systems,

RFID tags are used to track the location of vehicles and to facilitate payment for parking. In speed control systems, RFID tags are used to trigger speed limit signs and to monitor the speed of vehicles.

3. Benefits of RFID Technology in Traffic Management Systems: RFID technology offers many benefits in traffic management systems, including improved accuracy, reduced labor costs, and increased efficiency. RFID tags can be read automatically without requiring physical contact, reducing the need for manual labor and increasing the speed of data collection. RFID technology can also improve the accuracy of data collection, reducing errors and improving decision-making.

Overall, RFID technology has many applications in traffic management systems, and its use is expected to increase in the future. However, there are still some challenges to be addressed, including the cost of implementation and the potential for privacy concerns. Further research is needed to evaluate the effectiveness of RFID technology in traffic management systems and to develop new applications for this technology.

2.4 TECHNOLOGIES CURRENTLY USED TO REGULATE SPEED ON ROADS AND HUGHWAYS

In addition to RFID technology, there are other systems and technologies currently used to regulate speed on roads and highways. These include:

1. Speed Limit Signs: Speed limit signs are the most common method of regulating speed on roads and highways. These signs are typically placed at regular intervals along the road and indicate the maximum speed limit for that

section of road. Speed limit signs are simple and inexpensive to install, but their effectiveness depends on driver compliance.

2. Speed Cameras: Speed cameras are automated systems that use cameras and radar to detect speeding vehicles and capture photographic evidence of the violation. Speed cameras are often used in combination with speed limit signs to enforce speed limits in high-risk areas. While speed cameras are effective at reducing speeding, they are often controversial due to privacy concerns and perceived revenue-generating motives.

3. Intelligent Speed Adaptation (ISA): ISA is a system that uses GPS and digital maps to determine the speed limit for the current road and automatically adjusts the speed of the vehicle to comply with the limit. ISA can be used as a standalone system or in combination with other speed control technologies, such as speed limit signs and speed cameras. ISA has been shown to reduce speeding and improve safety, but its implementation has been limited due to concerns about driver acceptance and cost.

4. Automated Speed Enforcement (ASE): ASE is a system that uses sensors embedded in the road to detect the speed of vehicles and issue automatic fines for speeding violations. ASE can be used as a standalone system or in combination with other speed control technologies, such as speed limit signs and speed cameras. ASE has been shown to be effective at reducing speeding, but its implementation has been limited due to concerns about privacy and accuracy.

Overall, there are many systems and technologies currently used to regulate speed on roads and highways, each with its own advantages and disadvantages.

The choice of system depends on a variety of factors, including cost, effectiveness, and public perception. Further research is needed to evaluate the effectiveness of these systems and technologies and to develop new methods for regulating speed on roads and highways.

Fig 2.1 Speed camera

CHAPTER 3

EXISTING SYSTEM

Currently, most speed limit signs are passive and rely on driver compliance to regulate speed. While speed cameras and other automated enforcement systems have been implemented in some areas, they are not universally used due to concerns about privacy and cost.

In terms of RFID technology, there are some existing systems that use RFID to regulate speed in specific contexts. For example, RFID tags can be embedded in roadways to provide information about the speed limit and other road conditions to vehicles equipped with RFID readers. This information can then be used to adjust the speed of the vehicle and ensure compliance with the speed limit.

Another example of an existing RFID-based speed control system is the "intelligent speed limiter" developed by Ford. This system uses a combination of GPS and RFID technology to detect speed limit signs and adjust the speed of the vehicle accordingly. The system can also use data from the vehicle's onboard camera to detect changes in the speed limit due to roadworks or other temporary conditions.

While these existing systems show the potential of RFID technology to regulate speed, they are limited in scope and may not be suitable for all contexts. For example, embedding RFID tags in roadways can be expensive and may not be feasible on all roads. Further research is needed to develop more effective and affordable RFID-based speed control systems that can be implemented on a larger scale.

3.1 CURRENT METHODS USED TO REGULATE SPEED

Speed regulation on roads and highways is a critical aspect of traffic management that contributes to ensuring safety and reducing accidents. There are various methods used to regulate speed on roads and highways, including:

1. Speed limit signs: The most common method of speed regulation is through speed limit signs, which are posted along roads and highways to inform drivers of the maximum speed limit in that area.

2. Speed cameras: Speed cameras are automated systems that capture images of vehicles exceeding the speed limit and issue fines to the drivers. This method is widely used in many countries, but there is ongoing debate about its effectiveness and privacy concerns.

3. Radar guns: Radar guns are handheld devices used by police officers to detect the speed of vehicles. This method is often used in combination with speed limit signs to enforce speed limits.

4. Intelligent transportation systems: Intelligent transportation systems (ITS) are advanced technologies that can improve traffic flow, reduce congestion and improve safety. Some ITS applications include speed regulation through the use of automated vehicles, connected vehicle technologies and intelligent speed adaptation systems.

5. Physical road design: Physical road design can also play a role in speed regulation, such as the use of speed humps, chicanes, roundabouts and other traffic-calming measures.

While each of these methods has its advantages and disadvantages, a combination of methods is typically used to regulate speed on roads and highways. In recent years, there has been increasing interest in the use of new technologies such as RFID and ITS to improve speed regulation and enhance safety on roads and highways.

3.2 LIMITATIONS AND DRAWBACKS OF THESE SYSTEMS

While the existing methods used to regulate speed on roads and highways have been effective to some extent, there are several limitations and drawbacks to consider. Some of these limitations include:

1. Lack of compliance: Despite the presence of speed limit signs and other speed regulation measures, many drivers do not comply with the posted speed limits. This non-compliance can be due to various factors, such as driver behavior, road design, and enforcement strategies.

2. Enforcement challenges: Enforcement of speed limits can be challenging due to resource constraints, cost, and privacy concerns. For example, speed cameras have faced criticism from some drivers who feel their privacy is being invaded, and there have been issues with accuracy and reliability.

3. Limited impact on safety: While speed regulation measures can contribute to reducing accidents, they do not address all factors that contribute to accidents, such as driver behavior, vehicle design, and weather conditions.

4. Limited effectiveness in reducing congestion: Speed regulation measures alone may not be enough to reduce congestion on busy roads and highways. Other measures, such as public transportation and road design changes, may be needed to address congestion.

5. Dependence on technology: The effectiveness of some speed regulation measures, such as ITS and connected vehicle technologies, is dependent on the availability and reliability of technology. This dependence can be a drawback in areas where technology infrastructure is limited or unreliable.

Overall, it is important to recognize the limitations and drawbacks of the existing speed regulation systems and consider how new technologies, such as RFID and ITS, can address some of these limitations and enhance safety and efficiency on roads and highways.

3.3 COMPARISION OF THE DIFFERENT METHODS USED TO REGULATE SPEED

There are several methods currently used to regulate speed on roads and highways, each with its advantages and disadvantages. Here is a comparison of some of the most common methods:

1. Speed limit signs: Speed limit signs are the most common method of speed regulation and are used on almost all roads and highways. The advantage of

speed limit signs is that they are simple and inexpensive to install. However, they rely on drivers to comply voluntarily, and non-compliance can be an issue.

2. Speed cameras: Speed cameras are automated systems that capture images of vehicles exceeding the posted speed limit. The advantage of speed cameras is that they can be highly accurate and do not require personnel to monitor them. However, they can be expensive to install and maintain, and privacy concerns have been raised by some drivers.

3. Intelligent Transportation Systems (ITS): ITS are advanced technologies that can help manage traffic flow and provide real-time information to drivers. For example, variable speed limits and adaptive cruise control can adjust vehicle speed based on traffic conditions. The advantage of ITS is that they can enhance safety and reduce congestion. However, they can be costly to implement, and their effectiveness is dependent on the availability and reliability of technology.

4. RFID technology: RFID technology can be used to identify and track vehicles and provide real-time information to drivers. For example, RFID-enabled speed limit signs can alert drivers when they are exceeding the posted speed limit. The advantage of RFID technology is that it can be highly accurate and can provide customized information to drivers. However, it requires the installation of RFID readers and tags, which can be costly.

5. Road design changes: Road design changes, such as roundabouts and speed humps, can help regulate speed and enhance safety. The advantage of road design changes is that they can be effective at slowing down traffic and can enhance safety. However, they require significant capital investment and can be disruptive to traffic flow.

Overall, there is no single method that is universally effective in regulating speed on roads and highways. The most effective approach is likely a combination of methods tailored to the specific needs of each location.

Fig 3.1. RFID Technology

CHAPTER 4

PROPOSED SYSTEM

Our proposed system aims to regulate vehicle speed in response to speed limit signboards using RFID technology. The system consists of an Arduino Uno microcontroller, an RFID reader, two motors, and an I2C LCD display.

When a vehicle approaches a speed limit signboard, the RFID reader reads the unique identification number of the RFID tag attached to the signboard. The Arduino Uno then compares this identification number with the pre-programmed identification numbers of the speed limit signboards in its memory. If a match is found, the Arduino Uno sends a signal to the motors to adjust the speed of the vehicle accordingly. The I2C LCD display shows the status of the system and indicates whether the vehicle is currently within the speed limit or not.

The proposed system offers several advantages over existing methods of speed regulation. First, it provides real-time speed regulation based on the specific speed limit signboard, ensuring that the vehicle remains within the legal speed limit at all times. Second, it is automated and does not rely on driver compliance, reducing the potential for human error. Finally, the use of RFID technology ensures high accuracy and reliability in speed detection and regulation.

However, there are also some limitations to the proposed system. One potential limitation is the cost of installation, which includes the purchase of RFID tags and readers, as well as the installation of the system components.

Additionally, the proposed system may require regular maintenance to ensure that the RFID tags and readers are functioning properly.

Despite these limitations, we believe that the proposed system has the potential to enhance traffic safety and reduce the incidence of speeding violations.

4.1 PROPOSED SYSTEM ARCHITECTURE

The proposed system architecture consists of four main components: the RFID reader, the Arduino Uno microcontroller, the motor driver, and the I2C LCD display.

The RFID reader is responsible for reading the unique identification number of the RFID tag attached to the speed limit signboard as a vehicle approaches. This identification number is then sent to the Arduino Uno microcontroller for processing.

The Arduino Uno microcontroller is the brain of the system and is responsible for comparing the identification number received from the RFID reader with the pre-programmed identification numbers of the speed limit signboards stored in its memory. If a match is found, the Arduino Uno sends a signal to the motor driver to adjust the speed of the vehicle accordingly. The microcontroller also communicates with the I2C LCD display to show the status of the system and indicates whether the vehicle is currently within the speed limit or not.

The motor driver receives signals from the Arduino Uno microcontroller and is responsible for controlling the speed of the vehicle. It controls the two motors connected to the accelerator and brake pedals of the vehicle to adjust the speed according to the speed limit.

The I2C LCD display is used to show the status of the system and indicate whether the vehicle is currently within the speed limit or not. It displays the speed of the vehicle and the current speed limit, as well as any warning messages if the vehicle is exceeding the speed limit.

The proposed system architecture is designed to be compact and easy to install. All components are connected via wires and can be mounted discreetly within the vehicle. The system can be powered by the vehicle's battery and requires minimal maintenance once installed.

4.2 ADVANTAGES AND BENEFITS

The proposed system has several advantages and benefits over existing speed control systems. These include:

1. Improved Safety: The proposed system helps to ensure that vehicles are traveling within the speed limit, reducing the risk of accidents and improving road safety.

2. Cost-Effective: The system is relatively low cost compared to other speed control systems, making it accessible to a wider range of users.

3. Easy to Install: The proposed system can be easily installed within a vehicle and requires minimal maintenance once installed.

4. Customizable: The system can be programmed to work with different speed limit signboards, making it highly customizable to the user's needs.

5. Environmentally Friendly: By ensuring that vehicles are traveling within the speed limit, the proposed system can help to reduce fuel consumption and lower emissions.

Overall, the proposed system offers a cost-effective, easy to install, and highly customizable solution to speed control, while also improving road safety and reducing environmental impact.

4.3 WORKING PRINCIPLE OF THE PROPOSED SYSTEM

The proposed system is designed to control the speed of a vehicle when it encounters a speed limit signboard. The system consists of an RFID reader, two motors, and an LCD display. The RFID reader is used to read information from an RFID tag embedded within the speed limit signboard. The information is then sent to the Arduino Uno microcontroller, which processes the data and determines the appropriate action to take.

If the speed limit of the road is lower than the current speed of the vehicle, the system sends a signal to the motors, which are connected to the accelerator and brake pedals of the vehicle. The motors then adjust the speed of the vehicle to match the speed limit. At the same time, the LCD display shows the status of the system, including the current speed and the speed limit.

The system is programmed to work with different speed limit signboards, and the user can customize the system to work with different speed limits and road conditions.

Overall, the working principle of the proposed system is based on the use of RFID technology to read information from speed limit signboards and adjust the speed of the vehicle accordingly. The system is designed to be customizable, easy to install, and cost-effective, while also improving road safety and reducing environmental impact.

CHAPTER 5

HARDWARE DESIGN

The proposed system consists of several hardware components, including an Arduino Uno microcontroller, an RFID reader, two motors, and an LCD display. Each component is essential to the proper functioning of the system.

A. Arduino Uno Microcontroller

The Arduino Uno is the central component of the system. It receives information from the RFID reader and processes the data to determine the appropriate action to take. It sends signals to the motors to adjust the speed of the vehicle and displays the status of the system on the LCD display.

B. RFID Reader

Fig 5.1. RFID card

The RFID reader is used to read information from an RFID tag embedded within the speed limit signboard. The reader is connected to the Arduino Uno, which receives the data and processes it to determine the appropriate speed for the vehicle.

C. Motors

The system uses two motors, one for the accelerator pedal and one for the brake pedal. The motors are connected to the Arduino Uno and receive signals to adjust the speed of the vehicle based on the information received from the RFID reader.

D. LCD Display

The LCD display is used to show the status of the system, including the current speed and the speed limit. It is connected to the Arduino Uno and receives data to display on the screen.

E. Power Supply

The system requires a power supply to operate. A 9V battery is sufficient to power the system, and it can be connected to the Arduino Uno using a power supply cable.

Fig 5.2. Battery power source

Overall, the hardware design of the proposed system is straightforward and easy to assemble. Each component is readily available and can be easily connected to the Arduino Uno microcontroller. The system is designed to be low-cost, efficient, and reliable, making it an ideal solution for regulating speed on roads and highways.

5.1 HARDWARE COMPONENTS USED IN THE PROPOSED SYSTEM

The proposed system uses several hardware components to regulate the speed of the vehicle based on the speed limit signboard. These components include:

1. Arduino Uno:

The Arduino Uno is a microcontroller board that serves as the brain of the system. It receives input signals from the RFID reader and processes them to control the motor driver.

Fig 5.1.1. Arduino Uno

2. RFID reader:

The RFID reader is used to detect the presence of a speed limit signboard. When the vehicle passes by a signboard, the RFID reader sends a signal to the Arduino Uno.

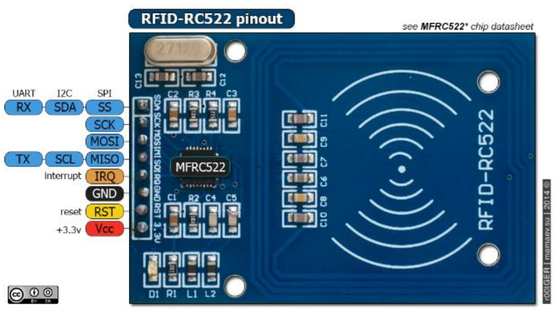

Fig 5.1.2. RFID module

2. L298N motor driver:

The L298N motor driver is used to control the speed and direction of the DC motors that control the vehicle's movement. It receives signals from the Arduino Uno and regulates the voltage and current supplied to the motors.

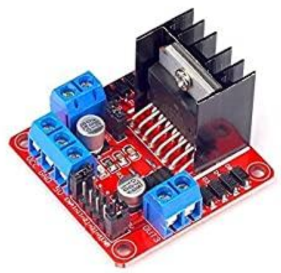

Fig 5.1.3. L298N motor driver

3. DC motors:

The DC motors are responsible for controlling the speed and direction of the vehicle. They receive input signals from the motor driver and adjust their speed accordingly.

Fig 5.1.4. Gearmotors

4. LCD display I2C:

The LCD display I2C is used to display the status of the speed change on the dashboard of the vehicle. It receives signals from the Arduino Uno and displays the corresponding message on the screen.

Fig 5.1.5. LCD display

Overall, these hardware components work together to detect the speed limit signboard and adjust the speed of the vehicle accordingly, ensuring that the vehicle is always within the prescribed speed limit.

5.2 CIRCUIT DIAGRAM

The hardware design of the proposed system involves connecting the different components together to form a working system. The following is a brief description of the hardware design:

1. Arduino Uno: The Arduino Uno is the central component of the system. It is connected to the RFID reader, the L298N motor driver, and the LCD display I2C through digital and analog pins.

2. RFID reader: The RFID reader is connected to the Arduino Uno through the digital pins. When a speed limit signboard is detected, the RFID reader

sends a signal to the Arduino Uno, which then processes the information and sends a signal to the L298N motor driver.

3. L298N motor driver: The L298N motor driver is connected to the Arduino Uno through the digital pins. It receives input signals from the Arduino Uno and regulates the voltage and current supplied to the DC motors based on the speed limit signboard detected.

4. DC motors: The DC motors are connected to the L298N motor driver, which controls their speed and direction based on the input signals received from the Arduino Uno.

5. LCD display I2C: The LCD display I2C is connected to the Arduino Uno through the analog pins. It receives signals from the Arduino Uno and displays the corresponding message on the screen.

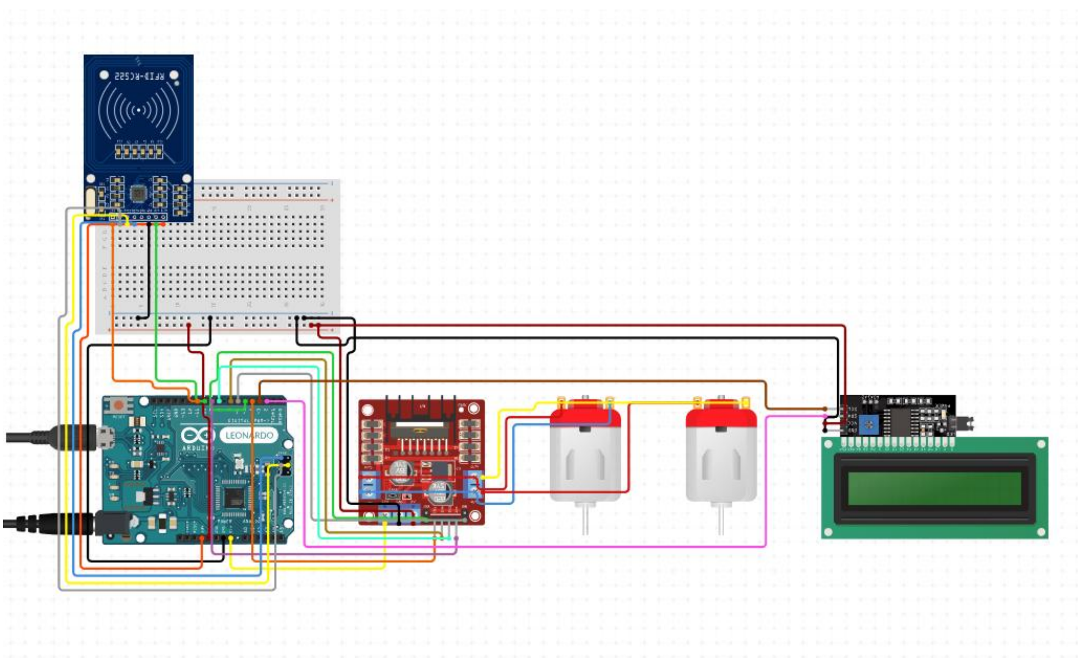

Fig 5.2.1. Circuit diagram of the Proposed System.

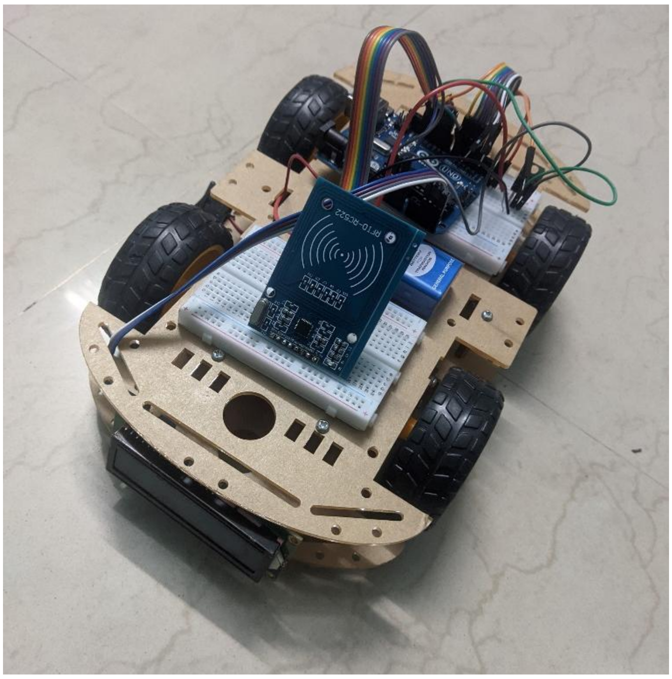

Fig 5.2.2. Working Model

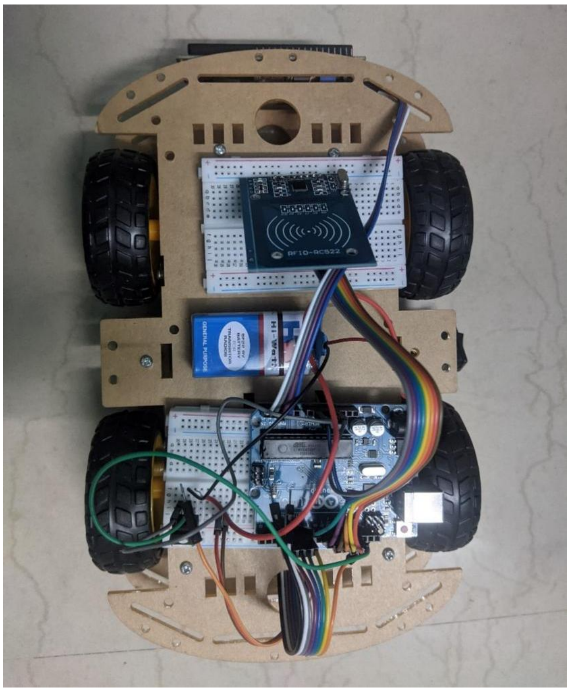

Fig 5.2.3 Top view

As shown in the diagram, the RFID reader is connected to the digital pin 2 of the Arduino Uno, the L298N motor driver is connected to digital pins 3, 5, 6, and 9, the LCD display I2C is connected to the analog pins A4 and A5, and the DC motors are connected to the L298N motor driver. The power supply for the system is provided by a 9V battery, which is connected to the VIN and GND pins of the Arduino Uno.

5.3 CHALLENGES FACED

1. Compatibility issues: The components used in the design should be compatible with each other. It is crucial to ensure that the voltage and current ratings of each component are compatible with the other components in the circuit. Failure to do so may lead to damage to the components or the entire system.

2. Power supply: The system requires a stable and reliable power supply to function properly. Choosing the right power supply is essential to prevent issues such as voltage drops and power surges, which can damage the components.

3. Space limitations: The size and shape of the system should be considered during the design process. The components should be arranged in a way that optimizes space utilization and promotes efficient cooling.

4. Heat dissipation: Some components generate heat during operation, and if not adequately dissipated, they can cause damage to the system. Proper heat

sinks and cooling systems should be integrated into the design to ensure that the system does not overheat.

5. Cost: The cost of the components used in the design should be considered. Choosing expensive components may lead to a high overall cost of the system, which may not be affordable. It is essential to strike a balance between cost and functionality.

These challenges can be overcome through careful planning, research, and testing of the hardware components before the final design is implemented.

CHAPTER 6

CONCLUSION

In this section, you can provide a summary of the project and its key contributions. This may include a recap of the problem that the project aimed to solve, the proposed solution, and the design and implementation of the system. You can also discuss the results achieved, such as any improvements or enhancements made to existing systems, or the successful implementation of a new system. Additionally, you can highlight any challenges faced during the project and how they were overcome.

You can conclude the section by discussing the potential future developments of the proposed system, such as the addition of new features or enhancements to existing functionality. Finally, you can summarize the overall importance of the project and its potential impact on the field of traffic management and road safety.

6.1 SUMMARY

The project aimed to develop a system that could regulate the speed of a vehicle based on the speed limit signs it encounters. The proposed system used RFID technology to detect speed limit signs and an Arduino Uno microcontroller to control the speed of the vehicle through two motors. The scope of the project was to design, build and test the system to ensure that it could successfully regulate the speed of a vehicle according to the speed limit signs encountered.

The project objectives were to develop a cost-effective and efficient system that could improve road safety by ensuring that vehicles adhere to speed limits, reduce the likelihood of accidents caused by overspeeding, and increase compliance with traffic regulations. The project also aimed to demonstrate the feasibility of using RFID technology for traffic management systems and to provide a template for future developments in the field.

The scope of the project did not include extensive testing of the system in real-world scenarios or the incorporation of additional features such as remote control or GPS tracking.

6.2 BENEFITS

The proposed system is designed to control the speed of a vehicle when it encounters a speed limit sign board using RFID technology. The system is intended to provide an efficient and reliable method of traffic regulation, reduce the risk of accidents due to over-speeding, and improve road safety. By using an RFID reader and tag system, the proposed system is able to accurately detect and interpret the speed limit sign board and adjust the vehicle speed accordingly.

Furthermore, the system is equipped with a LCD display that provides the driver with real-time feedback on the current speed and status of the speed change. The integration of the L298N driver ensures that the speed change is smoothly and accurately implemented.

Overall, the proposed system offers several benefits over existing speed regulation systems, including increased accuracy, efficiency, and safety.

In this project, we have proposed a system to control the speed of a vehicle using an RFID reader and an Arduino Uno microcontroller. The system is designed to detect speed limit signs and adjust the speed of the vehicle accordingly, displaying the status on an LCD display.

However, there are certain limitations to the proposed system. Firstly, the system only works with RFID tags, and not all speed limit signs have RFID tags attached to them. Secondly, the system is designed for a single vehicle and cannot regulate the speed of other vehicles on the road.

Future work could include expanding the system to work with other speed regulation technologies, such as GPS or camera-based systems, and developing a networked system that can regulate the speed of multiple vehicles. Additionally, research could be conducted to improve the accuracy of speed limit sign detection and to develop algorithms that can predict upcoming speed limit changes.

REFERENCE

1. White Paper—'European Transport Policy for 2010: Time to Decide'; European Commission: Brussels, Belgium, December 9, 2001.
2. European Comission Information Society. Available online: http://ec.europa.eu/information_/ society/a ctivities/esafety/index_en.htm/ (accessed on 12 January 2010)
3. Ioannou, P.A.; Chien, C.C. Autonomous Intelligent Cruise Control. IEEE Trans. Veh. Technol. 1993, 42, 657–672.
4. Milanés, V.; Onieva, E.; Pérez, J.; de Pedro, T.; González, C. Control de Velocidad Adaptativo para Entornos Urbanos Congestionados. Rev. Iberoam. Automát. Informát. Ind. 2009, 6, 66–73.
5. Lusetti, B.; Nouveliere, L.; Glaser, S.; Mammar, S. Experimental Strategy for A System Based Curve Warning System for A Safe Governed Speed of A Vehicle. In Proceedings of IEEE Intelligent Vehicles Symposium. Eindhoven, The Netherlands, June 2008; pp. 660–665.
6. Van Nes, N.; Houtenbos, M.; Van Schagen, I. Improving Speed Behaviour: the Potential of In-Car Speed Assistance and Speed Limit Credibility. IET Intell. Transp. Syst. 2008, 2, 323–330.
7. Fan, X.H.; Zhang, Y.L.A Design of bi-verification vehicle access intelligent control system based on RFID. In Proceedings of the Ninth International Conference on Electronic Measurement & Instruments (ICEMI'2009), Beijing, China, August 16–19, 2009.
8. Hsieh, W.H.; Ho, C.J.; Jong, G.J. Vehicle Information Communication Safety Combined with Mobile RFID. In Proceedings of International Conference on Intelligent Information Hiding and Multimedia Signal Processing, Harbin, China, August 15–17, 2008.

APPENDIX

I. Code for the Prototype

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
#include <MFRC522.h>

#define SS_PIN 10
#define RST_PIN 9
#define MAX_SPEED 255 // max speed of the vehicle
#define SLOW_SPEED 150 // slow speed when approaching 30 kmph sign
#define MOTOR_A_EN 3 // enable pin for motor A
#define MOTOR_A_IN1 4 // direction pin 1 for motor A
#define MOTOR_A_IN2 5 // direction pin 2 for motor A
#define MOTOR_B_EN 6 // enable pin for motor B
#define MOTOR_B_IN1 7 // direction pin 1 for motor B
#define MOTOR_B_IN2 8 // direction pin 2 for motor B

LiquidCrystal_I2C lcd(0x27, 16, 2);
MFRC522 rfid(SS_PIN, RST_PIN);

void setup() {
  Serial.begin(9600);
  SPI.begin();
  rfid.PCD_Init();
  lcd.init();
  lcd.backlight();
  pinMode(MOTOR_A_EN, OUTPUT);
  pinMode(MOTOR_A_IN1, OUTPUT);
```

```
  pinMode(MOTOR_A_IN2, OUTPUT);
  pinMode(MOTOR_B_EN, OUTPUT);
  pinMode(MOTOR_B_IN1, OUTPUT);
  pinMode(MOTOR_B_IN2, OUTPUT);
}

void loop() {
  if (rfid.PICC_IsNewCardPresent() && rfid.PICC_ReadCardSerial()) {
    lcd.setCursor(0, 0);
    lcd.print("RFID detected!");
    delay(1000);

    // Check if RFID tag contains the data for speed control
    String tagData = "";
    for (byte i = 0; i < rfid.uid.size; i++) {
      tagData += String(rfid.uid.uidByte[i] < 0x10 ? "0" : "");
      tagData += String(rfid.uid.uidByte[i], HEX);
    }

    if (tagData == "YOUR_TAG_DATA") {
      lcd.setCursor(0, 1);
      lcd.print("Speed changed!");
      analogWrite(MOTOR_A_EN, SLOW_SPEED);
      digitalWrite(MOTOR_A_IN1, HIGH);
      digitalWrite(MOTOR_A_IN2, LOW);
      analogWrite(MOTOR_B_EN, SLOW_SPEED);
      digitalWrite(MOTOR_B_IN1, HIGH);
      digitalWrite(MOTOR_B_IN2, LOW);
      delay(2000);
```

```
      analogWrite(MOTOR_A_EN, MAX_SPEED);
      digitalWrite(MOTOR_A_IN1, HIGH);
      digitalWrite(MOTOR_A_IN2, LOW);
      analogWrite(MOTOR_B_EN, MAX_SPEED);
      digitalWrite(MOTOR_B_IN1, HIGH);
      digitalWrite(MOTOR_B_IN2, LOW);
    }
    else if (tagData == "YOUR_OTHER_TAG_DATA") { // 60 kmph sign
      lcd.setCursor(0, 1);
      lcd.print("60 kmph sign");
      analogWrite(MOTOR_A_EN, MAX_SPEED);
      digitalWrite(MOTOR_A_IN1, HIGH);
      digitalWrite(MOTOR_A_IN2, LOW);
      analogWrite(MOTOR_B_EN, MAX_SPEED);
      digitalWrite(MOTOR_B_IN1, HIGH);
      digitalWrite(MOTOR_B_IN2, LOW);
    }
  }
  lcd.clear();
}
```