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# Time Based Speed Control of Vehicle Using Arduino

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**ABSTRACT:** This project addresses the critical issue of auto-mobile safety, particularly in speed-restricted zones, where reducing accidents is paramount to minimize loss of life and property. Recent surveys have highlighted a concerning increase in accidents near speed restricted zones, often attributed to drivers hurrying to reach their destinations promptly. Consequently, there is a pressing need to control vehicle speed effectively in such areas. To tackle this challenge, the project proposes a practical, compact, and straightforward solution.

An automatic vehicle speed control system based on time, specifically utilizing the Arduino platform. The system functions by incorporating a transmitter unit programmed with the designated speed limit and time, which wirelessly transmits signals to a receiver installed in the vehicle. This receiver, equipped with a speed encoder sensor, automatically adjusts the vehicle's speed based on the received signals, ensuring compliance with the prescribed speed limit.

By implementing this innovative technique, it is anticipated that accident rates in speed restricted zones will be substantially reduced, thereby enhancing overall road safety and mitigating the risk of accidents caused by speeding vehicles. Additionally, this system has the potential to address driver behavior issues and reduce nuisance caused by reckless driving. Moving forward, there is scope for further enhancements and optimizations to improve the system's effectiveness and applicability in various other speed-restricted areas, thereby contributing to a safer and more secure transportation environment.

**KEYWORDS:** Speed restricted zones, Accidents, Automatic vehicle speed control system, Arduino platform, Wireless communication, Road safety.

## I. INTRODUCTION

In the contemporary world, traffic congestion and reckless driving have become increasingly prevalent, posing significant challenges to road safety and efficiency. This project aims to address these issues by implementing a speed limiting mechanism, a system designed to control vehicle speeds effectively. The primary objective is to enhance road safety and reduce fuel consumption, two critical aspects of sustainable transportation.

As roads become more congested and incidents of reckless driving continue to rise, it becomes imperative to explore innovative solutions to enhance road safety. Traditional methods, such as traffic signals and manual enforcement of speed limits, have proven to be insufficient in addressing these issues. Therefore, the implementation of a speed limiting mechanism represents a proactive approach to curbing accidents and promoting responsible driving habits.

Another significant aspect of this project is its potential to contribute to the broader goal of smart city development. Smart cities aim to leverage technology to improve the quality of urban life and the efficiency of urban services. By integrating a speed limiting mechanism into the transportation infrastructure, we can enhance traffic management, reduce congestion, and improve road safety, all of which are key components of a smart city. Thus, this project aligns with the vision of creating smarter, safer, and more sustainable urban environment the contemporary world, traffic congestion and reckless driving have become increasingly prevalent, posing significant challenges to road safety and efficiency. This project aims to address these issues by implementing a speed limiting mechanism, a system designed to control vehicle speeds effectively. The primary objective is to enhance road safety and reduce fuel consumption, two critical aspects of sustainable transportation.

## II. LITERATURE REVIEW

- U.Jyoti Kameswari and M.Satwik literature highlights the increasing need for road safety due to high-speed driving in hazardous areas. While existing systems like Cruise Control and Adaptive Cruise Control offer speed regulation, they lack curve detection capability. To address this, a proposed dynamic model utilizes RF transmitters on poles to adjust vehicle speed based on real-time data, offering a proactive approach to prevent accidents [2].
- Jonathan A. Enokela and David O. Agbo study addresses the global issue of road traffic accidents caused by human errors like over-speeding. It proposes an arduino based car speed controller that automatically adjusts speed according to pre-set limits, enhancing road safety by preventing over-speeding incidents. The controller, utilizing a microcontroller, switches, and a stepper motor, offers a customizable solution adaptable to different regulatory zones, potentially mitigating accidents through early warnings and speed regulation [3].
- You-Ren Chen, Keng-Pin Chen, Pao-Ann Hsiung aims to address driver fatigue-related accidents by limiting vehicle speed. Real-time sensors such as gas, eye blink, and alcohol sensors, along with GPS and Google Maps API, enable the system to identify fatigue symptoms and manage vehicle speed accordingly. Additionally, the system incorporates alerting mechanisms and communication technologies to notify authorities about traffic violations, contributing to enhanced road safety [10].
- Shubhangi Sanjay Bhargave and Monika Vijay Jadhav paper discusses the importance of implementing speed control mechanisms in vehicles to mitigate accidents caused by reckless driving and traffic congestion. The system utilizes a speed limiting mechanism based on load requirements, effectively controlling the vehicle's speed. This approach integrates feedback control principles to maintain desired speed limits, enhancing road safety [6].
- Akash Batra and Anirudhh Ranjan Pandey literature underscores the need for automated speed control systems to prevent accidents in various speed limiting zones and highways. Utilizing RF technology, a smart display controller (SDC) embedded in vehicles provides real-time zone information, alerting drivers to adjust their speed accordingly, thus enhancing road safety through proactive speed management [4].
- reducing road accidents caused by high-speed driving, particularly in hazardous zones with sharp turns and junctions. Systems like Cruise Control and Adaptive Cruise Control aim to mitigate accidents but lack the ability to detect sudden turns. Proposed solutions involve Curve Warning Systems utilizing GPS and GIS data, with potential benefits including improved fuel efficiency through speed control using Arduino based timeline methods [1].
- Anuja Nanal and Pooja Motwani paper studies indicate a rise in road accidents due to factors like excessive speeds and road anomalies. This literature underscores the need for driver assistant systems and proposes a dynamic speed control model using RFID transceivers attached to road signs, potentially enhancing road safety and fuel efficiency for Electric Vehicles (EVs) through Arduino integration literature [5].
- E. Hariharan and Mr. M. Arun highlight the significance of traffic sign recognition systems in reducing accidents due to over speeding and negligence. Their proposed system utilizes image processing technology to detect and recognize traffic signs, enabling automatic speed control based on road conditions. By leveraging advancements in technology, this approach aims to enhance passenger safety and adherence to traffic regulations [7].
- V Naga Sowmya, Sravani G, P Sudharshana Chary, Shaik Rajak present a timeline-driven dynamic vehicle speed control system for Intelligent Transport Systems (ITS). The system integrates various real-time sensors and technologies such as GPS, Zigbee, and GSM modules to monitor driver fatigue, overspeeding, and traffic violations. By implementing dynamic speed control mechanisms and intelligent traffic management strategies, this approach aims to reduce accidents and traffic congestion [9].
- Rajesh Kannan Megalingam and Kondareddy Thanigundala presented Traffic signs play a crucial role in managing traffic and preventing accidents, as emphasized by multiple sources. Neglecting traffic rules and over speeding contribute significantly to road accidents, highlighting the importance of enforcing speed limits and adhering to traffic regulations. Advanced technologies such as image processing and deep learning offer promising solutions for automated traffic sign detection and recognition, facilitating efficient speed control mechanisms [8].



### III. METHODOLOGY

#### Block Diagram And Schematic of Transmitter:-

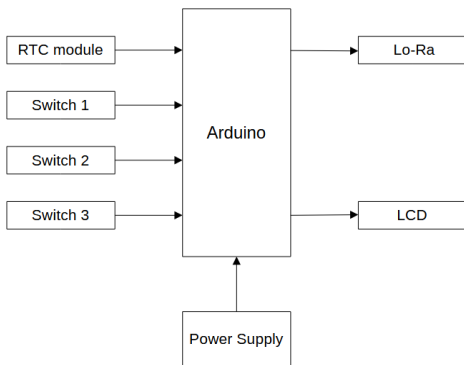


Fig 1:- Transmitter Block Diagram

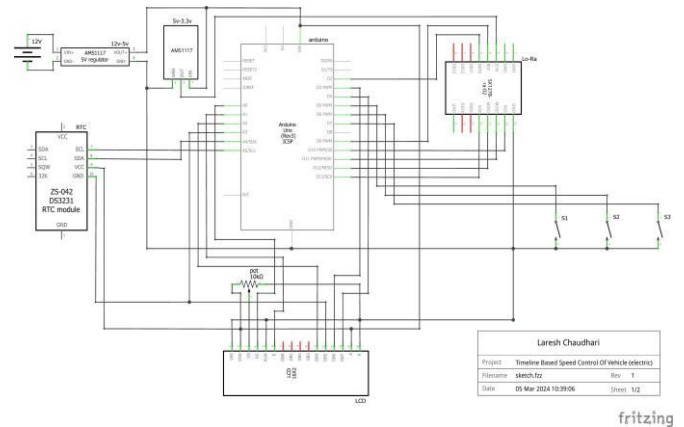


Fig 2:- Transmitter Schematic

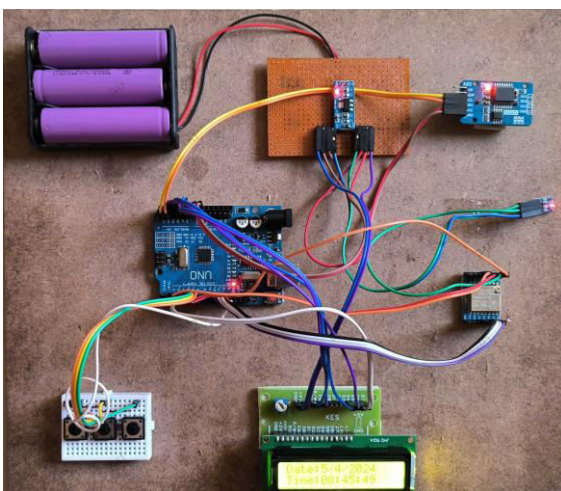


Figure 3:- Transmitter

Sr. No	Part Type	Quantity
1	Arduino Uno Rev 3	1
2	1602 LCD	1
3	LCD ext PCB	1
4	18650 battery	3
5	18650 battery holder 3S	1
6	LM2596 3A buck converter	1
7	3.3V Buck Module AMS1117	1
8	LoRa SX1278 ra02	1
9	12*12*12mm tactile switch	3
10	170 pts mini breadboard	1
11	ZS-042 RTC module	1
12	10k trimpot 6mm	1
13	Male to Female jumper wire 20cm	9
14	Female to Female jumper wire 20cm	22
<b>Total</b>		<b>47</b>

Table 1:- Component List Transmitter

#### Block and schematic description (transmitter):-

- **Arduino:** Serves as the brain of the system, processing input from various switches and the RTC module to control the outputs.
- **RTC Module:** Provides real-time clock functionality, likely used for time-stamping and scheduling transmissions.
- **Switches 1, 2, and 3:** Input devices that allow user to set time and modes of speed.
- **Lo-Ra:** Stands for Long Range, a wireless communication module for transmitting data over long distances.
- **LCD:** A display screen that provides a user interface, likely showing time, and modes of speed.
- **Power Supply:** Powers the entire system, ensuring all components receive the necessary voltage and current.

Block Diagram And Schematic of Receiver:-

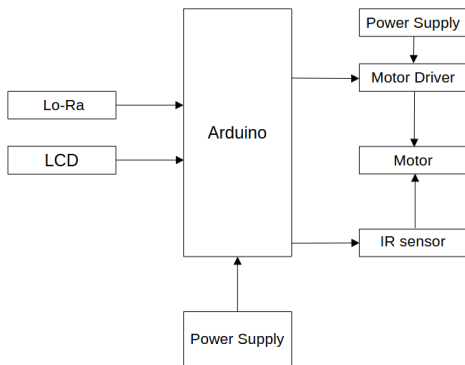


Figure 4:- Receiver Block Diagram

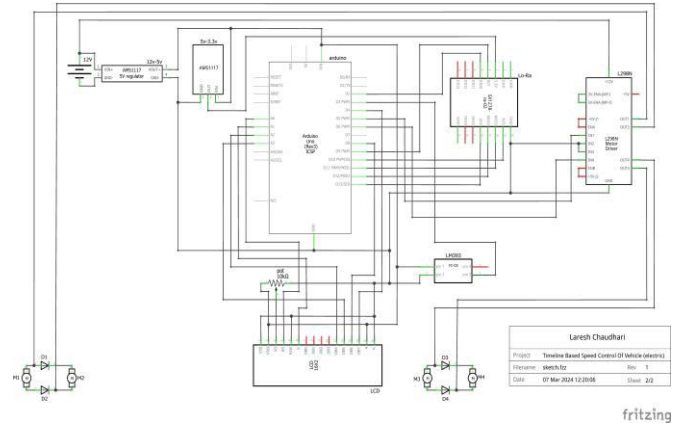


Figure 5:- Receiver Schematic

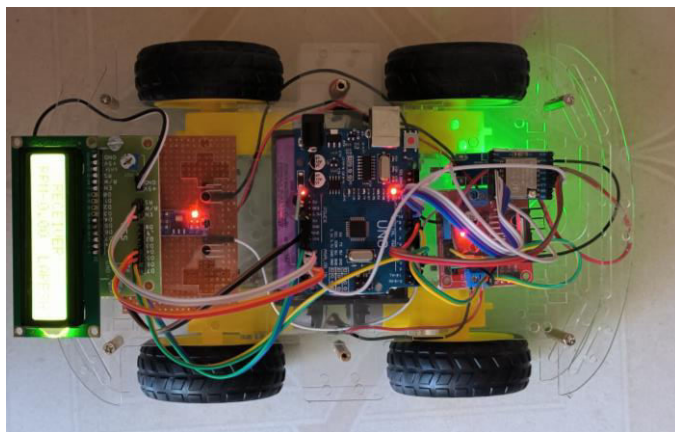


Figure 6:- Receiver

Sr. No	Part Type	Quantity
1	Arduino Uno Rev 3	1
2	1602 LCD	1
3	LCD ext PCB	1
4	18650 battery	3
5	18650 battery holder 3S	1
6	LM2596 3A buck converter	1
7	3.3V Buck Module AMS1117	1
8	LoRa SX1278 ra02	1
9	Diode 1N4007	4
10	FC03 IR speed sensor	1
11	L298N DC 2A motor driver	1
12	10k trimpot 6mm	1
13	4wd Acrylic Car Chassis	1
14	BO-Gear motor with wheel	4
15	Male to Female jumper wire 20cm	12
16	Female to Female jumper wire 20cm	17
Total		51

Table 2:- Component List Receiver

Block and schematic description (Receiver):-

- **LCD:** To display current mode of speed and RPM of motor.
- **Arduino:** Serves as the brain of the system, processing input from Lo-Ra and control motor speed using driver.
- **Lo-Ra:** for receiving transmitter signal from transmitter.
- **Motor Driver:** To control motor operations and speed.
- **IR Sensor:** For detecting motor RPM.
- **Power Supply:** To provide power to the system components.

Working:-

1. **Transmitter Setup:** The transmitter unit is responsible for encoding and transmitting speed restrictions for specific time intervals. Here's a detailed breakdown:

- **Real-Time Clock (RTC):** This is used to set different time values for various modes like normal, high, slow, off. These modes correspond to different speed limits.
- **Arduino:** Once the time values and corresponding modes are set, this information is stored in the Arduino's ROM (Read-Only Memory) for future execution.
- **Lo-Ra Module:** When the specific time for a mode occurs, the Arduino transmits these

signals wirelessly using the Lo-Ra (Long Range) module. These signals include the time intervals (start and end times) along with the corresponding speed limits.

2. **Receiver Setup:** The receiver unit is installed in the vehicle and is responsible for receiving the transmitted signals and controlling the vehicle's speed accordingly. Here's how it works:
  - **Lo-Ra Module:** When the time for a specific mode occurs, the receiver's Lo-Ra module receives the transmitted signals from the transmitter. These signals contain the encoded speed value for that time interval.
  - **Arduino:** The Arduino decodes the received mode and matches it with the corresponding speed value.
  - **Motor Driver:** After the matching process, the Arduino generates a PWM (Pulse Width Modulation) signal corresponding to the speed value. This signal is given as input to the motor driver.
  - **RPM Sensor:** The RPM (Revolutions Per Minute) sensor monitors the speed of the vehicle. If the speed exceeds the limit set by the PWM signal, it sends a signal back to the arduino.
  - **Speed Limit Enforcement:** Based on the feedback from the RPM sensor, the Arduino adjusts the PWM signal to the motor driver, effectively limiting the speed of the vehicle to the set limit.

#### IV. RESULT AND APPLICATION

##### Normal Speed Mode Transmitter:-

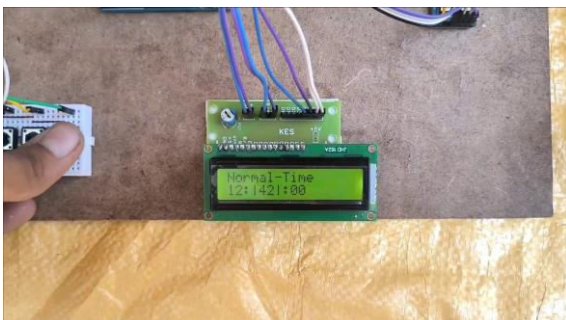


Figure 7:- Setting Time For Normal Speed Mode



Figure 8:- Transmitter On Normal Speed Mode

##### Normal Speed Mode Receiver:-



Figure 9:- Receiver On Normal Speed Mode



**High Speed Mode Transmitter:-**



Figure 10:- Setting Time For High Speed Mode



Figure 11:- Transmitter On High Speed Mode

**High Speed Mode Receiver:-**



Figure 12:- Receiver On High Speed

**Slow Speed Mode Transmitter:-**



Figure 13:- Setting Time For Slow Speed Mode



Figure 14:- Transmitter on Slow Speed Mode

Slow Speed Mode Receiver:-



Figure 15:- Receiver on Slow Speed Mode

Application:-

- **Intelligent Transport Systems:** These systems can be integrated into next generation intelligent transport systems to automatically control vehicle speed based on predefined zones. This can help reduce the number of incidents in speed-restricted zones such as school areas and hospitals.
- **Automatic Speed Control in Restricted Areas:** The system can be used to automatically control the speed of vehicles in cities and also in restricted areas such as schools, parks, hospitals, and speed-limited areas. This can help prevent accidents caused by over-speeding.
- **Blind-spot Vehicle Awareness:** The system can help increase vehicle awareness in blind spots, enhancing safety.
- **Automatic Speed Adaptation:** The system can automatically adapt the speed of a vehicle to the circumstances of the road, which can help decrease one of the major causes of fatalities: the excessive or inadequate vehicle speed.

## V. CONCLUSION AND FUTURE WORK

The development of Time Based Speed Control of Vehicles Using Arduino signifies a significant advancement in enhancing road safety within Intelligent Transportation Systems (ITS). By combining timeline-driven dynamic speed control principles with Arduino technology, the project introduces proactive traffic management solutions. The integration of advanced technologies and real-time data enables the system to adaptively regulate vehicle speed based on dynamic timelines, ensuring efficient traffic flow and minimizing congestion. Implementation of this technology holds promise for revolutionizing modern transportation, fostering safer and more efficient roadways in alignment with the goals of ITS. The project represents a pivotal step towards realizing the vision of safer, smarter, and more sustainable transportation networks through innovation and collaboration. Through a fast commitment to road safety and technological advancement, this project is poised to make a profound impact on the evolution of Intelligent Transportation Systems in the foreseeable future.

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