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Over-Speeding Fine System

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Abstract –The rise in road traffic violations and accidents due to overspeeding necessitates the development of an effective overspeeding fine system to enhance road safety. This paper introduces an intelligent overspeeding fine system leveraging modern sensor technology, data analysis, and communication infrastructure. We have designed an integrated solution that utilizes vehicle speed sensors to monitor vehicle speed in real-time. The collected data is processed and analysed in conjunction with posted speed limits to identify instances of overspeeding. Violations are documented and transmitted to relevant authorities for further action. Our system offers several advantages, including real-time notification of overspeeding events, which allows for immediate intervention and fine enforcement. Furthermore, it contributes to data-driven traffic management by identifying high-risk areas prone to overspeeding violations. This research contributes to the ongoing efforts to reduce overspeeding-related accidents and enhance road safety. The integration of modern technology with traffic enforcement provides an efficient and scalable solution to mitigate the risks associated with overspeeding on our roadways.

Keywords – Speed regulation, accident reduction, Overspeeding Fine System, Road

Safety, Traffic Violation Detection, Intelligent Transportation Systems, Speed Monitoring.

I. Introduction

Overspeeding is a common traffic violation in India and can result in fines, penalties, and even imprisonment depending on the severity of the offense. In India, the maximum speed limits are set by the state governments and can vary from state to state, as well as based on the type of road and vehicle. Out of all the accidents that took place, approximately 59.7% were due to overspeeding, which caused 87,050 deaths and 2,28,274 injuries.

Cutoff in September 2021, the general speed limits on Indian roads are as follows:

1. Urban Areas: The speed limit for cars and motorcycles in urban areas is typically set at 40 to 50 kilometers per hour (km/h). However, some specific areas, such as school zones, residential areas, or congested areas, may have lower speed limits, usually around 20 to 30 km/h.

2. Non-Urban Areas: On highways and nonurban roads, the speed limit for cars and motorcycles is generally set at 60 to 80 km/h. However, there are also expressways and national highways where the speed limit can be higher, typically around 100 to 120 km/h.

It's important to note that these speed limits can vary depending on the specific road conditions and signage in place. It's crucial for drivers to be aware of and adhere to the speed limits to ensure road safety.

If a driver is caught over speeding in India, they may be subject to penalties and fines as per the provisions of the Motor Vehicles Act, 1988. The penalties for overspeeding can vary depending on the degree of the offense, and repeat offenders may face more severe consequences.

However, please remember that traffic laws and regulations can change over time. It's always a good idea to consult the latest information from official government sources or local authorities to ensure you have the most up-to-date and accurate information regarding overspeeding and traffic regulations in India.

II. METHODOLOGY

- Components:
  - Arduino UNO
  - 16*2 LCD display
  - 2.2k Resistor
  - Connecting wires
  - Breadboard.
  - GSM SIM800L
  - Sim card
  - Buzzer

- Specification:
  - Arduino UNO-

Figure 1. Arduino UNO.

Arduino Uno is a cost-friendly and entry-level microcontroller. It is the mini-CPU of the project.

Microcontroller	ATmega328P
Operating Volt.	5V
Input Volt. (recommended)	7-12V
Input Volt. (limit)	6-20V
Digital I/O Pins	14 (6 PWM output)
PWM Digital I/O Pins	6
Analog Input Pins	6
DC Current per I/O Pin	20 mA
DC Current for 3.3V Pin	50 mA
Flash Memory	32 KB (ATmega328P) of which 0.5 KB used by bootloader
SRAM	2 KB (ATmega328P)
EEPROM	1 KB (ATmega328P)
Clock Speed	16 MHz
LED_BUILTIN	13
Length	68.6 mm
Width	53.4 mm

Table 1. Specifications of Arduino UNO. [10]

➢ GSM SIM800L

Figure 2. GSM SIM800L Module.

The GSM SIM800L is a compact and versatile cellular module widely used in IoT projects. It supports GSM/GPRS communication, operates on 2G networks, and features embedded TCP/IP and HTTP protocols for data transmission in various applications.

Features	Specifications
Operating frequency	GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz
Operating Voltage rating	3.2V – 4.8V dc
Output pin voltage	5V dc
Output pin current	25mA
Communication mode	UART interface, configured for full-duplex asynchronous mode
Baud rate	Supports auto bauding, 9.6kb/s used.

Table 2. Specifications of GSM SIM800L Module. [11]

Method:

➢ Hardware Setup:

- Arduino: Use an Arduino board with appropriate interfaces, such as Arduino Uno.
- Speed Sensor: Connect a speed sensor to the Arduino board to measure the vehicle's speed.
- Buzzer: Connect a buzzer to the Arduino board to generate an audible warning.

➢ Obtain Speed Limit Data:

- Access the Google Maps API to retrieve speed limit data for a particular road. One will need an API key from the Google Cloud Platform.
- Integrate your Arduino with a WiFi or GSM module to connect to the internet and fetch the speed limit data.

➢ Speed Monitoring Logic:

- Read the speed limit data from Google Maps using the Arduino and compare it with the vehicle's speed obtained from the speed sensor.
- If the vehicle's speed exceeds the speed limit, activate the buzzer to warn the driver.

➢ Fine Notification (Prototype Implementation):

- Implement a simulated notification system within the prototype.
- Define a threshold for triggering a fine after the initial warning, based on how long the driver exceeds the speed limit.
- If the driver continues to exceed the speed limit beyond the threshold, simulate sending a message or notification to a designated phone number using GSM communication.

➢ Circuit Diagram:

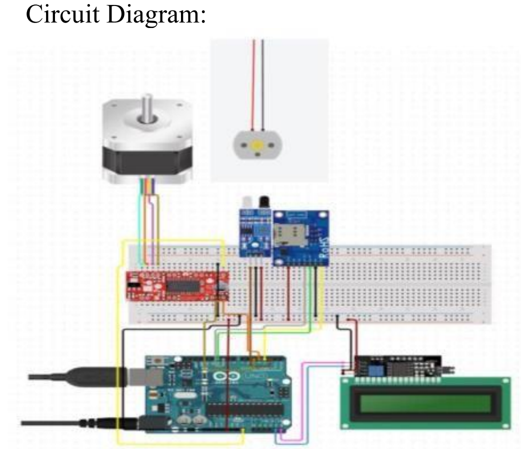

Figure 3. Circuit Diagram.

➢ Hardware Model:

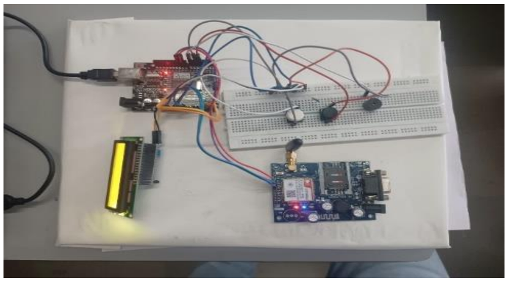

Figure 4. Project Model.

- Commands:
- AT-

This command is employed to verify the communication link between the module and the computer.

- +CMGF- (message format)

This command helps to toggle between text mode and PDU mode for SMS by specifying '1' or '0' in the command.

- +CMGS-(Send message)

This command is used to send an SMS message to a phone number.

- Message for RTO:

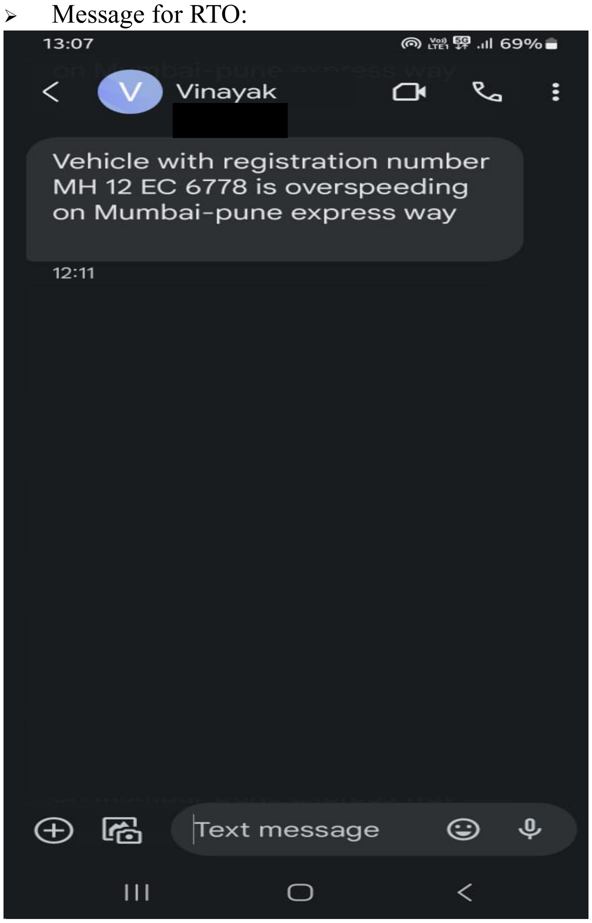

Figure 5. Message which will be received by the RTO.

III. RESULT AND DISCUSSIONS

Reduction in overspeeding incidents: The implementation of the over-speeding fine system leads to a significant decrease in overspeeding incidents. The automated detection and enforcement mechanisms act as a deterrent, resulting in improved driver compliance with speed limits.

Increased driver awareness: The fine system raises awareness among drivers about the consequences of overspeeding, fostering a culture of responsible driving. This awareness may result in long-term behavioral changes, even beyond the immediate impact of the fines.

Road safety improvements: The reduction in overspeeding incidents correlates with a decline in road accidents. The system helps mitigate risks associated with high-speed driving, resulting in fewer collisions, injuries, and fatalities.

Revenue generation: The fines collected through the over-speeding fine system contribute to government revenue. These funds can be reinvested in further road safety initiatives, infrastructure improvements, or education campaigns.

IV. CONCLUSION

The implementation of an over-speeding fine system demonstrates positive results in controlling overspeeding and improving road safety. The reduction in overspeeding incidents, increased driver awareness, and subsequent decline in road accidents are key outcomes of such a system. However, ongoing monitoring and periodic evaluation are necessary to address compliance challenges and ensure cost-effectiveness. This research provides valuable insights for policymakers and road safety authorities considering the implementation of an overspeeding fine system as part of their road safety initiatives.

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