

Automatic Vehicle Speed Limit Violation Detection and Reporting System By Using Raspberry Pi

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ABSTRACT

The majority of accidents occur as a result of excessive speeding. Almost everyone wishes to arrive at their destination without any problems. To avoid overspeeding due to negligence. We came up with a solution that could handle a variety of overspeeding issues. The speedometer is used as the primary device to measure speed, with the help of the Raspberry Pi module and speakers. We created a user-friendly website that assists users in changing speech modules (recorded voices that they may keep if desired) and sending notifications to their parents/guardians about the person who is speeding and directing them to the correct path. If the rider goes beyond the threshold 1, it plays the voice message from the speaker, If the rider goes beyond the threshold2 it sends the notification with the location of the vehicle. On the website, users can change voice modules and contact information.

KEYWORDS: Over-speeding, GPS tracking, Speed monitoring, Raspberry Pi, Violation Detection

I. INTRODUCTION

In countries like India, Over speeding is one of the major issues. With the help of the Internet of things, Traffic management can be done efficiently. Exceeding the posted speed limit and driving too fast for the conditions are both considered speeding. Unfortunately, many people do not consider following speed limits to be a critical part of avoiding collisions. Nearly one-third of all fatal crashes are thought to be caused by speeding. Mobility should never come at the expense of safety. Travel that is simple, quick, and relatively inexpensive is crucial for people's jobs and personal lives, and national economic progress.

Speed management (getting road users to a safe speed via an integrated set of measures) must prioritize safety, but governments and people involved in local speed management have issues in balancing mobility and safety. To resolve this problem, we came up with the idea of getting an alert sound. So we used a Raspberry Pi and connect it with an LCD and speaker. As we programmed we will give the limit of speed as per the government instructions. In turn, the Raspberry pi returns an auditory message to the speaker, telling the vehicle to slow down. We choose over the buzzer or beep sound, if the person can hear their loved one voice they can stop themselves from driving fast. We will keep the default voice and the user can change the voices of their loved ones as per convince. As we created the website for changing the voices as per the user's interest so they can get the information.

The user can add the mail ids of their family members and created a notification alert system so the parents or guardians will get the message or alert notification as per [15] when their child goes beyond the limit. The parent will get the location of the rider using a GPS sensor we referred to [10]. This is very useful to parents/guardians as they can monitor the rate of speed they are traveling and their location.

The main contributions of the proposed work are as follows:

- The proposed approach provides a system that tracks the speed and location of the vehicle.
- It plays the voice message when the vehicle exceeds threshold1.
- It also sends the location of the vehicle when it exceeds the threshold2.

The rest of the paper is organised as follows. Section II examines past research studies that were conducted in order to assess the data and develop the proposed plan Section III goes over the suggested technique in great depth. The results of the recommended method are examined in Section IV. Section V conclusion and future enhancement work.

II. LITERATURE SURVEY

T.Rajeshkumar et. al[1] proposed the system uses an embedded system, which is a special-purpose computer that is contained within the machine it operates. The technology will allow parents to receive a text message on their phone as an alert if their

automobile exceeds a previously defined speed restriction. One of the causes of accidents, particularly at night, is the driver's carelessness. Driver sleepiness is another key factor in automobile collisions. The technology uses an eye blink sensor to monitor the driver's eye blink, and if the driver loses consciousness, an alarm is generated. The proposed approach maincore idea is to avoid teen accidents by sending a text message When the driver becomes tired, the eye blink sensor and message help to send an alarm. This technique will allow you to safely arrive at your destination.

BegümKorunurEngiz, et. al[2] proposed Radar which has sensory components that give it new capabilities. Where it is feasible to view an appropriate set of objects that have been discovered, as well as discover or detect things that are beyond the human eye's ability to see. Night vision, fog, smoke, and other factors do not affect radar. One of the most significant functions of radar is to measure the speed of moving objects, whether they are traveling toward or away from the target. At long distances where seeing is possible within radar range, the radar can exceed regular vision. We chose Raspberry Pi because it can save us if there is no vehicle also.

Table 1. Summary of the various papers studied under the literature survey.

Ref. No	Methodology	Advantages	Limitations and Enhancements
1	Embedded System	Used to send Text messages to parents	Message delayed and not accurate in speed capture
2	ultrasonic radar.	Using sensors it can detect the objects clearly	Cannot keep the device in all places
3	MEMS, RF, GPS, and GSM technology.	Using GPS, it sends the location vehicle	GPS modules were used to get the user's location. This can be expensive as there is a requirement for a separate module in the vehicle
4	GSM modem,GPRS	Using a GSM modem it sends the SMS	The GPS coordinates are sometimes not accurate and SMS will be delayed

D. Narendra Singh et. al[3] suggested So, MEMS, RF, GPS, and GSM technology inform drivers about speed limits in zones and detect crashes automatically. to avoid such mishaps and to notify The highway department has placed signboards in such places to inform drivers about the speed limits. However, it is possible to view such signboards on occasion, and there is a risk of an accident.

Paras Gosa et. al[4] suggested A speed limit violation detection and warning system hardware prototype. The GSM modem will get an SMS cell broadcast message including the speed limit information while entering the cell area. When a user violates the stated speed limit for the third time, the system will issue a fine, as well as the vehicle's GPS coordinates, and will utilize GPRS to update the information about the overspeeding to the user's profile on a cloud website. The system will also send an SMS to the user's registered phone with information about the fine as well as the website address. A cloud-based webpage has been created where the user can pay their fine and view their location. The summary of the Literature Survey is given in table 1.

From the literature survey, we have noticed some limitations in the existing work. Some of the approaches are taking more time to send the message and it is not accurate also. In order to send the SMS it needs a network. The GPS is not enough to get the accurate location of the vehicle. Some of the device cannot keep in all places and it is expensive. The GPS coordinates are sometimes not accurate and SMS will be delayed. In our technique the notification is sent from the website which is accurate.

III. METHODOLOGY

We came up with the notion of making an alarm sound to remedy this problem. As a result, we used a Raspberry Pi and connected it to a monitor and speaker. As programmed, we will set the speed limit per government directives. The Raspberry Pi then sends an aural message to the vehicle's speaker, asking it to slow down.

We like the buzzer or beep sound because if a person can hear their loved one's voice, they will be less likely to speed. The default voice will be retained, and the user will be able to change the voices of their loved ones as desired. We designed a website to change the voices according to the user's interests and to provide them with information.

The user can add the email addresses of their family members to a notification alert system, which will send a message or alert notification to the parents or guardians when their child exceeds the limit. The parent will use the GPS sensor to determine the rider's whereabouts. Parents and guardians will appreciate this because it allows them to keep track of their children's pace and location.

A. Design Objectives

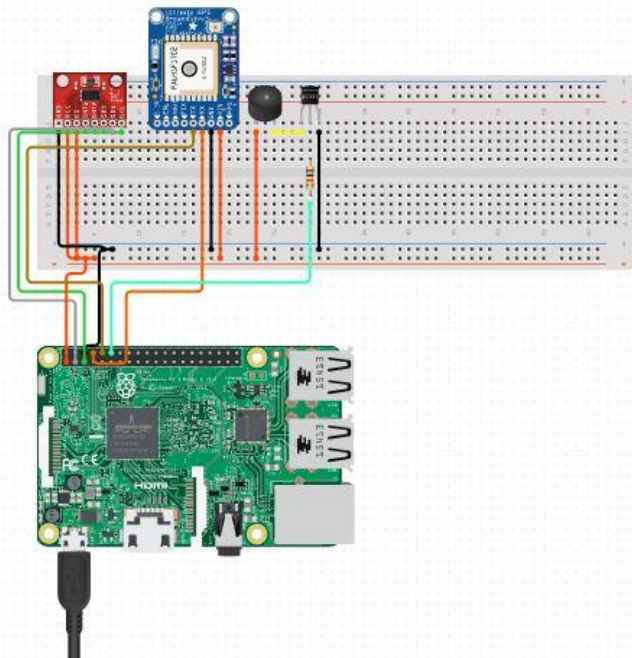
Some of the objectives which we intend to achieve through our proposed work are given below:

- To create a speed warning system that will monitor the vehicle's speed and activate an aural alert as well as record the infringement when the pre-set speed limit is exceeded.
- Using the voice of people is a much more easy way to stop people instead of buzzers.
- We want to provide different voice modules for users.
- We are providing multiple contact info on the website.
- It can send the location of the rider.

B. Architecture

The architecture comprises Raspberry pi, GPS sensor, speed sensor, speaker via jumping wires, and the code for the working is written using the python, as mentioned in the pin diagram.

1. GPS: The Global Positioning System (GPS) is a satellite navigation system that uses a radio receiver to gather signals from orbiting satellites to calculate location, speed, and time.
2. Raspberry Pi: The Raspberry Pi is a credit card-sized low-cost computer that connects to a computer display or television and uses a standard keyboard and mouse. It's a powerful little gadget that enables people of all ages to learn about computers and programming languages like Scratch and Python.
3. Jumper cables: which used to connect the speed sensor and GPS sensor to raspberry pi
4. Speaker: It is used as the output for the voice's
5. Speed sensor: which is used to measure the vehicle speed.
6. Breadboard : (one standard breadboard & Four Mini breadboards)- LEDs are placed on four mini breadboards according to the four-way junction, A standard breadboard is used to connect parts and give some power to multiple parts.



Working on Raspberry pi:

Connect the Speed sensor to Raspberry pi for the speed of the vehicle, and the GPS for the location of the vehicle as shown in fig1.

1. The Raspberry pi checks the speed of the vehicle,
2. According to the project where we have two cases, one is about the notification and the other about the voice and location.
3. If it crosses the threshold1 raspberry pi plays the audio file from the speaker that the user uploaded in the database.
4. If the vehicle goes beyond threshold 2 the raspberry pi sends the signal to a server that intends to go to the website and check the user contact details and sends the notification.
5. At the same time, the raspberry pi sends the location of the vehicle to contacts that the user gives on the website.

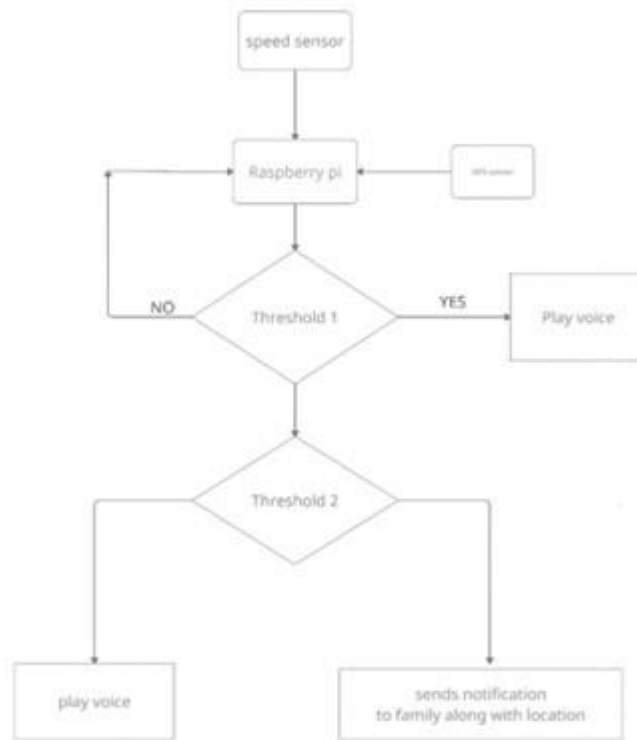


Fig 1 illustrates the schematic diagram of the components present in the system.

Working on the website:

1. The website has two main parts .one about adding and updating the family contact details.
2. The other main part about uploading the voices of family, we have given an option to update the voice whenever the user wants to change it.
3. According to the thresholds, the raspberry pi searches the user's contact details and sends the notification, and plays the voice that the user uploaded to the website.
4. With the help of GPS, the raspberry pi sends the location to the contacts along with the notification as shown in fg2.

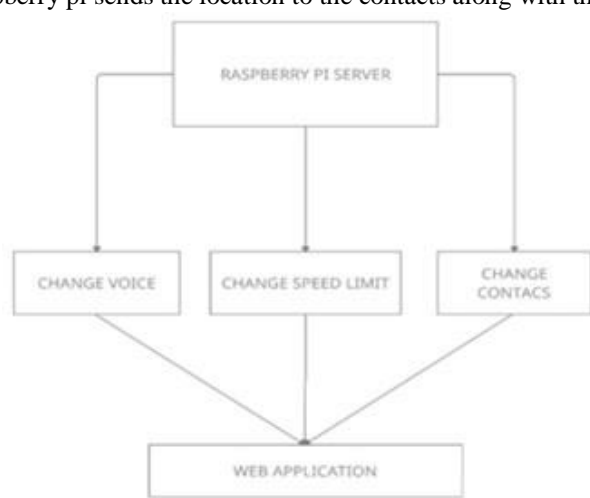


Fig2: shows the working of the website.

Algorithm:

- Step 1** The user should add their contact details to the website.
- Step 2** The user should upload the voice modules to the website.
- Step 3** The speed sensor calculates the speed of the vehicle.
- Step 4** If the vehicle exceeds the threshold1 it plays the voice message.
- Step 5** If the vehicle exceeds the threshold2 it plays the voice message and sends the notification to parents with the location.

IV RESULTS

Results obtained after performing the above-mentioned technique can be summarized as follows:

The speed of the vehicle is measured by the speed sensor. When the vehicle exceeds the speed of threshold 1, it connects to the Raspberry Pi server, selects the voice message from the local storage, and plays the voice message. When the vehicle exceeds the speed of threshold 2, it connects to the server, checks the contact details, sends the notification to contacts, and plays the voice message. The parents/guardians will get the notification with the location of the rider. As mentioned in fig3 the user can add or modify the contact details on the website. so when the vehicle exceeds threshold2 the notification will go to parents along with the location of the vehicle as shown in fig4. The user can upload or update the voice modules on the website as shown in fig5a&5b. Accuracy comparison between the proposed system and the existing system.

Table 2. Accuracy comparison between the proposed system and the existing system

Author	Methods used	Accuracy(%)
T. Rajeshkumar et al [1]	Embedded system	89
EngizBegümKorunur et al[2]	Ultrasonic radar	88
D. Narendra Singhetal[3]	RF	90
Paras Gossetal[4]	GSM	80
Proposed Method	Raspberry pi, GPS sensor, and speed sensor are integrated into a hardware device.	93

The screenshot shows a web interface titled "Contact Manager" with a red header. Below the header, there is a section titled "Add Contacts". This section contains three input fields: "Name" with a placeholder "Name", "Email" with a placeholder "Email", and "Message" with a placeholder "message". At the bottom of the form is a blue button labeled "Add".

Fig 3 shows how to add the contact details to the website



sailender reddy 2 days ago
to movva.praneeth82 ✓



Vehicle AP03Q9537 is traveling at a speed of 120KMPH at Nagavara Junction.

location link :

<https://maps.app.goo.gl/T4HKbDacos3docbg9>

Fig 4. Gives the mail information about the overspeeding and location of the rider.

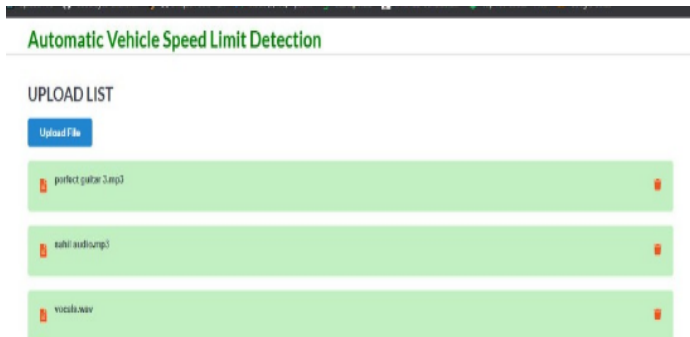


Fig 5a & 5b show how to upload the voice messages on the website

V. CONCLUSION& FUTURE ENHANCEMENT

Developed a vehicle over-speeding model using IoT. This project helps in saving the lives of people. By using our technique or model it tracks the speed of the vehicle and if it is more than the limit then it gives the Voice to reduce the speed. It not only gives you an alarm but also helps save a life. we have brought in an additional feature of Voice Message (while Over speeding). After the literature survey, we have come across the likes and dislikes of the community. vehicles prefer voice messages over sounds of Buzzers.

We also added a website to notify the parents about children's overspeeding. It can send the location of the vehicle. The user can add or remove the voice modules on the website. For future enhancement, we can use the cloud database for storing the data and voice.

REFERENCES

- [1] T. Rajeshkumar, "Speed Detecting, And Reporting System Using Gps/Gprs And Gsm", International Journal of Pure and Applied Mathematics, Volume 118 No. 20, 73-79, 2018
- [2] Begüm Korunur Engiz, "Implementation of a Speed Control System Using Arduino", 6th International Conference on Electrical and Electronics Engineering (ICEEE), 2019
- [3] Chandana HM, Anna M, Karnik PJ, Dorbi B, Gowda NC, "Cognitive way of detecting cyberbullying in chatbots", International Journal of Advanced Research in Computer Science, 9, pp.14-7, 2018.
- [4] Prof. Paras Gosa, "Automatic Speed Limit Violation Detection and Warning System Using GPS and GSM Modem", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Vol. 5, Issue 3, 2016
- [5] Athira Gopal, Haricharann D V, "Automatic Speed Surveillance and Vehicle Alerting System using Internet of Things (IoT)", International Journal of Innovative Technology and Exploring Engineering (IJITEE) Volume-8 Issue-4, 2019
- [6] Ravi Kishore Kodali and Sairam, M, "Over Speed Monitoring System", International Journal of Engineering Research & Technology (IJERT) - 2019.
- [7] A. Reddy, S. Patel, K. P. Bharath, and R. Kumar, "Embedded vehicle speed control and over-speed violation alert using IoT", in Proceedings of the Innovations in Power and Advanced Computing Technologies (i-PACT), vol. 1, pp. 1-5, 2019.
- [8] Arpita Kulkarni, Amulya K J, Radhika A D, "A Research For Tracking Overspeeding Vehicles", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-2, July 2019
- [9] M. Jain, P. Kumar, P. Singh, C. Narayan Arora, and A. Sharma, "Detection of Over Speeding Vehicles on Highways", International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-8 Issue-2, July 2019
- [10] S Basha, S. M., Ahmed, S. T., Iyengar, N. C. S. N., & Caytiles, R. D. (2021, December). Inter-Locking Dependency Evaluation Schema based on Block-chain Enabled Federated Transfer Learning for Autonomous Vehicular Systems. In *2021 Second International Conference on Innovative Technology Convergence (CITC)* (pp. 46-51). IEEE.
- [11] Ravi Kishore Kodali and Sairam, M, "Over-speeding monitoring system", Conference: 2nd International Conference on Contemporary Computing and Informatics (IC3I), 2016
- [12] Mr. Prathmesh Jadhav, Prof. Prasad Mane, Mr. Omkar Nai, Mr. Satyawan Bhise, Mr. Balkrishna Arolkar, "Development of Speed Control and Accident Alert System For Bike", National conference on Changing Technology and Rural Development -2017
- [13] A. Anusha, Syed Musthak Ahmed, "VEHICLE TRACKING AND MONITORING SYSTEM TO ENHANCE THE SAFETY AND SECURITY DRIVING USING IoT", International Conference on Recent Trends in Electrical, Electronics and Computing Technologies-2017
- [14] Ms. Sarika B. kale, Gajanan P. Dhok, "embedded system for ambulance and traffic control management", International Journal of Computer and Electronics Research, Vol.2, Issue 2, pp.137-142, 2013.
- [15] Nimisha Chaturvedi and Pallika Srivastava, "Automatic Vehicle Accident Detection and Messaging System Using GSM and GPS Modem", International Research Journal of Engineering and Technology, pp.252254. 2018.
- [16] Fatin Balkis Binti Alzahri, Maziani Sabudin, "Vehicle Tracking Device", International Conference on Advanced Informatics: Concepts, Theory and Application (ICAICTA)-2016
- [17] Abdullah H. Alquhali, Mardeni Roslee, Mohamad Y. Alias, Khalid S. Mohamed, "IOT Based Real-Time Vehicle Tracking System", IEEE Conference on Sustainable Utilization and Development in Engineering and Technologies (CSUDET)-2019
- [18] Jasmine David, Roopa Jayasingh, Deepak Daniel, M Joel Morris Raj, "Design of Automatic Speed Controlling System", International Conference on Devices, Circuits and Systems (ICDCS), 2020

[19]Abhi Lad, PrithvirajKanaujia,Soumya,YashSolanki,"Computer Vision enabled Adaptive Speed Limit Control for Vehicle Safety", International Conference on Artificial Intelligence and Machine Vision (AIMV),-20210