A Review paper on Automatic Fine Collector for Over Speeding

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Abstract - One of the key factors contributing to accidents and the loss of many lives is excessive vehicle speed. To address this issue, a proposed method was developed. The project's goal is to make a user-friendly, dependable device that can measure the speed of a vehicle using infrared sensors, display that speed on an LCD (liquid crystal display), and sound an alarm if it detects excessive speed. It utilizes a GSM module to send the SMS (chalan) to the car owner.

***Key Words*:** Arduino UNO, IR Sensors, GSM module, RFID module, Buzzer.

1. INTRODUCTION

In many places on the highway route, accidents found a serious social concern. There are numerous causes of auto accidents. The majority of highway accidents are the result of speeding. To date, a technology called "Automatic Traffic Fine Collector For Over speeding" has been developed to solve this issue. The project's goal is to accurately track speeding vehicles utilizing RFID tags and Infrared sensors. There is an SMS sent to the vehicle owner's phone as part of our project. The traffic management personnel could successfully trace any traffic light faults using our technology in the best possible and desired way. Traffic accidents are frequent and frequently brought on by careless driving. Government records show that more than 140,000 people died on Indian roadways in the previous year. The amount of traffic in India has significantly increased as a result of inadequate traffic regulation and speed monitoring systems. An efficient solution has been created using an Arduino board outfitted with two IR sensors, an IR transmitter (IR LED), and an IR receiver to address this issue (photodiode). When a vehicle passes over the two sensors, the sensors, which are wired to the Arduino's interrupt pin, detect the interruption wave and the amount of time that passes before the internal timer sensor activates. An SMS (Chalan) is sent to the car owner using a GSM module.

2. LITERATURE SURVEY

Vishal Pande *et al* [1] proposed a framework for the radio frequency design of a controller to manage vehicle speed and a display to track the zones that can function on an embedded system platform for autonomous speed management of speeding cars.

Monika Jain *et al* [2] suggested technology is demonstrated that can spot reckless driving and alert the traffic authorities to any offenses. By using this frame of reference, a system that warns drivers about risky driving habits will be developed. In each location where the system is implemented, the police determine the speed limit based on the volume of traffic. This device manages excessive speeding violations by recording, showing, and gathering information.

Ni Hlaing *et.al* [3] suggested building a system that can track a car's speed on streets, main thoroughfares, and other places where drivers routinely exceed the speed limit. If the speed is higher than the allowed limit, the information is sent to a PC (Personal Computer), which turns on a camera and records the speeding vehicle.

Amarnarayan *et.al* [4] proposed the creation of a speed estimation system that alerts drivers to road conditions, is dependable and robust, and helps prevent automobiles from joining traffic jams is an important topic that has attracted a lot of attention recently.

Nehal Kassem *et al* [5] suggested a ground-breaking RF-based vehicle motion and speed detection system that can estimate vehicle speed in typical streets with 90% accuracy and detect motion with 100% accuracy.

Rajesh Kannan Megalingam *et al* [6] suggested developing a wireless sensor network, or smart traffic controller, which not only manages efficient traffic routing but also keeps track of speeding cars. This is done using MicaZ motes' MRP2400 (2.4 GHz IEEE 802.15.4) and Crossbow's TWMS (Tiny Wireless Measurement System). To acquire, transmit, and receive data, you need a gateway and DAC. The over-speed detection unit contains a microcontroller that generates interrupts and simulates a speedometer.

Muhammad Tahir Qadri et al [7] discussed the number plates of vehicles entering highly restricted places, such as military bases or governmental structures like the Parliament or the Supreme Court, can now be automatically detected and identified by a security system. Vehicles that are approaching the entry are detected by the system, and photographs of them are taken. The technology may extract the vehicle license plate for recognition and further security control through picture segmentation.

Shyr-Long Jeng et al [8] proposed a new tool has been developed that can detect reckless driving on highways and alert the necessary traffic authorities when any offenses take place. The main goal of this new device is to identify harmful driving behaviors early and issue alerts for potentially hazardous driving patterns, even though there have been countless prior attempts to construct comparable systems. Past solutions to this issue have been difficult to adopt since they frequently required a lot of human effort and attention.

Nurhadiyatna A et al [9] discussed to handle traffic issues on a worldwide scale, an intelligent transportation system (ITS) has been developed. The technology estimates speed using real-time video processing and a camera sensor to assess vehicle speed. Principal Component Analysis (PCA) is used to categorize cars. Vehicles are tracked and identified in real-time as they pass using the Kalman filter. The Euclidean Distance technique is then used to calculate the speed of the vehicle.

DR. S.S. Lokhande et al [10] proposed this research study uses the Caffe model for DNN to recognize objects while simultaneously using an ultrasonic sensor to measure the obstacle's distance and a PWM controller to control motor motions by the obstacle's distance. BAIR created the deep learning framework Caffe. The sensor will determine how far away the car is from any obstacles it detects in that frame. The matching frames are turned into a blob which is compared with the pre-trained model. A low signal is sent and the vehicle is stopped if the calculated distance is 30 cm or less.

Jozef Gerat et al [11] discussed the clustering methods DBSCAN and the Gaussian Mixture Model are combined in this study's strategy for recognizing and following moving objects. The tracked objects are then managed by a Euclidean Manager that is built by integrating the Kalman Filter and Optical Flow techniques. The footage is changed to grayscale to reduce noise, and pixel moment analysis is used to determine the speed of the observed car. The algorithm is tested on vehicles traveling at 15 and 20 km/h. The Department of Electronics and Communication Engineering at AIET developed an Automated Fine Collector for Over speeding in 2022–2023 that uses the suggested methodology.

Arash Gholami Rad et al [12] proposed the camera calibration approach described in this research study uses geometrical equations and only needs one video camera and a computer running MATLAB. The system is made up of six subsystems: reference, vehicle detection, background update and removal, camera calibration, speed measurement, and result analysis. The camera is placed at a fixed height above a motorway. Using the CVS approach, which combines saturation and value, foreground and background are extracted. The vehicle's position is identified in each frame, and the distance between the next frame is determined using the blob centroid. Speed is determined using the movement's known frame rate as a reference. The typical inaccuracy for detected vehicle speed is ± 7 km/h for speeds below 50 km/h.

Zaidy et al [13] suggested this study aims to assess the Raspberry Pi 2's capacity for measuring object speed, notably that of moving automobiles. Two USB 2.0 ports on the Raspberry Pi 2 are connected to a LAN9512 combo hub/Ethernet Chip IC3, which is also a USB device connected to the BCM2835's lone upstream USB port. On the software front, OpenCV-python is installed on Raspbian OS. To handle traffic issues on a worldwide scale, an intelligent transportation system (ITS) has been developed. The technology estimates speed using real-time video processing and a camera sensor to assess vehicle speed. Principal Component Analysis (PCA) is used to categorize cars.

Before recognizing the pixel of the object, the algorithm first reads the video and does the color conversion to eliminate the RGB color noise. The object is then identified and its speed is estimated for each frame of the movie. The Raspberry Pi 2 reportedly operates identically with 320p, 540p, and 720p shot photos, with the only difference being in memory usage up to a specific limit, according to the results section.

Hakan Koyuncu et al [14] discussed the study report used linear and discrete motion speed detection as its two approaches for measuring vehicle speed. By dividing the actual distance traveled while the vehicle was in the field of vision (FOV) by the time it took for it to enter and leave the FOV, the linear technique allowed for the calculation of the vehicle's speed. The time stamps at the start and end of the FOV were used to calculate the duration of time. The vehicle speed was calculated using the discrete motion method at various timestamps inside the field of view (FOV) about the startup time stamp. Trigonometry was used to calculate the vehicle's journey distance inside the FOV as well as the vertical distance between the camera and the moving object. When compared to the calculated speed, the speedometer's inaccuracy was 1.2 meters per second.

Yang Xu and Xiaorong Zhou et al [15] suggested a wireless vehicle detection system including vehicle detection nodes, a master node, and an upper computer is covered in the research report. The STM8L SCM, a geomagnetic sensor, and a 433MHz wireless transceiver module are all used by the vehicle detection nodes. The AMR sensor, a novel kind of geomagnetic sensor that tracks variations in magnetic strength to detect the presence of a vehicle in the field, is utilized to create the system. The system records the time when a vehicle passes two nodes, divides the distance by the time difference, and determines the final speed. The system may be utilized for outdoor parking space identification and is small in size, inexpensive, and high performing, according to the results.

3. CONCLUSIONS

The current design demonstrates a feature that unifies all of the hardware components that were incorporated into it using Arduino. Each module's presence has been thoughtfully chosen and placed. As a consequence, the contributing unit for vehicle speed detection using Arduino and IR sensors has been designed correctly. With the help of technology, the SMS (Chalan) can be sent to the car owner automatically, and the car's speed is also continuously tracked and shown on a laptop.

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