Automated Speed Violation and Detection

(To detect the speed of vechile that cross thee speed limit)

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ABSTRACT

One of the most common routes to road accidents is speeding and this greatly causes casualties and damage to property. ASVD systems play an important role in enhancing traffic safety and preventing speeding as a known cause of multiple crashes. This paper describes an Adaptive Intelligent Speed Violation Detection System, which is an automated system consisting image processing, radar and machine learning. The proposed system uses speed sensors or radar for measuring velocity of the vehicles and cameras for capturing details of vehicle's license number. Using image recognition technology along with an efficient database, offending vehicles are recognized and the violation reports are predicted

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automatically. Further, real-time data processing is included in the system in order to avoid delay in detecting and enforcing to a level that has less dependence on manual work. Integrability with the legacy smart city structures is enabled by the variables of the system's scalability and flexibility. The results showcased in this paper provide a solid basis for appreciating the effectiveness of the proposed system for speed control and violation identification as a means for improving the road safety condition and implementing the traffic law compliance effectively.

I.INTRODUCTION

` IAccelerations are considered an antecedent for global road crashes, which result in great losses in terms of human and capital. In the past that disturbance of manual enforcement of speed limits has been becoming more and more difficult and time-consuming subject to the fact that there are many more vehicles on the road nowadays. Conventional techniques rely much on control by manpower, which is limited by aspects such as human error, time elasticity, and cost restraint. In response to these challenges, there is need to have Automatic systems for speed vioators' detection as one of the most effective strategy in enhancing road safety and compliance to traffic laws.ASV/ADS involve the use of radar, sensors, and computer vision to observe, detect, and record violators of the speed limit in as much as possible. These systems also replace reliance on individuals and at the same time enhance the efficiency, accuracy, and effectiveness of enforcement. Through technology like image processing, machine learning algorithms, the required vehicle and its details can be monitored and the violation report can be prepared at once.

The subject of this paper is the conception and application of automated speed violation detection system for improving traffic control and safe-by- desig,n driving practices. As the system is compatible with smart city installations, the scalable and adaptive solution is capable of handling current and future traffic problems in different climates and contexts.

II. EXISTING SYSTEM

Current System Used in Automating Speed Violation DetectionThere are several systems available in the existing conventional systems to detect and prevent cases of speed violations. These systems use a blend of older technology and partially automated techniques to measure and police speeding. The author has established that despite the fact that they have been proven to decrease traffic violation to a certain extent, they have Limitations.Existing system characteristics that research has identified as important include:

1. **Radar-Based Speed Detection**:There are basically auto radar guns and speed cameras that are mostly used in determining the velocities of the cars. These devices record any vehicle going above the preset speed and fines the offenders with information from the license plate number.
2. **Static Speed Cameras**:Initially, it involved the use of Speed-on-Rectangular-Paths derived from images recorded by fixed cameras mounted astride prominent positions like highways, intersections, and or accident-prone zones to monitor the speed of moving vehicles continuously. These cameras are predeterminately set in terms of speed, and create a violation record each time that amount is exceeded
3. **ANPR (Automatic Number Plate Recognition**):A few others combine radar surveillance or laser speed measuring with ANPR for detecting automobiles and connecting their proprietors for ticketing/ warning.
4. **Mobile and Handheld Devices**:Police departments employ two types of speed measuring equipment that is portable which allow for constant assessment of vehicles' speed at different locations.

III. PROPOSED SYSTEM

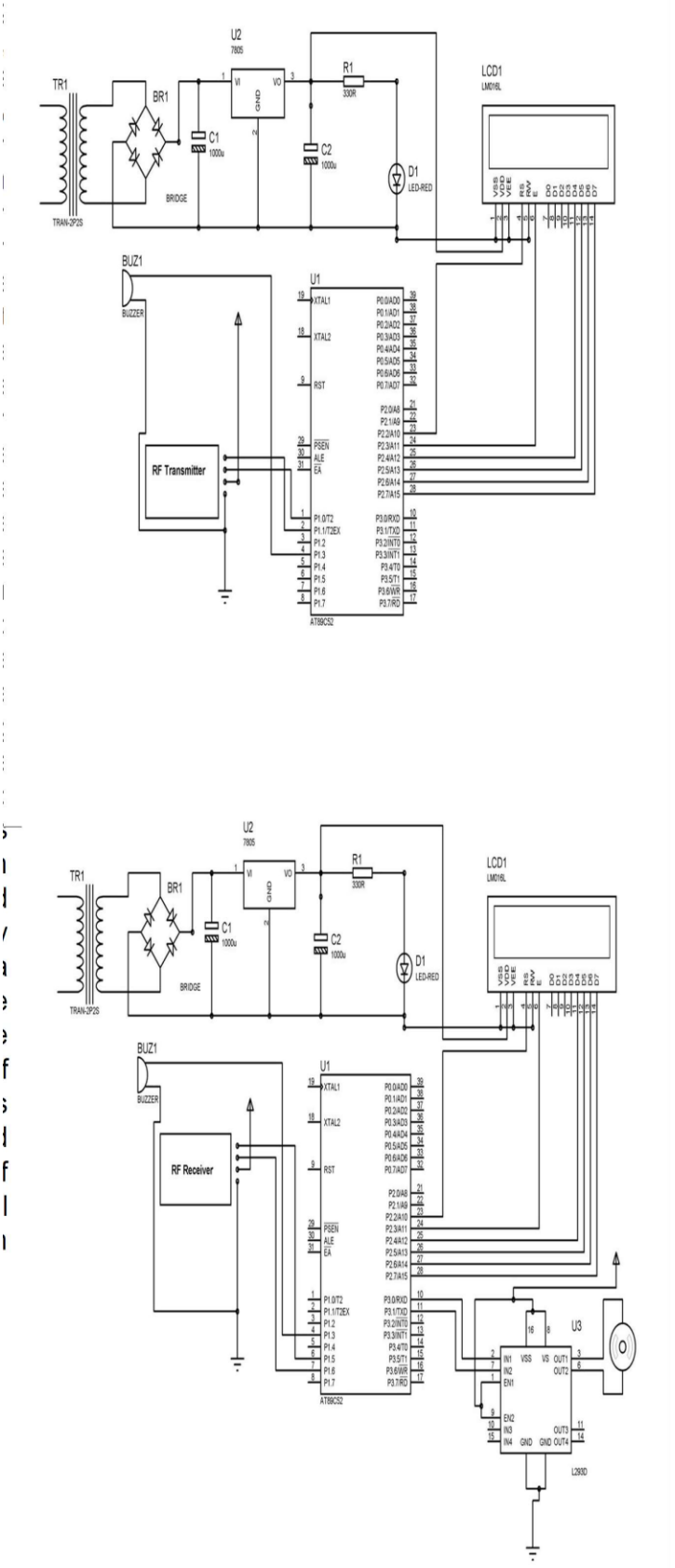
The theoretical model for this proposed system is then the Automated Speed Violation Detection System.The conceptual model of the proposed system for automated speed violation detection is an innovative model that supplements the present modes of enforcing traffic. The system incorporates hi-tech technologies and formulas to enhance on the observation of speed rates in vehicle traffic without much human input.• This module uses radar, LIDAR or piezoelectric sensors that are used to determine the speed of vehicles.• Speed is then measured through sensors that are mounted on the roads to measure real time speeds without causing congestion.• In the process, the sensor data are flowing constantly into the system for analysis.• Video devices record actions of cars or other vehicles traveling with high speed or beyond the allowed limit.• The system uses ANPR to extract license plate information from the images taken by the system.• Thanks to ML performers, accuracy increases even when the car is in different lighting and weather conditions.• The AI Algorithms work on the speed and vehicle data to determine real violations excluding those caused by environmental or technical implications.• There is also a record of registered vehicles to compare with the license plate number details in the module.• For any violation that has been noticed, the system is able to create an electronic violation report complete with the registration number of the vehicle, speed recorded, time, date, and place.• Offenders are notified through mobile message, or email or even postal message.

IV. METHODOLOGY

The theoretical approach towards automated speed violation and detection system is to adopt latest technologies such as sensors and artificial intelligence, image processing techniques for detecting and reporting real-time speed violations. This approach has been designed to be relatively independent and that minimizes the involvement of human interventions while it would be maximally reliable and can easily be scaled up.

The system is initiated by establishing monitoring points with speed detection devices radar, LIDAR, or piezo-sensors, installed at the network of roads under observation. These sensors perpetually monitor the velocity of passing through automobiles by either the Doppler shift or modulation of electromagnetic signals. Information collected by the sensors is analyzed on the fly in order to detect vehicles that go over the predetermined speed limit determined by law.At the same time, high definition cameras take pictures or shoot video frames of vehicles that are suspected to have over sped. The image is then passed through an ANPR system where license plate numbers for identification are read out. The ANPR module uses sophisticated OCR, and the module also uses the machine learning algorithms to increase the performance of the module under adverse condition such as low illumination and poor weather conditions and also high speed of the moving vechicle.The speed and identification data are transmitted to a headquarters data processing unit and analyses through the artificial intelligence algorithms which eliminate mirage points caused by the anomalies or shenanigans by the sensors and their surrounding environment. The system compares all vehicle data with the registered vehicle database, further enhancing the credibility of the entered information and calculation of a violation. Some of the information contained in the report includes; the registration number of the vehicle, speed recorded, time, date and point of the violation .For this purpose, the system is comprised of a notification module that would eliminate the need for manual sending of notifications where the offender receives an email notification, an SMS notification or from the system application

V.FIGURES



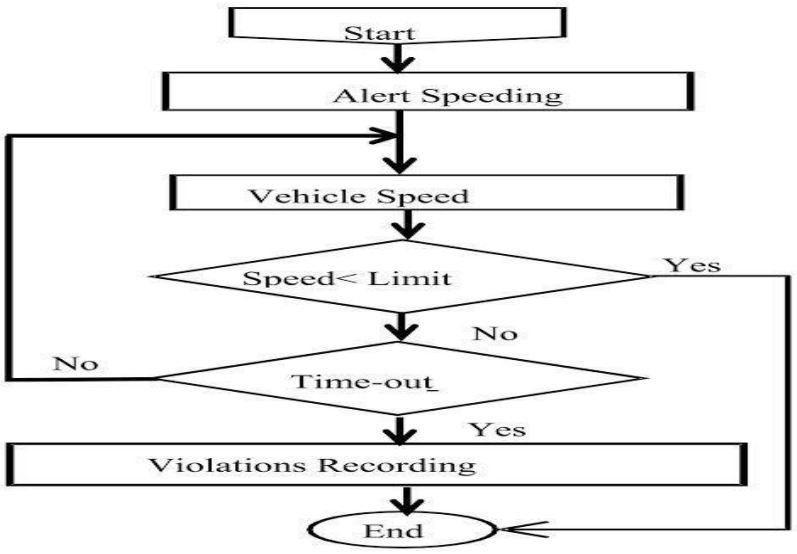


Figure 3.Monitoring Section

APPLICATIONS

1. Traffic law enforcement
2. Accident prevention
3. Smart city integration
4. Dynamic speed limit monitoring
5. Analytics and traffic planning
6. Fleet management 7.Environmental benefits

VII. HARDWARE DETAIL

Hardware details of wireless sensor networks for monitoring urban air quality, it's essential to understand the components that make up these systems.

Wireless sensor networks consist of various hardware components that work together to collect, process, and transmit data on urban air quality.

The key hardware details of these networks include sensors, nodes, communication modules, and data processing units.

Sensors are the heart of wireless sensor networks for air quality monitoring. Different types of sensors are used to detect specific pollutants such as carbon monoxide, sulfur dioxide, and particulate matter. These sensors measure pollutant concentrations and environmental parameters like temperature and humidity, providing crucial data for assessing air quality.

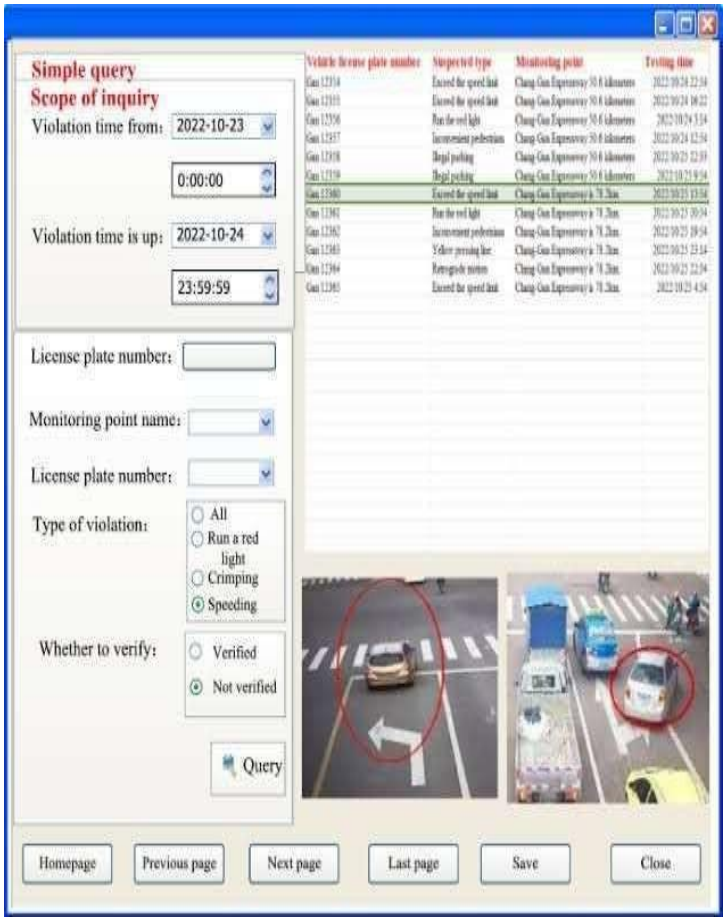
They are used in conjunction with illumination systems for instance LED flashlights during situations like low light shine. The number plate is then analyzed through detecting soft ware that helps in getting the licence plate number for identification.The system also encompasses locally-computing nodes such as edge processors or remote centralized servers for analysis. These units are equipped with GPUs or AI accelerators for processing real- time image processing and for handling of machine learning algorithms. Other hardware consist of communication devices; routers and other IoT modules applied to interface the information recorded by the various sensors, cameras and servers. Last but not the least; a power supply system including with solar panel or backup batteries makes sure to operate incessantly if any place is located in the remote areas.

VIII. DESCRIPTION OF SOFTWARE

An automated speed violation and detection system is software that incorporates data from at least one piece of system hardware than processes the data. The core component of the system is the speed detection software which acts in conjunction with radar or lidar or piezoelectric sensors for the detection and estimation of speed of vehicles in actual operating conditions. This software treats data from the sensor and checks the value of the measure speed with the authorized speed limits. When a violation is detected it sets an event that requires that high-definition cameras be to take pictures or record videos of the car. OCR is an image recognition algorithm intended to work with ANPR to parse and verify the license plate of the vehicle that's in the captured images.Other elements of the software are the speed detection overlaid on the live view from the vehiclemounted cameras.

another has an automatic number plate recognition area, and a data management block that is a central computer that collects all of the input from the sensors and cameras. This module employs the help of big data analytics, machine learning, as well as artificial intelligence to eliminate cases of fake violations. The program provides extensive violation reports, with the vehicle's plate number, speed, and time it was caught, date and location of the infringement. It also co.mmunicates with other databases from outside .

IX. SIMULATION RESULT

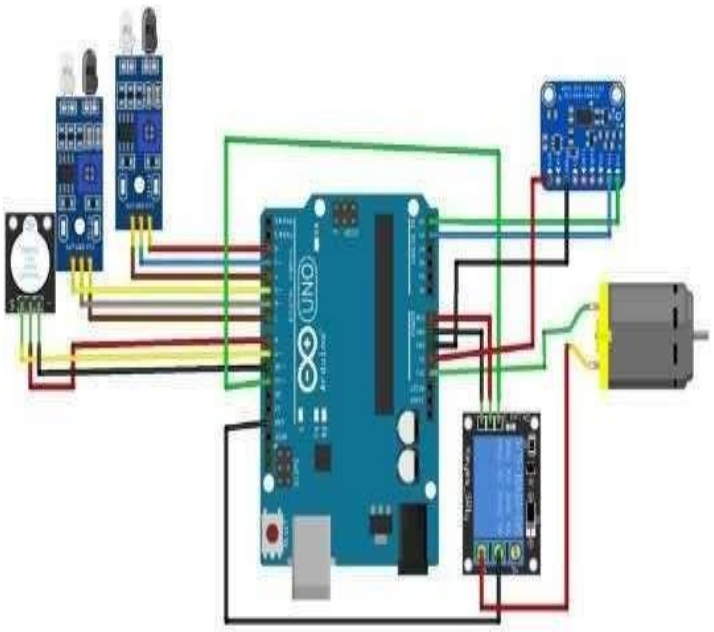


Air Quality Index, sub-categories proposed by IITM (MoES) for the Indian standards. Each group corresponds to the various levels of health risks.

- Good: Air quality is good and no health hazard when the AQI value is between 0 to 50
- Moderate: Air quality is acceptable and can cause respiratory problems to those who are sensitive to ozone or particle pollutants when the AQI value is in the range of 51- 100.
- Unhealthy: Only Sensitive group will experience health effects when the AQI value is in the range of 101-150.
- Unhealthy: Every person will experience the risk of health concerns, and the sensitive group will have serious health issues when AQI is between 150 – 200.
- Very Unhealthy: Poses severe health problems to all when AQI value is in the range of 201 - 300.

X . SCHEMATIC DIAGRAMS

CIRCUIT DIAGRAM:



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CONCLUSION

Finally, the automated speed violation and detection system is shown to be a highly efficient and reliable means for monitoring and enforcing traffic speed regulations. The system combines advanced technologies such as radar LIDAR ANPR and artificial intelligence to provide real time speed violation detection and accurate identification with low human intervention

By processing large volumes of data and producing instant violation reports and minimizing false positives it greatly improves the efficiency of traffic law enforcement. In addition, its scalability and its ability to adapt to a variety of settings, such as urban areas, highways and school zones, make it appropriate for many potential deployment locations. Finally, this system plays an essential role in the development of traffic enforcement techniques, and the results in improved road safety, less accidents and more efficient management of traffic.

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