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IOT BASED SIGNAL VIOLATED VEHICLE DETECTOR

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ABSTRACT

The number of new vehicles on the road is continuously increasing, resulting in extremely congested highways. Due to the long wait for red lights, many vehicle drivers disregard traffic rules by disregarding traffic signals. This results in a significant frequency of road accidents, hence it's critical to automatically recognize signal-violated vehicles. Traffic violation monitoring systems that use IoT technology can communicate information about violating vehicles to the concerned traffic police station automatically, allowing the car to be fined right away. The proposed system is adaptable implemented using a vehicle ID card installed in the vehicle itself, so that if the vehicle moves further during the presence of a red signal, vehicle information in the shape of vehicle registration number, type of vehicle (two-wheeler, automobile, truck, auto, etc.) owner's name, vehicle color, etc., and so on can be automatically forwarded to the concerned authorities via mobile phones. To demonstrate the concept in practice, all vehicles must be equipped with these low-cost wireless ID cards that allow vehicle data to be transferred in real time. A miniature post with an automatic traffic signal and a virtual road are included in the demo module. When the red signal is activated, and any vehicle crosses the zebra lines during this time, the system receives the vehicle data and communicates it over the Wi-Fi module. If someone disobeys a traffic light, an alarm will go off immediately, alerting the nearest traffic cop. The primary processor must be placed near the traffic signals, as it is difficult to obtain vehicle information while there are yellow and green signals present. One toy automobile will be included in the demo module, which will be outfitted with its own wireless ID card.

Keywords: Arduino Processor, LCD, Voltage Regulator, LM555 Timer Chip, 89c2051, Wi-Fi Module.

I. INTRODUCTION

INFORMATION ON TRAFFIC SIGNAL:

Traffic lights follow a universal color code with a sequence of illuminating lamps or LEDs of three standard colors.

- Green light; Allows traffic to proceed in the direction denoted.
- A red light means that no traffic is allowed to proceed.
- Amber or yellow light indicates that the signal is ready to turn red. The three main traffic signals are as follows.

These are the three main traffic lights that are universally used around the world. Some people fail to obey traffic signals for a variety of reasons. One of the most common causes is a rush, as well as a loss of patience due to long periods of time spent driving on congested roads. Another key reason is negligence. In this situation, if somebody crosses the zebra line when there is a red light activated, the signal violator may be involved in a serious accident caused by oncoming vehicles. It is critical to detect and catch signal violating automobiles on the spot in order to avoid such accidents. As a result, this system was created to automatically convey information about violating vehicles to the nearest traffic cop who is stationed near the signal.

BACKGROUND THEORY:

Because the number of new cars on the road is steadily rising every day, roads are becoming increasingly congested, and people are becoming increasingly frustrated as a result of traffic jams and long waits at signal posts, which is the most common reason for breaking traffic laws. Those who ignore traffic signals at intersections are responsible for the majority of accidents. IoT-based traffic violation detection systems are a highly effective method for decreasing traffic violations by tracking and regulating vehicles. To detect vehicles that have disobeyed the traffic signal, each vehicle must be equipped with a vehicle ID card, and a passing a vehicle identification card, and a passing vehicle identification card reader must be installed at or near a traffic signal post wirelessly. The vehicle identification card is a basic gadget containing an 89c2051 microcontroller IC that transmits the information about the vehicle saved on the card through an infrared LED. The next chapter

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will provide a full description of the complete system.

II. PROBLEM STATEMENT

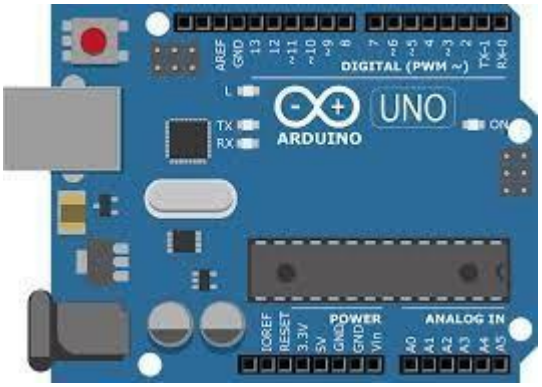
The goal of the project is to automate the traffic signal violation detection system, making it easier for traffic cops to monitor traffic and take swift and effective action against violators. The system's principal objective is to correctly detect the vehicle. To resolve the issue and avoid such serious consequences, traffic violation detecting devices are required. Because of this, the system is continually enforcing proper traffic rules and arresting those who do not comply. A real-time traffic violation detection system is essential since authorities are always monitoring the streets. As a result, traffic enforcers will have no trouble not just implementing safe highways exactly, but also efficiently, because traffic rule breaking detecting technology detects transgressions faster than people. This system can detect traffic signal breaches in real time.

COMPONENTS:

1) Arduino :

The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microprocessor, designed by Arduino.cc. The board has pins for board is equipped with sets (I/O) for connecting to circuits and expansion boards (shields).

There are 14 digital I/O pins on this board (six of which are capable of PWM output) and6 analogue I/O pins and 6 digital I/O pins, and it can be programmed making use of the Arduino IDE and a USB type B connector (Integrated Development Environment). It can be powered by a USB cable or an external power source with voltages ranging from 7 to 20 volts and 9- volt battery. Its microcontrollers are identical to the Leonardo and Arduino Nano.



The reference hardware design is licensed under the terms of a Creative Commons Attribution Share-Alike 2.5 license can be found on the website of Arduino. Design and layout manufacturing files are also available some variations of the device.

To honor him, the Italian term "uno," which means "one," was chosen as Arduino Software's first release. The Arduino Uno board, together with version 1.0 of the Arduino IDE, was the first of a series of USB-based Arduino boards; it served as the standard version of Arduino until it was overtaken by future releases.

2) LCD-Display:

The term "liquid crystal display," or LCD, comes from this definition. It is composed of two states of matter: solid and liquid. On an LCD, a liquid crystal is employed to create a viewable image. LCD (LCDs) are ultra-thin display screens that can be found in laptop computers, televisions, cell phones, and portable video games. LCD technology, as opposed regarding the technology of the cathode ray tube (CRT), allows for far thinner displays. The components of a liquid crystal display are: several components, including two polarized electrodes and panel filters. The LCD technology is employed to display images in notebooks and other electronic devices, such as computers, such as small PCs. A lens focuses light onto a liquid crystal layer.

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The liquid crystal display panel, rather than emitting light, operates by blocking it. LCDs require a backlight because they do not emit light. We frequently utilize LCD screens, which have mostly supplanted the use of cathode ray tubes. Cathode ray tubes require more energy than LCDs and are also heavier and bulkier.

3) Voltage-Regulator:

A voltage regulator is a device that maintains a stable voltage automatically. In a voltage regulator, negative feedback or a basic feed-forward architecture can be used. It's possible to use an electromechanical mechanism or electrical components. Depending on the design, it may be used to regulate one or more AC or DC voltages. Electronic voltage regulators are used in systems like computer power supplies to stabilize the DC voltages required by the processor and other components. In vehicle alternators and central power plants, voltage regulators control the output of generating plants. Voltage regulators can be installed in an electric power distribution system at a substation or along distribution lines to ensure that all customers receive constant voltage regardless of how much electricity they consume.

4) Wi Fi Module:

The Arduino Uno Wi Fi is a version of the Arduino Uno with a built-in Wi Fi module. The board is built around the ATmega328P and includes an ESP8266WiFi Module. 6 The ESP8266WiFi Module is a self-contained SoC with an integrated TCP/IP protocol stack capable of providing Wi-Fi access (or the device can act as an access point). The Uno Wi-Fi's support for OTA (over-the-air) programming, whether for Arduino sketches or Wi Fi firmware, is a useful feature. The Arduino Software (IDE) is used to program the Arduino Uno Wi Fi, which is the same for all of our boards and can be used both online and offline. For more information on how to get started with the Arduino Software, go visit the Getting Started page.

5) TSOP1738:

Miniaturized receivers for infrared remote control systems are available in the TSOP1738 series. The preamplifier and PIN diode are mounted on a lead frame, and the epoxy packaging serves as an IR filter. A CPU may directly decode the demodulated output stream. The TSOP1738 line of IR remote control receivers is the industry standard, covering all main transmission codes.

Specifications:

- Supply Voltage: 5 V
- Power consumption: 0.4 to 1.0 mA
- Min. Ee irradiation: 0.35 mW/m2 typ.
- Angle of detection: 90
- Dimensions of the casing (mm): 12.5 x 10 x Thickness 5.8
- Temperature range: -25 C to +85 C

6) AT89C2051 Micro Controller:

The AT89C2051 is an 8-bit CMOS microprocessor with 2K bytes of programmable and erasable read-only memory (PEROM). The device is manufactured with Atmel's high-density non-volatile memory technology and is compatible with the industry-standard MCS-51 instruction set. The Atmel AT89C2051 7 is a powerful microcomputer that combines an 8-bit CPU with Flash on a monolithic chip to give a highly customizable and cost-effective solution for a wide range of embedded control applications.

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The AT89C2051 comes bundled with the following features: 2K bytes of flash memory, 128 bytes of RAM, 15 I/O lines, two 16-bit timer/counters, a five vector two-level interrupt architecture, a full duplex serial connection, and a precision timer/counter analogue comparator, on-chip oscillator and clock circuits, and a full duplex serial port Furthermore, the AT89C2051 8 comes with static logic for low-frequency operation and two software-selectable power-saving modes. In Idle Mode, the CPU is turned off, but the RAM, timers/counters, serial port, and interrupt system are still active. In power-down mode, the RAM contents are retained, but the oscillator is frozen, making all other chip operations useless until the next hardware reset.

III. VECHICLE DETECTION METHOD

DESIGN IMPLEMENTATION

3.1 Vehicle Detection and Attribute based search of vehicles in video surveillance system [1]

According to the report, vehicle identification is the first step in observing and controlling traffic. Low-resolution cameras are used in current surveillance systems, however some standard approaches, such as number plate recognition and vehicle classification, may fail with low-resolution cameras. This study introduces a feature selection and classification approach based on training. For vehicle detection, a Haar-based As a classification methodology, the Adaboost algorithm is utilized to train the models. It also generates strong classifiers by combining the performances of weak classifiers based on weighted versions of data samples. Furthermore, several attributes are used to search for a specific automobile. Date and time, color, speed, and travel direction are among the features. These features give accurate information, allowing for a more concise list of identified automobiles to be displayed.

3.2 A rapid learning algorithm for vehicle classification [2]

Because there is so much heterogeneity in vehicles, vision-based approaches must be employed for detection. The appearance of the car is influenced by neighboring things such as a crowded background, vehicle shadows, and environmental conditions. As a result, Adaboost is the most recommended technique for vehicle detection. Adaboost is a program that is commonly used to train data samples and increment weights. However, the biggest drawback of this strategy is the lengthy training duration. This research solves the problem by introducing a vehicle categorization system that uses rapid incremental learning. Standard feature extraction algorithms like Principal Component Analysis (PCA) and Gabor Filter were utilized at first, but they took a long time to compute. On a 32x32 grey scale image patch, this paper employs a Haar-like feature pool with 2D Haar functions. The sample key feature value is coupled with the label "class" to boost the classifier's training speed. The basic idea is to create new key Haar-like features from new training data and then combine them with previously created key Haar-like features. This improves the team's performance algorithm drastically. The experimental results illustrate a better accuracy rate which can be further utilized in real-time applications.

3.3 RED LIGHT VIOLATION DETECTION METHOD

3. 3.1 Development of an Automated Red Light Violation Detection System (RLVDS) for Indian vehicles [3] The Integrated Traffic Management Systems (ITMS) that are now in operation in India are the subject of this research. ITMS is primarily concerned with road safety and regulation. The technique proposed in this study generates a comprehensive list of all vehicles that break the regulation. This process begins by capturing backdrop photos from the surveillance cameras' recordings. It's an adaptive method in which the new image retrieved for comparison is added to the background image stack if it's a picture for the background .On average, of those photos is then used to find violations. The system examines probable occlusions that happened over the stop-line using the background subtraction technique. Over the zebra crossing line, a virtual stop line is drawn. Furthermore, 5 imaginary lines on each sides of the stop line, which serves as a threshold, are taken into account. If an object crosses the line in the sand subtracted image, it is determined if the thing is a vehicle or not. Furthermore, if it is a car, the system makes advantage of Optical Character Recognition technology to identify the vehicle license plate. The device is capable of accurately evaluating up to 92 percent of autos.

3.3.2 Traffic Violation Detection and Penalty Generation System at a Street Intersection [4]

Violation of red light traffic signals is the primary cause of traffic congestion and accidents at street junctions. It's possible because there aren't enough traffic cops at every crossing. This research suggests a traffic management system infraction detection system based on video post-production techniques. The system

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functions alone, without the assistance of other external systems such as acontrol box for traffic signals. Through video processing techniques, the device initially identifies red light. The red color matrix is extracted from the RGB layer after a picture is recorded. This image is turned by converting it to a binary picture subtracting it from the grey frame. A bounding box is formed around the red signal using the Blob technique. If the detected signal is red, the Hue a method based on the HSV color spaceis employed in the detection of cars. The authorized officer can utilize the android application to charge a penalty based on the identified license plate.

3.4 NUMBER PLATE RECOGNITION METHOD

3.4.1 An efficient approach for System for recognising licence plates automatically [5]

The next critical stepis to acknowledge the vehicle's number plate once it has been spotted. Automated number plate identification with image processing is critical for retrieving the car owner's information. The precision is part of the system influenceda variety of parameters, including the time it takes to retrieve an image and the image quality. As a result, the paper separates the number plate into three sections for automatic recognition. Template matching, character segmentation, and optical character recognition are the three methods. The paper recommends using Gabor filtering on a greyscale image for character recognition. The image has a lot of noise in it then displaced using the linear Gabor filtering approach. The Greyscale image is segmented into characters. It breaks down the license number into different characters. After that, the characters are pixel by pixel correlated by comparing formats. It has been noticed that the proposed process achieves satisfactory results, with OCR taking less time and producing higher accuracy. When Haar-like feature extraction is employed and Adaboost is It is a classification tool. discovered that vehicle detection is accurate. When the same car crosses the red light for the second time, a message is sent to the RTO unit, and the RTO sends a message via GSM to the corresponding vehicle to slow down and stop.

FLOW CHART FOR SOLUTION PROPOSED

Our proposed solution will be a one-of-a-kind system that combines a web page that displays the result of the recorded plate number, as well as the ability to query a database for a certain plate number defaulter's identification, with current Python source code for OpenCV. The license plates of all the cars will be saved in a database, which will be searched to find the defaulter. To identify fast-moving autos, the developed system will employ a logical and effective strategy, utilizing cost-effective methods to get good results.

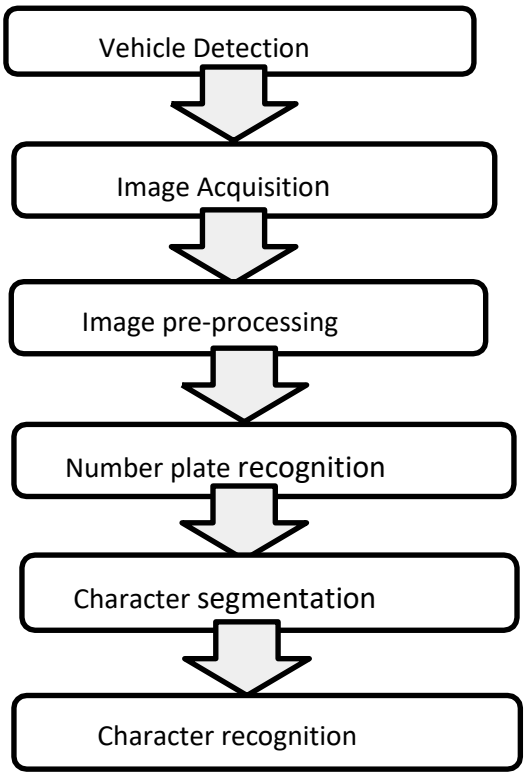

Fig 1: Flow diagram for the design process.

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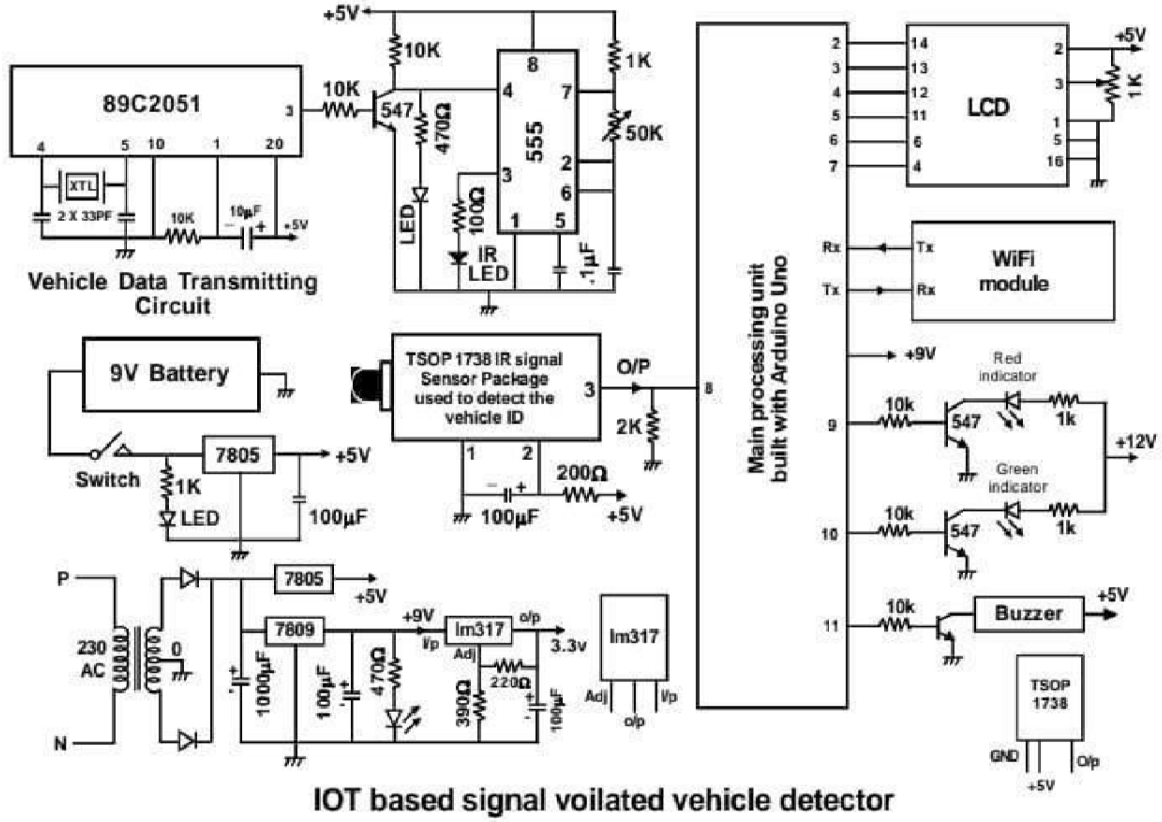
capturing real-time images of moving cars in such a way that the vehicle plate number may be detected can be incredibly difficult. Several methods for capturing plate number systems have been used in the existing systems discussed above. The majority of them were successful in capturing the license plates of fast-moving vehicles. The study that came closest to this, which used OpenCV and Python was able to detect the licence plate number, but there was no database system in place to identify the culprit.

IV. WORKING

The process starts with the vehicle data transmitting card, which is constructed with an 89C2051 microcontroller and is supposed to be inserted in the vehicle. Because this chip is a little device with only 20 pins, it takes up very little space. As a result, the data transmission card is intended to be small and is housed in a small toy car. The car's controller generates digital information appropriate to the vehicle; it's a pre-programmed microprocessor that always produces the same data. The controller's digital data is modulated at 38 KHz is the frequency. Because the data generated by the controller cannot be transmitted as a modulated wave, it must be superimposed over this frequency. The frequency generated The timer chip acts as a carrier oscillator, mixing the digital data from the controller with this frequency and delivering it as a modulated wave through an infrared LED. The digital data generated by the controller is transferred via an infrared LED. The below figure 4.2 shows the use-case diagram of the entitled project and it's flow. The user provides the raw dataset as input along with the flow of the input in the system, as shown in the illustration. The system evaluates and processes the dataset and extracts the meaningful dataset to process and refine the cluster data. From the given cluster of data, the system plots the data values and gives a figurative result as prediction and displays exactly the same as refined output in the display screen. So, this is how we can detect the violated vehicles and send the information of vehicles to nearby police.



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V. SIMULATION RESULTS

VI. RESULTS AND DISCUSSION

So, using a microcontroller, a wifi module, and other sensors, we can detect vehicles that have been violated. We will assign a vehicle id to the vehicle, which will contain all of the vehicle's information in addition to owner's information. As a result, anytime that specific car breaks the rules, the IR sensor package identifies it and sends the data to Arduino. The Arduino identifies the vehicle's details and sends the information to nearby cops via a wifi module. We may also use this technology from afar with the assistance of a mobile app called wifi controller.

VII. CONCLUSION

The project work **"IoTbased Signal infringed on the vehicle detector"** is completed successfully and results are found to be satisfactory. During our trail runs we found that, sending data from the vehicle is very difficult

because we won't get any suitable sensors or circuits not available. In this regard we have designed our own circuit, after conducting so many trails over different circuits and finally we could able to achieve the desired result. The final purpose of this circuit is to transfer the digital data generated by the microcontroller chip. Initially, we planned to transmit the data using an RF transmitter, but we discovered a big problem: the car begins sending data before the circuit is completed reaching the zebra line. Aim is to send information when the vehicle crosses the zebra line.when the red light is turned on in on condition.In this regard, we discovered that data must be delivered in a single direction rather than in an omnidirectional manner, as RF transmitters do, so an IR signal transmitter circuit is built utilising an IC 555.

Regarding IOT technology, it is considered one of the booming fields in forthcoming years and plays a major role in the field of communication. IOT helps in connecting the people by exchanging the data of various devices.A new trend in the internet of things has emerged as a result of recent advancements in wireless sensor networks. The major goal of this project is to do thorough research on effectively collecting signal-violated vehicles.

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