

AUTOMATED TRAFFIC MONITORING SYSTEM

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Abstract: This study has been undertaken to investigate and analyze the implementation prospects of an Automated Traffic Monitoring System at a minuscule level and providing an alternative for the application of the same at a larger level. The point of convergence of this scheme is scaling down the number of red light violations using camera along with character recognition and face counting feature together with a safety feature that notifies the commuter of the traffic light status of the road. This scheme can be effective at reducing traffic congestion, speed and flow of the traffic.

Index Terms - Microcontroller, IR Sensor.

I. INTRODUCTION

This world, that has come to terms with the commercialized industrialization and technical advancements that it confronted and is still growing with it is struggling. During all of this we still kept overlooking the gradual awakening of the environmental distress. The major reasons for this climatic crescendo were emissions and extreme use of fossil fuel. Though the use of fossil fuel is drastically reduced, the adjacent problem is still steadily rising and the proximate solution to this had to be control over vehicular use and systematic traffic surveillance and control system. Roads, streets and paths are part of the fabric of our communities, facilities for all to use. They enable us to move around in order to do what we want or need to do in our lives. But to ensure that this can happen effectively, and that traffic on these routes is not detrimental to our communities, the whole system of travelers, vehicles and travel routes needs to be carefully managed


II. LITERATURE SURVEY

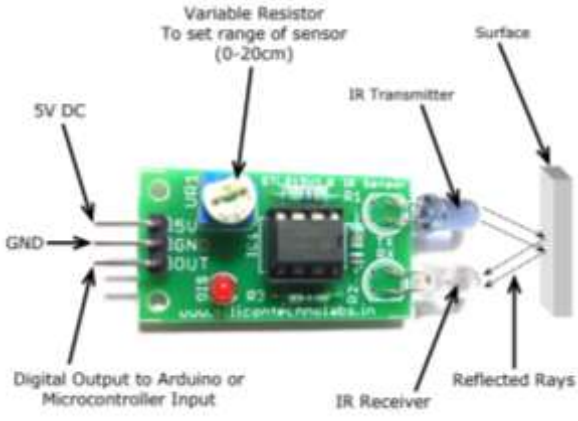


The purpose of the study is based on the investigation of several detailed analysis of key issues that are on effect and these key issues are the focal point for the evolution of the traffic system. The survey done by the Chinese research team led by Professor H.N. Ley concluded that, "the critical parameters that affect traffic congestion are the density, speed and flow of traffic. To control these parameters, supervising the red light violation is very important". A project named Indian Automated Traffic Monitoring System was prepared by the National Police Mission of Ministry of Home Affairs, Government of India (Ministry of road transport and highways led by T. R. Baalu). This project was implemented in the year 2009, which concluded that rise in vehicular accidents on road were mainly due to red light violation.

From the above analysis of the various problems arising from time to time, we concluded that RED LIGHT VIOLATION if controlled will lead to controlling the amount of vehicular accidents, density, speed as well as the flow of traffic.

This led to the proposal of an advanced automated traffic monitoring system, which will aid in the above issues that are currently circumventing the country. This system emphasizes on surveying and controlling the red light violation and accidents. It provides a safety feature which focuses on speed reduction. This system employs character recognition as well as facial recognition and also helps in the generation of instant memo for the violator. The implementation of the system in the city would also reduction in manpower.

III. COMPONENT DESCRIPTION

Sr. No.	Component Name	Component Description
1	AtMega16A Microcontroller 	<p>It is a low power and a high performance 8/16-bit microcontroller. It has a 16KB flash memory. The endurance cycle of flash memory and EEPROM is 10,000 and 100,000, respectively. There are 32 I/O (input/output) lines which are divided into four 8-bit ports.</p> <p>The alternative for the above component when project is to be built on a larger scale is PLC and SCADA system. This will allow for multiple inputs at a time as well as reduce the processing time. The controlling of the system will be fast and monitoring of traffic can be controlled as well.</p>
2	Infrared IR Sensor	<p>An IR sensor can measure the heat of an object as well as detects the motion. The emitter is simply an IR LED and the detector is simply an IR photodiode which is sensitive to IR light. When IR light falls on the photodiode, the resistances and these output voltages, change in proportion to the magnitude of the IR light received.</p> <p>On the other hand, piezoelectric sensor can also be used for detection of red light violation. These sensors are installed on</p>

		<p>road ground for better performance. This sensor is used to measure the change of pressure, force, temperature, strain and acceleration. They are converted into an electrical charge.</p>
3	<p style="text-align: center;">CCTV Camera</p> 	<p>CCTV stands for closed circuit television. This device has a high power lens for clear and distant vision, which allows clearly capturing of number plates of vehicles as well as their faces that are violating red light signal. Depending on the scale of operation of the traffic system, different range of CCTV cameras are variable with variable lens powered focus for optical zooming.</p>
4	<p style="text-align: center;">LCD Display</p> 	<p>This device is used as a safety feature in this project. When a vehicle is approaching the traffic signal, a few meters ahead, the LCD Display will display a message stating that, "Traffic Signal Ahead, Slow down your vehicle". In this way the citizens will slow down their vehicle and will avoid breaking laws related to violation of traffic.</p>

IV. SOFTWARE DESCRIPTION

5.1 MatLab: MATLAB, a language developed by MathWorks, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, Fortran and Python.

The MATLAB application is built around the MATLAB scripting language. Common usage of the MATLAB application involves using the command window as an interactive mathematical shell or executing text files containing MATLAB code.

MATLAB has structure data types. When creating a MATLAB function, the name of the file should match the name of the first function in the file. Valid function names begin with an alphabetic character, and can contain letters, numbers, or underscores. Functions are often case sensitive.

5.2 Atmel Studio: It is an integrated development platform (IDP) for developing and debugging all AVR and SAM microcontroller applications. The Atmel Studio 7 IDP gives you a seamless and easy-to-use environment to write, build and debug your applications written in C/C++ or assembly code. It also connects seamlessly to the debuggers, programmers and development kits that support AVR and SAM devices.

5.3 phpMyAdmin:

phpMyAdmin is a free software tool written in PHP, intended to handle the administration of MySQL over the Web. phpMyAdmin supports a wide range of operations on MySQL and MariaDB. Frequently used operations (managing databases, tables, columns, relations, indexes, users, permissions, etc) can be performed via the user interface, while you still have the ability to directly execute any SQL statement. phpMyAdmin comes with a wide range of documentation.

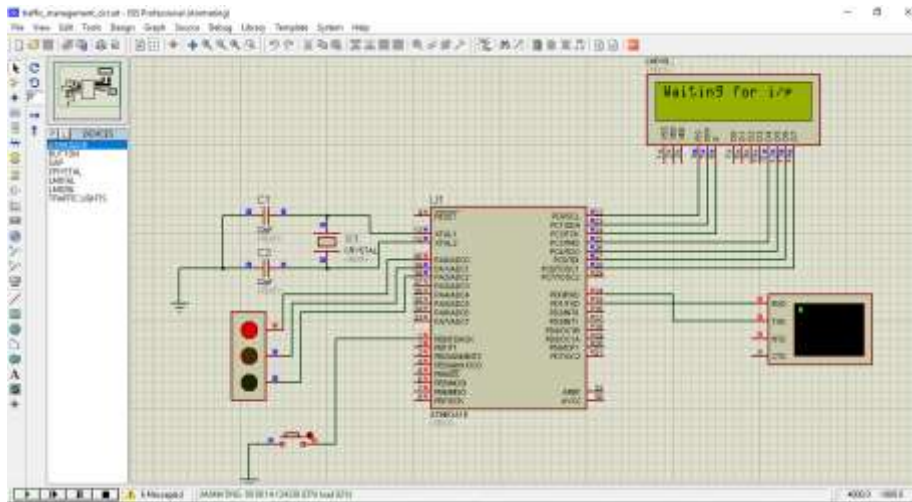
Features provided by the program include:

1. Web interface
2. MySQL and MariaDB database management
3. Import data from CSV and SQL
4. Export data to various formats: CSV, SQL, XML, PDF (via the TCPDF library), ISO/IEC 26300 - OpenDocument Text and Spreadsheet, Word, Excel, LaTeX and others
5. Administering multiple servers
6. Creating PDF graphics of the database layout
7. Creating complex queries using query-by-example (QBE)
8. Searching globally in a database or a subset of it
9. Transforming stored data into any format using a set of predefined functions, like displaying BLOB-data as image or download-link
10. Live charts to monitor MySQL server activity like connections, processes, CPU/memory usage, etc.
11. Working with different operating systems.
12. Make complex SQL queries easier.

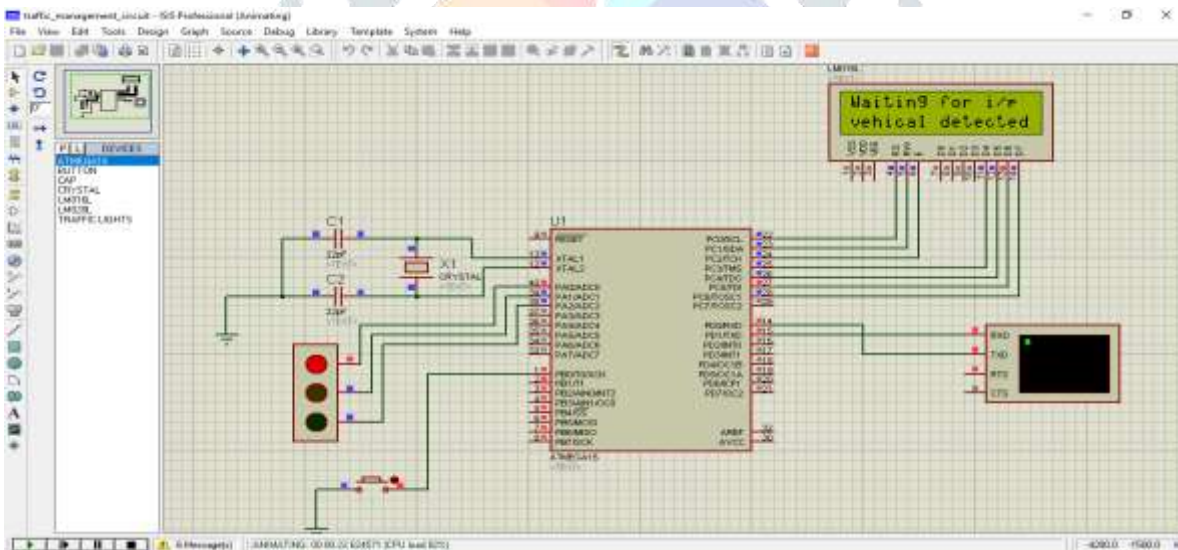
V. RESULT ANALYSIS:

The violation detection unit is a sensor circuit which is used for identifying the vehicles and the program circuit of microcontroller connected to a communicated network is employed. This system has an arrangement of infrared sensors at either sides of the road. IR sensors are used to detect any vehicle that is passing by during the time of red light. When the traffic light is red the sensors get activated and tracks when a vehicle crosses its path. This process triggers the camera to take instant picture of the license plate of the vehicle as well as capturing the picture of the person driving it. This data is then transferred to the controlling unit which verifies it with the stored data. This process does not need any manual help because it is internally programmed. This helps in generation of fine in the name of the violator directly.

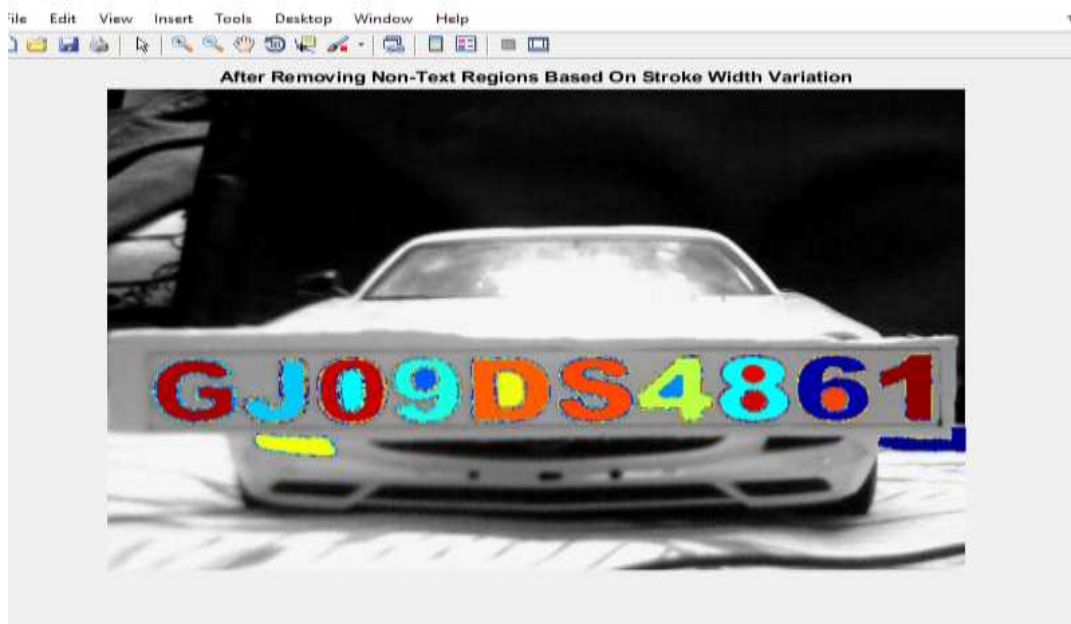
Step 1: In the below given figure it can be observed that the system is now activated, which means the ultrasonic sensor are switched ON. The duration of green light to yellow light is of 10 seconds time and yellow light to red light time gap is of 3 seconds. Now on the LCD as we can see it displays, "Waiting for i/p".



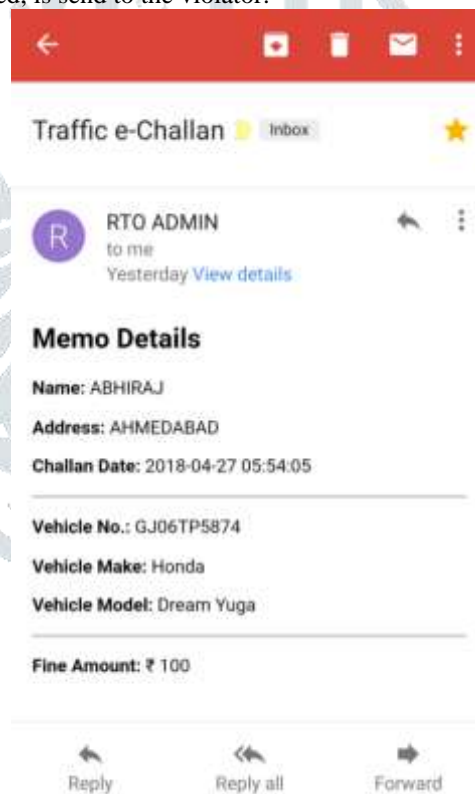
Step 2: The IR infrared sensors are activated as the red light is switched ON, now as any vehicle crosses the sensors barrier line, the CCTV camera gets activated the vehicles image is captured at that exact time. In the figure below as we can see that the LCD displays, "Vehicle Detected". Now the number plated image captured by the CCTV camera is now processed out.



Step 3: In the above figure we can observe that the number plate image captured by the CCTV camera is processing. The MatLab code now tries to pick out the set of alphabets and numbers (or string set) from the number plate. Each and every string detected and processed by the MatLab is boxed and surrounded. In the above figure we can observe that the MatLab code has completely executed and the alphabet set and number set are finally detected and this number plate is now forwarded to the stored database of all the individuals with their Name and contact details for further penalizing the red light violator.

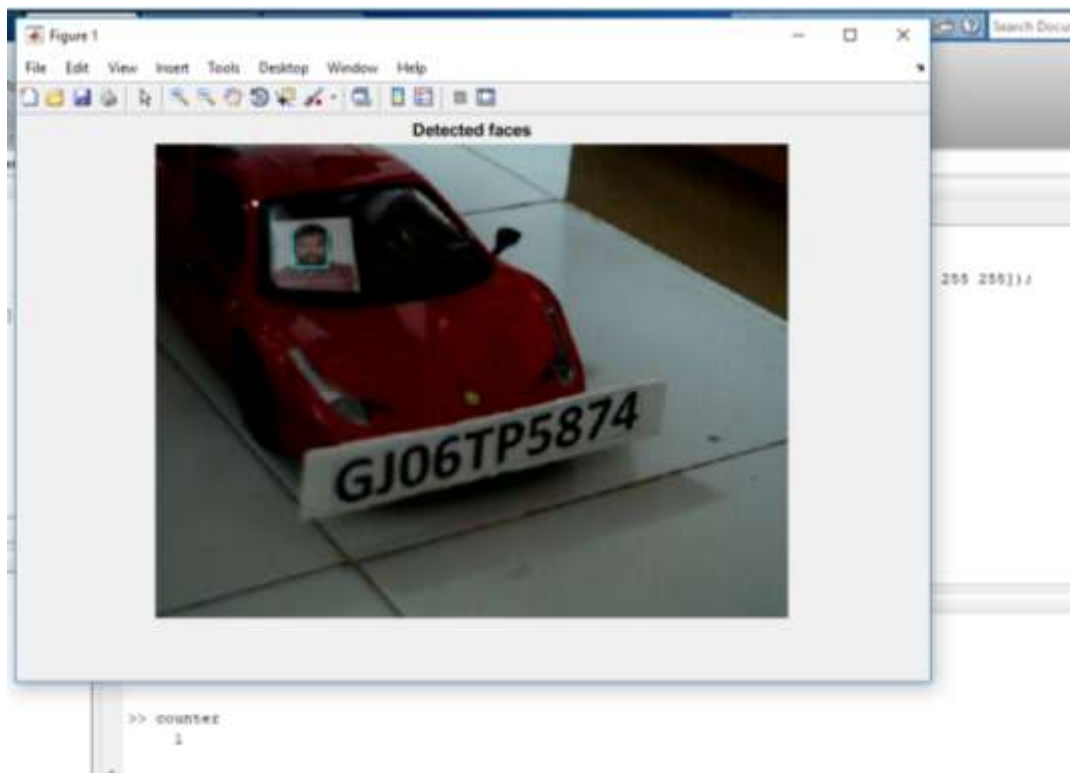


Step 4: Below is a figure of the memo generated with the name of the violator, penalized amount fined, vehicle number and the date and time when the red light violation occurred, is send to the violator.



(Figure 11: Memo)

Step 5: The number of people involved in violating is also captured with their faces picture. As well as the number of people sitting in the vehicle as well. The detection or counting of people is based on the eyes and nose structure of the person to form an inverted triangle. Hence the matlab coding allows counting of persons also.



VI. CONCLUSION

A simple, recuperated and low cost system for monitoring and reporting incidences of red light violation at the traffic intersections is performed in this research. The proposed system consists of a traffic rules violation detection unit and the alleged offender identification unit. Upon detection of a predefined traffic law infringement at the intersection and recognition of the suspected desperado, the corresponding action can be performed by the traffic monitoring system. The system is more impeccable as it is free from the effects of the bad weather conditions, improper lighting, which influence the performances of the red light camera system for identifying the operator or the license plate number of a violating vehicle. As the overall system is automatic, it is more invincible. However, the prime constraint of the system is that there should be a trustworthy wireless mobile communication network throughout the site of operation. In this regard, the system can be made more economical.

VII. FUTURE PROSPECTS

In future vehicles can have IR sensor fixed to number plate and using this sensor can be communicated by using signals and hence path sending an alert message using built-in GSM modem. In this, we can eliminate manually detecting hardware and also send SMS without using the internet. The vehicles having GPS settings in it can be provided with the alternative path on their screen. RFID, GPS, GPRS and network, upon those technologies Internet of Things is found, to construct an intelligent traffic monitoring system, which makes the latter as a part of the former. Intelligent traffic monitoring system based on Internet of Things has a number of advantages such low cost, high reliability, never affected by adverse weather, all weather operations etc. The technologies of Internet of Things makes it possible that a complete automation in monitoring system from data detect to data transmission, and to intelligent decision-making, from vehicle management to highway congestion control.

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(b) <https://www.google.co.in/imgres?imgurl=https%3A%2F%2Fmicrochip.lk%2Fwp-content%2Fuploads%2F2016%2F06%2Fhc-sr501-labelled-alt.png&imgrefurl>
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