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Traffic Rule Violation Information System TRuVIS

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Abstract— In this paper, we have presented a system which monitors, regulates and takes appropriate actions against traffic rule violations, specifically violating no-horn restrictions. When a vehicle breaks the law by blowing the horn in a no-horn zone, a message is sent to a designated mobile number, presumably traffic control, and the violation is reported.

Keywords—Traffic rule violation; Arduino; GSM SIM-300; alert system; Transmitter-receiver

I. INTRODUCTION

With the recent ballooning of urbanization, industrialization and population, there has been an escalation in traffic. The growth in traffic has its related problems; these problems include severe noise pollution, traffic jams, accidents and traffic rule violations. This in turn has an adverse effect on the environment of the country. The expected increase of cars and SUVs from 2005 to 2035 is 13 times (35.8 million to 236.4 million vehicles), while two wheelers are expected to increase about 6.6 times (35.8 million to 236.4 million vehicles) [1] .We can safely assume that the problems related to snarling traffic are going to persist if not increase.

An increase in traffic will automatically lead to an increase in the levels of sound pollution. The noise produced by these vehicles not only lowers the quality of life and work of the majority of people but also can result in permanent hearing loss for vehicle operators and people living nearby (this includes unborn children, since noise penetrates the womb). At high levels, this noise can result even in tissue damage (body parts and organs resonate and tissues can fracture at some low frequencies) leading to serious health problems (it can even lead to a miscarriage). Walking on the street is a hazard these days and is not at all enjoyable (which has no doubt an impact on tourism as well).These vehicles are highly distracting in traffic and can cause accidents since they mask sounds and agitate drivers. Loud sounds can affect hearing, vision, reaction time and judgement of drivers and nearby people, increasing dangers significantly for everyone involved. Noise pollution caused by modified vehicles is a very fast growing problem. They are the weapons of intimidation and acoustical terrorism in the hands of disrespectful and ignorant people. Proposed measures should be introduced quickly by the government in order to stop this dangerous trend and to protect the environment, as well as the well-being and health of people. As can be seen from the diagram below, one of the major sources of sound pollution is cars.

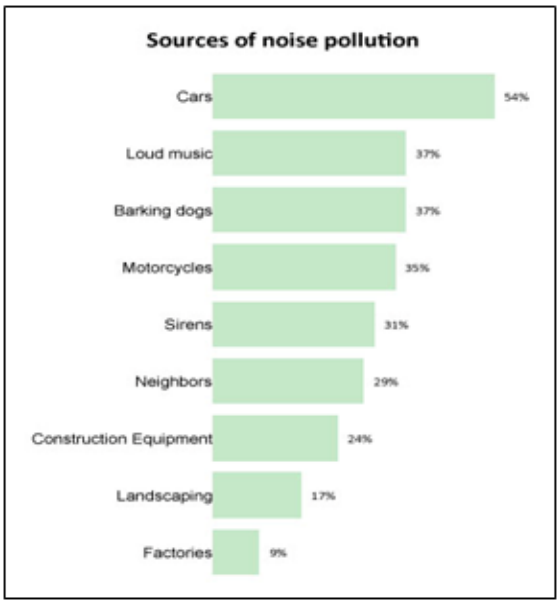

Fig. 1 Sources Of Noise Pollution

The permissible limit of presence of sound in air as decided by Noise Pollution (Regulation and Control Rules), 2000 [2], are shown in Table I,

TABLE I ALLOWABLE DECIMAL LIMITS

Area Code	Category of Area/Zone	Limits in dB(A) Leq	
		Day	Night
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note: -

1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
3. Silence zone is defined as an area comprising not less than 100 meters around hospitals, educational institutions and courts. The silence zones are zones, which are declared as such by the competent authority.
4. Mixed categories of areas may be declared as one of the four-abovementioned categories by the competent authority.

*dB (A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.A "decibel" is a unit in which noise is measured."A" in dB (A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear. Leq: It is an energy mean of the noise level over a specified period.

It is necessary to record the violation of these rules and penalise the violators, it is much more reliable, maintainable and efficient to conduct electronic policing rather than manually recording the violation.

We have implemented an information system that can track if a car is violating traffic rules. We can trace the area in which the car is running and report the exact act of violation. In this project we have only incorporated the system of tracking if a car is blowing its horn in restricted areas. The same system plan can be tweaked to accommodate other features such as tracking speed limit violations etc.

II. LITERATURE REVIEW

Traffic rules violation has become very frequent nowadays, and it is not possible to catch all such violations manually by the traffic police. Hence various researchers and scientists have tried to device automated traffic rule violation detection systems to tackle the problem.

The authors in [3] have taken advantage of the latest "smart-card driving licenses" to scan the info of the driver, without which the driver will not be able to start the car. In case of any fine, the driver is charged with the penalty automatically.

The authors in [4] have used IR transmitters and receivers to detect traffic signal violations. On violation, a message containing the details of the driver is communicated to the law enforcing agency.

Various approaches have been proposed by the authors in [5] to identify the traffic rule violator's vehicle and then take snapshots of the driver's face and the vehicle's registration plates so that the violator can be charged.

The authors in [6] have proposed an approach to penalize the traffic rule violators by using RFID and road-side cameras.

The authors in [7] have also proposed a traffic monitoring system using RFID tags, routers and coordinators.

We have used low cost TX-ASK and RX-ASK to designate the specific areas (zones) and the vehicles respectively. To explain the flow of control in a nutshell, the receiver in the car receives a signal when it is in a restricted zone. The display alerts the driver. If the driver blows the horn, then a message is sent to the traffic controller (via the GSM module) with the car registration number as well as the area code. The restriction will be lifted as the car goes out of the zone.

III. COMPONENTS

A. Arduino

Arduino is a single board microcontroller designed to make the process of using electronics in multidisciplinary projects more accessible, The hardware consists of a simple open source hardware board designed around an 8 bit Atmel AVR microcontroller ,though a new model has been designed around a 32 bit Atmel ARM. The software consists of a standard programming language compiler and a boot loader that executes on the microcontroller.

Arduino boards can be purchased pre-assembled or do it yourself kits. Hardware design information is available for those who would like to assemble an Arduino by hand. There are sixteen official Arduino kits that have been commercially produced to date.

B. Arduino IDE

The Arduino Integrated Development Environment (IDE) is a cross platform application written in Java , and is derived from the IDE for the processing programming language and the Wiring Projects. It includes a code editor with several features and is capable of compiling or uploading programs to the board with a single click. Arduino programs are written in C or C++. Users only need to define two functions to make a runnable cyclic executive program:

- setup(): a function run once at the start of a program that can initialize settings.
- loop(): a function called repeatedly until the board powers off.

We have used Arduino Uno in our project, which consists of Atmega 328 Microcontroller. Uno provide 14 digital I/O pins, six of which can produce pulse-width modulated signals, and six analog inputs, which can also be used as six digital I/O pins. These pins are on the top of the board, via female 0.10-inch (2.5 mm) headers.

C. Transmitter-Receiver

The RX-ASK is an ASK Hybrid receiver module and the TX-ASK is an ASK hybrid transmitter module. TX-ASK is designed by the saw resonator with an effective low cost, small size and simple to use for designing.

D. Encoder-Decoder

HT12E (parallel to serial encoder) and HT12D (serial to parallel decoder) are 18 pin ICs. The HT12E is a 12 bit parallel to serial encoder. Of those 12 bits 8 bits are the address code and the remaining 4 bits are data. To send a signal, the address bits on the transmitter and receiver should be the same. It's like a password. One can use a single RF transmitter to control different RF receivers (at the same frequency) by configuring the address bits appropriately. All receivers would have to be set to different addresses. With 8 bits one can create a total of 256 combinations.

E. GSM Module

This is a plug and play GSM Modem with a simple to interface serial interface. It is used to send SMS, make and receive calls, and do other GSM operations by controlling it through simple AT commands from micro-controllers and computers. It uses the highly popular SIM300 module for all its operations. It comes with a standard RS232 interface.
The modem consists of all the required external circuitry required to start experimenting with the SIM300 module like the power regulation, external antenna, SIM Holder, etc.

F. Nokia 5110 LCD Screen

The Nokia 5110 is a basic graphic LCD screen for lots of applications. It was originally intended for as a cell phone screen. This one is mounted on an easy to solder PCB.
It uses the PCD8544 controller, which is the same used in the Nokia 3310 LCD. The PCD8544 is a low power CMOS LCD controller/driver, designed to drive a graphic display of 48 rows and 84 columns. All necessary functions for the display are provided in a single chip, including on-chip generation of LCD supply and bias voltages, resulting in a minimum of external components and low power consumption. The PCD8544 interfaces to microcontrollers through a serial bus interface.

IV. FUNCTIONALITY AND DESIGN

A. Working

Transmitters are installed in the no-horn areas of the city. Each and every area which is designated as a no horn zone is assumed to have been assigned an area code and this information is known to the control station. As soon as the car enters the no horn zone the receiver module installed in the car receives the signal and the message displayed on the LCD screen fitted in the car alerts the driver that he should not blow the horn and it is a restricted zone. If the driver blows the horn ignoring the alert message a traffic violation report is sent to the control station with the registration number of the car and the area code in which the violation had taken place. This is possible because of the SIM card fitted in the module installed in the car. The control station can also have an idea about the exact time of the rule violation by considering the timestamp of the incoming message and it can call back to the particular number to decide the penalty. We can incorporate more features to the system such as speed tracking, pollution tracking etc. in the future to make an integrated traffic rule enforcement system.

B. Block Diagram

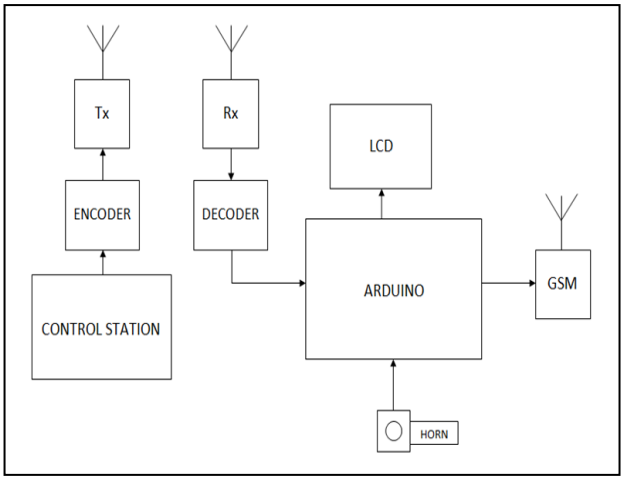

Figure 1

C. Circuit Diagram

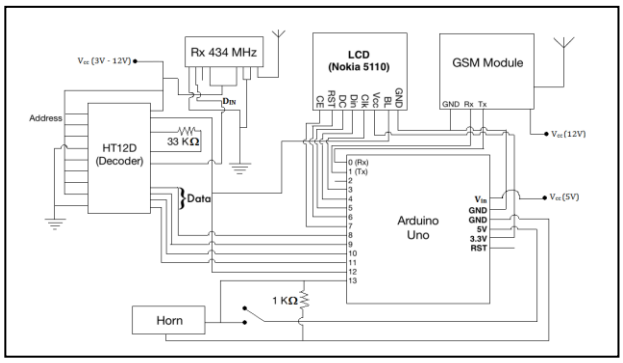

Figure 2(a): Circuit Diagram (Dashboard)

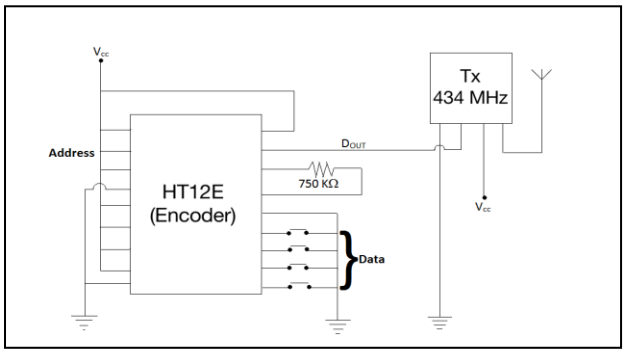

Figure 2(b): Circuit Diagram (Transmitter)

D. Implementation

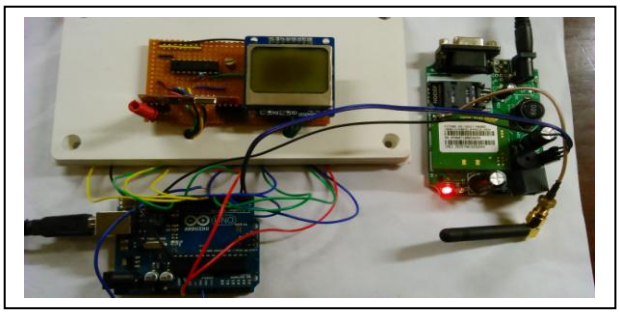

Figure 3(a): Completed Circuit (Dashboard)

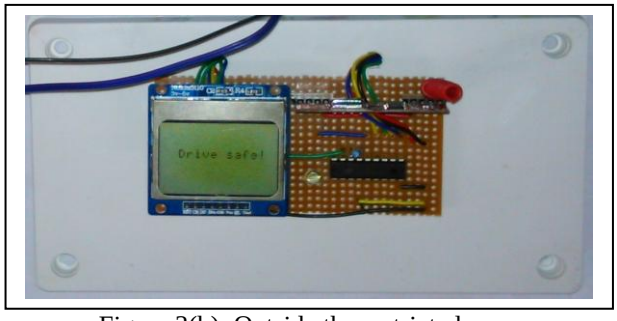

Figure 3(b): Outside the restricted zone

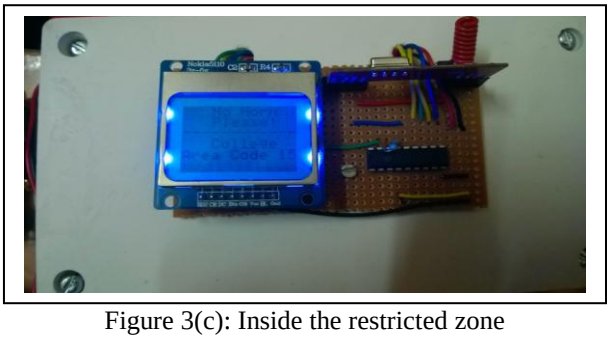

Figure 3(c): Inside the restricted zone

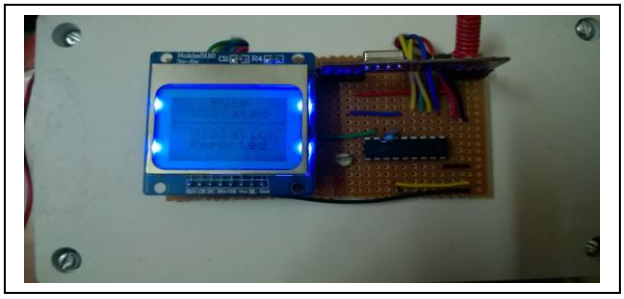

Figure 3(d): Violation alert

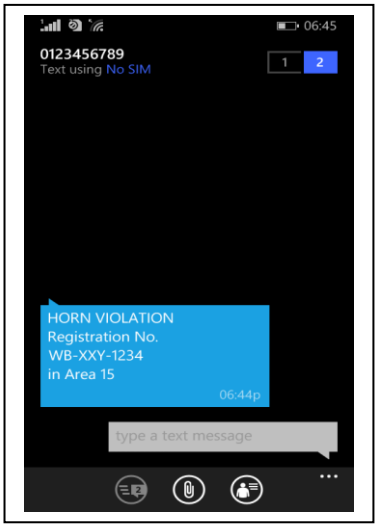

Figure 4: Received message at control tower

E. Abbreviations and Acronyms

TRuVIS - Traffic Rule Violation Information System
AVR - Advanced Virtual RISC
RISC - Reduced Instruction Set Computer
ARM - Advanced RISC Machine
IDE - Integrated Development Environment
RX-TX - Receiver Transmitter
ASK - Amplitude Shift Keying
HT12E - HolTek Encoder
HT12D - HolTek Decoder
RF - Radio Frequency
GSM - Global System for Mobile Communication
SMS - Short Message Service
LCD - Liquid Crystal Display
SIM - Subscriber Identification Module

V. ALGORITHM

TRuVIS algorithm works as follows:

- Step 1: While the vehicle is not in a restricted zone, the message “Drive Safe!” is displayed on the dashboard.
- Step 2: When the vehicle enters the restricted zone the message “No Horn Please!” along with the area the car is in and the area code is displayed on the dashboard. The LCD lights up as well.
- Step 3: If the horn is activated in the zone, an alert is generated and is sent to the control tower. The control tower receives the registration number of the car and takes appropriate action.
- Step 4: Monitoring continues as long as the vehicle is in the zone.
- Step 5: When the vehicle leaves the restricted zone, the message “Drive Safe” appears on the dashboard and the LCD backlight switches off.

VI. CONLUSIONS

In conclusion, we would like to point out the fact that our device only monitors horn violations. There is a vast scope of improvement. We can improve on this by adding some other features. We often come across the problem of cars speeding within city limits. We can check this problem by monitoring the speed of automobiles and taking appropriate

action if it goes over the stipulated speed limit. Also, we can track stolen vehicles. The device can send data via an Ethernet shield to an administrator, by which the tracking can be done. Thus, we present a device which while still in a prototype phase, can hopefully lead to the development of a device which can be used to monitor and enforce traffic laws and make the roads safer.

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