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TRAFFIC SIGNALS VIOLATION DETECTION SYSTEM BASED ON RFID BY USING ARDUINO

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Abstract: *Road Traffic Accidents are a major cause of disability and death throughout the world. The control of intelligent vehicles in order to reduce human error and boost ease congestion is not accomplished solely by the aid of human resources. The present article is an attempt to introduce an intelligent control system based on RFID technology. By the help of RFID technology, vehicles are connected to computerized systems, intelligent light poles and other available hardware along the way. In this project, intelligent control system is capable of tracking all vehicles, crisis management and control, traffic guidance and recording Driving offences along the highway and at the traffic signals.*

Keywords: RFID, ARDUINO, Traffic violation, GSM.

I.INTRODUCTION

The main types of Traffic Violations are ‘Moving Violations’ and ‘Non-Moving Traffic Violations’. Driving offences involving fatalities are 'dangerous driving' and 'careless or inconsiderate driving'. A moving violation can only be issued if the car is in motion. A person drives dangerously when the way they drive falls far below the minimum acceptable standard expected of a competent and careful driver; and it would be obvious to a competent and careful driver that driving in that way would be dangerous.

Some typical examples from court cases of dangerous driving are:

• Speeding, Racing, Weaving
• Ignoring traffic lights, road signs
• Overtaking dangerously
• Knowing the vehicle has a dangerous fault or an unsafe load
• Permitting to drive without valid license
• Drove on wrong side of divided highway

A person drives carelessly or inconsiderately when the way they drive falls below the minimum acceptable standard expected of a competent and careful driver. Some examples of careless driving are:

• Overtaking on the inside
• Driving through a red light by mistake
• Cut across driveway to make turn
• Parked in No Parking area
• Leaving vehicle in dangerous position
• Speed under minimum

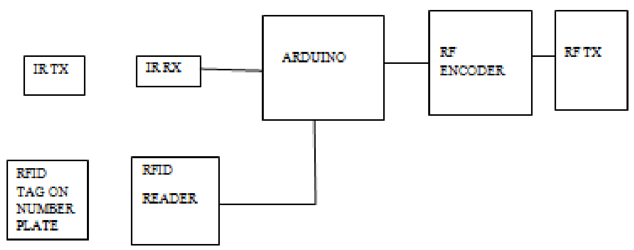

Fig: Block diagram of transmitter

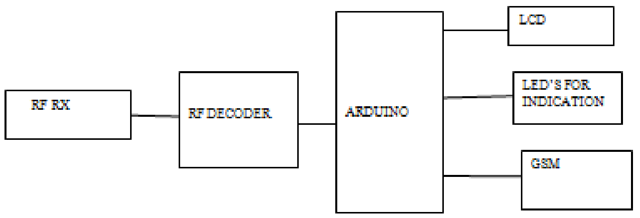

Fig: Block diagram of receiver

II.THE RFID SYSTEM

RFID is an electronic method of exchanging data over radio frequency waves. An RFID system is comprised of several components including:

• Antennas: Linear or Circular polarized.
• Readers: This is sometimes referred to as an interrogator.
• Tags: This is sometimes referred to as a transponder.
• Software: This may also be referred as middleware.

Antenna: The antenna emits radio signals to activate the tag and read and write data to it. Antennas are available in a variety of shapes and sizes; they can be built into a doorframe to receive tag data from persons or things passing through the door, or mounted on an interstate tollbooth to monitor traffic passing by on a freeway. Antennas can also be mounted on mobile devices and under print heads.

Readers: Often the antenna is packaged with the transceiver and decoder to become a reader, which can be configured either as a handheld or a fixed-mount device. The reader emits radio waves in ranges of anywhere from one inch to 100 feetor more, depending upon its power output and the radio frequency used. When an RFID tag passes through the electromagnetic zone, it detects the reader's activation signal. The reader decodes the data encoded in the tag's integrated circuit (silicon chip) and the data is passed to the host computer for processing.

Tags: There are a variety of RFID tag types. Selecting the correct tag will be imperative to ensure a proper functioning system. A tag is comprised of:

• Silicon chip: Integrated circuit (IC chip) that contains the data.
• Antenna: An antenna is attached to the chip in order to receive and transmit its data.

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• Substrate: This is the paper or plastic film or housing that the chip and antenna are mounted on. RFID tags can be active, semi-passive (semi-active) or passive

RFID transmitter: Power supply +5V is connected to the 40 pin of microcontroller and ground is connected to 20th pin. Here, we got two switches which are duly connected to microcontroller with pulled up to 5V and this two switches form the input command to the microcontroller. We also got an LCD display for displaying the data to be transmitted. We also have an arrangement for a computer key board to be connected for positive and negative part from clock and data pin which is connected as input to the microcontroller from the output of key board and that data is ultimately displayed in the LCD. We also have one RF transmitter. It has VCC supply, GND. Data pin which goes to microcontroller. The program is so written that by appropriate operation of this working we first make the key board active. Once the key board is made active by pressing the buttons then the keyboard entry can take place which is displays in LCD. If it has to be sent against codes varying from 0 to 9 this will be displayed in LCD. Here every press is advancing as per the code from 0 to 9 and ultimately when we press one of the push button for sending it will go to microcontroller and then to the RF transmitter module over a 433 MHz frequency transmitted from antenna.

RFID Receiver: At receiver end we have similar connections for power supply as microcontroller needs +5V. Similarly to transmitter, hear also we are using two push buttons with 10k pull up resistors through 5V supply for RF Module. We are using pin 3.0 to connect data pin of RF module and 1 and 2 pins of RF module is used for GND and VCC. We also have two buttons for selection of code and for receiving the data. Once the data is received by the receiver module that data is demodulated and goes to the receiver pin 10 of microcontroller as per the program. It then displays the message on LCD display.

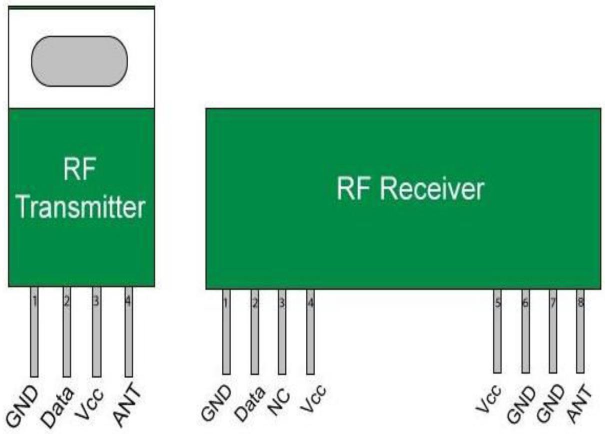

Fig: Working of RF transmitter.

III.RFID types

• Passive RFID tags have no internal power supply. The minute electrical current induced in the antenna by the incoming radio frequency signal provides just enough power for the CMOS integrated circuit (IC) in the tag to power up and transmit a response. Most passive tags signal by backscattering the

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carrier signal from the reader. This means that the antenna has to be designed to both collect powers from the incoming signal and to transmit the outbound backscatter signal.

• Semi-passive RFID tags are very similar to passive tags except for the addition of a small battery. This battery allows the tag IC to be constantly powered. This removes necessity the aerial to collect power from the incoming signal. Therefore, Aerials can be optimized for the backscattering signal. Semi-passive RFID tags are faster in response and therefore stronger in reading ratio compared to passive tags.

• Active RFID tags or beacons, on the other hand, have their own internal power source, which are used to power any ICs and to generate the outgoing signal. They may have longer range and larger memories than passive tags, as well as the ability to store additional information sent by the transceiver. To economize power consumption, many beacon concepts are operated at fixed intervals.

Software: A consistent intelligent system requires consistent components such as intelligent software for crisis management, reporting and training the system for different conditions. Therefore, genetic algorithm plays a significant role. In this project, the genetic algorithm of artificial intelligence or feedback is used. Genetic algorithms are one of the best ways to solve a problem for which little is known. They are a very general algorithm and so will work well in any search space. All you need to know is what you need the solution to be able to do well, and a genetic algorithm will be able to create a high quality solution. Genetic algorithms use the principles of selection and evolution.

IV.ARDUINO SYSTEM

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560 (datasheet). It has 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega is compatible with most shields designed for the Arduino Duemilanove or Diecimila.

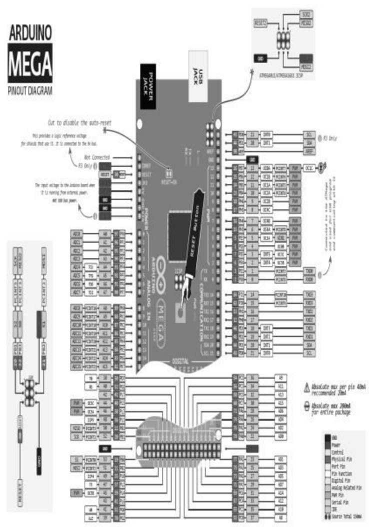

FIG: PIN description.

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The Arduino Mega can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts. The Mega2560 differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

Communication: The Arduino Mega2560 has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega2560 provides four hardware UARTs for TTL (5V) serial communication. An ATmega8U2 on the board channels one of these over USB and provides a virtual com port to software on the computer (Windows machines will need in file, but OSX and Linux machines will recognize the board as a COM port automatically. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the board.

The RX and TX LEDs on the board will flash when data is being transmitted via the ATmega8U2 chip and USB connection to the computer (but not for serial communication on pins 0 and 1). A Software Serial library allows for serial communication on any of the Mega2560's digital pins. The ATmega2560 also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus; see the documentation on the Wiring website for details. For SPI communication, use the SPI library.

Programming: The Arduino Mega can be programmed with the Arduino software (download). For details, see the reference and tutorials. The ATmega2560 on the Arduino Mega comes pre burned with a boot loader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol (reference, C header files).

You can also bypass the boot loader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header; see these instructions for details.The ATmega8U2 firmware source code is available in the Arduino repository. The ATmega8U2 is loaded with a DFU boot loader, which can be activated by connecting the solder jumper on the back of the board (near the map of

Italy) and then resetting the 8U2. You can then use Atmel's FLIP software (Windows) or the DFU programmer (Mac OS X and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU boot loader). See this user-contributed tutorial for more information.

Automatic (Software) Reset: Rather than requiring a physical press of the reset button before an upload, the Arduino Mega2560 is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega2560 via a 100 nano farad capacitor.

When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

This setup has other implications. When the Mega2560 is connected to either a computer running Mac OS X or Linux, it resets each time a connection is made to it from software (via USB). For the following half-second or so, the boot loader is running on the Mega2560. While it is programmed to ignore malformed data (i.e. anything besides an upload of new code), it will intercept the first few bytes of data sent to the board after a connection is opened.

If a sketch running on the board receives one-time configuration or other data when it first starts, make sure that the software with which it communicates waits a second after opening the connection and before sending this data.

The Mega2560 contains a trace that can be cut to disable the auto-reset. The pads on either side of the trace can be soldered together to re-enable it. It's labeled "RESET-EN". You may also be able to disable the auto-reset by connecting a 110 ohm resistor from 5V to the reset line; see this forum thread for details.

USB Over current Protection: The Arduino Mega2560 has a resettable poly fuse that protects your computer's USB ports from shorts and over current. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500 mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

V. GSM

GSM stands for Global System for Mobiles. This is a world-wide standard for digital cellular telephony, or as most people know them Digital Mobile Telephones. GSM was created by the Europeans,

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and originally meant "Group Special Mobile", but this didn't translate well, so the now common more globally appealing name was adopted. GSM is a published standard by ETSI, and has now enjoys widespread implementation in Europe, Asia, and increasingly America.There are many arguments about the relative merits of analogue versus digital, but for my mind it comes down to this: Analogue sounds better and goes further, Digital doesn't sound as good, but does a whole lot more. Check out the links page for sites that have some good discussion on the Digital v Analogue debate.

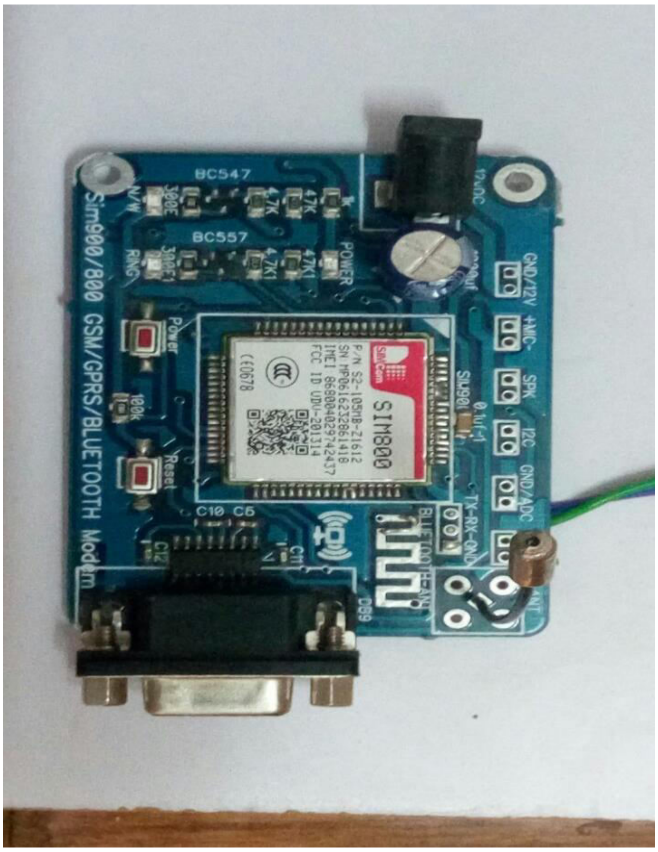

Fig: GSM module

Throughout the evolution of cellular telecommunications, various systems have been developed without the benefit of standardized specifications. This presented many problems directly related to compatibility, especially with the development of digital radio technology. The GSM standard is intended to address these problems.

From 1982 to 1985 discussions were held to decide between building an analog or digital system. After multiple field tests, a digital system was adopted for GSM. The next task was to decide between a narrow or broadband solution. In May 1987, the narrowband time division multiple access (TDMA) solution was chosen.

VI.FUTURE SCOPE

RFID defence technologies and applications and the use of RFID to monitor and track items safely and securely in the military supply chain.

Transport facility is suffering with many issues like

- Accident risk management
- Environment alert
- Traffic rule violation control
- Vehicle theft identification
- Traffic signal management

By using the RFID technology we can detect these problems.

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VI.RESULT

When the traffic signal shows a green signal then the IR transmitter will be in 0 logic. i.e,it in of condition. Otherwise either for red light or yellow signal the IR transmitter is in on condition and the IR transmitter continuously sends the infrared rays if any object is detected then the infrared rays reflected back to the IR receiver.

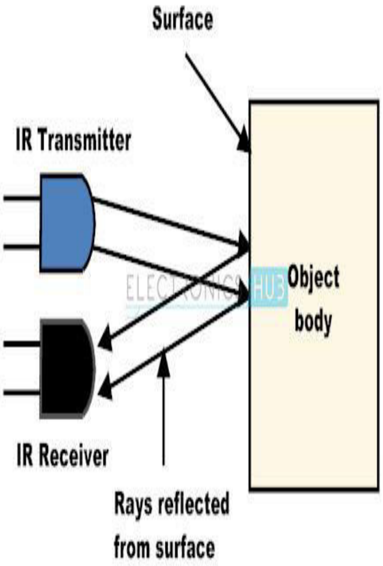

FIG: 9.1(a): object detection using IR LED

The receiver sends the message to the arduino and its sends message to the LCD display or GSM. Through the GSM the message is send to the person who crosses the signal.RFID is placed in vehicle with owner info, RC book, service details etc. to send vehicle identification to traffic information database. From RFID Tag the information is received by the RFID receiver and sends the information to LCD and GSM through arduino.

We used GSM module with ARDUINO unit in the moving vehicle to transmit traffic signal violation information to different point.

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VII.CONCLUSION

Conducting the above project, the following data is being sent to the data centre

- Red light crossing
- Wrong route

Today, in most parts of the world, anticipating the future and pre-programming leads to the augmentation of the efficiency and placing the necessary equipment in the necessary places. With paying little attention, it becomes known that this method has less delay in comparison to JIT method. For this purpose, through using the history of the past and locating, the most of the future events can be predicted. Consequently, by decreasing the time of delay, the efficiency will certainly increase.

Some of the advantages of using this system are as the following:

- Increasing traffic's safety
- Decreasing the cost: such as traffic fatalities, financial damages and fossil fuels
- Decreasing delay time while entering and leaving the highway
- Decreasing traffic crimes

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