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Travolution-An Embedded System in Passenger Car For Road Safety

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ABSTRACT

Road traffic crashes are one of the world's largest public health and injury deterrence problems. According to the World Health Organization (WHO), more than a million people are killed in road accidents, each year, all over the world. A report published by the WHO in 2009 revealed that more people die on roads in India than anywhere else in the world. The statistics for India are chilling. At least 13 people die every hour in road accidents in the country; the latest report of the National Crime Records Bureau reveals. In 2007, 1.14 lakh people in India lost their lives in road mishaps. Poor road infrastructure, failure to comply with speed limits, growing drinking and driving habits is among the main factors contributing to deaths from road crashes, WHO said in its report on 'Decade of Action for Road Safety 2011-2010. Each year, there are thousands of highway deaths and tens of thousands of serious injuries due to "Run-Off-Road" accidents. Everything from simple driver inattentiveness, to fatigue, callousness, to drunk driving, is responsible. Simple sensors can be fitted inside vehicles embedded with various features like, automatic collision notification, vehicle security, speed control which can give impetus to an efficient road safety system. The features that are proposed in this work are: Automatic collision notification that gives notification to the victim's relative, Red light traffic control makes sure vehicle doesn't break signal, Speed control alters speed in different zones, Horn control prevents honking in horn prohibited zone, Alcohol detection detects drunk driving and Vehicle security is used to prevent theft.

Keywords : GSM Modem, SMS, Embedded System, Run-Off-Road

I. INTRODUCTION

Currently Road safety systems are available in high end luxury cars such as Audi, Mercedes Benz etc. to name a few. Example: OnStar Corporation provides subscription-based communications, in-vehicle security, hands free calling, turnby- turn navigation, and remote diagnostics systems throughout the United States, Canada and China. A similar service is known as Chevy Star in Latin American markets. OnStar FMV became available to the public on July 24, 2011. It provides some of the features an OEM system has, such as Automatic Crash Response, Stolen Vehicle Tracking, Turn-by-Turn Navigation, and Roadside Assistance

DISADVANTAGES:

1. Doesn't take care of major road accidents
2. Drunken driving is not considered

PROPOSED SYSTEM:

The motivation behind the project Travolution is an attempt to make an embedded system which is to bring a positive difference in the field of road safety and road discipline. The project tackles some major causes of road accidents such as breaking traffic signals and drunken driving. It also has a major objective of exercising road discipline such as speed control in different areas and horn control in horn prohibited zones.The features added in this work are: Vehicle Speed Control in Variable Zone- in this feature, speed of the vehicle is controlled in different areas such as flyovers, bridges, highways, schools, cities and internal areas. Horn Control of Vehicle in No Honking Zone- Control unwanted disturbances in horn prohibited zones such as hospitals, public libraries, courts, schools etc. Red Light Traffic Control- In this feature the vehicle is controlled on traffic signal, when signal is red the

vehicle is automatically stopped. Automatic Collision Notification- In this feature when vehicle meet with an accident, the system of this project sends messages (SMS) via GSM Modem to control room and the nearest relative of the victim. Vehicle security- In this feature, if the vehicle is stolen or someone tries to break in, theft sensor is activated and message is sent to the police control room and to the owner if the vehicle via GSM modem.

Alcohol Control- The alcohol sensor prevents the ignition key from working if the driver breathes into it and a significant quantity of alcohol is detected. Consequently message is sent to the RTO.

ADVANTAGES:

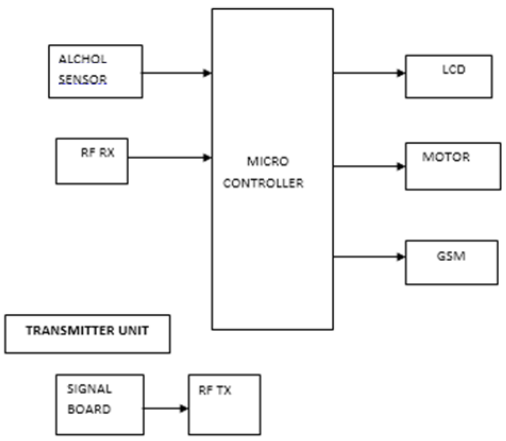
1. Takes care of several road safety issues
2. Vehicle speed control in variables zones is main feature

II. METHODS AND MATERIAL

HARDWARE REQUIREMENT:

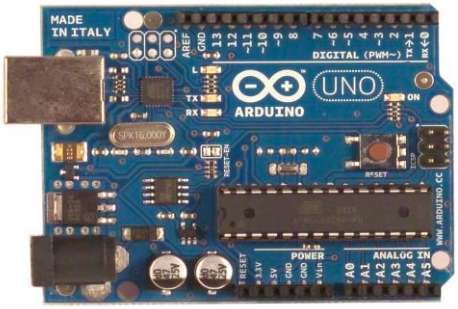
- AT89C51 / AT89C52
- LCD 16X2
- Sensors
- Switches
- GSM
- GPS
- Relays
- Power supply circuit
- uart

Vehicle Unit



ARDUINO:

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, 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 Uno 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. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform; for a comparison with previous versions.



POWER:

The Arduino Uno 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.

SENSORS:

Ultrasonic sensors work on a principle similar to sonar which evaluates distance of a target by interpreting the echoes from ultrasonic sound waves. This ultrasonic module measures the distance accurately which provides 0cm - 400cm with a gross error of 3cm. Its compact size, higher range and easy usability make it a handy sensor for distance measurement and mapping. The module can easily be interfaced to micro controllers where the triggering and measurement can be done using two pin. The sensor transmits an ultrasonic wave and produces an output pulse that corresponds to the time required for the burst echo to return to the sensor. By measuring the echo pulse width, the distance to target can easily be calculated. Features non-contact measurement with blinding from 0-1cm*.

Alcohol Sensor for use in Breathalyzer's or in an alarm unit, to detect the presence of alcohol vapors. This sensor unit offers very high sensitivity, combined with a fast response time. The unit will work with a simple drive circuit and offers excellent stability with long life. When all the acetic acid is cleared out of the FUEL CELL, the instrument is ready to analyze another sample.

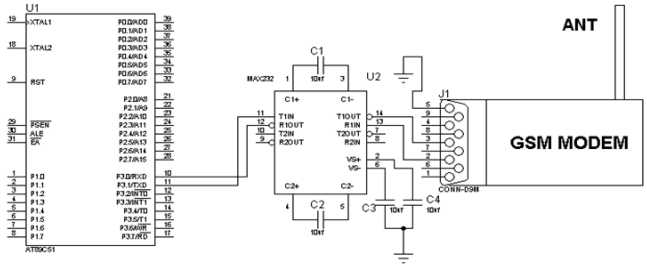
GPS:

The **Global Positioning System** (**GPS**) is a U.S. space-based global navigation satellite system. It provides reliable positioning, navigation, and timing services to worldwide users on a continuous basis in all weather, day and night, anywhere on or near the Earth.

GPS is made up of three parts: between 24 and 32 satellites orbiting the Earth, four control and monitoring stations on Earth, and the GPS receivers owned by users. GPS satellites broadcast signals from space that are used by GPS receivers to provide three-dimensional location (latitude, longitude, and altitude) plus the time.

GSM:

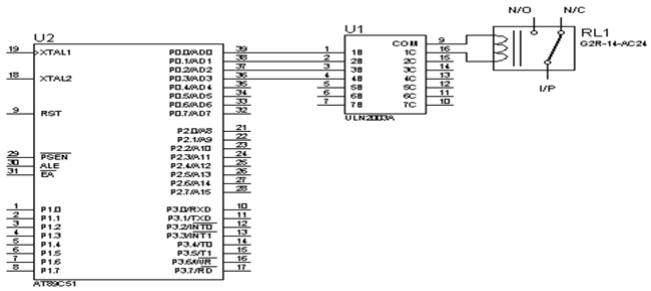
A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means ATtention) and finish with a <CR> character. For example, the dialing command is ATD<number>; ATD3314629080; here the dialing command ends with semicolon.



The AT commands are given to the GSM modem with the help of PC or controller. The GSM modem is serially interfaced with the controller with the help of MAX 232. Here max 232 acts as driver which converts TTL levels to the RS 232 levels. For serial interface GSM modem requires the signal based on RS 232 levels. The T1_OUT and R1_IN pin of MAX 232 is connected to the TX and RX pin of GSM modem

RELAY:

- A relay is an electrically operated switch.
- Electric current through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts.
- The coil current can be on or off so relays have two switch positions and there are double-throw (changeover) switches.
- It consists of a coil of wire surrounding a soft iron core, an iron yoke, which provides a low reluctance path for magnetic flux, a movable iron armature, and a set, or sets, of contacts.
- 7. In this condition, one of the two sets of contacts in the relay pictured is closed, and the other set is open.
- 8. The P0_0, P0_1, P0_2 and P0_3 pin of controller is assumed as data transmit pins to the relay through relay driver ULN 2003. ULN 2003 is just like a current driver.



UART:

RECEIVER

All operations of the UART hardware are controlled by a clock signal which runs at a multiple of the data rate, typically 8 times the bit rate. The receiver tests the state of the incoming signal on each clock pulse, looking for the beginning of the start bit. If the apparent start bit lasts at least one-half of the bit time, it is valid and signals the start of a new character. If not, it is considered a spurious pulse and is ignored. After waiting a further bit time, the state of the line is again sampled and the resulting level clocked into a shift register. After the required number of bit periods for the character length (5 to 8 bits, typically) have elapsed, the contents of the shift register are made available (in parallel fashion) to the receiving system. The UART will set a flag indicating new data is available, and may also generate a processor interrupt to request that the host processor transfers the received data.

Communicating UARTs usually have no shared timing system apart from the communication signal. Typically, UARTs resynchronize their internal clocks on each change of the data line that is not considered a spurious pulse. Obtaining timing information in this manner, they reliably receive when the transmitter is sending at a slightly different speed than it should. Simplistic UARTs do not do this, instead they resynchronize on the falling edge of the start bit only, and then read the center of each expected data bit, and this system works if the broadcast data rate is accurate enough to allow the stop bits to be sampled reliably.

DATA FRAMING

Bit number	1	2	3	4	5	6	7	8	9	10	11
	Start bit	**5–8 data bits**								**Stop bit(s)**	
	Start	Data 0	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Stop	

It is a standard feature for a UART to store the most recent character while receiving the next. This "double buffering" gives a receiving computer an entire character transmission time to fetch a received character. Many UARTs have a small first-in, first-out FIFObuffer memory between the receiver shift register and the host system interface. This allows the host processor even more time to handle an interrupt from the UART and prevents loss of received data at high rates.

TRANSMITTER:

Transmission operation is simpler as the timing does not have to be determined from the line state, nor is it bound to any fixed timing intervals. As soon as the sending system deposits a character in the shift register (after completion of the previous character), the UART generates a start bit, shifts the required number of data bits out to the line, generates and sends the parity bit (if used), and sends the stop bits. Since transmission of a single character may take a long time relative to CPU speeds, the UART maintains a flag showing busy status so that the host system does not deposit a new character for transmission until the previous one has been completed; "ready for next character" may also be signaled with an interrupt. Since full-duplex operation requires characters to be sent and received at the same time, UARTs use two different shift registers for transmitted and received characters.

SOFTWARE REQUIREMENT:

- Keil 4 IDE
- Willar pro programmer

Keil MicroVision :

Keil MicroVision is a free software which solves many of the pain points for an embedded program developer. This software is an integrated development environment (IDE), which integrated a text editor to write programs, a compiler and it will convert your source code to hex files too.
Here is simple guide to start working with Keil uVision which can be used for

- Writing programs in C/C++ or Assembly language
- Compiling and Assembling Programs
- Debugging program
- Creating Hex and Axf file

Testing your program without Available real Hardware (Simulator Mode)

Willar Pro Programmer:

This is programmer for 89 series microcontroller devices in 20 & 40 pin packages and supports various 8 pin serial EEPROM ICs. ZIF socket enables easy insertion and removal of devices for programming. Programming is very fast since it is USB based. No external power required since it is powered from USB port itself.

Features

- Supports 89 series & serial EEPROM devices
- Powered from USB port(No external power required)
- High speed writing (8kb flash file in 10 seconds)
- Auto Identify connected programmer
- Error checking and verification in-built
- Lock of programs in chip supported to prevent program copying
- 40 pin ZIF socket for easy insertion & removal
- Auto Erase/Lock/Verify
- Informative window and access to latest programmed file
- Simple and Easy to use

Supported Devices

Atmel

AT89C51,AT89C52,AT89S51,AT89S52,AT89S53,AT89S8252,AT89C1051,AT89C2051,AT89C4051,

Winbond
W78E51,W78E52

SST
SST89C54,SST89C58,SST89C59,SST89E54RD,SST89E58RD,SST89E554RC

Serial EEPROM
AT24C01,AT24C02,AT24C04,AT24C08,AT24C16,AT24C32,AT24C64,AT24C164,AT93C46,AT93C56,AT93C66

Specification

Communication USB 2.0 compliant
Power +5V from USB Cable

- Cable USB A to B type

III. CONCLUSION

The proposed work can able to help the automotive people to be safety and make heir time efficiency in a less time

consumed manner. In futue it can be implemented by various simple technologies to improve the quality of services, which would be better for the development of the society.

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