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INTELLIGENT VEHICLE SPEED CONTROLLER

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Abstract - *The system presented here is aimed at automatically sensing the areas / zones like "School Zone", "Work Zone" accordingly and inform the driver and also assist him in controlling the vehicle. As the design of this system goes, the system proposed here consists of a set of units : Zone / Area Unit and Vehicle Unit. In convention, these special zones or areas are indicated at the roadside on a pillar or road sign poles. As an example, near school zone, the sign board displays "School Zone Ahead, Drive Slowly", or "Curve Zone Area-Do not go fast"[4]. This project is developed based on EMBEDDED and RF Technology. When a vehicle enters a particular Zone then the signal will be detected by the Receiver which was transmitted by the Transmitter already placed in the Zone. The Signal received will be decoded by the microcontroller and alert the driver through a LCD Screen. According to signal received by Microcontroller controls the DC Motor Speed after a few seconds from the time it received the signal.*

***Key Words*: Automate, Zone unit, Vehicle unit, Transmitter, Receiver.**

1. INTRODUCTION

At present accidents occur mostly due to rash driving and over speeding on roads. The accident rates are increasing year to year by more vehicles on to ground. The government has taken many steps to prevent these kinds of things but it is not enough. Most of the manufacturers have developed a laser based control system but its cost is too high. At first we had an idea to use laser diodes but it was costly and then we decided to use IR sensor but it works only under line of sight so finally we used RF module.

The main objective is to design a Smart Display and Controller (SDC) unit for vehicle's speed control and monitors, which can run on an embedded system. Smart Display & Controller unit can be designed to fit into a vehicle's dashboard, and it automatically controls vehicle's speed in different zonal state (like school zone, hill area, U-turn, highway etc.)

It is composed of two separate units: zone status transmitter unit and receiver (speed display and control) unit. The wireless transmitter module can send data up to 100 feet away from the vehicle. Once the information is received from the zones, the vehicle's embedded unit automatically reduces the speed according to specific zone.

2. LITERATURE SURVEY

Recent studies show that one third of the number of fatal or serious accidents are associated with excessive or in appropriate speed, as well as changes in the roadway (like the presence of road-work or unexpected obstacles). Reduction in the number of accidents and mitigation of their consequences are a big concern for traffic authorities, the automotive industry and transport research groups. One important line of action consists in the use of advanced driver assistance systems, which are acoustic, hectic or visual signals produced by the vehicle itself to communicate to the driver the possibility of a collision. These systems are somewhat available in commercial vehicles today, and future trends indicate that higher safety will be achieved by automatic driving controls.

Road transport is important mode of transport in India. India has large network of road throughout the country. India faces the highest number of accidents and accidental fatalities in the world. Ministry of Road Transport & Highways report reveals that India witnesses one road accident every minute in a year which claims one life in 3 minutes. Contrary to the popular belief, only 1.5% of the accidents are caused by defective roads. In majority of the cases (77%), driver is at fault. This becomes more dangerous in populated regions like schools or hospitals. In school areas speed breakers are provided to reduce the speed of vehicles, but the drivers do this manually. Many times due to driver's fault speed is not controlled. This process can be automated by means of RF communication i.e. speed is controlled automatically.

3. COMPONENTS AND SOTWARE

- **Arduino:** Arduino Uno is a microcontroller board based on the ATmega328P.
- **16X2 LCD Module:** LCD (Liquid Crystal Display) screen is an electronic display module.
- **HT12D IC:** HT12D is a decoder integrated circuit that belongs to 2^{12} series of decoders.
- **HT12E IC:** HT12E is an encoder integrated circuit of 2^{12} series of encoders.
- **RF Transmitter and Receiver:** This is a ASK Hybrid Transmitter and receiver module operates at 433 MHz frequency.

- **Arduino IDE:** The Arduino Integrated Development Environment contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

4. IMPLEMENTATION

4.1 Transmitter Circuit

The transmitter section which is placed at the sensitive zones consists of an RF Transmitter[1] and the HT12E encoder IC.

HT12E Encoder IC[3] will convert the 4 bit parallel data given to pins D0 – D3 to serial data and will be available at DOUT. This output serial data is given to ASK RF Transmitter. Address inputs A0 – A7 can be used to provide data security and can be connected to GND (Logic ZERO) or left open (Logic ONE). Status of these Address pins should match with the status of address pins in the receiver for the transmission of the data. Data will be transmitted only when the Transmit Enable pin (TE) is LOW. 1.1MΩ resistor will provide the necessary external resistance for the operation of the internal oscillator of HT12E.

It also has an inbuilt short range antenna or we can use handheld antenna. The antenna type used in the RF module has a scanning antenna. The scanning antenna just release the signal and it is in short range. Whenever an RF receiver come across the transmitter devices the information transmitted by the transmitter is passed to the receiver module placed in the vehicle will get the signal.

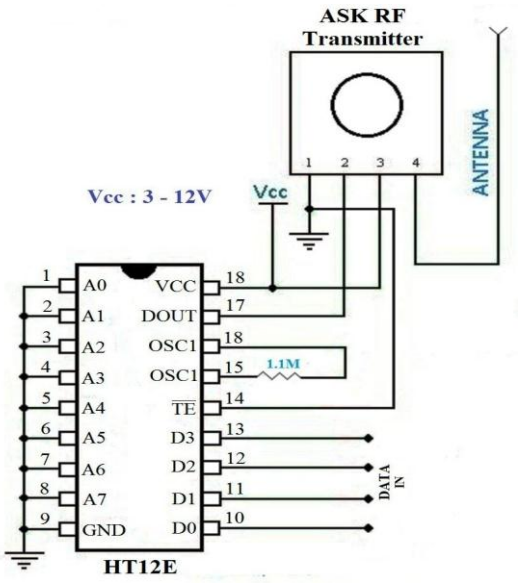

Fig -1: Transmitter Circuit

4.2 Receiver Circuit

The receiver section which is placed on the robot consists of an RF Receiver, the HT12D decoder IC, LCD display and the arduino.

ASK RF Receiver receives the data transmitted using ASK RF Transmitter. HT12D decoder will convert the received serial data to 4 bit parallel data D0 – D3. The status of these address pins A0-A7 should match with status of address pin in the HT12E at the transmitter for the transmission of data. 51KΩ resistor will provide the necessary resistance required for the internal oscillator of the HT12D. The receiver's Data out pins are connected to arduino digital pins. The decoded 4 bit parallel data is sent to the arduino which detects the zone and changes the speed accordingly. Pin 17 of the IC can be left open or connected to an LED as an indication when a signal is received.

Also, an LCD display is connected to the arduino[5] to display when the robot enters the particular zone. Pins 7, 8, 9, 10 of arduino is connected to the Data pins of LCD display. LCD RS pin is connected to the digital pin 12 and Enable pin is connected to digital pin 11. Additionally, a 10k pot is wired to +5V and GND, with its wiper (output) to LCD screens VO pin (pin3). A 220 ohm resistor is used to power the backlight of the display, usually on pin 15 and 16 of the LCD connector.

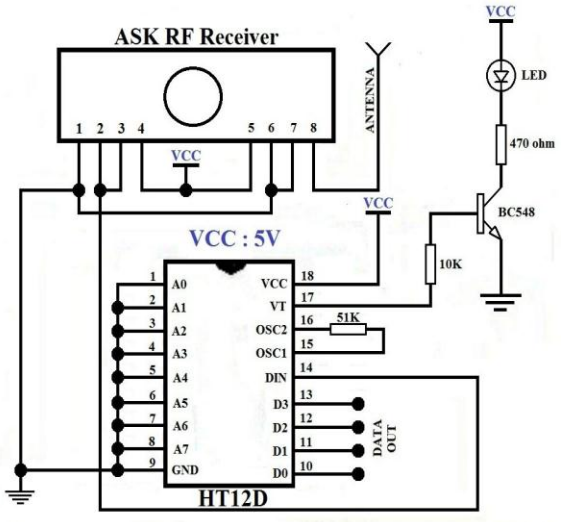

Fig -2: Receiver Circuit

5. WORKING

The main objective is to design a Smart Display and Controller meant for vehicle's speed control and monitors, which can run on an embedded system. Smart Display & Control can be custom designed to fit into a vehicle's dashboard, and display information on the vehicle to be traveled in the different zone and it automatically controls vehicle's speed in different zonal state (like school zone, hills area, U-turn, highway etc.).

The Smart Display and Control Unit is composed of two separate units: zone status transmitter unit and receiver (speed display and control) unit. When the vehicle enters in the normal area it speed does not decrease and it goes normally no action is performed. When the vehicle enters into the restricted areas that means it enters into the speed limiting. Whenever it enters the transmitter module just send an information that contains how much speed a vehicle can go inside the speed limited region. The transmitter modules operate with a carrier frequency of 418MHz within the 260MHz-470MHz RF spectrum (unlicensed spectrum) thus avoiding any FCC charges or regulations. The wireless transmitter module can send data up to 100 feet away from the vehicle.

The signal or information is then received by the receiver and the signal acquired from the speed meter is also given to the controller. The signal is basically analog in nature that will be converted into digital and the micro controller is able to process the signal.

Pin 6 of arduino which gives PWM output is used to control the speed of motors. Pulse Width Modulation, or PWM, is a technique for getting analog results with digital means. Digital control is used to create a square wave, a signal switched between on and off. This on-off pattern can simulate voltages in between full on (5 Volts) and off (0 Volts) by changing the portion of the time the signal spends on versus the time that the signal spends off. The duration of "on time" is called the pulse width. To get varying analog values the pulse width is changed. A call to analogWrite() is on a scale of 0 - 255, such that analogWrite(255) requests a 100% duty cycle (always on), and analogWrite(127) is a 50% duty cycle (on half the time).

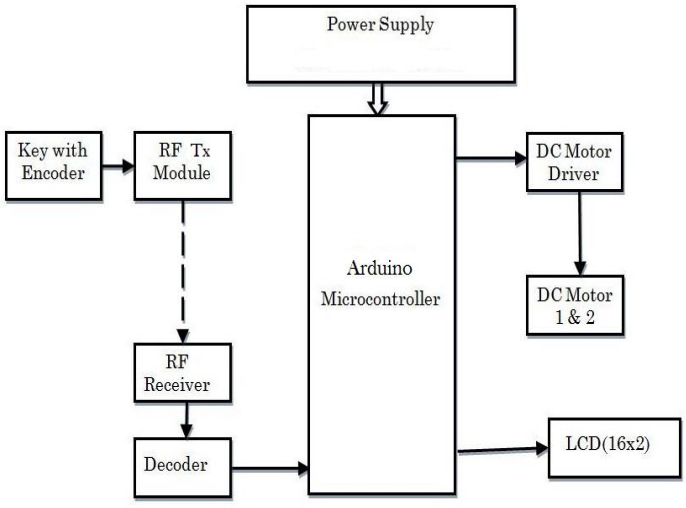

Fig -3: Block Diagram of Overall Implementation

6. PRACTICAL IMPLEMENTATION

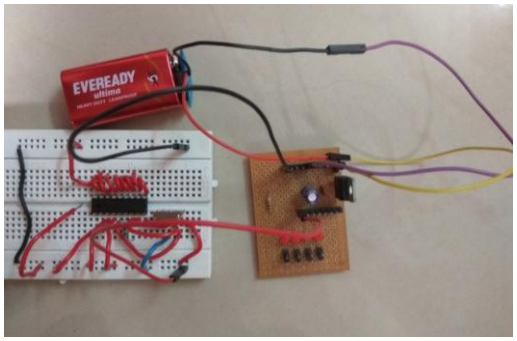

Fig -4: Transmitter circuit

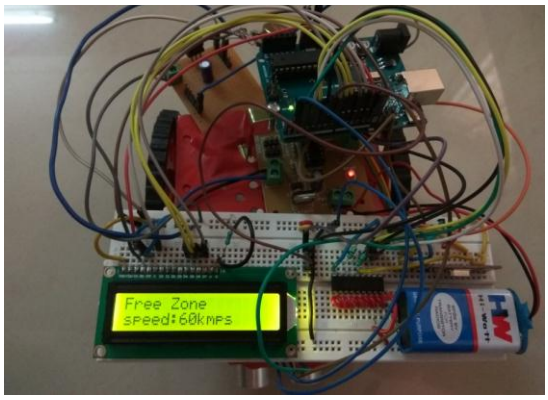

Fig -5: Vehicle in Free Zone

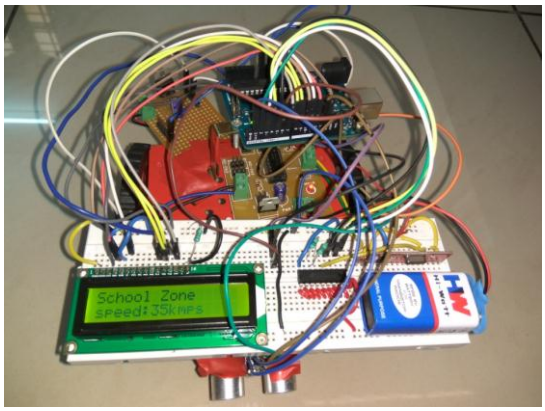

Fig -6: Vehicle in School Zone

7. APPLICATIONS

- This project can be implemented in automated systems for wireless control
- It can be used at heavy traffic areas to reduce the drivers efforts of constantly operating the break and clutch
- It can be used in school zones, hospital zones and other sensitive areas

- It can also be used in ghat section roads where visibility of road is not very clear

- This can be used in driving guidance systems and automatic navigation systems

8. CONCLUSION AND FUTURE SCOPE

Collision detection and avoidance systems should become more commonplace with the passage of time. People are living in a networked world and constantly feel that they have less time on their hands. It has been jokingly said, that "The more developed a country is, the more time it's citizens waste behind the steering wheel." To perfect this technique, it might take several years, but this project is surely a step in the right direction. Prevention is better than cure. So instead of treating patients after an accident, accidents should be prevented by incorporating this system. This project is very feasible as very less expensive parts are used.

We can modify the system with the help of GPS to identify the zones. We can also modify this with efficient braking system in associations with air flow control to the carburetor. This system can be more effectively used for any kind of automobiles such as bikes, cars, lorries, buses etc. This system can also be improved to identify the position and orientation of the vehicle in track.

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[5] https://www.arduino.cc/en/Tutorial/LiquidCrystalDisplay this link contains tutorial on interfacing LCD display to arduino