ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 2, Issue 12, December 2016

Zonal Speed Control

[1] Akhil Athawale, [2] Kedar Kadam [3]Prof. S.S.Navale
[1][2] Student
[1][2][3] Electronics Engineering Department,
MAEER'S MIT Polytechnic,
Pune, India

Abstract:-- **Due to amateurish execution of traffic laws, the number of accidents is on the rise. Increasing number of accidents at busy junctions is a major threat faced by today's India. People, mostly youngsters, drive very fast; this results in damage to life and property because of momentary mistakes made while driving near busy junctions like schools/colleges, hilly areas, highways and villages.**

Zonal speed control is a vehicular system in which a vehicle, upon entering a certain speed zone such as a hospital or a hilly road, will automatically slow down as per the required speed. This technique will not only prevent accidents but ensure that the basic driver discipline is followed by people.

In this paper, we present a system that involves controlling the speed of electric vehicles. This project is composed of three separate units: a speed code transmitter placed on the signboard, a receiver unit mounted inside the incoming vehicle, and a decoder section to decode the speed code transmitted.

An astable multivibrator will transmit a certain frequency code that corresponds to the maximum speed of the zone. The infrared receiver inside the car will decode the frequency and a correspondence logic inside the microcontroller will match it to the required speed stored in an internal database. The microcontroller will direct the motor drivers to accordingly reduce the speed of the motors. This is a multicast system. All the vehicles entering the zone will receive speed control signal and will be forced to reduce the speed as per speed zone. Currently this project works for Electric Vehicles but can be adapted for Petrol/Diesel vehicles with suitable fuel injection controller electronics.

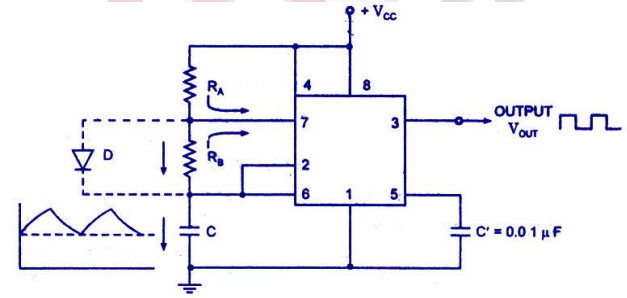
Keywords:— **astable multivibrator, infrared receiver, microcontroller, motor drivers, speed zone.**

I. INTRODUCTION

The Project:

1. Frequency code transmitter

As mentioned before, an astable multivibrator serves as a pulse train generator. An astable multivibrator is shown in the figure below.



Circuit of The Timer 555 as an Astable Multivibrator

Here, IC 555 has been used to design the astable multivibrator. 8th pin and 1st pin of the IC are used to give power, Vcc and GND respectively. The 4th pin is RESET pin which is active low and is connected to Vcc to avoid accidental resets. 5th pin is the Control Voltage pin which is not used. So to avoid high frequency noises it is connected to a capacitor C' whose other end is connected to ground. Usually C' = 0.01µF. The Trigger (pin 2) and Threshold (pin 6) inputs are connected to the capacitor which determines the output of the timer. Discharge pin (pin 7) is connected to the resistor Rb such that the capacitor can discharge through Rb. When voltage is applied to it, the astable multivibrator produces a constant square wave at output i.e. pin 3.

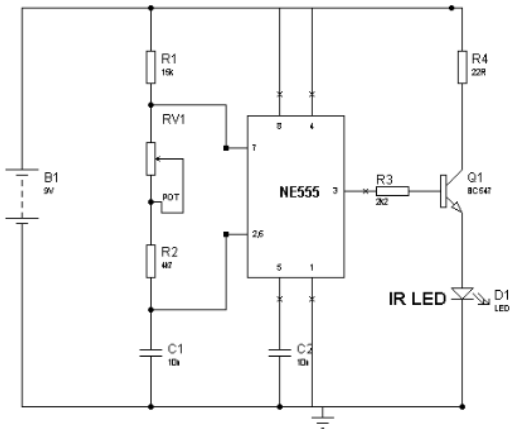
Transistor BC547 is a standard NPN BJT, used here as a switch & IR LED Driver. It operates in two regions – cutoff and saturation. Since the output pulses are applied to the base of the transistor, it initially operates in saturation region. In saturation region, the transistor serves as an ON-switch.

Finally, for transmission, the pulses are applied to an infrared LED. An infrared LED, also known as IR transmitter, is a special purpose LED that transmits infrared rays, usually in the range of 760nm wavelength. In IR LED, like all LEDs, the longer end is the anode and the shorter end is the cathode.

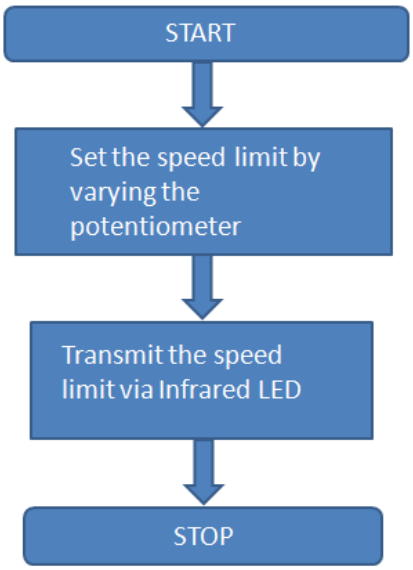
ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 2, Issue 12, December 2016

Combining all these, the schematic for the IR transmitter comprises of an IC 555 in astable multivibrator configuration, a BC 547 NPN BJT connected as a switch and an infrared LED for transmission.

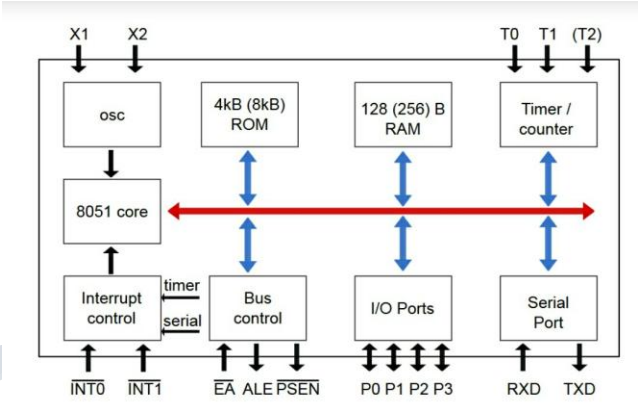


The occurrence of events takes place in the following order-



2. *Receiver part*

The major part of the receiver is the microcontroller. A microcontroller is effectively a computer embedded into a small chip. The block diagram of a standard 8051 microcontroller is as follows.

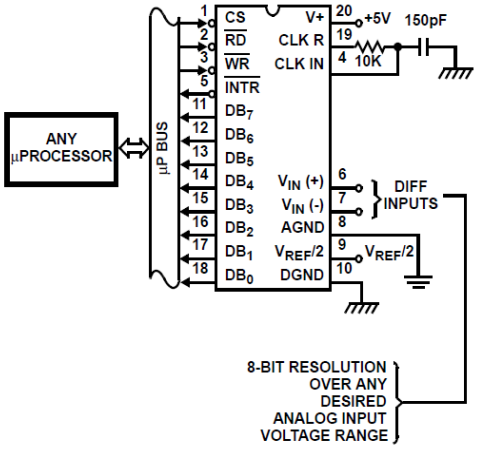


In the microcontroller, ports 0 and 2 function as both simple input-output ports as well as multiplexed address-data lines. The code for operating this project is loaded into the microcontroller. Port 0 and 1 are used to interface the 16*2 LCD display and the analog-to-digital converter (ADC) respectively. The motor driver IC is connected to the port 3 which is used as a simple I/O port.

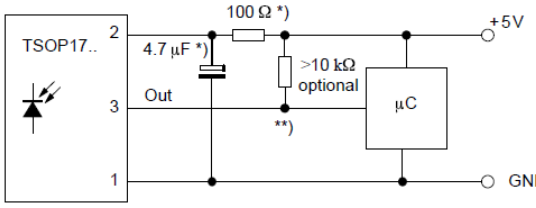
A potentiometer is used as accelerator to set the initial speed of the vehicle before slowdown begins. The voltage level adjusted to by the potentiometer is converted to digital equivalents using an ADC 0804. The ADC0804 family is a CMOS 8-Bit, successive approximation A/D converter which uses a modified potentiometric ladder and is designed to operate with the control bus via three-state outputs. This converter appears to the processor as memory locations or I/O ports, and hence no interfacing logic is required. The differential analog voltage input has good common mode-rejection and permits offsetting the analog zero-input voltage value. In addition, the voltage reference input can be adjusted to allow encoding any smaller analog voltage span to the full 8 bits of resolution.

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 2, Issue 12, December 2016



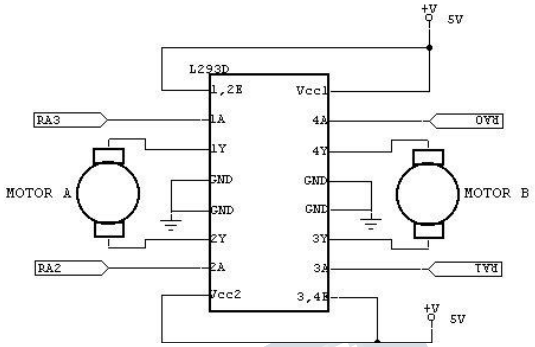
To receive the infrared frequency code transmitted by the infrared LED, a TSOP1738 infrared receiver is used. A TSOP1738 is connected directly to the microcontroller. The TSOP1738 is a miniaturized receiver for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, while the epoxy package is designed as IR filter. The received output signal can directly be decoded by the microcontroller. The connection is illustrated below.



Finally, the TSOP1738, the ADC and the microcontroller work in sync to control the speed of the motors.

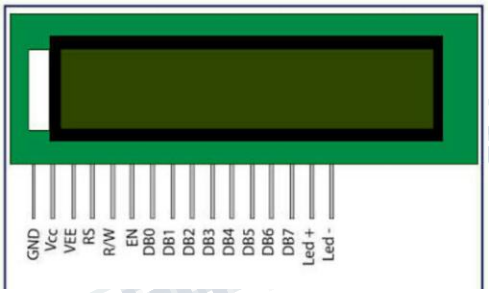
3. Speed Control and display

For motor speed control, the motor driver IC L293D is used. The L293D controls the speed of the motors used. The L293 and L293D are quadruple high-current half-H drivers. These devices are designed to drive a wide array of inductive loads such as relays, solenoids, DC and bipolar stepping motors, as well as other high-current and high-voltage loads. All inputs are TTL compatible and tolerant up to 7 V. The connection of motors with L293D and of L293D with microcontroller is shown below.

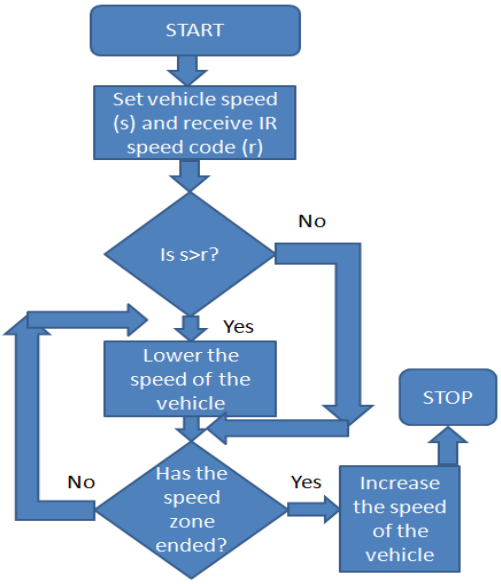


Finally, for driving the vehicle, two 100 RPM motors have been used.

The 16*2 LCD display can display both alphanumeric and punctuation characters.



The flowchart of receiver section, combined with the speed control, is as follows.



ISSN (Online) 2395-2717

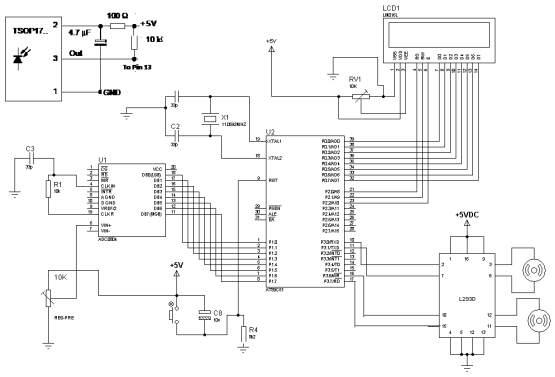
International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 2, Issue 12, December 2016

4. Working

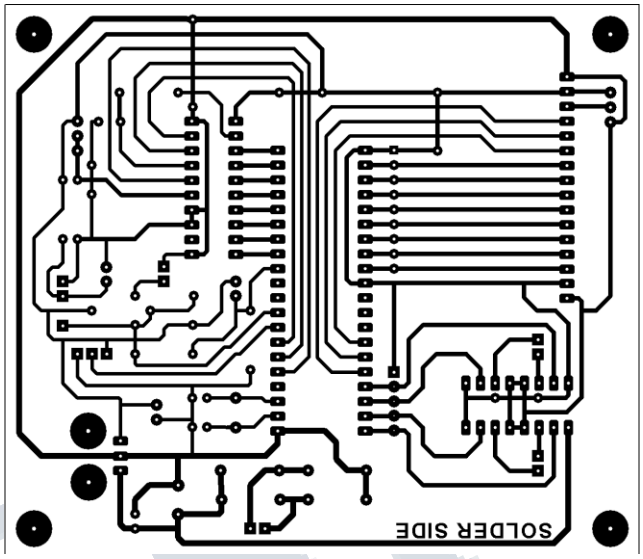
The astable multivibrator generates a frequency code of 38 KHz that is applied to a NPN transistor. The transistor serves as an infrared LED driver and is operated as a switch. The IR LED then transmits the frequency code.

The receiver circuit is wired around Atmel 89C51 microcontroller, ADC 0804, TSOP1738 IR receiver and motor driver IC L293D. As soon as the vehicle enters the speed limit zone, the TSOP starts receiving the IR code. Till then the vehicle is running on the speed set by the potentiometer. Analog output of potentiometer which stimulates acceleration is converted to digital form using ADC0804. The microcontroller does the calculations and sets the bit pattern, driving the motor control IC, resulting in desired speed of the vehicle. However, as described earlier, when the vehicle enters the speed control zone and the IR code is detected, the microcontroller decodes it using inbuilt timer-counter and upon successful detection, computes the required bit pattern to set the motor speed to a preset level of 30kmph. The LCD display displays the current speed in normal operation and preset speed when IR code is received.

5. Schematic of Receiver section

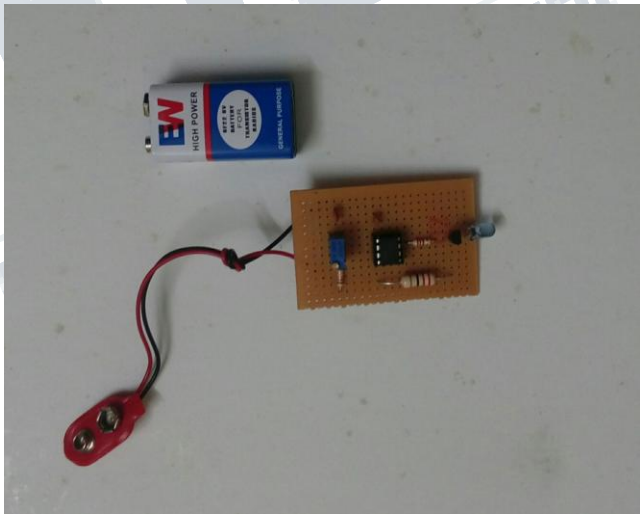


6. PCB Layout



7. Actual Project

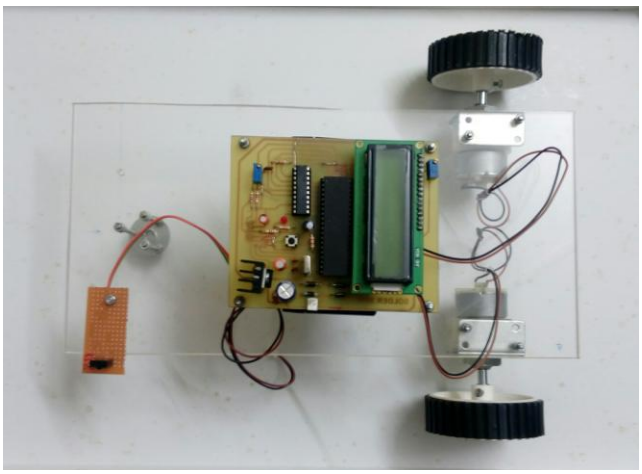
Transmitter



Receiver/Vehicular module

ISSN (Online) 2395-2717

International Journal of Engineering Research in Electrical and Electronic Engineering (IJEREEE)
Vol 2, Issue 12, December 2016



REFERENCES

1. International Journal of Mechanical Engineering and Technology, Volume 6, Issue 4, 2015,"Smart Vehicle And Smart Signboard System With Zonal Speed Regulation".

2. Data sheet, Emerging Display Technologies Corporation (16*2 LCD)

3. Data sheet, Texas Instruments (L293D)

4. Data sheet, www.datasheetarchive.com, Vishay Telefunken (TSOP1738)

5. Data Sheet, Intersil®, August 2002 (ADC 0804)

6. The 8051 Microcontroller and Embedded systems, by Muhammad Ali Mazidi

7. www.electronicstutorials.ws – Astable Multivibrator and Transistor as a switch.