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Zone Based Vehicle Speed Control System

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ABSTRACT

In this fast-moving world, where people are always in rush which causes a lot of driving errors like exceedingly dangerous speeds which leads to accidents. In India 60% of people die due to road accidents in which 35% of such fatalities die due to over speeding according to the data analyzed by the Government. To overcome this issue Government has installed speed limit banners, current speed display and strict law, yet the number of violations which leads to accidents are still high. This project comes in handy in these situations to prevent accidents and control the speed that the drivers' need to maintain in the coming areas like schools, residential areas and highways. The main motive of this project is to style a convenient speed control unit and area monitoring technique in one integrated system. This indeed envisions a future that is accident-free and stresses the importance of road safety and rules beyond human errors and false approval.

I. INTRODUCTION

In this evolved planet, where vehicle speed maintenance and control is a major problem, that leads to accidents caused due to rash driving or excessive speed. 'AREA BASED VEHICLE SPEED CONTROL SYSTEM' project is designed to control the speed of the vehicle in different zones.

The line of focus of this project is that, this system is designed in such a way that speed is regulated and confined at the particular mapped area with the help of the RF module. These areas are mostly to be schools, colleges, educational institutes, medical institutes, hospitals, crowded markets, highways, residential areas etc. These zones have the highest human proximity, crowd, and traffic as far as the road is concerned. So there needs to be a systematic solution to ensure the utmost safety at such zones in the scope of saving several unnecessary deaths and injuries due to accidents.

This is the idea behind an area-based speed control of vehicles using RF transmitter and receiver modules. The transmitter is installed in defined areas where their speed limit of the vehicle has to be controlled. The transmitter will transmit a signal and the receiver has to be installed within the vehicle for speed controlling purposes. Whenever the vehicle enters the mapped area, the speed of the vehicle is decreased to cutoff speed and kept constant until the vehicle leaves that particular area. After that, the vehicle can be controlled by the driver based on standard traffic rules. This is how the project aims at Area based speed controlling system targeting the importance of road safety in the defined areas.

II. LITERATURE SURVEY

1. Vaishal B. Niranjane, "AUTOMATIC VEHICLE SPEED CONTROL SYSTEM IN A RESTRICTED ZONE RF BASED AUTOMATIC SPEED LIMITER FOR VEHICLES", International Journal of Scientific & Technology Research February 2020.

This project has setup device as a transmitter where the multiple devices are combined to monitor the speed of the vehicle when the vehicle enters the prescribed speed and controls it by placing a receiver at the vehicles, based on the signals transmitted the speed of the vehicle gets reduced by interfacing a microcontroller. The current speed of the vehicle is sensed by the dc motor and the output of it was given to the microcontroller where it compares the speed with the prescribed limit and the speed is controlled automatically. The technology used in this system to communicate between transmitter and receiver is Zigbee technology, which covers up to 10-100m within its range.

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2. K.Govindaraju,S.Boopathi,F.ParvezAhmed,S. ThulasiRam,M.Jagadeeshraja, "EMBEDDED BASED VEHICLE SPEED CONTROL SYSTEM USING WIRELESS TECHNOLOGY", International Journal of Innovative Research In Electrical, Electronics, Instrumentation and control Engineering Vol. 2, Issue 8, August 2014.

Embedded Based Vehicle Speed Control System Using Wireless Technology proposed a system that has an alerting, recording and reporting feature for over-speed violation management. Zigbee transmitter is used to send the speed limit of the particular lane entered by the vehicle and it also gives alerts like road works, steep slopes, school zone in the form of acoustical messages and also in LCD. An increase in the count of violation increases the penalty amount which can be collected in toll gates located nearby.

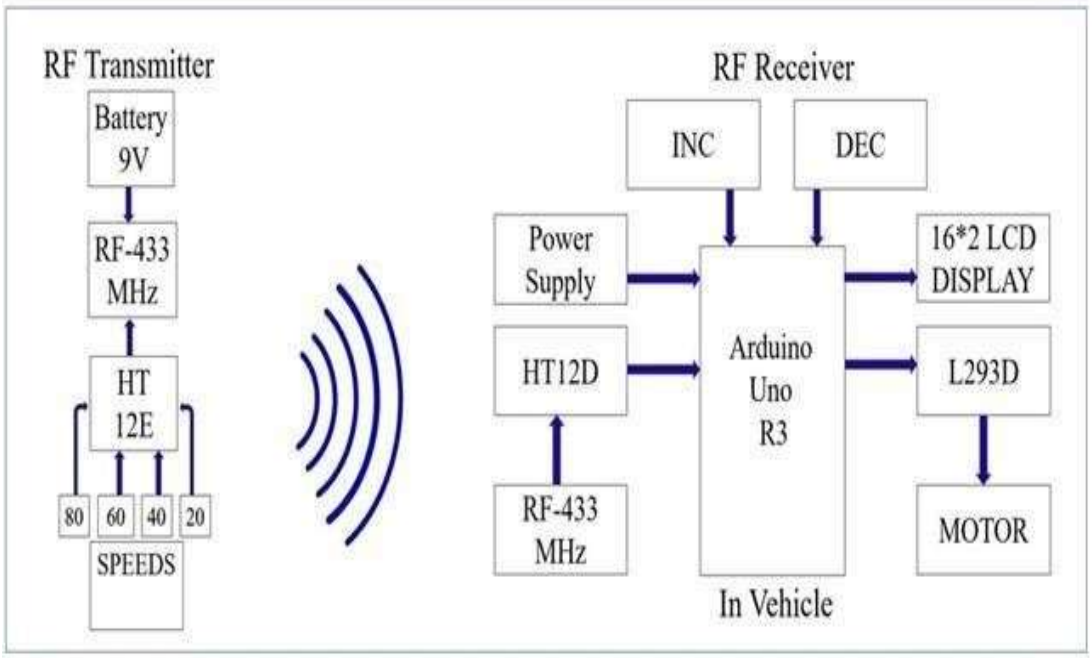
3. Santhana Krishnan, Mohanraj.S, Mohana Deepak, "RF BASED AUTOMATIC SPEED LIMITER FOR VEHICLES", International Journal of Research and Scientific Innovation (IJRSI) Volume V, Issue IV, April 2018

This system immediately lowers the speed of overspeeding vehicle, when overspeeding it uses fuel valve. In the proposed system, the system waits for certain time for drivers to lower the speed of vehicle and if it is still not reduced then its controlled automatically.

4. GummarekulaSattibabu, B.V.V.Satyanarayan, VV Satyanarayana Kona, "AUTOMATIC VEHICLE SPEED WITH WIRELESS IN VEHICLE ROAD SIGN DELIVERY SYSTEM USING ARM7", International Journal of Technology Enhancements and Emerging Engineering Research, VOL 2, ISSUE 8,2020.

In this paper the prototype design of a system that can deliver road signs to commuters' vehicles and can control the speed of the automobile has been demonstrated. This project is very simple which is durable and is of low cost. This project consumes less power. This system is easy to implement on present system which ensures maximum safety for drivers, passengers and pedestrians. The driver can get the information without any kind of distraction. This proto-type works even in bad weather conditions while the technology of artificial vision-based recognition of traffic signals might fail if visibility is poor and GPS Navigation.

III. EXPERIMENTAL WORKS



Overall Block diagram

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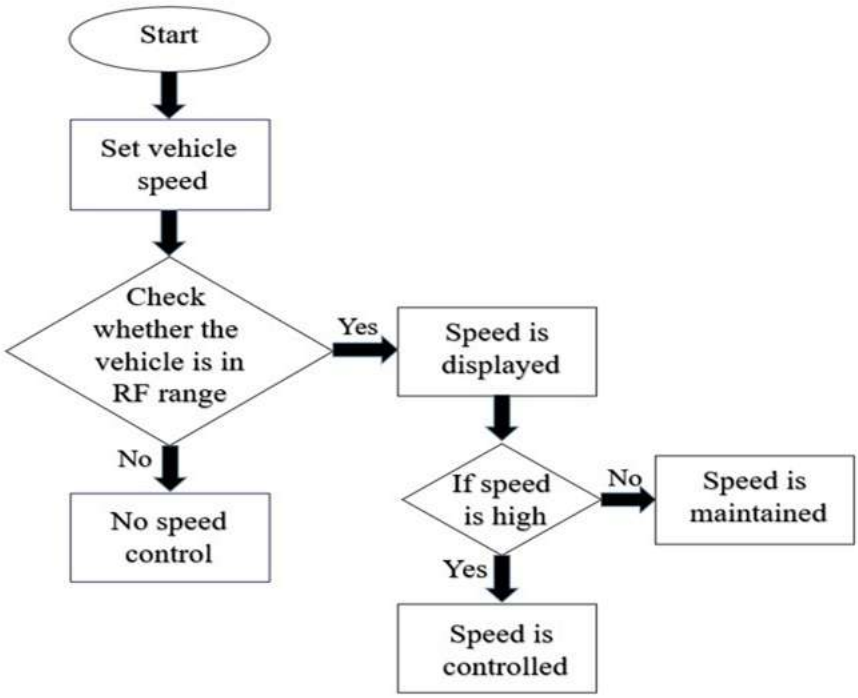
The area based vehicle speed control using RF is designed to limit the over speed on the road and avoid injuries and accidents. This proposed system consists of RF transmitter and receiver that is within the range of 433MHz which require to sourcing the battery for usage of long period of time. RF receiver is included within the vehicle. After scanning of the signal at transmitting side, the information is passed to the receiver side and the vehicle receives the signal. In this project, RF indicates the speeding range limit so these are placed at start and end of the restricted areas with a threshold speed. In transmitter and receiver , Arduino with analog to digital conversion and LCD is being used. At the receiver side, HT12D is used as decoder and at the transmitter side, HT12E is used as encoder. For the vehicle, prototype DC motor is being used. By default, the speed of the motor is set to cutoff speed, to show over speeding of vehicle, increment switch is used.

FLOW CHART



Flow chart of area based vehicle speed control system

1. When the system is on, the transmitter receives the analog signal with the help of RF speeding ranges.
2. The vehicle speed is set using increment switch.
3. If the vehicle is not in the RF range, the vehicle travels according to the drivers' operation and no speed is controlled.
4. If the vehicle is in RF range , the speed is displayed.
5. If the speed is more than the cutoff threshold, speed is controlled.
6. If the speed is not more than the cutoff threshold, speed is not controlled and it travels normally.

IV. DESIGN REQUIREMENT

Arduino UNO

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Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (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 an AC-to-DC adapter or battery to get started. It simplifies the process of creating any control system by providing the standard board that can be programmed and connected to the system without the need to any sophisticated PCB design and implementation. It is an open source hardware, anyone can get the details of its design and modify it.

LCD Display

16X2 LCD Display

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels. LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight. The term LCDstands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits and devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi- segment light-emittingdiodesand seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations.

DC Motor

DC Motor

A DC motor is defined as a class of electrical motors that convert direct current electrical energy into mechanical energy. DC motors can vary in size and power from small motors in toys and appliances to large mechanisms that power vehicles, pull elevators and hoists, and drive steel rolling mills. DC motors include two key components: a stator and an armature. The stator is the stationary part of a motor, while the armature rotates. In a DC motor, the stator provides a rotating magnetic field that drives the armature to rotate. A simple DC motor uses a stationary set of magnets in the stator, and a coil of wire with a current running through it to generate an electromagnetic field aligned with the centre of the coil. One or more windings of insulated wire are wrapped around the core of the motor to concentrate the magnetic field. The windings of insulated wire are connected to a commutator, that applies an electrical current to the windings. The commutator allows each armature coil to be energized in turn, creating a steady rotating force (known as torque).When the coils are turned on and off in sequence, a rotating magnetic field is created that interacts with the differing fields of the stationary magnets in the stator to create torque, which causes it to rotate. These key operating principles of DC motors allow them to convert the electrical energy from direct current into mechanical energy through the rotating movement, which can then be used for the propulsion of objects.

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Motor Driver- L293D

L293D driver module

The L293D is a popular 16-Pin Motor Driver IC. As the name suggests it is mainly used to drive motors. A single L293D IC is capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently. So if you have motors which has operating voltage less than 36V and operating current less than 600mA, which are to be controlled by digital circuits like Op-Amp, 555 timers, digital gates or even Microcontrollers like Arduino, PIC, ARM etc.. this IC will be the right choice for you. The L293D IC receives signals from the microprocessor and transmits the relative signal to the motors. It has two voltage pins, one of which is used to draw current for the working of the L293D and the other is used to apply voltage to the motors. The L293D switches it output signal according to the input received from the microprocessor.

HT12E

HT12E

The IC HT12E can be used only with its pair HT12D. These two ICs together form an Encoder and Decoder pair. They are 12-bit Encoders/Decoders, meaning they can transmit 12-bit a data among them. But your encoder IC should not communicate with someone else decoder IC, so an Encoder and Decoder IC pair will share a common Address which is an 8-bit data. So out of the 12-bits 8-bits will be used to set address and the remaining 4-bit will be used to transmit data. With 4-bit data we can create 16 types (2^4 =16) of combinations. These IC's are commonly used with RF pairs or IR pairs. So if you are working on a project which has to transmit a 4-bit data from one end to other CIRCUITeither by wire or wireless then this IC pair will be best suited for you.

HT12D

HT12D

The IC HT12D can be used only with its pair HT12E. These two ICs together form an Encoder and Decoder pair. They are 12-bit Encoders/Decoders, meaning they can transmit 12-bit data among them. But your encoder IC should not communicate with someone else's decoder IC, so an Encoder and Decoder IC pair will share a common Address which is an 8-bit data. So out of the 12-bits 8-bits will be used to set address and the remaining 4-bit will be used to transmit data. With 4-bit data we can create 16 types (2^4 =16) of combinations. These IC's are commonly used with RF pairs or IR pairs. So if you are working on a project which has to transmit a 4-bit data from one end to other either by wire or wireless then this IC pair will be best suited for you.

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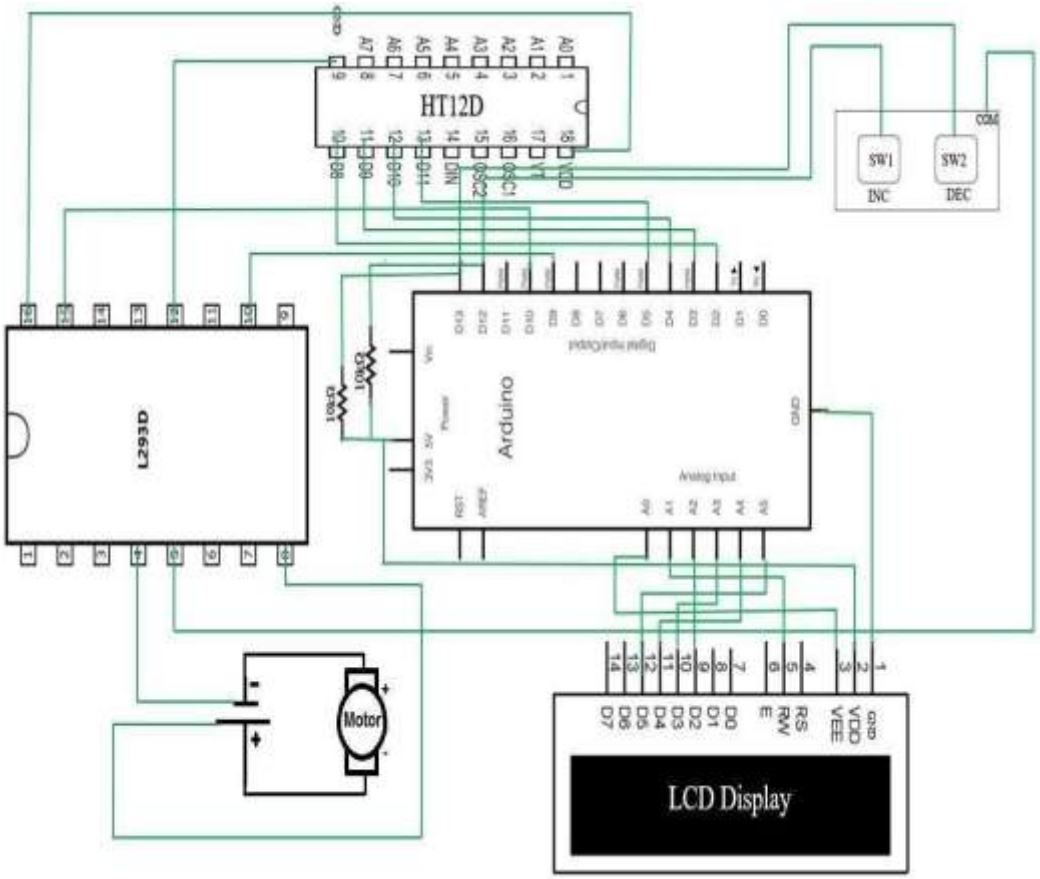
TINKERCAD

TinkerCAD Logo

TinkerCAD is a free online service for creating basic 3D shapes and developing digital prototypes of electronic components. These prototypes include basic circuits with LED lights, buzzers, switches, and even light sensors. These prototypes can include a microprocessor as part of the design. Microprocessors are the simplest form of computer that can be programmed. They can be programmed to manipulate electronic components like LED lights and buzzers. Microprocessors can be programmed to gather information from sensors and interpret that information. They are used in a variety of devices all around us. They are in microwaves, refrigerators, cars, computers and many other electronic devices. The process used in TinkerCAD is often used for rapid prototyping. Prototyping is a process where we can develop components in a flexible manner than can be quickly updated and modified to test a variety of options when developing a project or product. We will use this process of prototyping to learn how to create basic electronic circuits

V. EXPERIMENTAL WORK

CIRCUIT DIAGRAM



RF Transmitter Module

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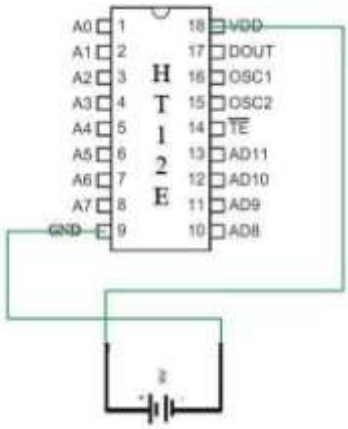

RF Receiver Module

1. The circuit diagram is divided into two stages: RF Receiver as shown in Figure: 8.1.1 and RF Transmitter as shown in Figure: 8.1.2.
2. The RF transmitter uses an HT12E as encoder given with an 9V supply. HT12E is an 18 pin IC which consists of 8 address bits from A1-A8 which should be exactly similar in the decoder to pair them. HT12E also consists of 4 data bits from AD0-AD3 and the data sent from transmitter will be decoded at the HT12D decoder sharing the same address bits. Pin numbers 15 and 16 have inbuilt oscillators which can be activated by connecting 1MΩ resistor.Positive pin of the battery is connected to HT12E pin number 18(VDD) and negative is connected to HT12E pin number 9(GND)
3. The RF receiver uses an HT12D as decoder given with an 9V supply. HT12D is an 18 pin IC which consists of 8 address bits from A1-A8 which should be exactly similar in the encoder to pair them. HT12D also consists of 4 data bits from AD0-AD3 that decodes the data sent from HT12E encoder sharing the same address bits. Pin numbers 15 and 16 have inbuilt oscillators which can be activated by connecting 1MΩ resistor.
4. It also consists of a prototype DC motor in order to represent one wheel of the vehicle, which works on the principle of Lorentz law that describes, when a current carrying conductor is kept in magnetic field, it gains torque and develops a tendency to move, it experiences a mechanical force.
5. An L293D motor driver is used to drive DC motors, which is a 16 pin IC in which bidirectional drive currents can be driven up to 600mA at a same time. Hence the positive pin of DC motor is connected to L293D pin number 8 and negative pin is connected to L293D pin number 4.
6. Arduino uno is an 8-bit ATMEGA328 microcontroller. It has 14 digital pins as input or output out of which 6 are PWM outputs and 6 analogpins which is utilized as ADC.
7. A 16x2 LCD is used which is made of 1000's of pixels and pin no 9-12 are given for analog inputs of Arduino.

PROCEDURE OF WORKING:

8. The RF transmitter (HT12E) is placed at the start of the zone.
9. The RF receiver (HT12D) is placed in the vehicle and consists of an Arduino uno board, DC motor, L293D motor driver, HT12D decoder and an LCD display.
10. The vehicle speed is set.
11. When the vehicle is in the RF range, the vehicle receives the signal from the transmitter about the current speed of the vehicle and is displayed on LCD.
12. If the vehicle speed is high, according to predefined speed then the speed is controlled using RF receiver to the defined speed for that particular area.
13. Once the speed is being controlled the drivers' has no operation of speed.
14. If the cut-off speed and the vehicle speed matches then the vehicle will not be controlled within the RF range.

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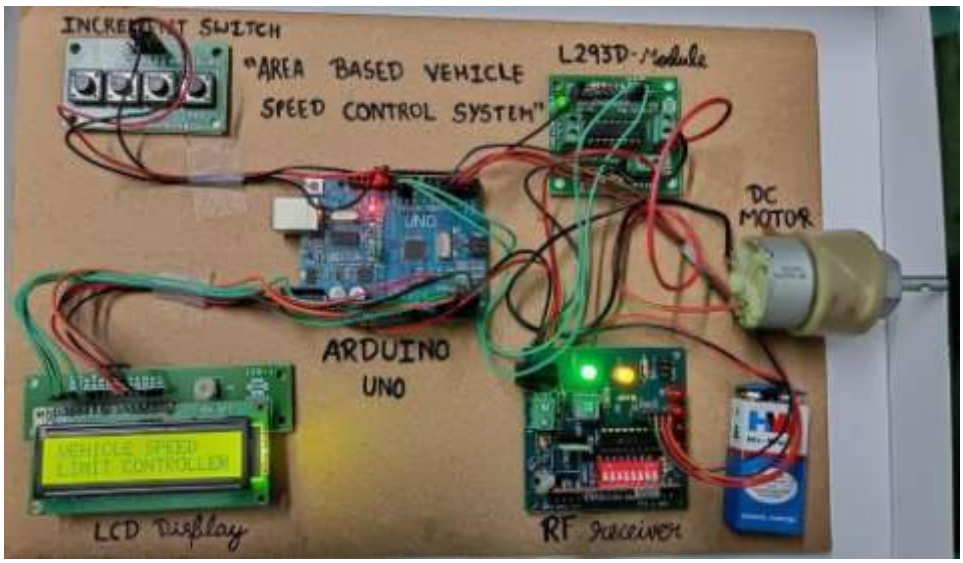
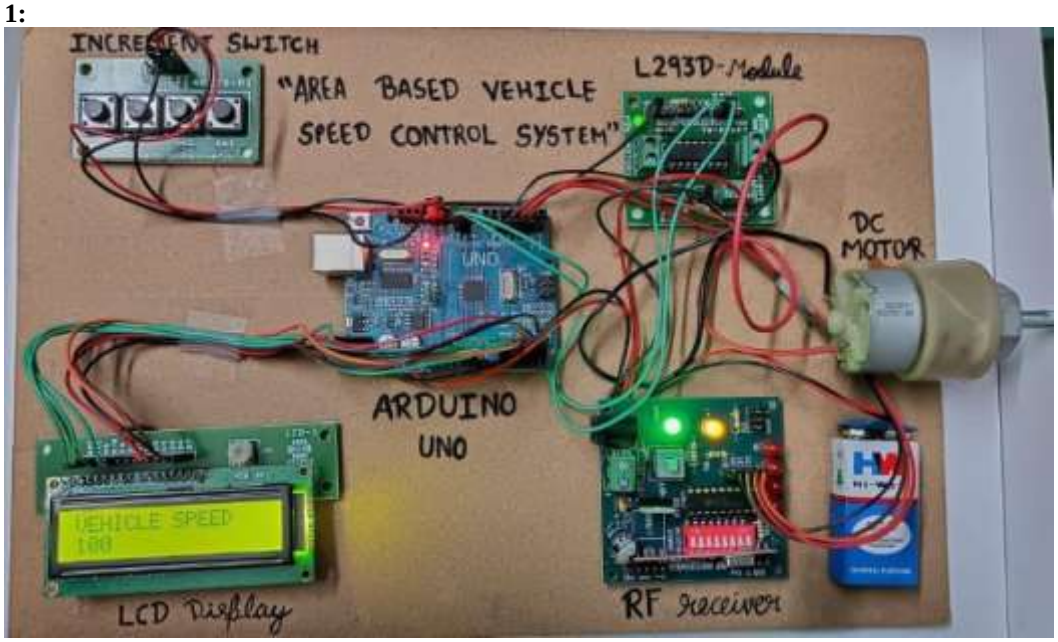


Receiver displaying the name of the project

CASE 1:



Vehicle speed showing 100km/hr
The vehicle is in the RF range hence the vehicle current speed is displayed in LCD.

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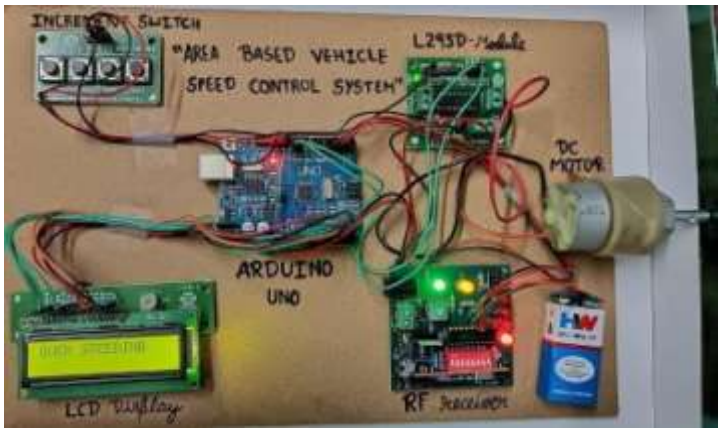
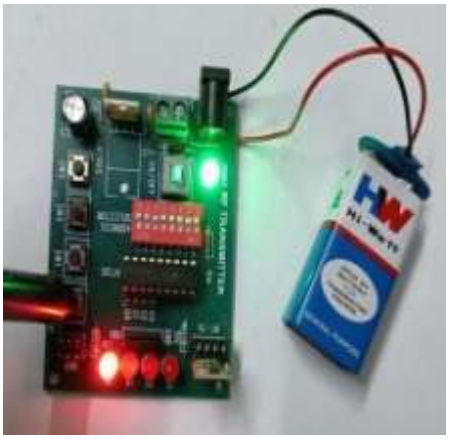
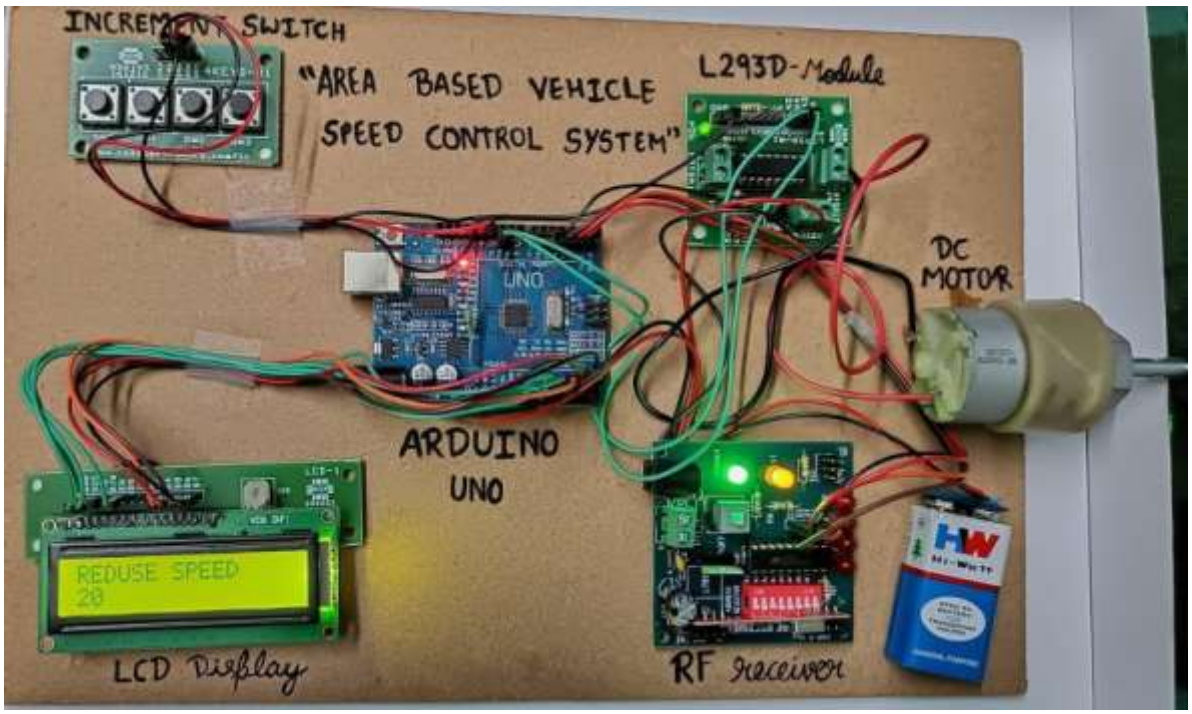


Over speeding of the vehicle



Transmitter encoding 20km/hr.

When the transmitter is transmitting the signal to the receiver, switch D0 is high in HT12E. The receiver, HT12D receives the signal to reduce it to 20km/hr. Hence the LCD displays "Over speeding".



Reduced speed to 20km/hr

Since school zone are defined to 20km/hr speed the vehicle is controlled to 20km/hr from 100km/hr.

- **CASE 2:**

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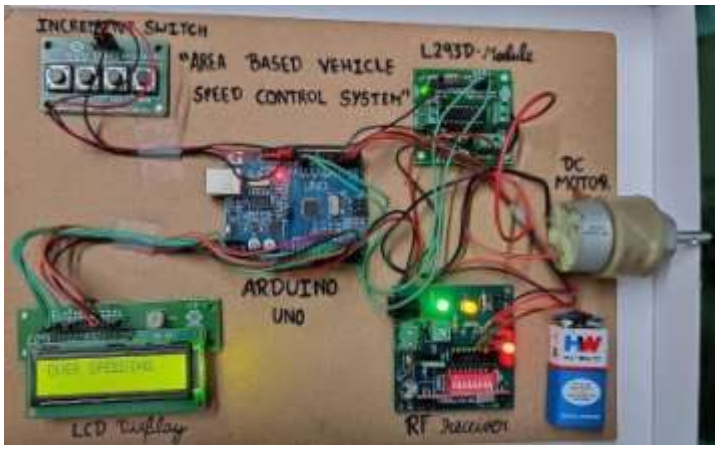
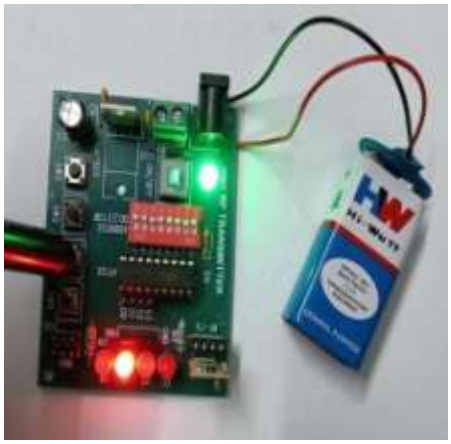
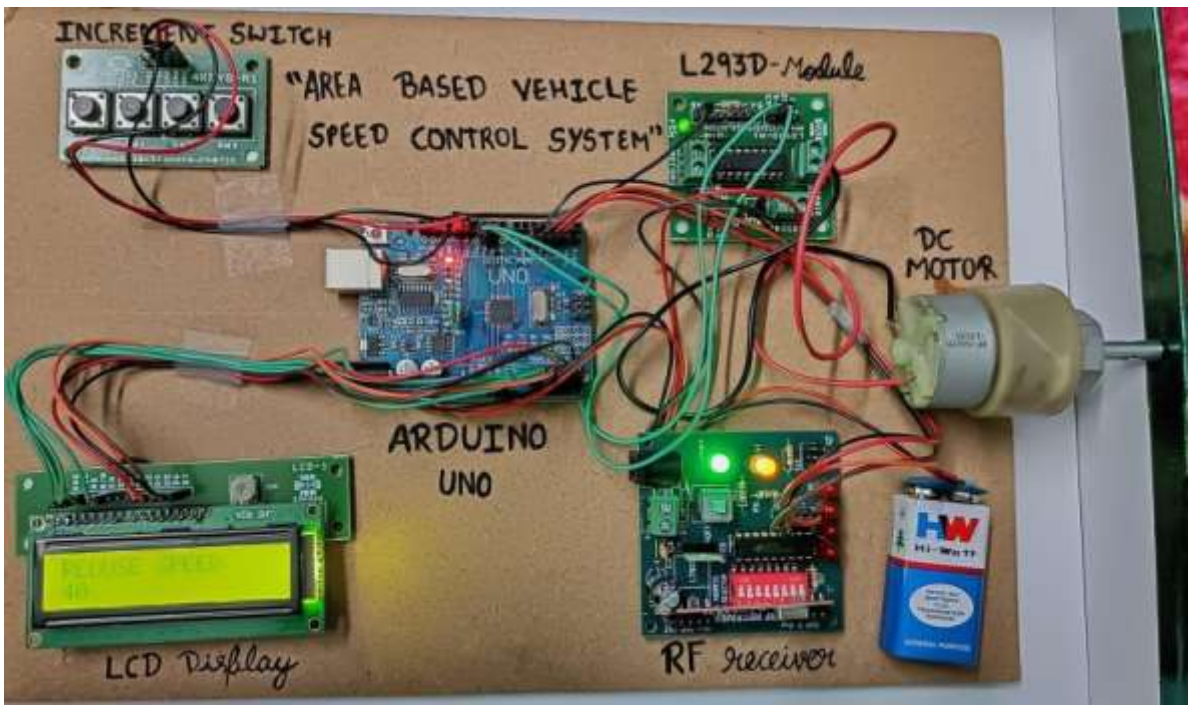


Over speeding of the vehicle



Transmitter encoding 40km/hr

When the transmitter is transmitting the signal to the receiver, switch D1 is high in HT12E. The receiver, HT12D receives the signal to reduce it to 40km/hr. Hence the LCD displays "Over speeding".



Reduced speed to 40km/hr

Since residential zone are defined to 40km/hr speed the vehicle is controlled to 40km/hr from 100km/hr.

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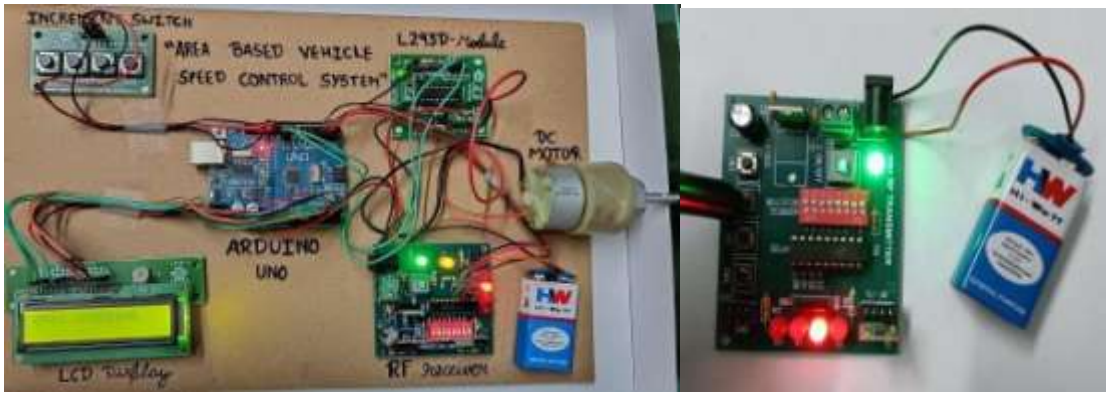
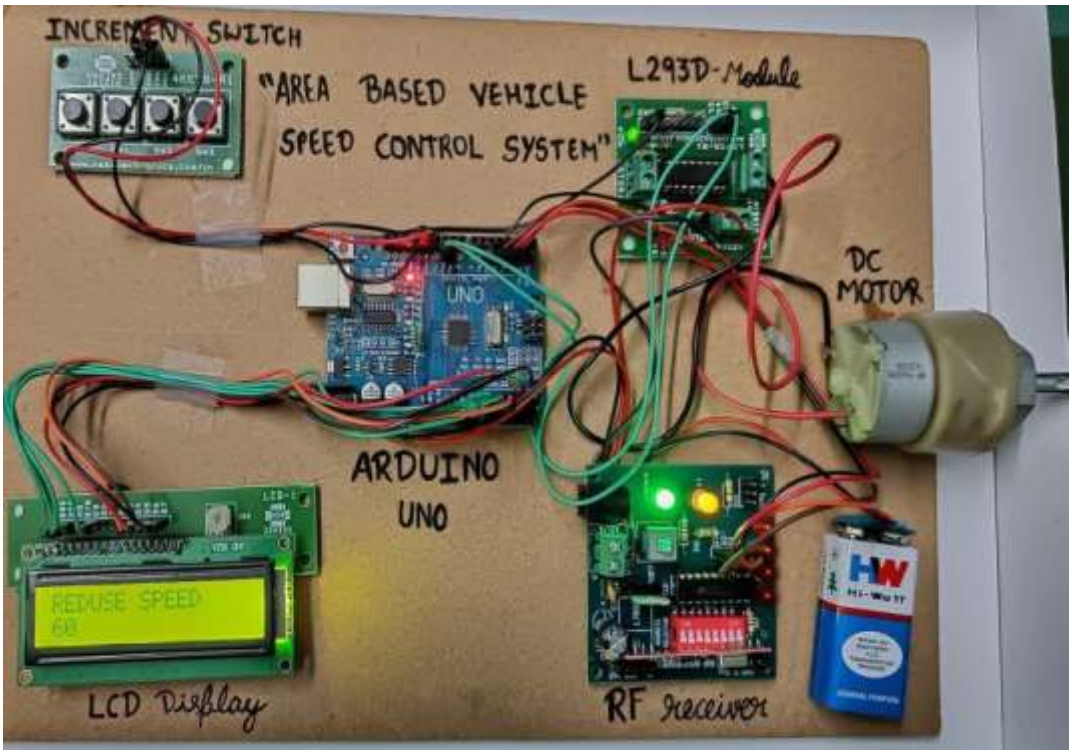
- **CASE 3:**



Over speeding of the vehicle Transmitter encoding 60km/hr

When the transmitter is transmitting the signal to the receiver, switch D2 is high in HT12E. The receiver, HT12D receives the signal to reduce it to 60km/hr. Hence the LCD displays "Over speeding".



Reduced speed to 60km/hr

Since highway zone are defined to 60km/hr speed the vehicle is controlled to 60km/hr from 100km/hr

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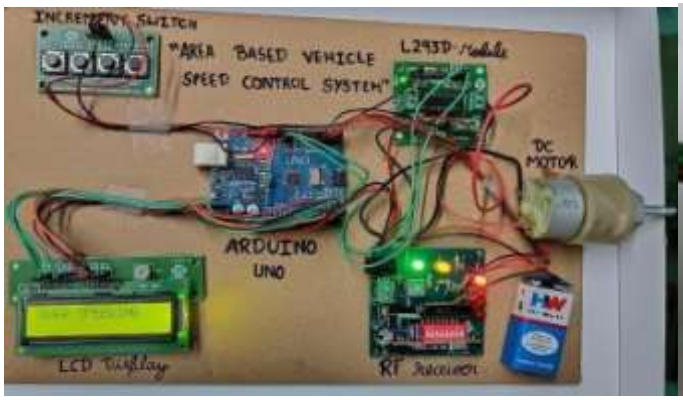
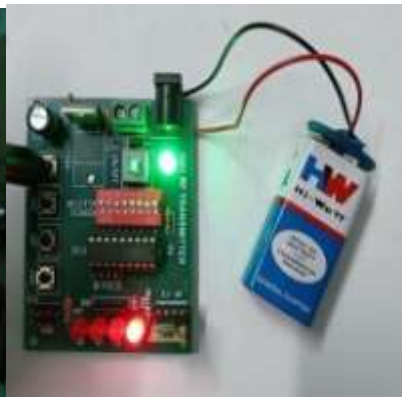
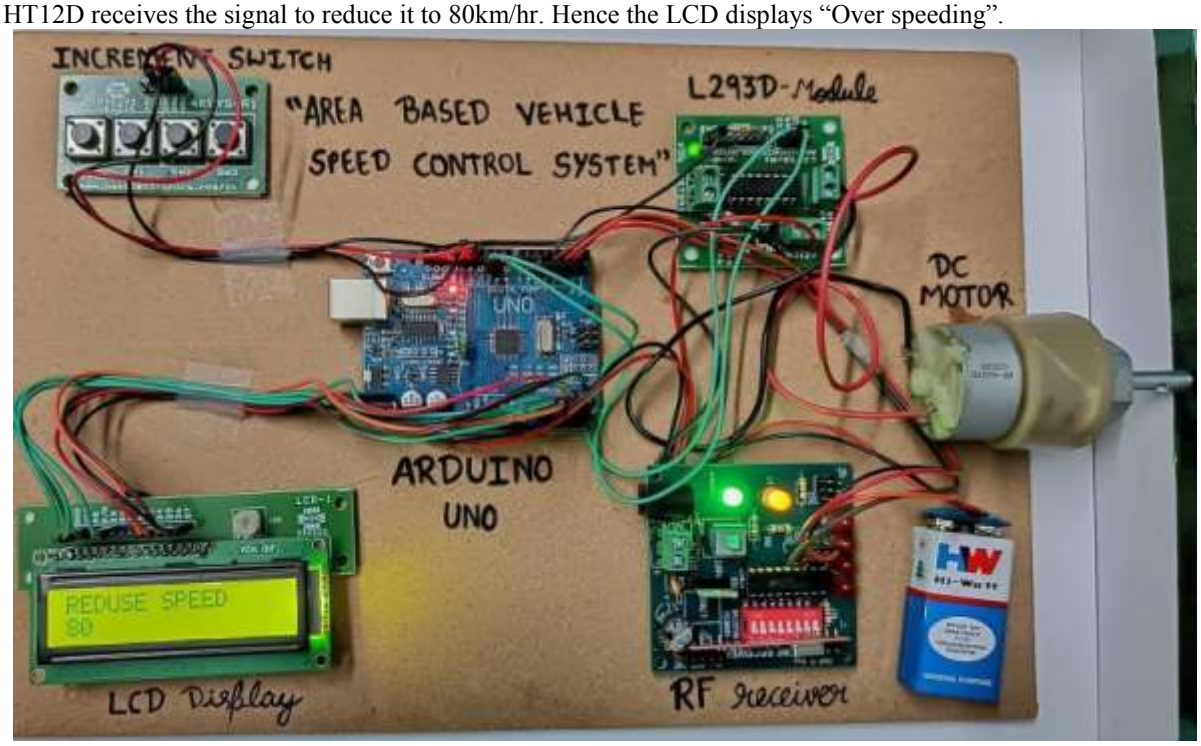


Over speeding of the vehicle



Transmitter encoding 80km/hr

When the transmitter is transmitting the signal to the receiver, switch D3 is high in HT12E. The receiver, HT12D receives the signal to reduce it to 80km/hr. Hence the LCD displays "Over speeding".



Reduced speed to 80km/hr

Since highway zone are defined to 80km/hr speed the vehicle is controlled to 80km/hr from 100km/hr

VI. CONCLUSION

The project presents a solution to control the speed of the vehicle automatically using the RF signal. Here the vehicle speed is controlled automatically without the help of a driver in the defined zones. This strategy is created for the most part in the intention of decreasing the demise rates that are lost amid mishaps. Hence it is concluded from the above study that the uses of Area Based Vehicle Speed Control System minimize unwanted accidents to a great extent compared to normal behavior. It is an easily conveyable and cost-efficient system. So, this project notifies that the idea and the review of a Area Based Vehicle Speed Control System is a relatively more reliable option .

REFERENCES

[1] Santhana Krishnan, Mohanraj, Mohana Deepak, Vinoth Kumar, Prabu, "RF Based Automatic Speed Limiter for Vehicles", International Journal of Research and Scientific Innovation (IJRSI) | Volume V, Issue IV, April 2018 | ISSN 2321–2705.

[2] Vijay Deep Bhatt, Sachin Singh Khati, Diwesh Pandey, Hem Chandra Pant, "Wireless traffic system with speed control"

2nd International Conference on Computer and Automation Engineering (ICCAE), 2010.

[3] V Kranthi Sai Reddy, V Sai Jahnavi, Prathima Sheela, "Intellegent Smart Zone Based Vehicle Speed Control", International Journal of Research in Electronics and Computer Engineering IJRECE Vol. 6 Issue 4 (Oct- Dec 2018).

[4] Md. EftekharAlam, Naznin Nahar Nipa, Kaniz Fatima, Mohammed Abdul Kader, "An efficient model to limit the vehicle speed and horn sound in sensitive public zone with encrypted wireless communication." Int. Conf. on Innovations in Science, Engineering and Technology (ICISET), 27-28 October 2018.

[5] Deepa B Chavan, Abdul Rahim Makandar, Faizul Hakeem Khan, Syed AzimuddinInamdar "Automatic Vehicle Speed Reduction System Using Rf Technology" International Journal of Engineering Research and Applications (IJERA) Vol. 4, Issue 4(Version 9), April 2014, pp.13-16.

[6] E.Pathak, T.Sharma, Ashutosh, &S.Dixit," RF Based Smart Zone Vehicle Speed Monitoring and Control System" Second International Conference on Green Computing and Internet of Things (ICGCIoT), 2018.

[7] Anamfirdous, Indu, Vandana Niranjan, "Smart Density Based Traffic Light System", IEEE 8th International Conference on Reliability, Infocom Technologies and Optimization (ICRITO '2020), June 4-5 2020, Amity University,noida,India

[8] Ishita Prashar, PinkyKaushikand Vandana Niranjan, Intelligent System for Health Monitoring Applications" IEEE International Conference on Computing, Communication, and Inteligent Systems, Greater Noida, India, October 18-19, (2019).

[9] Pearl Pullan and Vandana Niranjan, Intelligent Clogged Sewer Control System" 5th IEEE International WIE Conference Electrical and Electronics Engineering (WIECON), Banglore, India, 15-16 November 2019.

[10] Gangadhar, S.; R N shetty Inst. Of Technol, an Intelligent Road traffic control system, IEEE conference publication kahargpur (2010).