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IMPLEMENTATION OF SPEED LIMIT ON A VEHICLE

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ABSTRACT:
The main objective of the paper is to provide a risk free journey for the vehicle drivers and also to the pedestrians by controlling the speed of the vehicles using radio frequency signal. To be more lucid, this paper is mainly built in order to prevent the people from breaking government laws and rules by forcing the vehicle to drive in the specified speed. This paper combines the concept of Wireless networking and Instrumentation Control engineering. Radio frequencies are used in order ensure that all vehicles are controlled using this method. Microcontrollers are used for comparing the set point and the actual speed of the motor. The sign boards acts as a radio frequency transmitter and the Vehicle acts as the receiver. The set point (accumulator) is assigned to the microcontroller which is placed inside the vehicle and the current speed of the vehicle is assigned as actual value (base register)to the microcontroller. The logic of this program is that if the current value exceeds the set point, then the speed of the vehicle is automatically controlled with the help of motor driver. A liquid crystal display is used in order to display the number of rotation of the motor before and after receiving the Radio frequency. Instead of coding every sign board to emit a particular radio frequency signal, a server is placed which sends the radio frequency to the sign boards. Thus the sign board acts both as transmitter and receiver. The server is coded in such a way that it is capable of broadcasting radio frequency at a particular frequency.
Keywords: PID controller, LCD, RF transmitter and receiver, Motor driver, Server, ECU, Speed governor.

2. INTRODUCTION:

According to the recent survey, major accidents that occur are due to rash driving and over speeding. Even by providing strict rules and regulations from the government, the death rate has not reduced. In order to provide a satisfactory solution for this problem, this paper is built.

- The entire control operation is done without the help of human interface.
- Indication with the help of LCD is given to the driver if the speed limit exceeds the set point in order to alert the driver about the over-speeding.
- Decrease the death rate and make sure that the government rules are not broken.

In this project the speed of the vehicle is controlled without the help of human interface. With the help of wireless networking concepts, the signal is transmitted from the sign boards to the vehicle. When the vehicle enters the zone where the transmitter is placed, the speed of the vehicle is controlled and the vehicle is forced to be driven in the particular speed. At this zone, even when the vehicle is accelerated, it cannot go beyond the specified speed range. When the vehicle leaves the zone, it is free to be accelerated in the desired speed.

Since there is no human interface in this project, there occur no man-made errors such as calculations. The overall efficiency of the system is increased as the speed is automatically controlled only in desired places and in other places the vehicle can drive in its own speed. Since the vehicle is controlled only in the desired localities, a closed loop control is created.

Having sign boards for every locality will directly affect the cost estimation. In

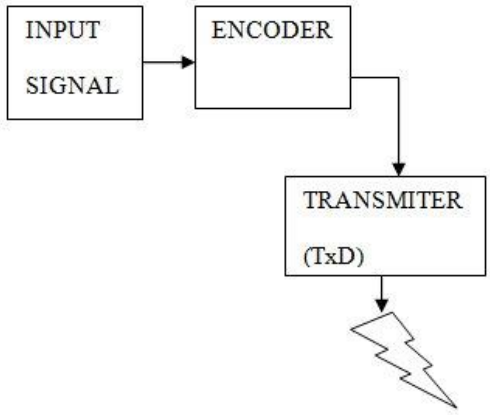
order to have both increased efficiency and optimal cost, a server is introduced. This server is programmed in such a way that it exactly does the job of the RF transmitter. The sign boards are made to act as both transmitter and receiver. They accept the signal from the server and again transmit them to the vehicles present in that particular zone. In simple, the sign boards acts as a reflector. It just reflects the signal from the server to the vehicle. Instead of converting all sign boards into radio frequency transmitters, they are made as reflectors of radio waves. This innovative method of converting the sign boards into a transmitter and receiver greatly helps us to reduce the amount of money spent.

When the speed of the vehicle is automatically controlled when it approaches the school zone, a hospital zone or any particular locality then there is no necessity need to have speed-breakers in that locality. Thus this project prevents people from breaking government laws as well as it help the government economy by reducing the cost indulged in building speed breakers.

The main reason of using radio wave to control the speed of the vehicle is that it can travel a longer distance as compared to infrared signals. The signal strength of radio waves are very much higher When there are many vehicles travelling across a particular zone, the radio waves ensure that every vehicle's speed present in that particular locality is controlled in an effective way.

BLOCK DIAGRAM:

1. **RFID Transmitter**



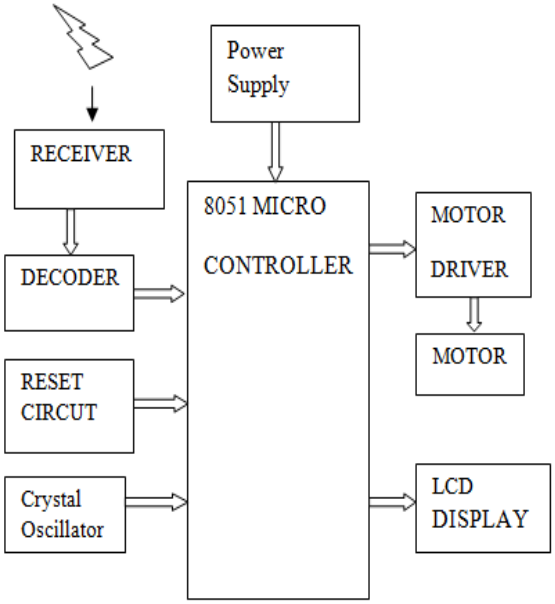
The transmitter is used to emit the radio waves in air at a particular frequency. The transmitter circuit remains the same for both battery driven vehicle as well as fuel driven vehicle. The purpose of the RFID transmitter is to broadcast the radio waves in a particular zone.

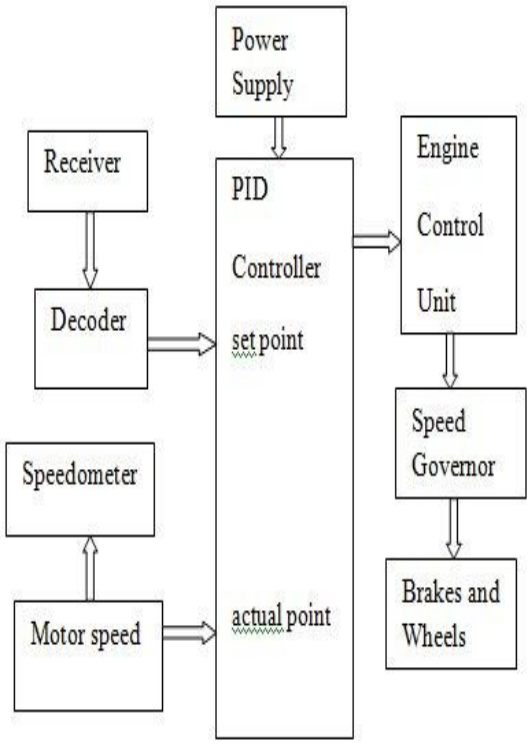
TRANSMITTER COMPONENTS:

1. Transmitter: The transmitter encodes the input signal and sends it in free spaces (air medium) with the help of antenna. The transmitter used for this project is 433MHz. This transmitter is affordable and efficient too and hence they are employed in this project.
2. Encoder: It is used in order to convert the electrical signals into codes.
3. Antenna: It is used in order to broadcast the encoded signals through air medium. Antennas are do not transmit the signals in one direction instead they transmit it in all direction.

Receiver Circuit

Receiver Circuit





The above design is for implementing it in a battery driven car. This project could be implemented in a fuel driver car too. Even though the mechanism of fuel driven vehicle and a battery driven car are slightly similar, the working differs by a larger extent. The actual or the current value of the vehicle in fuel driven car is got by taking a connection from the speedometer. The controller is used to compare the current value of the vehicle with that of the set point and thus speed of the vehicle could be controlled in a fuel driven vehicle. In order to implement it in real-time fuel driven car, the following circuit has been designed. The transmitter circuit remains same for both battery driven cars and fuel driven car.

RECEIVER COMPONENTS:

4. Receiver: The receiver detects the signal that is transmitted and decodes it in order to feed it into the PID controller.
5. PID controller: The value from the receiver is assigned as the set point in the PID controller. The current speed of the vehicle is given as the actual value in the PID controller.
6. ECU: Engine Control Unit. It is generally called as the brain of the vehicle. This sends the instructions to the speed governor if the speed of the vehicle exceeds the speed limit in that particular locality.
7. Speed governor: In order to control the rpm speed of the motor, speed governor is used.

WORKING MODULE:

- The transmitter is coded in such a way that it emits the radio waves in a frequency directly proportional to the rotating speed of the motor.
- The transmitter sends the radio waves at every particular interval; say 5 to 10 microseconds, and this radio waves circumference last for few ranges depending on the type of transmitter used.
- The radio frequency wave is then received by the receiver which is decoded and then fed to the PID controller. This decoded value is given as the set point for the controller. The actual speed of the motor is taken from the speedometer and it is given as the current value to the controller.
- The logic that is coded inside the controller is that when the speed of the vehicle is greater than that of the set point in the PID controller, then the speed is control with the help of speed governor via engine control unit.
- The speed governor is responsible for the acceleration and deceleration in vehicles. If a vehicle has to retard its speed, then brakes are applied with the help of speed governor.
- This speed control is applicable only for a particular area and once the vehicle crosses the particular locality the speed barrier on the vehicle is taken off and the vehicle can be driven in a faster speed.
- The Liquid Crystal Display is provided in order to indicate the person who is driving the vehicle about the over speeding so that the driver could have a better control over the vehicle and thus this method proves to be efficient enough in controlling the vehicle's speed.

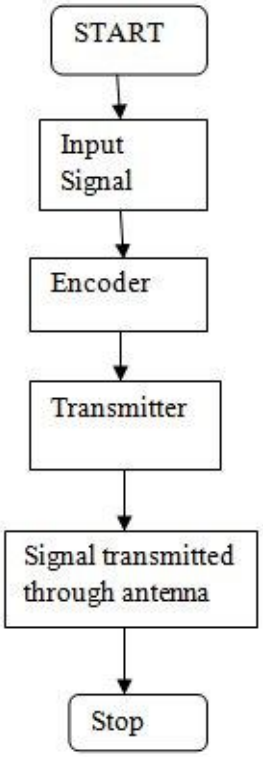
FLOW CHART:

For Transmitter:

STEP 1**:** The input signal is fed to Radio Frequency transmitter.

STEP 2: This signal is converted into codes with the help of encoder.

STEP 3: With the help of transmitter, the signal is transmitted. The main purpose of antenna is to broadcast the signal which is widely spread over a particular zone.

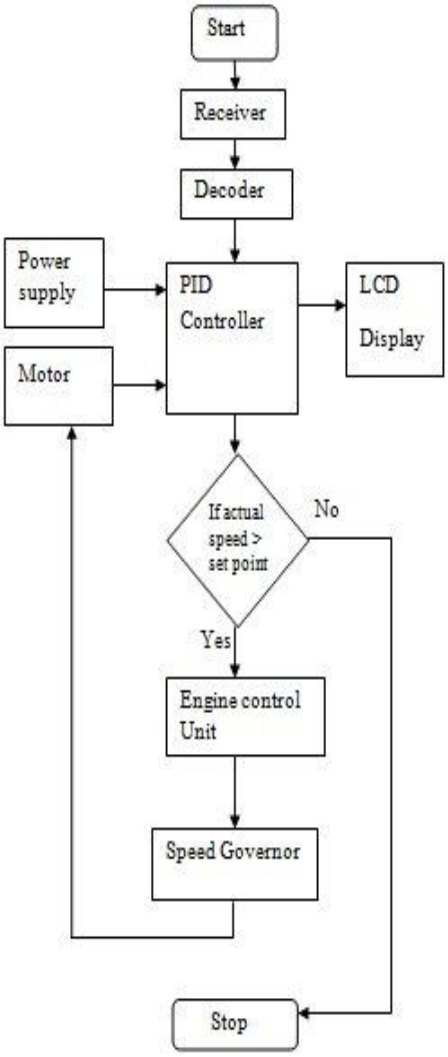


For Receiver:

STEP 1: The signal that is transmitted by the transmitter is detected and received by the Radio frequency receiver.

STEP 2: This signal is converted back into electrical signal with the help of decoder.

STEP 3: The current speed of the motor, power supply and the decoded signal is given as the input to the PID controller and the output of the PID controller is given to the LCD display where the speed of the motor is displayed in rpm.



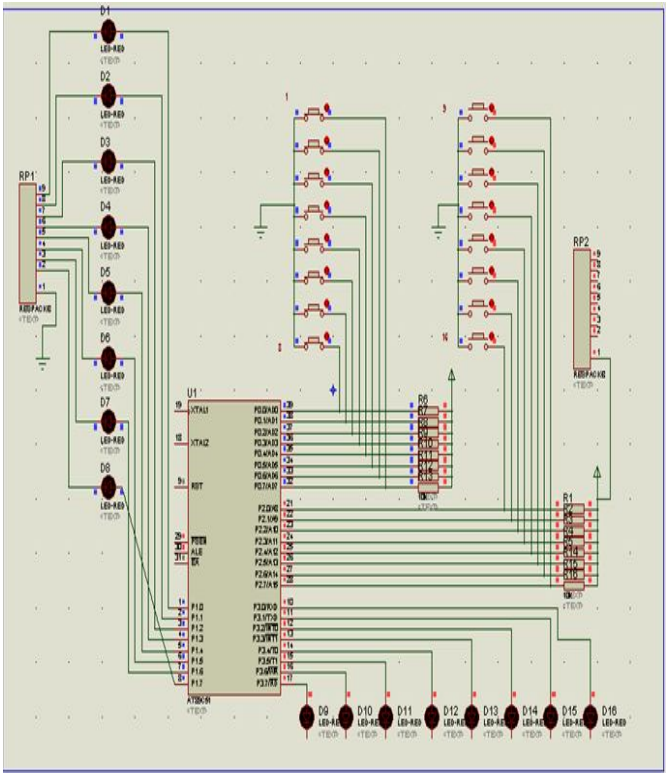
STEP 4: The condition in which the program works is explained in the "if" condition. If the actual speed of the motor is greater than that of the set point in the PID controller, then the vehicle is decelerated with the help of speed governor.

STEP 5: If the actual speed is below the set point, then the speed governor does not come in action. The loop terminates.

STEP 6: The loop is iterated till the speed of the vehicle is equal to or below the specified set point in the PID controller.

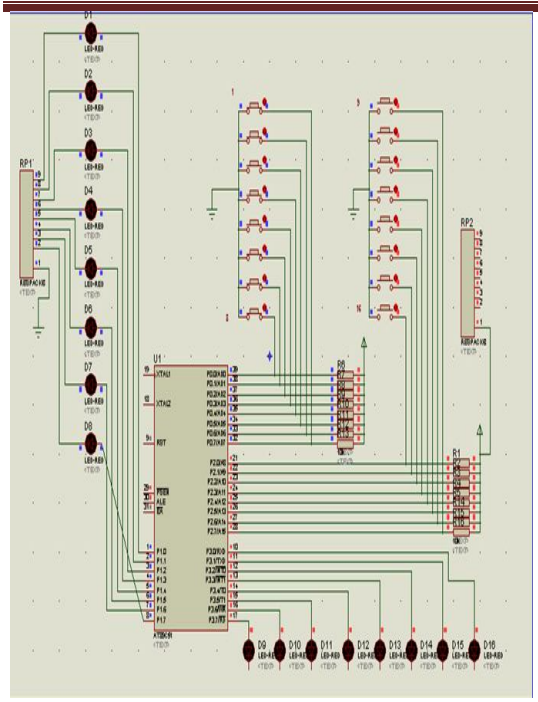
SIMULATION:

BEFORE RECEIVING THE RF SIGNAL:



SPEED OF THE MOTOR IN RPM BEFORE RECEIVING THE SIGNAL

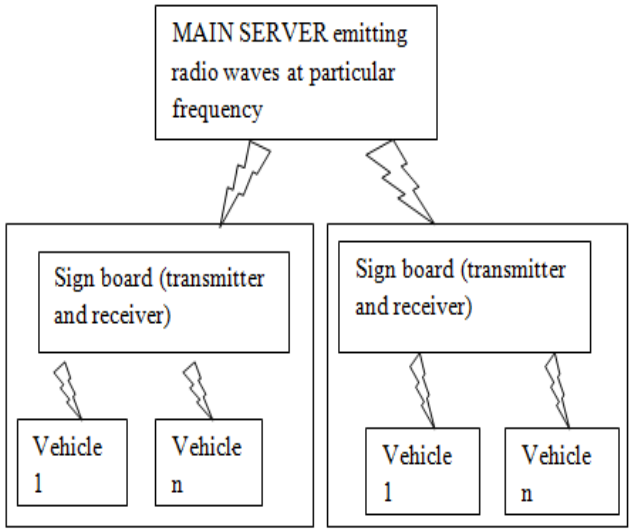
AFTER RECEIVING THE RF SIGNAL



SPEED OF THE MOTOR IN RPM AFTER RECEIVING THE SIGNAL

FUTURE SCOPE:

Instead of making every sign boards as a radio frequency transmitter, we are assigning a server which is capable of emitting radio waves at a particular frequency. This radio wave frequency is directly proportional to the speed limit of the zone.



The main merit of using this method is that:

- If a school/hospital is closed or shifted from one locality to another, instead of removing all the sign boards, the server could be turned off for that particular zone.
- The cost of converting all the sign boards in a zone into a radio frequency transmitter is too high and this method is not feasible too. Instead, we can use the server to transmit the radio waves which greatly reduces the cost of the overall setup.

This entire project is for the vehicles like car, bus, Lorries etc and not for vehicles like Police jeeps and ambulances. This receiver circuit is not placed in ambulances and thus ambulances can be driven in higher speed even in these zones.

This project could also be used to manage traffic in heavily congested areas. Recent survey has proved that accidents rates are higher because of the increase in number of vehicles and thus traffic management holds a vital key. This includes big data analysis concept. The data is made to flow

for 24 hours a day thus a terabyte of data is received everyday to the system.

TECHNICAL RESULTS

• Enhanced storage capacity for large data. Apache Hadoop provided a mass data storage solution with high fault tolerance and throughput, allowing reliable storage for massive information and seamless expansion capacity.

• Achieved powerful I/O processing function. The Intel Xeon processor E5 series enhances I/O processing. Now a single server can allow synchronous transmission of a 500KB picture with an average speed of 250 times per second, or asynchronous concurrent storage of 2,000 times.

BUSINESS VALUE

• **Improved traffic case detection ability.** With 24 months of traffic violation image information stored in the system, traffic police departments can easily retrieve vehicle's Information such as the color, model, and license plate in real time along with other Important and relevant information such as historical behavior, driving routes, the the identity of the driver.

• **Improved traffic police supervision of motor vehicles**. Traffic police can easily retrieve the plate numbers and the driving track of a passing vehicle from the over 2.4 Billion records in the system.

• Easy access to relevant vehicle analysis data. Investigating traffic cases that require complex inquiries, such as data from multiple checkpoints or multiple vehicles, now takes just 10 seconds.

The big data challenge

As traffic data continues to grow, the average monthly data has now reached 10 terabytes. Since data such as pictures and video are stored in different data centers in different divisions, it has become difficult to use. Moreover, some traffic management facilities, equipment, and application systems run in silos, which need to be integrated. The city kept 12 months of traffic data. But the historical data showed that traffic data has grown 60 percent per year, forcing the duration of stored data to become shorter and shorter. The city needed to extend the storage period of traffic data to support public security staff, criminal investigation teams, economic investigations, and frontline police. Vehicle traffic data is often key evidence that helps identify individuals involved in legal cases. As the city continues to develop, the scale of traffic monitoring operations has also grown. The data collected through monitoring equipment needs reliable storage. Also, with the development of new technologies and the upgrade in the electronic police checkpoint system to high-definition video images, image size is larger than before, demanding better storage performance.

RESULT:

Thus the speed of the vehicle is controlled in an efficient way and also in a cost effective way.

This project could be implemented in areas like school zone, hospital zones, hilly areas, accident zones, pedestrian crossing and so on. This innovative technique was developed mainly in a motive of reducing the death rates that are lost during accidents. This project creates a satisfactory solution for the long lasted problem. All vehicles irrespective of the cost, brand could be controlled using this project.

CONCLUSION:

In this project Automatic wireless speed control of vehicles has been studied and implemented. My future works includes embedding the detection of road condition, traffic sensing and automatic ambulance alert during emergencies in the above explained project.

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