Active Intelligent Speed Adaptation System

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Abstract: This study focuses on the speed controlling technique which involves the transmission of speed controlling signals to the vehicle in which receiver of these signals is installed as the inappropriate speed is a significant factor in serious road accidents. Road safety authorities around the world devote considerable resources to addressing the speeding problem particularly compliance with speed limits. In the system the speed is automatically reduced to the speed specified in a particular area and also an information system is also incorporated which display information in the vehicle about the route. Microcontroller PIC16F876A which is RISC based controller it has 35 set of commands set. Has various peripheral inbuilt such as USART, TIMER, ADC, SPI and many more features.

Keywords: ISA, Microcontroller PIC16F876A, PID Loop, RF Module, USART.

I. INTRODUCTION

Cars have been the most important transportation for the progress of science and technology. While we have to face the more serious traffic problems meanwhile enjoying the convenience of the cars, the intelligent transportation system (ITS), which was put forward in recent years, has made people believe that the problems would be solved. However, due to the restriction of experimental environment and cost, research about ITS is very hard to open up in real life [1]. Scaling down the model of ITS in proportional could get a high accuracy simulation and analysis of the real one.In these systems there are two part transmitter and receiver in the transistor when press the micro switches key given some input of microcontroller , the microcontroller check the key input whose key, press the data or information sending after this process the microcontroller encoded the input by the RF module the receiver receives the data by RF module and collected by receiver microcontroller and the microcontroller decoding the information signal and display on the seven segment and microcontroller sending the data in dc Motor, and motors start the receiver part send feedback which data is receives ,sending by the RF module again the transmitter RF module receive feedback information and decoding by microcontroller and display on LCD (liquid crystal display). It's whole process based on the frequency modulation [2].
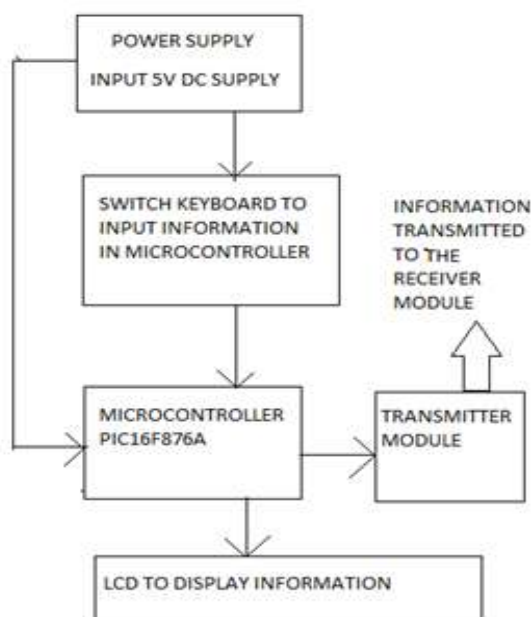
A. Transmitter

Fig 1 Block diagram of Transmitter

Basic function of a transmitter is to control the speed of the moving vehicle also send a message to the drive if any for road. For e.g. on a road there is left turn, right turn, work in progress. When the system is in the transmitter mode it controls the speed of car [3]. It continuously transmit the Transmitting frame and the contains following information's message, it may be the speed limit specified in a particular area information such as road under construction, left turn, right turn etc. The components of transmitter card are clearly shown in fig.1 below; the information is fed from the keyboard which is further encoded by microcontroller to be fed to RF transmitter module.

B.Receiver
The receiver program works in two sections, motor driving section and control section of driving, it receives the signals transmission board. The RF Module is used for the communication from transmitter to receiver [3].

a. The motor driving section
Speed ofthemotorof thecar isincrease anddecrease by The pulse widthModulationwhosefrequency is 1 kHz. When we want to increasethe speed of car we increasethe Duty cycle and it is shown on screen in a form of percentage. When we decrease the speed of the car we decrease the DutyCycle.

b.The control section driving section.
This system is active any valid frame is received. For e.g. Its receive a transmitting frame it extract speed and message and first shows the message check the current speed with received speed. If it is greater it decrease the amount of duty cycle. If it is lesser or equal it takes no decision.
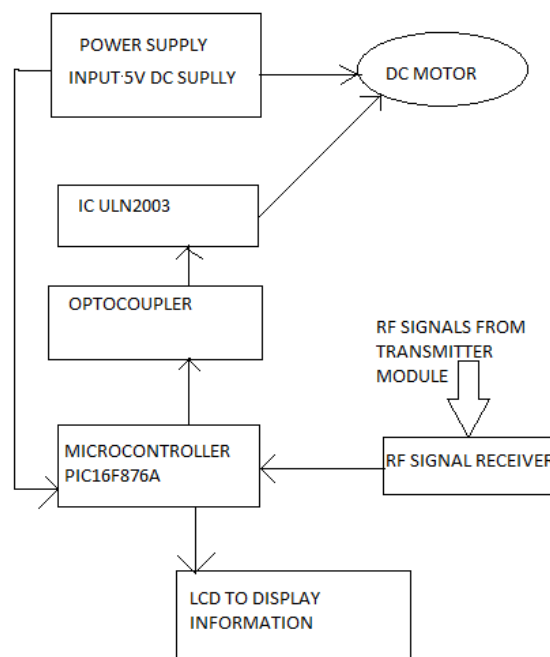

Fig. 2 Block Diagram of Receiver

II. PRACTICAL SYSTEM IMPLEMENTATION

We have to make changes in our existing vehicle carburetor;it has to be designed in such a way that a new slide is introduced below the inbuilt slide of the carburetor which was fully controlled by the driver section and ECU. Our new slide is now controlled by the receiver circuitry of the receiver of speed adaptation system. The movement of this new slide is done by the high resolution DC or stepper motor whose speed is controlled according to the received signal, which is transmitted by transmitter section. A digital Speedometer is also used in this system. This digital speedometer measures the running speed of the vehicle for PID LOOP. At first receiver section takes the transmitted data and check the running speed of the vehicle through PID LOOP. if the running speed is greater than received speed limit then an optimal target opening degree of the throttle valve is calculated by the ECU and PID LOOP of the driving section of vehicle and hence calculated opening degree of the throttle valve is done by the new introduced slide below the older slide by the dc motor. As the speed of the vehicle increases beyond the speed limit then our receiver system decreases the opening of the new slide and adjust the amount of intake air fuel supplied to the engine and hence the speed is

maintained at safe optimal speed level. If driver want to move above the speed limit of a particular zone then he/she cannot increases the speed above the safe limit .the reason is that when he/she want to increases the speed of the vehicle system then he/she increases the opening of slide of throttle through accelerator .now even he/she fully open the throttle slide to increases the speed, our new introduced slide which is located below the older slide maintained the safe speed of the vehicle according to the received signal. Hence our vehicle is within the safe limit.
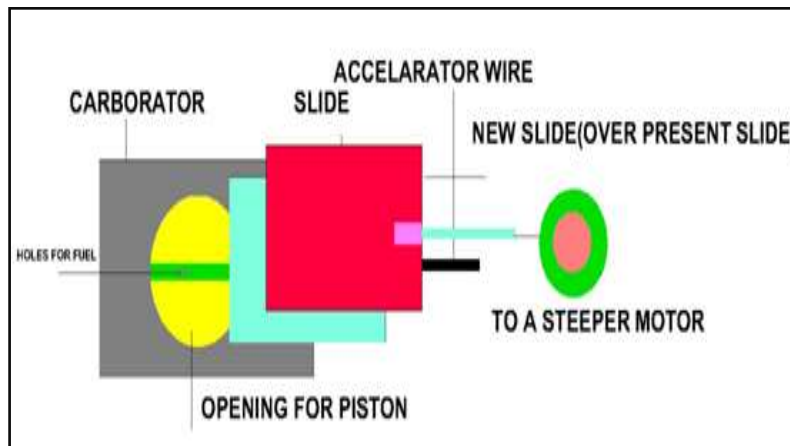

Fig. 3 Block diagram of required modification in Carburetor

A digital Speedometer is also used in this system. This digital speedometer measures the running speed of the vehicle for PID LOOP. At first receiver section takes the transmitted data and check the running speed of the vehicle through PID LOOP. If the running speed is greater than received speed limit then an optimal target opening degree of the throttle valve is calculated by the ECU and PID LOOP of the driving section of vehicle and hence calculated opening degree of the throttle valve is done by the   new introduced slide below the older slide by the dc motor. As the speed of the vehicle increases beyond the speed limit then our receiver system decreases the opening of the new slide and adjust the amount of intake air fuel supplied to the engine and hence the speed is maintained at safe optimal speed level.

III. METHODOLOGY

After going through several researches the systems incorporated are mostly passive that is ISA has got GPS incorporated devices installed in vehicles but these systems does not decrease the speed automatically they create warning signals and decision is of driver but to prevent road accident cases we must incorporate active systems that automatically reduces the speed of vehicle by adopting the carburetor system specified in this paper. The transmitter can be installed on road sides and can be monitored or an intelligent GSM network system can be used so that the monitoring area can be increased. These Active systems are very useful in case of theft and road rage by such systems we can control the speed of car also we can stop it but it quite hinders the private vehicle system when used by GSM transmitters but by use of RF the range can be defined and the areas where speed control is a must like schools, hospital, government organizations etc. We can provide the automatic control of speed.

IV. RESULTS AND FINDINGS

With the help of ISA, there is a decrement in road accidents due to unlimited and uncontrolled speed of the vehicles. By using ISA, all the vehicles will be run in the maximum speed limit of respective areas. As it is clear from the description of ISA, it reduces the consumption of fuels [1]. This ultimately results in reduced harmful emission. There are also noise and amenity benefits with the implementation of ISA. In the ISA implemented vehicles, we can display any useful information inside the vehicle which will helpful to the driver during the travelling periods, as an example if there is any blind curve ahead the traveling path or there is any construction is going on in a highway then these useful information's can be displayed in the display section inside the vehicle before reaching to that particular zone [6].

V.ADVANTAGES

This ISA will be risky for those light vehicles which are move at a very high speed the reason is that when ISA implemented vehicle which are moving at a very high speed in non ISA implemented zone, entering in a new zone where the required speed is very low compared to speed of moving vehicle then ISA system of the vehicle tries to reduce the speed of the vehicle immediately which will causing an unbalancing problem to drivers [4].

VI. LIMITATIONS

There are some limitations of the ISA system such as not working when more number of vehicles are passing from a particular zone – ISA system will not work in such type of zones from where more number of vehicles are passing every time or at any particular instant such as after any gathering etc. this is because of jamming of GSM network [7]. The jamming condition will occurred because there will be only one transmitter for controlling of all the vehicles i.e. for transmitting the signals and receiver i.e. vehicles are more in numbers and hence will causing jamming of network.

VII. CHALLENGES

The biggest requirement of this system is uninterrupted network and the receiver systems installation in the vehicle and if the speed parameters are not set correctly that can result in varying speeds and with so many advancement if external third party manipulation in network can cause wrong information transmitted for that strict security of network will be required.

VIII. CONCLUSION

The system proposed is very easy to implement on current system, low cost and durable, ensures maximum safety to passengers and public, the driver gets all information about the road without distracting him from driving; driver gets all information even in bad weather conditions, low power consumption. This project is further enhanced by automatic speed control when the vehicles get any hazard signal from outside environment.

FUTURE ENHANCEMENTS

We can also use this system to find the route of a particular vehicle – in the future if we will transfer the data bidirectional i.e. from transmitter to vehicle and also from vehicle to transmitter then we can find the route of a particular vehicle which will very helpful in some special cases such as in case of strolling of a vehicle. Also, we can predict the speed limit through digital map – if we will uses the GPS system in the vehicle then we can predict the upcoming speed ahead the way as well as of the any other path / zone through a digital map. Displaying other traffic and weather related information's – we will also display some traffic condition related information's as well as some whether related information's to the driver through the GPS System implementation which will helpful to driver during traveling.

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