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Smart Vehicle with Automatic Speed Regulation

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Abstract: **The major threat faced by today's world is increasing number of accidents. Nowadays people are driving very fast; we lost our valuable life by making small mistake while driving (school zone, hills area, and highways). So in order to avoid such kind of accidents and to alert the drivers and to control their vehicle speed in such kind of places the highway department have placed the signboards. But sometimes it may be possible to view that kind of signboards and there is a chance for accident. In this paper we are controlling the speed of two wheelers. This paper is composed of two separate units: zone status transmitter unit and receiver (speed display and control) unit. Once the information is received from the zones, the vehicle's embedded unit automatically alerts the driver, to reduce the speed according to the zone, it waits for few seconds, and otherwise vehicle's speed control unit automatically reduces the speed.**

Index Terms— **CDI-Capacitive discharge ignition**

I. INTRODUCTION

One of the major causes of road accident in the world is driving too fast, recent studies shows that one third of the serious road accidents are due to inappropriate speed [4], as well as change in road way (like presence of road work or unexpected obstacles).So in order to avoid such kind of accidents and to alert the drivers and to control their vehicle speed in such kind of places the highway department have placed the signboards. But sometimes it may not to possible to view that kind of signboards and there is a chance for accident [1]. So there is an utmost need to design a system which can control the speed of vehicles. Here we are designing a speed control system for vehicles which can intimate the driver about the zones and limit speed of the vehicle automatically.

This paper develops an intelligent speed adaptation, which can monitor the vehicle speed and implements an action when the vehicle is detected to be exceeding the speed displayed in the speed display (sign) boards. The speed display boards are working as per the highway speed limiting protocol. The driver should take great attention on the speed of the vehicle especially when driving through busy junctions, railway crossings, school and college zones etc[5].The citizens are ought to obey the speed enforcement rules in order to avoid the accidents, any violation in this are considered as a greater offence. Traffic Police are authorized to check every vehicle and take actions against the violation. But it may not be practically possible always. The proposed system is designed in such a way that the vehicle speed is automatically controlled through over a wireless communication [3].

I. BLOCK DIAGRAM

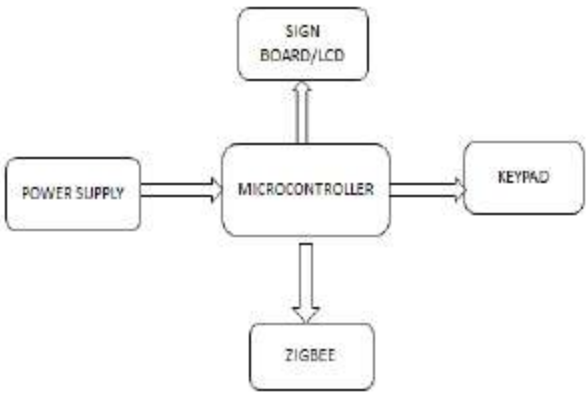

Fig.1. Block diagram of transmitter section

It consists of two microcontroller based embedded modules [2] connected, one in the speed display board and the other inside the vehicle. The module at display Board includes, Fig.1Microcontroller based Embedded System with Zigbee wireless communication module etc. Speed limit of each sign board can be configured by the authority by using keypad. The system uses wireless methods for the communication using ZIGBEE Trans- Receive module.

The wireless ZIGBEE module transmits the speed limit and warnings to the vehicle. On the other hand in the vehicle module, the ZIGBEE Receiver unit announces the speed limit warnings through audio encoder and speaker. The microcontroller in the receiver unit Fig.2, checks the current speed of the vehicle and compare it with zone speed. If the speed is above the specified limit, the Central controlling

signal produce trigger signals for the motor that control accelerator unit to drop the speed within the specified range.

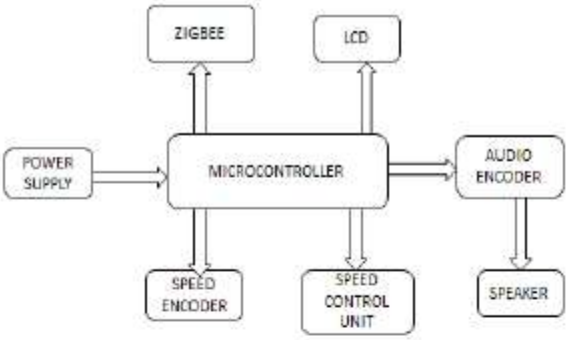

Fig.2. Block diagram of receiver section

II. Overview of working model

1) Transmitter section

The transmitter portion is a stationary part, which is placed at the sign board near the road sides. The transmitter section is shown in the Fig3. The transmitter section consist of a microcontroller 16F877A, which control the unit, a 16x2 LCD display which displays the speed of the zone. A 4x3 matrix membrane type keypad, through which authority can set the speed of the particular zone and a zigbee module is used for wireless communication. The authorities can set the speed of a particular zone using keypad. The speed of the zone is different for different zones. The zigbee will continuously send the set speed.

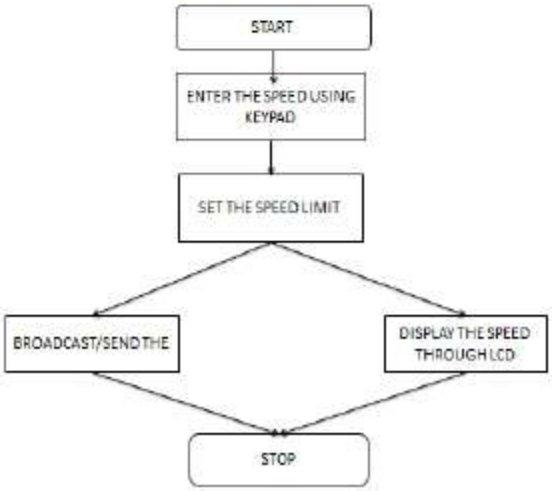

Fig.3.Flow Chart of transmitter section

2) Receiver section

Receiver section is placed in the vehicle. The diagram of the receiver is shown in the Fig.4. The receiver section consists of a microcontroller, speed sensor. Speed controlling unit consist of audio encoder, zigbee and an LCD display. The LCD display is shown in the speed of a particular zone. A relay is connected to the micro controller. The relay switches the input to CDI unit from the pulsar coil to our pulsar generating unit. The zigbee receives the speed unit to the zone sent by the transmitter. Audio encoder is on IC APR9600, which is used to inform the driver about the zone details. A mic and a loudspeaker are connected to the audio encoder for recording and informing the driver about the zone. Speed sensor is a magnetic reed switch which is used to measure the current speed of the vehicle. When the vehicle enters into a particular zone, the rescue zigbee receives the speed of the zone. At the same time microcontroller informs the driver about the particular zone, through audio encoder, loud speaker and LCD and give action for controlling the speed. If the driver is not controlling the speed, the micro controller activates the relay which will switch the CDI unit to our pulsar generating circuit.

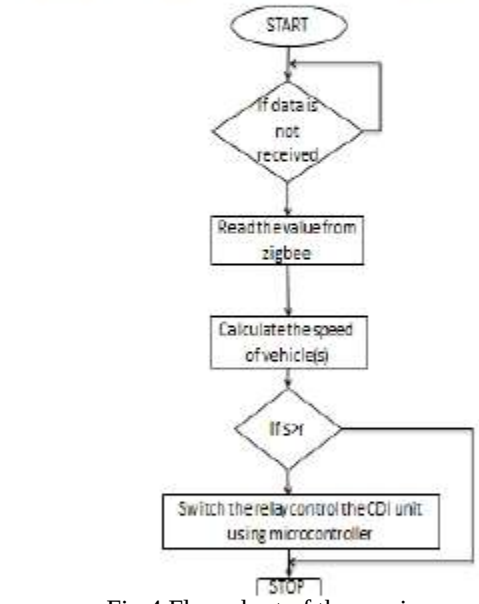

Fig.4.Flow chart of the receiver section

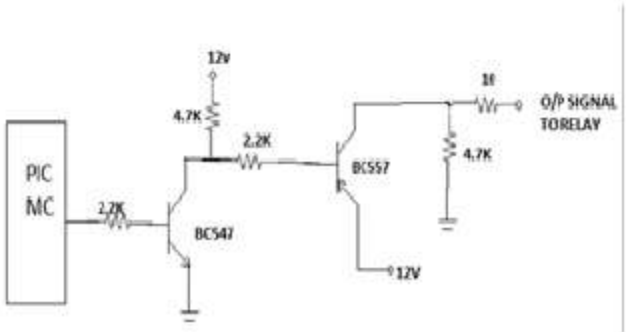

Fig.5. Pulse generating circuit.

For controlling the speed the distance between the pulsars given to the CDI unit is varied. The amplitude of the pulsar given to CDI unit is 12V. Under normal sped, without acceleration the distance between the pulses is 60ms. For decreasing the speed the distance between the consecutive

pulsars is increased. The time delay between the consecutive sparks increases.

Fig.6. Normal pulse from pulsar coil without acceleration

As the time delay between the consecutive sparks increases the working of the engine is delayed. The engine used in a two wheeler is a 4 stroke engine. The ignition stroke requires spark for the ignition of the fuel. When the spark is delayed the stroke after ignition stroke, stroke will not operate there by the speed of the engine will be decreases and hence the speed of the vehicle decreases .speed of the engine will be decreases and hence the speed of the vehicle decreases.

3) Magnetic Reed switch

Fig7.Magnetic reed switch

The reed switch Fig.7 is an electrical switch operated by an applied magnetic field. It consists of a pair of contacts on ferrous metal reeds in a hermetically sealed glass envelope. The contacts may be normally open, closing when a magnetic field is present, or normally closed and opening when a magnetic field is applied. The switch may be actuated by a coil, making a reed relay or by bringing a magnet near to the switch. Once the magnet is pulled away from the switch, the reed switch will go back to its original position. The switch is placed at the wheel of the vehicle. The speed of the vehicle is measured using this switch. It calculates the number of times it gets attracted.

4) CDI unit

Capacitor discharge ignition (CDI) Fig.8 or thyristor ignition is a type of automotive electronic ignition system which is widely used in outboard motors, vehicles etc. It was originally developed to overcome the long charging times associated with high inductance coils used in inductive discharge ignition (IDI) systems, making the ignition system more suitable for high engine speeds (for small engines, racing engines and rotary engines). The capacitive-discharge ignition uses capacitor discharge current output to fire the spark plugs. It receives a pulse from pulsar coil which is proportional to rpm of the vehicle. Normally it is a pulse which has amplitude of 9-12v and time period of 9ms, and the offset time period is around 60ms. When acceleration increases offset time period decreases.

Fig.8. CDI unit

We have to recreate this pulse if the driver doesn't decrease the speed of the vehicle in speed limit zone. Microcontroller can create these pulses with amplitude of 5v dc. This pulse is used to switch a 12v power supply with a circuit. Normally relay is connected with pulsar coil and CDI unit. If the driver doesn't decreases the speed, then microcontroller switches the relay. Then a connection will be established with pulse generating circuit and CDI unit, and the speed will controlled using corresponding pulse which is generated by the microcontroller. The wave shaping circuit of the CDI unit is shown in Fig9.

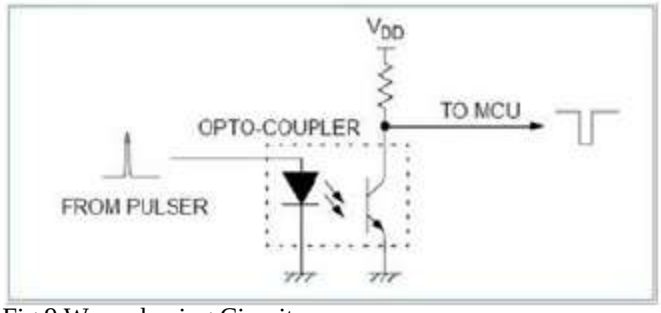

Fig.9 Wave shaping Circuit

III. PROGRAM LOGIC

A. Transmitter Section: In transmitter section the microcontroller will receive the value of speed entered through the keypad. This speed is displayed on the LCD and this speed will set through zigbee.

B. Receiver Section: In the receiver section the microcontroller count the pulsar coming from the magnetic reed switch (speed sensor). So the corresponding rpm of the wheel is obtained. From the rpm value the speed of the vehicle can be obtained by knowing the radius of the wheel. Then the microcontroller compares the zone speed and the

current speed of the vehicle. If the speed is greater than the zone speed then the controlling action will be initiated by the microcontroller. Also the microcontroller will give the alert to driver about the zone

IV. IMPLEMENTATION AND RESULT

applied. And when the vehicle leaves the zone it is found the original speed retained. The implementation and result is shown in Table.1.

ZONE	SPEED LIMIT OF THE ZONE(km/hr)	INITIAL SPEED OF THE VEHICLE(km/hr)	SPEED OF THE VEHICLE IN ZONE OF 100m(km/m)
1	20	60	20
1	20	66	20
2	25	55	25
2	25	63	25
3	30	57	25
3	30	60	25

Table. 1. Implementation and result

CONCLUSION

The paper succeeded in implementing a system to reduce the traffic violations. The driver is made aware of his driving behaviour and violations made so that careful and conscious driving can be achieved. Wireless transmission is achieved with the help of zigbee. Hereby we conclude that this project is 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 from driving, driver gets all information even in bad weather conditions, low power consumption. This project is further enhanced by automatic sped control when the vehicle gets any hazard signal from outside environment.

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