

Vehicle Collision Prevention System

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Abstract— Vehicle collision prevention system creates an environment of comfort for the drivers and the pedestrians. It implements the use of mobile computing technology for setting up the speed limit for the vehicle based on the user convenience. As mobile devices have become an inseparable part of our life, it also helps in the life saving process more seamlessly to our everyday life. It enables the main user to monitor the vehicle's speed not exceeding the set speed. The Peripheral Interface Controller (PIC) is interfaced with GSM and Relay. The intrinsic function of micro controller begins in setting up the speed limits and stimulating the control process. The two control processes are controlling the speed of the vehicle and accident prevention. The main user will assign the speed of the vehicle up to a maximum speed of 60 km/hr through GSM, which in turn will send a message stating that speed limit is set. If the person driving the vehicle exceeds the set speed, the vehicle will be stopped automatically. When the maximum speed is reached, the front side ultrasonic sensor in the vehicle will get actuated. The sensor which in turn will detect the obstacle and sends the signal to microcontroller. The controller gives the command signal to stepper motor and gear motor through relay driver and motor driver respectively. Thus the vehicle gets slow down to a minimum speed.

Keywords— PIC Micro controller; RS232; MAX232; Ultrasonic sensor GSM

1. INTRODUCTION

In the current scenario, the occurrence of accident is mainly due to the carelessness of human beings and lack of awareness about the traffic rules. A higher speed increases the likelihood of an accident. Major accidents are because of not following the traffic rules. A recent research experimented nearly 600 drivers aged between 17 and 25, drives much faster than the average drivers have a higher accident risk. The drivers under 25 are a high-risk group anyway due to inexperience and immaturity. The drawback of today's younger generation is that they don't consider speed as a factor of death. 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. So to intimate the driver about the zones and the speed limit automatically, is done by means of using GSM technology. GSM system is the most widely used cellular technology in use in the world today. It has been a particularly successful cellular phone technology for a variety of reasons including the ability to roam worldwide with the certainty of being able to be able to operate on GSM networks in exactly the same way provided billing agreements are in place. It uses a combination of TDMA (time division multiplexing) and FDMA (frequency division multiplexing).

The proposed solutions for this problem are controlling the speed of the vehicle by setting up a speed limit through GSM by the main user. When the user dials for the first time the speed limit is set to 60 and by continuous dialing it varies by 40 and 20. Thus preventing youngsters not exceeding the specified speed limit. GSM can also be turned off under emergency conditions. Even the accidents can be prevented above the speed of 60km by detecting the distance of the vehicles using sensors, which performs operations to stop the vehicle. Automatic hand

brake indication will be sent to the user after a delay, whenever vehicle is turned on or off. If the vehicle turns off, the Hand brake is applied automatically and vice versa. Thus, the vital role of our project is to make an effective speed control system as a automated one. The detailed description about our project is explained in the forthcoming chapters.

2. EXISTING SYSTEM

Driver errors cause a majority of all car accidents. Forward collision avoidance systems aim at avoiding, or at least mitigating, host vehicle frontal collisions, of which rear-end collisions are one of the most common. This is done by either warning the driver or braking or steering away, respectively, where each action requires its own considerations and design. The objective of the system focus on avoiding forward collision by braking, and present a general method for calculating the risk for collision. A brake is activated to mitigate the accident when the probability of collision is one, taking all driver actions into considerations. The system has been tested in real traffic, and in collision scenarios (with an inflatable car) showing promising results.

2.1 DRAWBACKS OF EXISTING SYSTEM

- The main drawbacks of this system are
- High cost implementation.
 - It cannot be easily implemented in low end cars.
 - This system contains ineffective functional modular and does not substitute modernized parts or equipment for older ones.

3 PROPOSED SYSTEM

3.1 BLOCK DIAGRAM

3.1.1 SPEED LIMIT CONTROL

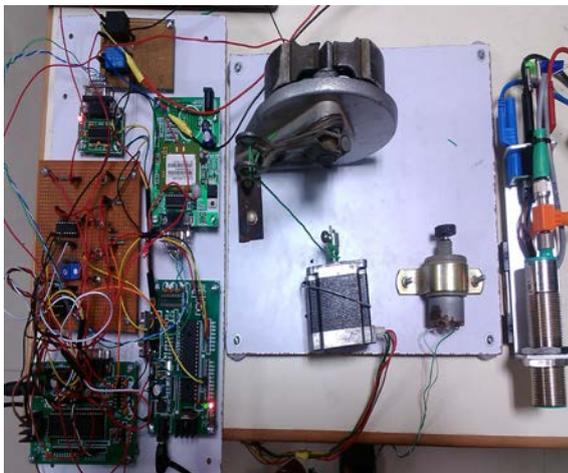
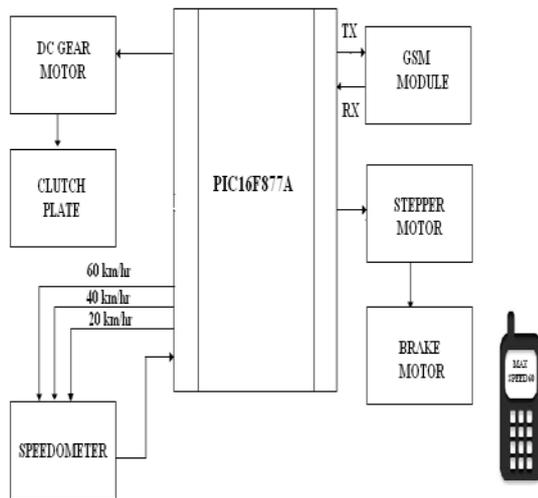


Fig:1 Speed limit control.

3.1.1.1 STEPPER MOTOR

A unipolar stepper motor, used for braking system has one winding with center tap per phase. Each section of windings is switched on for each direction of magnetic field. Since in this arrangement a magnetic pole can be reversed without switching the direction of current, the commutation circuit can be made very simple (e.g., a single transistor) for each winding. Typically, given a phase, the center tap of each winding is made common: giving three leads per phase and six leads for a typical two phase motor. Often, these two phase commons are internally joined, so the motor has only five leads.

3.1.1.2 GSM

GSM(Global System for Mobile Communications) is a global digital mobile communication system, with wide coverage and reliability is very high. SMS (Short Message Service) is a kind of short messaging service, by which the limited data or text message can be transmitted. A GSM modem is a wireless modem that works with a GSM

wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device. GSM is the most popular standard for mobile phones in the world. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

3.1.1.3 MICRO CONTROLLER

The microcontroller used is PIC16F877A. The microcontroller, reads the speed limit of the vehicle and avoids the collision of vehicles. The microcontroller programming is done using Embedded C, a middle level language for controller units. The PIC microcontroller PIC16F877A has an operating speed of 20 MHz and operating voltage is in the range 2-5.5 V. Memory consists of flash program, RAM, EEPROM and data memory. It has 5 ports for internal and external usage. It has three on chip timers and in built analogue to digital converter. It has serial as well as parallel communication facilities.

3.1.1.3.1 PERIPHERAL FEATURES

- Timer0: 8-bit timer/counter with 8-bit prescaler.
- Timer1: 16-bit timer/counter with prescaler, can be incremented during sleep via external crystal/clock.
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler.
- Two Capture, Compare, PWM modules
 - Capture is 16-bit, max. Resolution is 12.5 ns
 - Compare is 16-bit, max. Resolution is 200 ns
 - PWM max. Resolution is 10-bit

3.1.2 COLLISION PREVENTION CONTROL

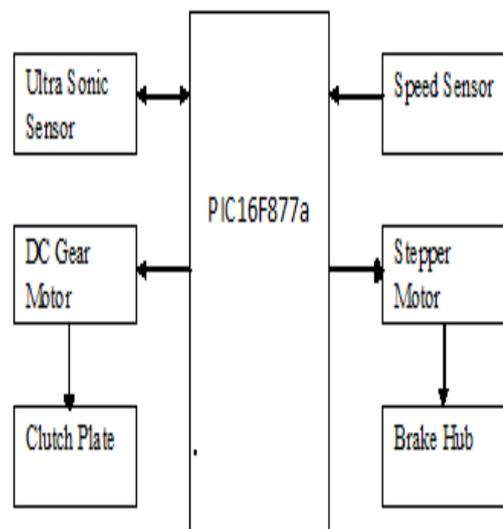




Fig: 2 Brake Shoe at operating condition.

3.1.2.1 ULTRASONIC SENSORS

Ultrasonic sensors are proximity sensors that are able to measure distance of objects, within the specified range and without any physical contact. The sensor gets activated based on the command signal from the microcontroller. Ultrasonic sensors work on a principle similar to sonar which evaluates attributes of a target by interpreting the echoes from sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. The time interval between the sent signal and received signal is determined to measure the distance from an object.

3.2 ADVANTAGES OF PROPOSED SYSTEM

- The speed limit of school and college students will be controlled and also to be an beneficial in driving schools.
- Speed limit can be varied as per the main user.
- The mileage of vehicles can be improved.
- If the system is implemented in all the vehicles 99% of the accidents will be prevented.

3.3 SPECIAL FEATURES

3.3.1 PIC MICROCONTROLLER

- High-performance RISC CPU.
- 8K x 14 words of FLASH Program Memory, 368 x 8 bytes of Data Memory (RAM), 256 x 8 bytes of EEPROM data memory.
- Interrupt capability (up to 14 sources)
- Power-on Reset (POR)
- Low power consumption.

3.3.2 RS232

RS-232 (Recommended Standard - 232) is telecommunications standard for binary serial communications between devices. It supplies the roadmap for the way devices speak to each other using serial ports. The devices are commonly referred to as a DTE (data terminal equipment) and DCE (data communications equipment); for example, a computer and modem, respectively.

3.3.3 MAX232

MAX232 is an IC that operates on single 5V supply and it is integrated with two drivers and two receivers and also that meets all specifications under EIA/TIA 232-F standards. All receivers can be used to convert RS232 levels to TTL/CMOS levels and all drivers can be used to convert TTL/CMOS level inputs to RS232 levels.

3.3.4 GSM

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. The MXE is a node that provides integrated voice, fax, and data messaging. Specifically, the MXE handles short message service, cell broadcast, voice mail, fax mail, e-mail, and notification. The MSN is the node that handles the mobile intelligent network (IN) services. The GIWU consists of both hardware and software that provides an interface to various networks for data communications.

3.3.4.1 GSM Transmitter

One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. Alternatively, the users change operators while retaining the handset simply by changing the SIM. Some operators will block this by allowing the phone to use only a single SIM, or only a SIM issued by them; this practice is known as SIM locking, and is illegal in some countries.

3.4 SIMULATION

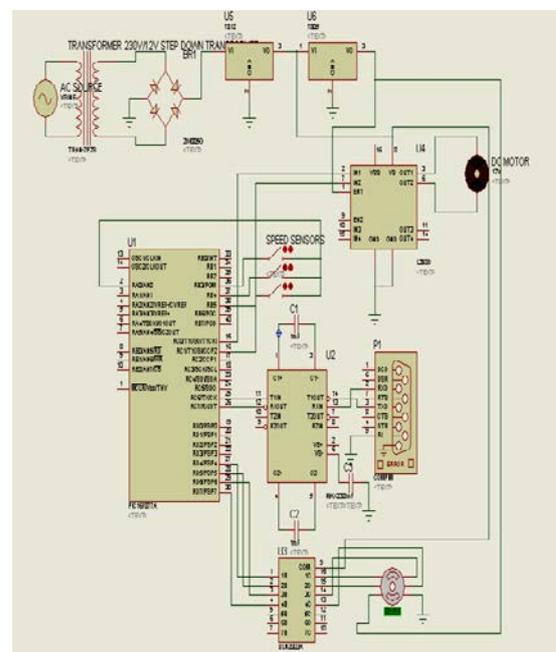


Fig:3 Speed limit control.

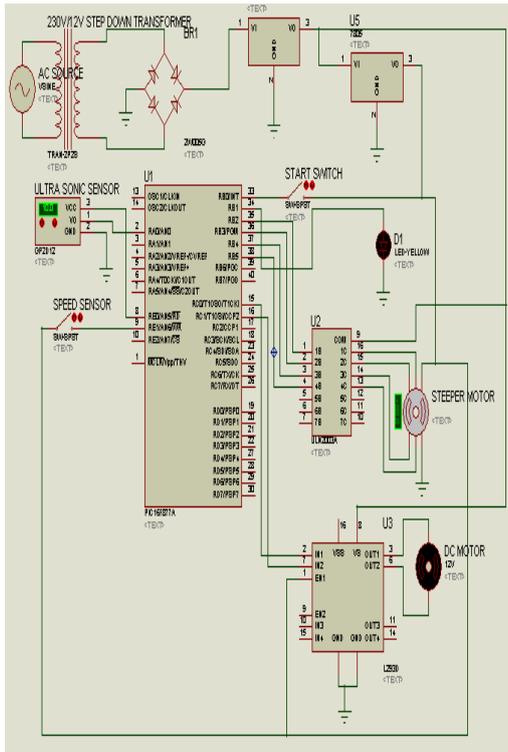


Fig:3 Collision prevention control

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3.5 CONCLUSION

Thus an optimized microcontroller based architecture for vehicle collision prevention system based on GSM wireless data transceiver is developed. Its capability has been tested through standard sensor such as ultrasonic sensor to analyze the progress in real time. The system ensures that the speed is under control and sends the acknowledgement message through SMS. The novel aspect of the design is its low cost and the prevention against accidents to a greater extend.

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