The International Journal Of Engineering And Science (IJES)
||Volume||2 ||Issue|| 3 ||Pages|| 71-74 ||2013||
ISSN: 2319 – 1813 ISBN: 2319 – 1805

Adaptive Cruise Control

[1,]Minal Zunjarrao, [2,] Sayali Shirude
[1,2,]*Department of E&TC,P.V.P.I.T,Bavdhan Pune .*

----------Abstract----------
This project is an Adaptive cruise control (ACC) system which provides assistance to the driver in the task of longitudinal control of their vehicle during motorway driving by using ultrasonic sensor. The system controls the accelerator, engine power train and vehicle brakes to maintain a desired time-gap to the vehicle ahead. This system will also send message to the pre defined number by using GSM if vehicle meet with an accident. The send message contains place of an accident by using GPS.

Keyword: *speed control, distance measurement,*

Date Of Submission: 9 March , 2013 Date Of Publication:25 March 2013

I. INTRODUCTION

Every day the media brings us the horrible news on road accidents. The concept of assisting driver in longitudinal vehicle control to avoid collisions has been a major focal point of research at many automobile companies and research organizations. The idea of driver assistance was started with the 'cruise control devices' first appeared in 1970's in USA. When switched on, this device takes up the task of accelerating or braking to maintain a constant speed. But it could not consider the other vehicles on the road.While cars certainly provide freedom and convenience, cars can also be quite dangerous. Even if you are a safe driver there are many other drivers on the road that may not be. With cars, lots of things can go wrong. You could be hit, or hit something or someone. Any of the thousands of parts on your vehicle could break or malfunction. A car is a complex machine with lots of parts and it is not uncommon for cars to break down at some point in their life.

Although there is no promise that your vehicle will last forever without causing problems, all of these issues can be limited by using the right car safety products. These devices may not completely eliminate these problems, but they can limit them, and even make things easier if any of these problems happens to you. Adaptive cruise control is similar to conventional cruise control in that it maintains the vehicle's speed. However, unlike conventional cruise control, this new system can automatically adjust speed in order to maintain a proper distance between vehicles in the same lane. This is achieved through a radar headway sensor, digital signal processor and longitudinal controller. If the lead vehicle slows down, or if another object is detected, the system sends a signal to the engine or braking system to decelerate. Then, when the road is clear, the system will re-accelerate the vehicle back to the set speed. This system also includes GSM modem & GPS system which will send message to the pre defined number if vehicle meet with an accident. The send message contains location of an accident.

II. LITERATURE SURVEY:

Many safety systems are there in today's vehicles, but these provide safety after meeting with an accident .For example, Air Bags, Anti lock Breaking etc
Existing technologies and devices includes:

1. Enhanced Accident Response System (EARS)
2. Anti-lock Breaking System (ABS).
3. Pressure Sensing system (Airbags)

2.1 ENHANCED ACCIDENT RESPONSE SYSTEM (EARS)

There are a variety of ways vehicles now and in the future will handle an emergency situation. For example, DaimlerChrysler's Enhanced Accident Response System (EARS) turns on interior lighting, unlocks doors and shuts off fuel when airbags deploy.

2.2 ANTI-LOCK BREAKING SYSTEM (ABS)

An antilock brake system (ABS) prevents a vehicle's wheels from locking during "panic" braking, which allows the driver to maintain greater steering control — a key factor in avoiding a collision. However, an ABS does not guarantee your ability to avoid a crash. Furthermore, you still may lose control when driving at excessive speeds or when using extreme steering maneuvers. Learning to use the ABS correctly will provide you with the greatest benefit from the system.All passenger cars equipped with ABS have four-wheel ABS. Sport utility vehicles, trucks, and vans equipped with ABS can have either four-wheel or two-wheel ABS. Four-wheel ABS monitor and control all the wheels of the vehicle, while two-wheel ABS only monitor and control the rear wheels of a vehicle. Some ABS's also include brake assist, which senses emergency braking by detecting the speed or force at which the driver presses the brake pedal and boosts the power as needed. Under certain conditions, brake assist may reach the braking force needed to activate the ABS more quickly and easily compared with vehicles without brake assist, and can potentially reduce overall stopping distance by eliminating the delay caused by not braking hard enough or soon enough.

2.3 PRESSURE SENSING SYSTEM (AIRBAGS)

Depending on the speed at impact and the stiffness of the object struck, front air bags inflate to prevent occupants from hitting the dashboard, steering wheel, and windshield. Side air bags reduce the risk that occupants will hit the door or objects that crash through it. Although air bags provide life-saving benefits for the vast majority of people, there are situations in which air bag deployment can have adverse effects, such as when occupants are unbelted. Front air bags do not eliminate the need for seat belts and are not designed to offer protection in rollovers, rear, or side impacts. In fact, maximum air bag effectiveness depends upon seat belts, which help keep you in place should a collision occur. You can significantly reduce the risk of injury from an air bag by buckling your seat belt and keeping about 10 inches or more between your breastbone and the air bag.

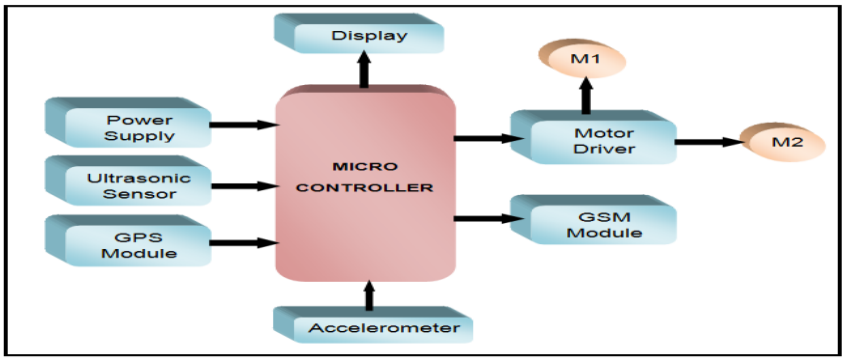
Fig 1: Airbags

Children can be killed or seriously injured by an air bag, so you should always put children age 12 and under in the rear seat. You should never use a rear-facing child seat in the front seat of a vehicle equipped with a front passenger air bag unless the air bag is off.

III. PROBLEM DEFINITION

The studies made have revealed that 60% of front-end crashes would not occur if the driver could react a split second earlier. In order to alleviate to this reaction time, research has demonstrated that Adaptive Cruise Control or ACC significantly aids driver comfort by reducing driving stress and fatigue, which allows better concentration when driving. This includes definitely ACC systems in active safety.

3.1 BLOCK DIAGRAM



IV. Description:

- Ultrasonic sensors are devices are use to measure distance from the sensor to the target object. The output of ultrasonic sensor is given to the controller.
- Microcontroller takes the output from ultrasonic sensor and drives the motors as per our requirement.
- Maximum current rating of micro controller is 15- 20 mA but motor needs more than 500 mA current and that's why we use motor driver.
- LCD display will display the distance of object from car.
- An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer. The output of accelerometer is given to the microcontroller Accelerometer help us in our project to understand its surroundings better and find out the longitude and latitude values.
- GPS is use to give location of the location of car.
- A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. . We use GSM to send the message to the respective saved number if car meet with an accident Message contains the location of an accident.

V. ULTRASONIC SENSOR

Ultrasonic sensors are devices that use electrical–mechanical energy transformation, the mechanical energy being in the form of ultrasonic waves, to measure distance from the sensor to the target object. Ultrasonic waves are longitudinal mechanical waves which travel as a succession of compressions and rarefactions along the direction of wave propagation through the medium. Any sound wave above the human auditory range of 20,000 Hz is called ultrasound. Depending on the type of application, the range of frequencies has been broadly categorized as shown in the figure below:

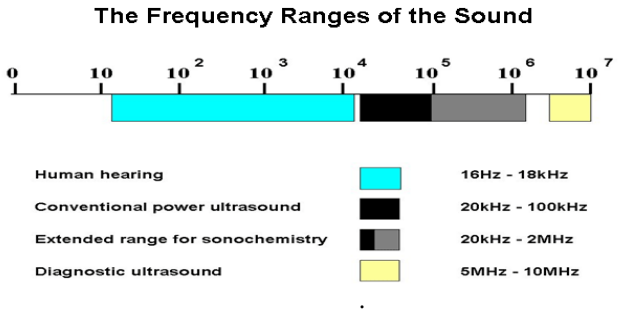
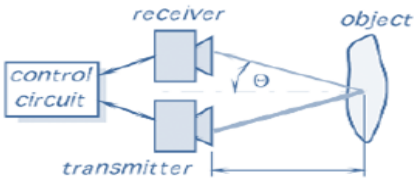


Fig The Frequency Ranges Of Sound

When ultrasonic waves are incident on an object, diffused reflection of the energy takes place over a wide solid angle which might be as high as 180 degrees. Thus some fraction of the incident energy is reflected back to the transducer in the form of echoes and is detected. The distance to the object (L) can then be calculated through the speed of ultrasonic waves (v) in the medium by the relation.



$$L = \frac{v\, t \cos\theta}{2}$$

Where 't' is the time taken by the wave to reach back to the sensor and 'θ' is the angle between the horizontal and the path taken as shown in the figure. If the object is in motion, instruments based on Doppler shift are used. Get all the details about internal structure and working of an ultrasound sensor at Insight.

VI. Motor Driver:

A motor controller is a device or group of devices that serves to govern in some predetermined manner the performance of an electric motor. A motor controller might include a manual or automatic means for starting and stopping the motor, selecting forward or reverse rotation, selecting and regulating the speed, regulating or limiting the torque, and

protecting against overloads and faults. Maximum current rating of micro controller is 15- 20 mA but motor needs more than 500 mA current and that's why we need motor driver.

VII. Accelerometer:

An accelerometer is an electromechanical device that will measure acceleration forces. These forces may be static, like the constant force of gravity pulling at your feet, or they could be dynamic - caused by moving or vibrating the accelerometer. By measuring the amount of static acceleration due to gravity, you can find out the angle the device is tilted at with respect to the earth. By sensing the amount of dynamic acceleration, you can analyze the way the device is moving. At first, measuring tilt and acceleration doesn't seem all that exciting. However, engineers have come up with many ways to make really useful products with them. An accelerometer can help our project to understand its surroundings better. Is it driving uphill? Is it going to fall over when it takes another step? Is it flying horizontally or is it dive bombing your professor? A good programmer can write code to answer all of these questions using the data provided by an accelerometer. An accelerometer can help analyze problems in a car engine using vibration testing. There are many different ways to make an accelerometer! Some accelerometers use the piezoelectric effect - they contain microscopic crystal structures that get stressed by accelerative forces, which cause a voltage to be generated. Another way to do it is by sensing changes in capacitance. If you have two microstructures next to each other, they have a certain capacitance between them. If an accelerative force moves one of the structures, then the capacitance will change. Add some circuitry to convert from capacitance to voltage, and you will get an accelerometer. There are even more methods, including use of the piezoresistive effect, hot air bubbles and light.

VIII. GSM Modem:

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. We are sending messages to a pre defined number when any accident occurs.

XI. GPS System:

Using the Global Positioning System (GPS, a process used to establish a position at any point on the globe) the following two values can be determined anywhere on Earth:

1. One is exact location (longitude, latitude and height co-ordinates) accurate to within a range of 20m.
2. The precise time (Universal Time Coordinated, UTC) accurate to within a range of 60ns.

Speed and direction of ravel (course) can be derived from these co-ordinates as well as the time. The coordinates and time values are determined by 28 satellites orbiting the Earth.

It provides users with the capability of determining position, speed and time, whether in motion or at rest. It has a continuous, global, 3dimensional positioning capability with a high degree of accuracy, Irrespective of the weather.

X CONCLUSION

This Adaptive Cruise Control system can be developed for the purposes of driving safety and comfort. It reduces the number of brake and switch operations that are required by the driver. As a result, the system reduces the driving burden, so that the driver can drive in comfort. This project is very feasible as very less expensive parts are used.

References :

[1] http://www.wikipedia.org/wiki/**Auto**mobile_**safety**
[2] Embedded systems by Raj kamal .
[3] http:// path.Berkeley.edu
Willie D. Jones, "Keeping cars from crashing." , IEEE Spectrum September 2001