Automatic Distance Measurement and Breaking for Automobile/AGV (Automated Guided Vehicle) Using Ultrasonic Waves and Accident Detection by GSM

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Abstract - The paper is the implementation of distance measurement system using the ultrasonic waves. As the human ears audible perception range is 20 Hz to 20 kHz, it is insensitive to ultrasonic waves, and hence the ultrasound waves can be used for applications in industries/vehicles without hindering human activity. They are widely used as range meters and proximity detectors in industries also it can be used in parking assistance system. The measurement unit uses a continuous signal in the transmission frequency range of ultrasonic transducers. The signal is transmitted by an ultrasonic transducer, reflected by an obstacle and received by another transducer where the signal is detected. The time delay of the transmitted and the received signal corresponds to the distance between the system and the obstacle. And also, safety of vehicle/AVG, in this project, we are meant to design a system that can help drivers stop the vehicle/AVG automatically, an electronic circuit was constructed. According to this circuit we design, a signal was produced to the braking system of automobile/AVG based on the distance between automobile/AVG and obstacle for a safe braking purpose.

Automatic accident system is used to recognize the location of the accent and accident occurred, easily to reach the location. Every second is valuable for the ambulance and relatives. There is loss of life due to the delay in the arrival of the ambulance/relatives to the hospital in the golden hour. Ambulance/relatives will reach the nearest hospital at the exact time to save the human life. This project is fully by using GSM, GPS technology and thus it locates the accident spot exactly.

Keywords — Microcontroller, ultrasonic sensor
GPS, GSM

I. INTRODUCTION

The development of a transportation system has been the generative authority for human beings to have the uppermost evolution above creatures in the earth. Automobile has a great significance role in our daily life. We employ it to go to our work place, keep in touch with our friends and family, and transport our goods. But it can also bring tragedy to us and even can kill us through accidents.

The purpose of this project is to design and build up an anti-crash vehicle security system and reduces the accident effect for passenger and vehicle. Requirement of this project is the system use using the amalgamation of integrated circuit, sensing technology and computerized technology like Programmable microcontroller where the microcontroller will program by computer. The sensing technology was progress and significant year by year especially in security arrangement in industry where most physical phenomena can be detected by sensors, monitored by amplifiers and activate circuits, and then presented by meters or personal computers.

Speed is one of the most significant and essential risk factors in driving. It not only affects the harshness of a crash, but also increases risk of being concerned in a crash. In spite of much hard work taken by different governmental and non-governmental organizations all around the world by a range of programs to awake against careless driving, yet accidents are taking place every now and then. However, many lives could have been saved if the emergency facility could get the crash information in time, an well organized automatic accident detection with an automatic notification to the emergency service with the accident location is a most important need to save the precious human life.

II. NEED FOR THIS SYSTEM

A. Accidents

Accidents are resulting in loss of invaluable lives, materials and money. So far the accident preventing systems are not very efficient and the loss of lives is continuing. There are many systems like air bags, GPS, robot driven cars, tracked cars etc which can avert accidents to some extent.

1) Causes of Accidents
There are many causes of accidents. Some of them are:
- Ignoring traffic rules
- Drunken driving
- Dream driving
- Mechanical failures in the vehicle
- Mistakes of the drivers

In all these cases, the basic reason cited is malfunction to apply the brakes at the right time. In all the above cases, if the brakes are applied at the right time, the accidents can be averted. If a system is build, which applies the brakes at the time of accidents automatically will avoid accidents, which are caused by all the above reasons. This project aims to defeat the mistake made by the drivers and at the time of accidents, the system takes control of the vehicle and brings the vehicle to stop before colliding.

III. LITERATURE SURVEY

The existing approaches used for safety measure and preventing accidents are Emergency braking systems (EBS), traction control and stability control [1]. Even infrared (IR) sensors are also widely used as proximity sensors and for obstacle avoidance, [2] but not successful due to some drawbacks.

System and approaches mentioned above employ different types of sensors to uniformly monitor (observe) the conditions and react quickly in emergency situations. Sensors are vastly used for measuring distances, but different sensors have different characteristics.

A. Drawbacks of Emergency braking systems

1) Inconsistent stop times: ABS can keep the direction of our car which helps us to avoid obstacles on the road without losing control of the vehicle. The ABS helps reduce braking distances on dry or wet, but increases slightly when braking on snow or gravel. [3]

2) EBS: This system works under particular speed limit and when brakes are applied in specific ways.

3) Delicate systems: As we increase the mechanics there are more possibilities of system damages to occur. Sometimes it reported that disorientation for the ABS occurs, in which the compensating brake sensor, causes the vehicle to shudder, make loud noise or generally brake worse [4].

IV. BASIC DISTANCE MEASUREMENT PRINCIPLE

In modern years, with the development of science and technology, radar technology has been widely used in different industries. More typical is the millimetre wave and ultrasonic wave radar transmitter. Millimetre wave refers to electromagnetic waves in the wavelength range between 1 ~ 10mm. and its high resolution and small size of the antenna elements can be modified to the cruel environment. So the millimetre-wave radar has high accuracy, anti-interference capability, low altitude performance and small size, light weight and can adjust to all-weather.

Ultrasonic wave is generated by mechanical vibration of a frequency higher than the audible sound wave frequency range of sound waves, can be transmitted at different speeds in different medium, having a well-built directivity in the communication process, apt to focus energy in a multiplicity of advantage of spread of the type of medium, small reduction in the transmission process, the reflection ability, having a certain ability to adapt to the ruthless working environment, etc. Ranging schematic figure of shown in Fig. 1 based on the collision prevention system of the ultrasonic and millimetre wave radar, mainly include the foremost vehicle distance and the measurement of the side barriers.

![Fig. 1 Working Principle of Ultrasonic Distance Measurement](image)

V. BASIC GSM AND GPS WORKING PRINCIPLE

The Global Positioning System (GPS) is a trendy technology which was developed by American Department of Defence for military employ. Presently it was offered for civilian use. It is utilized for large range of applications such as location, direction, speed, timing, surveying, logistics, traffic management, security etc. Nowadays, it has become an essential part of a vehicle system for identifying and navigation system. It can give accurate time, location coordinate and speed. On the other hand, Global System for Mobile communications (GSM) is a digital mobile telephony system that is commonly used. More than 690 mobile networks give GSM services across 213 countries and GSM represents 82.4% of all global mobile connections. In addition that voice communication it also offers Short Message Service (SMS) and General packet radio service (GPRS) to transfer data.
In This project I utilize the capability of a GPS to spot an accident basing on the monitored speed and send the location and time of the accident from the GPS data processed by a microcontroller by means of the GSM network to the hospital, relatives, friends and ambulance.

VI. PROPOSED WORK

The scope of this work is to develop a safety car braking system using ultrasonic sensor and to design a vehicle with less human attention to the driving. Currently in cars there aren't technologies to prevent accidents. But they have introduced sensors that would detect any obstacles. In this work we are enhancing the existing work by introducing automatic brakes, which would get its input from the sensors, which will then generate the brakes and prevent from collisions to take place.

The ultrasonic transmitter has a piezoelectric crystal that resonates up to a required frequency. This also converts the electrical energy into acoustic energy and vice versa. While transmitting the ultrasonic wave, there is a part which is ultrasonic wave generator that functions to generate ultrasonic wave.

After ultrasonic waves were produced, ultrasonic transmitter transmits the ultrasonic waves toward a road surface to find out the obstacle. The range that obstacle detected is depends on the range of ultrasonic sensors that used. The ultrasonic wave detects any kind of physical obstacle hence it will produce a reflected wave.

Once the obstacle is detected there is a reflector which reflects the ultrasonic waves. An ultrasonic receiver is used for this which does the receiving of the ultrasonic waves, reflected from the road surface to generate a reception signal. There is ultrasonic transducer that will transform back the sound wave to electrical energy. This signal amplified by an amplifier. The amplified signal is compared with reference signal to detect components in the amplified signal due to obstacles on the road surface. The magnitude of the reference signal or the amplification factor of the amplifier is controlled to maintain a constant ratio between the average of the reference signal and the average of the amplified signal. This allows the ultrasonic sensor to examine the existence of vehicles. Once this is complete the sensors give an alarm as to an obstacle detected. The processed signal will be send to the braking circuit.

In breaking circuit that gives the signal to the gear box so that the gear disengages takes places because of that automatically gear down will takes place to the possible lower gear. Then vehicle comes to top speed to lower speed.

If obstacle hit the vehicle due to more time in the slowing down of vehicle, then an IR sensor which is placed in front of the vehicle which sense the collision and send the single to the microcontroller. The microcontroller gives instruction to breaking circuit to turn of the engine. And sends the accident note nearest hospital, relatives of pre described number in the microcontroller.

A. Components Required
1) Arm controller (LPC 2148)
2) Ultrasonic & IR sensor,
3) Robo model
4) Power supply
5) GSM

B. Softwares Used:
1) Kel version 4
2) Flash magic
3) Orcad for schematic

C. Advantages of the Proposed Work
1) High security is obtained since the car can be reducing the speed automatically after detecting the obstacle.
2) Reduce the human effort and accident occurrence probabilities.
3) A quick medical support for the accident victims can be given.
4) Exact coordinate can be identified during accidents.

VI. CONCLUSIONS

Speed is one of the most significant causes of an accident Nowadays. The aim of the planned system is developed for a safety automobile/AGV braking system using ultrasonic sensor and to design a vehicle with less human concentration to the driving. This technology could be further improved. The same can be implemented in aircrafts, submarines. But automatic brakes cannot be used always. GSM modem to send the accident note to the hospital and relatives that try to save the valuable human life

REFERENCES

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