AVOID ACCIDENTS BY USING DISTANCE MEASURING SYSTEM IN INDUSTRIES

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ABSTRACT

The main aim of the investigation is to develop automatic speed control by using ultrasonic sensor system. Whenever any obstacle is detected in running vehicle depends on distance automatically control the speed of vehicle. The ultrasonic sensor system continuously sends signals and monitors the obstacles in front of car. The distance up to which ultrasonic sensor can work may be up to 8 meters. When any obstacle detected by ultrasonic sensor system it will send signal to the embedded board. After receiving this signal to embedded board it sends signal to the motor to reduce the car speed automatically. Vehicle is controlled automatically without any manual operation when the vehicle is at eight-meter distance away from the front. Input signals given to the microcontroller from the sensors and then the controller takes the appropriate action according to the program written in it and drives motors as desired.

Keywords

Solar panels, Dc motors, battery, ultrasonic sensors, micro controllers, motor drive circuit.

NOMENCLATURE

D	Distance (m)
I	Current (A)
N	Speed (RPM)
R	Resistance (Ω-m)
T	Torque (Nm)
v	Voltage (V)
V	Velocity ($^{m}/_{s}$)
τ	Time (s)
USS	Ultrasonic sensor system
Z	Input Powers
ɳ	Efficiency

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Introduction

The embedded system is a predefined task even described as a mixture of software and hardware. A general concept of embedded systems is that they are instruments that are used to manage, track or assist machines, machinery, or plant operations. At the other end, the activity of a huge complex manufacturing plant will be managed by a general-purpose device, and its existence would be apparent. Computers or microprocessors are used with all embedded systems. The opportunity to provide programs suggests that a number of different uses may be used by the same embedded framework. In certain situations, the microprocessor can be configured to allow application functionality to be applied to the basic software for specific use in a second phase, after which no further adjustments may be made. The program for applications on such processors is often referred to as firmware. Computers or microprocessors are used with all embedded systems. However, opposed to a personal computer, some of these machines are very basic systems.

A study was performed by the World Health Organisation on multiple causes of death due to injuries. The study tells a horrible tale that most of the deaths occur due to road traffic collisions between the ages of 15 to 29 years and more than 1.25 million people risk their lives each year due to road crashes. [1] A World Health Organisation (WHO) report suggested that more than 30,000 deaths have been caused by road traffic collisions in Pakistan.

The airbag system is proposed for crash detection, but this system is only for vehicles, not for bicycle and bike users, because if two bike riders collide, this system does not provide medical assistance [2] & [3]. A system for all cars, though, should be generic. It is proposed to identify injuries using mobile applications, but various handset models have different processors. Ultrasonic sensor crash monitoring is a new concept [4]. Different ultrasonic sensors for injury detection have been used in the proposed framework. To measure the distance, an ultrasonic sensor is used. It transmits a sound wave and waits for the wave to return after an obstacle collides. The distance between the sensor and the obstacle defines the time taken by the wave to come back.[5] Ultrasonic sensor accidents detection provides the facility to detect an accident not only in several street circumstances such as crossing points, in an underpass, or in a passage, but it may also work well in different natural conditions such as rains. The explanation behind this is that the theory of sound wave transmission is used by an ultrasonic sensor [6]&[7] in 2018.

In consideration of the fact that it is necessary to detect a traffic collision in the current scheme. The proposed approach, however, has some drawbacks. There is a full range of four meters on the HCSR04 sound sensor [8]. Consequently, the suggested system cannot be extended to cars with a threshold gap greater than four meters.

Many researchers have worked on different types of speed control systems. Some of them worked on manual speed control system and some on automatic speed control system using different techniques. Very less effort has been done on ultrasonic speed control system. Hence, the author worked on developing an automatic ultrasonic sensor system to control the speed. To achieve successful results from an ultrasonic sensor module, the positioning of the sensor module often plays a critical role as an ultrasonic sensor module senses reflected sound waves up to fifteen degrees. The first two simulations are based on the Doppler Effect theory. The difference in the frequency of a wave with an observer traveling relative to its source is the Doppler shift or the Doppler's effect."

Design and Architecture of the planned framework

In order to serve a single predetermined purpose, the very simplest embedded systems are able to perform only one function or series of functions. The functionality of the embedded system shown in Fig.1 is defined in more complex environments by an implementation software that requires the embedded system to be used for a specific task in a given application. The opportunity to provide programs suggests that a number of different uses may be used by the same embedded framework. In certain situations, the microprocessor can be configured to allow application functionality to be applied to the basic software for specific use in a second phase, after which no further adjustments may be made. The program for applications on such processors is often referred to as firmware. Software is concerned with languages such as ALP, C, and VB, etc., and processors, peripherals, and memory are operated with by hardware shows in Fig.1. The architecture of automated crash detection using ultrasonic sensors shown in Fig.2 & 3. It is understood that sound waves can propagate very easily at the same time in all states of matter, i.e. solid, liquid, and gas.

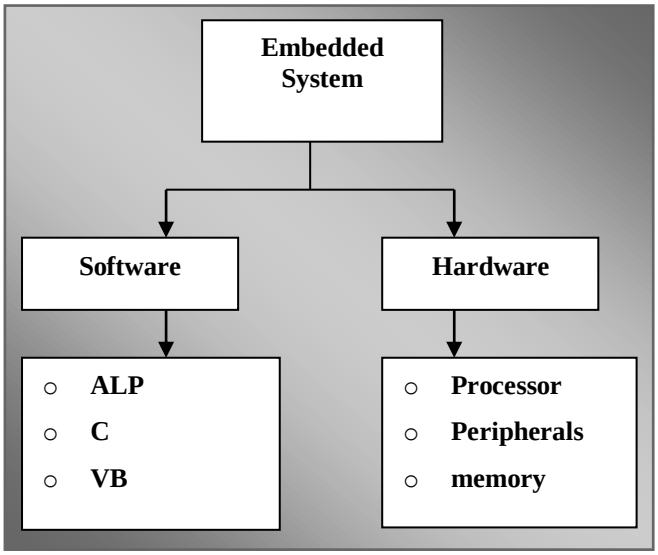

Fig.1 Block diagram of Embedded system [9]

Fig.2 Ultrasonic Sensor

Fig.3 Ultrasonic sensor detecting the object

It is also possible to track traffic collisions in caves or during the rainy season. This functionality makes the ultrasonic sensor an attractive choice for the detection of automatic injuries. As follows, the document is structured. The Collision Detection device model is defined in the next section. On the front windscreen of the vehicle, one sensor module is positioned and the other module is positioned on the car's back wind panel. Then it tests the distance between the modules of the sensor and the corresponding bumpers. Those distances are distance threshold 1 and distance threshold 2. The distance between them is often greater than the present threshold distance if either object moves away from the vehicle. The threshold gap is crossed and the processing mechanism flips on as some object collides with the vehicle. Using GPS, the device automatically identifies the location of the car and sends it to the ambulance service using GSM. This is how the scheme suggested would work. Fig. 4 displays the architecture of the planned framework.

Fig.4 Architecture of the planned framework

Fig.5 shows the flow Chart of process used in planned framework The reason for simulating Fig. 3 is that it is known that the propagation of sound waves must be disturbed when a car moves on the road and produces sound waves." As a consequence, the effects are achieved regardless of the interference that happens in the transmission of sound waves. In conjunction with the motion of the vehicle, the simulation helps to change the sensor output. The specifications of DC motor are given in Table 1.

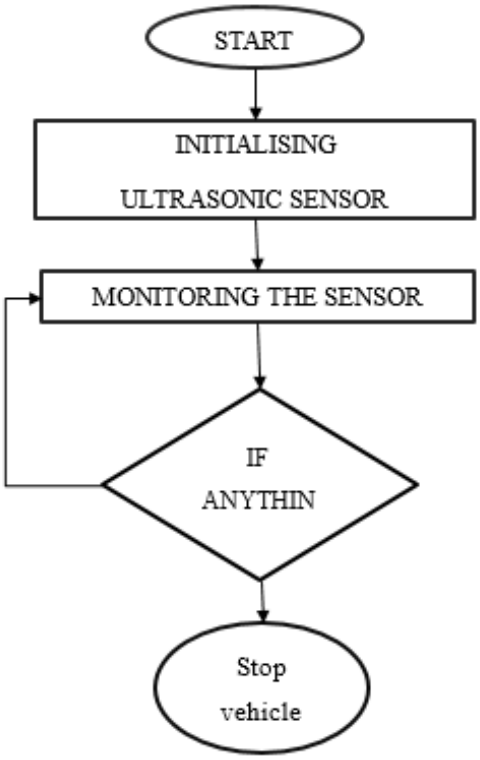

Fig. 3 Process flow Chart for using planned framework

Table 1 Specification of DC motor

S.No	Name	Value
1	Speed	10 RPM
2	Torque	10 Nm
3	Resistance	0.2 Ω -m
4	Voltage	12 V
5	Current	1.2 A

The input power (Z) of the DC motor were given by

$Z = v \times I$ (1)

Power is a physical term that, based on the context and the knowledge that is available, has many different interpretations. Power may be a calculation of how much work is done over time by someone or something. Power can be measured as a function of velocity in a second sense, how easily you get a weight to travel. Finally, the product of voltage and current is electrical power [10]. Power developed in the DC motor is given by [10]

$$P = \frac{2\pi NT}{60} \quad (2)$$

Some of the losses are considered under the DC motor specifications

Stator losses = $Z - P$ (3)

Friction and Windage losses = Output $- P$ (4)

Rotor copper losses = I^2r (5)

Total losses are to be calculated as given

Total losses = stator losses + friction and windage losses +rotor copper losses (6)

Efficiency is defined as the ratio of DC motor output power and input power of DC motor is to be given as

$$\eta = \frac{\text{output}}{\text{input}} \quad (7)$$

Results and Discussion

The design fabrication of the project has a sensor-based system known as ultrasonic sensor as it measures the distance between the obstacle and vehicle. At first it senses the obstacle for every 8m because in the project ultrasonic sensor capacity is 8m if anything detects it stop the engine it is in the position of microcontroller and if nothing is detected then it again monitoring the sensors. Distance between the vehicle and obstacle is 8m time taken to stop the engine is 0. 023sec if the distance is 10 m time taken to stop the engine is 0.029 sec. In table 2 the discussion is how much time it will take to stop the engine at different distance parameters. Distance is directly proportional to time. Distance increases time is also increases. In this project the main consideration is dc motor design and ultrasonic sensor detection of the object by taking different parameters. In this project by taking the specifications of the Dc motor as 10RPM having the torque 10 Nm, resistance 0.2ohm-m, voltage 12V current 1.2A. Calculating the input power (it is the product of voltage and current) is 14.4 watt. Power developed in the motor (it is the product of angular velocity and torque) 10.4 watts. They are different types of losses in dc motor. Stator losses (it is the difference between the input power and power developed by the motor) 4 watts. Rotor copper losses as 0.28 watts, friction and windage losses (difference between the output and power developed by the motor) 1.6 watts. Total losses (it is the sum of stator losses, friction and windage losses, rotor copper losses) 5.88 watts and finally calculating efficiency of the dc motor (it is the ratio of output to input) as 83%. In this project all the sensors work properly and they detect the obstacles which is near to the vehicle and it stops the vehicle. The results of time required for the distance; and velocity are presented as Table 2. Effect of time required for the distance is shown in Fig.6.

Table 2 Time taken to detect for different distance parameters

DISTANCE	VELOCITY	TIME
8 meters	$340\ ^{m}/_{s}$	0.023s
10 meters	$340^{m}/_{s}$	0.029 s
12 meters	$340^{m}/_{s}$	0.035 s
14 meters	$340^{m}/_{s}$	0.041 s

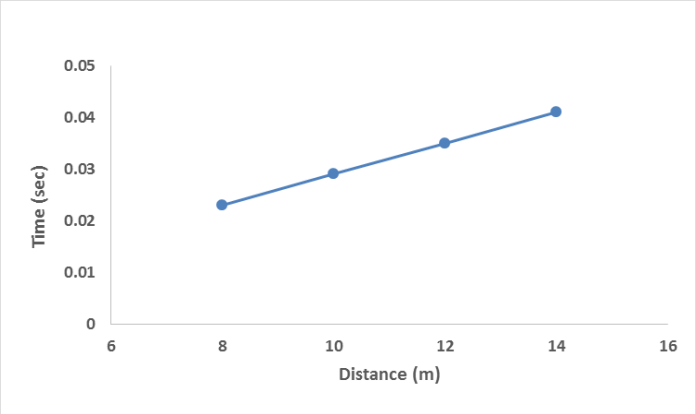

Fig.4 Time measuring with different distances

Conclusion

In many industries the problem which is usually occurred is accidents this leads to danger to the workers who are working in the industries and loss of the products. In order to avoid these type situations. We have to introduced these types of technique i.e., avoid accidents by using distance measuring systems by ultrasonic sensors. By using these concepts in the real-life problems, it requires low-cost low power for distance measuring it is the most efficient and reliable method for distance measuring systems. Advantage of the project it is pollution free vehicle i.e., eco-friendly vehicle because in the project we are using solar panels for power to run the dc motor. The vehicle is not used for outside premises because due to some disadvantages. It should be run only in industrial premises for transforming the loads from one place to another. In future the scope of the project is useful for different applications based on their frequency levels. The vehicle should be useful only for low-speed vehicles for high-speed vehicles some of the specification need to be improved.

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