Control system for automatic brakes using ultra sonic sensor

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Abstract

We see that many automobile accidents are becoming a significant safety problem in the current society. Both human and animal lives are damaged by vehicle collisions. Due to breaking problems and quick response times when there is an impediment, more crashes happen. Therefore, the automated braking system for cars is presented in this work. Consumers are increasingly using their cellphones and the internet to make direct purchases rather than going to conventional brick-and-mortar establishments. Thanks to the internet, conducting business has never been quicker or easier than it is right now. A transmitter and a receiver are part of an ultrasonic system that is positioned in front of the vehicle. Life's price cannot be calculated. This device measures the distance between obstacles using an ultrasonic sensor and notifies the driver when one is present. This essay also demonstrates the automated microcontroller's operation. The car will automatically stop when the safe separation distance is achieved. Its typical response time is 0.90 seconds, and its typical error rate based on the actual distance of the barrier is 11.2 seconds.

Keywords: Braking system; Automobiles; Ultrasonic sensor; Microcontroller; Arduino

1. Introduction

Road accidents claim the lives of about a million people every year, in addition to countless numbers of animals. The inadequate braking systems of vehicles are to blame for all these fatalities. An integrated system known as an accident avoidance system is made up of sensors within the vehicle that warn the driver of impending risks on the road. The proximity of the car to other cars around and the speed of the vehicle are two instances of threats that these sensors can identify. A common ultrasonic sensor measures the separation between a car and the one before it in respect to the rear end. When approaching other cars, the majority of vehicles equipped with ultrasonic sensors travel at rather slow speeds. As approximate distance readings Since data cannot be used immediately, a clever mechanism has been developed to analyze sensor readout at a distance and provide the relevant cautionary messages and preventative steps.
Controlling the steering maneuvering framework and warning systems that interfered with drivers' ability to lock in the brake framework in the car collision evasion framework has received a lot of attention. Even for people with middle-class incomes, purchasing such automobiles is quite expensive. Additionally, the safety distance from start to stopping is not taken into consideration by these methods. Always allow for human error while doing this. The creation of an autonomous accident-avoidance system based on a microcontroller that uses ultrasonic sensors to identify obstacles and gauge distance while braking the automobile without human input is therefore covered in this article. The rest of this essay is organized as follows: Section 2 and Section 3 describe previous relevant efforts.

Hand operated lever

One of the most essential components in both hydraulic and pneumatic machinery are directional control valves (hand operated valves). They enable fluid to flow from one or more sources along several pathways. Typically, they consist of a spool inside of a cylinder that is operated manually or electronically.

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Figure 1: Hand operated directional valve

2. Related work

The collision evasion framework, a vehicle security system, is intended to reduce the possibility and likelihood of an accident. With time, these frameworks have become more sophisticated, evolving from simple systems to the ones that are currently in use and the focus of research. They use electrical circuitry along with a variety of sensors, occasionally video sensors, to detect an inevitable accident. These frameworks act automatically to stop the vehicle without further input from the driver after the cause of the collision has been identified. The approach employs two run sensors, one for moving forward and the other for turning around. Obstacles were highlighted when a least distinct divide was going take place. The framework can only identify No automatic precautions are ever taken to prevent collision; obstacles only cause warnings. The framework first enters the road and calculates where they will be in one second utilizing laser pillars.
It may not be practical to use lasers in utility and common sense autos due to their high cost and the high control supply required for continuous operation.
The method uses sensors that broadcast and receive signals from autos, obstructions inside the street activity lights, and a central database that is set up inside the car to assess whether activity measures should be taken.
The framework is restricted to electrical impedances and has a high implementation cost, which may have an impact on how well it performs.
The framework also makes the driver nervous because a collision is likely to happen at speeds under 20 km/h. If speeds are below 20, the framework also keeps the driver in warning mode to prevent crashes.

There are no collision avoidance countermeasures in the actualized framework. uses a raspberry pi as well as ultrasonic sensors to detect and assess the removal of stationary or moving objects. The sensors are integrated to distinguish between a deterrent that is present in front of the car and one that is present in the dazzle spot of the car. The framework does not employ a radar finder that rapidly flashes out high frequency radar signals or any other collision-avoidance techniques. After the waves have reflected off the closest objects and returned to the sensor, it will nearly immediately calculate the separate speed and relative speed. To alert the driver, the framework is only allowed to use visual warning. The procedure performs its operational duties, such as controlling speed control circuits and methods for locating collisions that combine sophisticated imaging, image processing, and false insights. Too illustrated how laser sensors, which recognize cars by sending and receiving laser beams, operate. The laser transmitter. hub, which links the laser sensor and a Controller Zone Organize (CAN), which connects to all sides of the laser, transmits the message to the LCD output on the driver's side via Zigbee.

The framework is restricted to transmitting and accepting without returning in order to avoid collisions. Several sensors are used by the system to keep track of a vehicle's surrounds, measure the distances between it and other vehicles, and scan the area for potential deterrents. Software complexity, a weak foundation for vehicle modelling, and sensor integrity are the main barriers to this field's advancement. The framework detects objects or deterrents using sonar sensors, which emit sound waves and receive the waves reflected back from obstructions. Avoidance algorithms serve as the basic reflexive collision shirking framework. The system's barrier is the sensor integrity, which has been seen in usage.

3. Prototype Implementation

The Arduino Uno microcontroller board is connected to the framework via an ultrasonic module. The project makes use of an ultrasonic transducer with a transmitter and receiver. The Ultrasonic sensor receives a trigger beat from the Arduino Uno and responds by sending out ultrasonic waves. The transducer again receives the sent waves after they have been reflected back from the object in question. The Arduino Uno receives a beat from an ultrasonic sensor. To measure distance, a microcontroller

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processes an electrical signal that is converted into a sound flag by an ultrasonic sensor. The velocity of sound is taken into consideration while calculating the total amount of time between sending and receiving waves. At that point, a microcontroller-based programme calculates the separation. the calculated The common block diagram consists of a control supply unit, sensors and other yield devices, a run detecting unit (forward and turn around ultrasonic extend sensors) for remove measurement, a warning unit, which consists of a buzzer, LCD, and driven shows to supply caution signals to the driver of the vehicle or street users, and a braking unit for braking purposes. The control supply unit is a DC battery that can supply up to 12 volts, and the circuit consumes 7 to 12 volt The framework's stream diagram is displayed.

Proteus is a computer application that is used to implement the circuit stick associations of the various components.

Power supply unit: The control supply system developed for this investigation provides the microcontroller, buzzer, LCD, and LEDs with the necessary voltages. The operating voltage for the framework is 5V DC. In this way, a 12V battery will be used to power the model from a voltage source of (7-12V) DC in this case, and a voltage controller is used to give consistent power.

Range detecting unit: Ultrasonic sensors make up the separate detection system. In this investigation, the HC-SR04 ultrasonic sensor modules are used. Sonar is used by the range sensor to determine when to remove the sensor. It is stated that this uses SR04 ultrasonic sensor modules. inquiry. Sonar is used by the range sensor to choose between the two. It is stated that the HC-SR04 gives incredible run accuracy and reliable readings in a convenient Bundle. The HC-operation SR04's is also unaffected by sunlight or dull surfaces, unlike IR run sensors. Additionally, the ultrasonic sensor may be extended up to a maximum separation of 400 cm and a minimum separation of 3 cm.

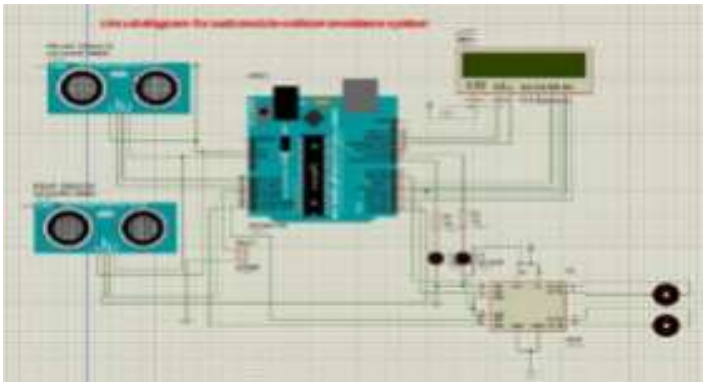

Figure 2: Automatic braking system using ultrasonic sensor

Before drivers enter a potentially dangerous position or location, this subsystem provides them with credible collision warnings. The buzzer, Driven, and LCD make up the warning framework's composition. The caution framework operates by flashing a red light when a protest is detected; if the protest is 3 metres distant while being displayed on the LCD, the buzzer starts buzzing.

Design and interface for LEDs: LEDs are powered by a low-voltage DC source, and a configuration resistor limits the forward current to a respectable value of around 5- 6mA.

Calculating distance: The duration of the input and output refers to the time from delivering ultrasonic vibrations to the time. it needs to bounce back after hitting an item. In the air, sound travels at a speed of 343 m/s, or 1130 ft/s. Divide by two since the total time includes both the sending and receiving of protest messages. The calculation of temperature adjustments makes use of (7). Where v is the speed of sound under consideration and Tair is the air temperature in degrees Celsius, we get v = 331.5 + 0.6 Tair (7). The speed of sound in the discussed area at 20 °C is = 331.5 + 0.6 20 = 343.5 m/s.

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The choice of microcontroller: A mega 328p Arduino microcontroller was used in this project. The controller was chosen for the following reasons: It is simple to programme using high level programming languages like C, C++, and Java; It has a reasonable number of 13 digital and 5 analogue pins, allowing for more inputs and outputs; It has 6 PWM channels, allowing for coordinated output into the risk and braking subsystems; It has a large amount of memory; It has built-in ADCs, making it simple to interface with analogue inputs and on-board encoders.

Operational setup: The DRV883x family of products provides a coordinated engine driver arrangement for cameras, toys, and other battery- or low-voltage motion control applications. The device has the ability to drive solenoids or one DC motor. an insider attack Pump produces the necessary entryway driving voltages and is capable of supplying up to 1.8 A of yield current to the engine. The device includes a PWM (IN1-IN2) input interface and a PH-EN input interface, both of which are compatible with industry-standard devices as shown in Table I. Inside shutdown capabilities are given for overcurrent security, short-circuit assurance, beneath voltage lockout, and over temperature. The power supply voltage used ranges from to 11 V.

4. Design and Calculation

The primary component taken into account by this approach is the braking distance. The interval between when the brakes are applied and when the vehicle completely stops moving at a specific speed is known as the braking distance. It is computed using the formula below.

$$\text{Braking Distance} = V / 2\mu g \text{ (meter)}$$

Where V= Velocity of the vehicle (m/s) μ = Coefficient of friction of road = 0.8 g = Acceleration due to gravity = 9.81(m/s2) , The coefficient of friction in this formula does not take the state of the brakes or the state of the road into account.Table displaying the length of braking:

Table 1: Velocity vs. Braking distances

Velocity (km/hr)	Braking Distance (m)
90	**26.35**
80	**22.28**
70	**19.85**
60	**17.95**
10	**0.24**

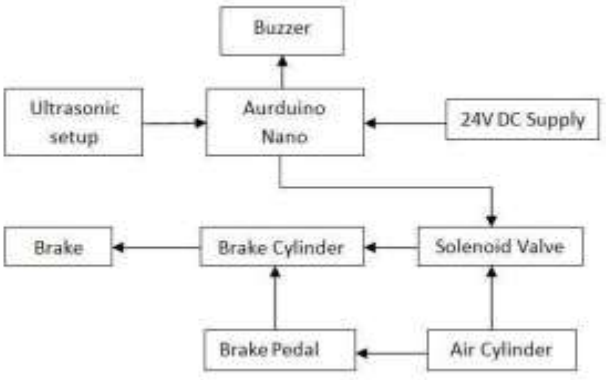

Figure 3: Actual working of Braking system

Tyres

Tyre is used to support the frame on its hub present on the wheel so that the body weight can equally distributed over all the surface after the load is applied on the frame. The friction cause tyre rotate on move the shaft in the hub which is hold by bearing to rotate freely on its own by transmission of power

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from engine through chain. Tyre used in this thesis is the wheel and diameter 9.5*100.

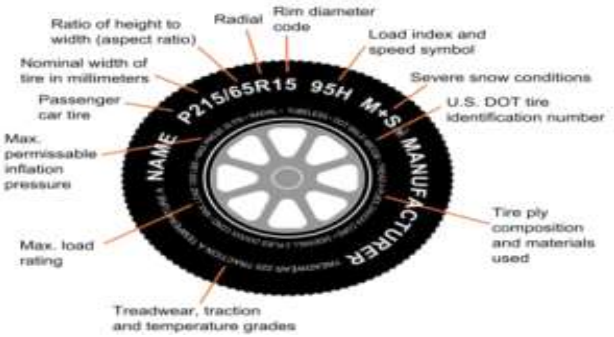

Figure 4: Specification of a wheel

5. Conclusion

The implementation of a collision avoidance system based on ultrasonic sensors has improved the ability of vehicles to avoid collisions. The goal was to reduce crashes so that fewer people would be killed, fewer animals would perish, fewer cars would be damaged, and fewer properties would be harmed, which would result in the elimination of associated expenditures. The Atmega328 microcontroller-based framework was run as a programmed system in order for it to accomplish the intended function. With an average response time of 0.86 seconds and a rate error of 12.8% while operating, the actualized system was able to decide the partition separations between the automobile and impediment appropriately, provide warning through on board warning systems, and lock in braking at a minimum partition separate. The desired results were achieved. The Future consideration will be given to the following directions: The framework isn't limited to a model; it might be applied to a car. When combined with brake control, the consolidation of fuel infusion control may be utilized to provide more precise automobile speed control. Ultrasonic and radar-based sensors may be combined to create a cutting-edge safety system that can be used in automobiles.

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