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Automatic Braking System Using Ultrasonic Sensor

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Abstract- In this modern world we note a lot of car accidents have become a major safety concern. The collision in automobiles cause damage to human life and also animals. More collisions occur due to the breaking issues and fast reaction delay while there is an obstacle. So this paper presents the automatic braking system for automobiles. The cost of life cannot be estimated. In this system we are using an ultrasonic sensor to calculate the distance between the obstacles, and it will alert the driver when there is an obstacle. This paper also shows how the automatic microcontroller works. When the safe separation distance is reached the automobile will automatically stop. It's average response time is 0.90s and its average percentage of error based on real distance of the obstacle is 11.2s

Keywords. Braking system, Automobiles, Ultrasonic sensor, Microcontroller

1. Introduction

Nearly millions of people die due to road accidents and not only humans and also more animals' lives are ended due to road accidents. All these life damages occur due to automobiles' weak braking systems. An accident avoidance system is an integrated system made up of sensors inside the car that alert the driver to upcoming dangers on the road. Examples of dangers that these sensors detect include the proximity of the car to other cars around it, and the speed of the vehicle. In a typical ultrasonic sensor, the distance between a vehicle and the previous car is measured in relation to the rear end. Most vehicles available with ultrasonic sensors reach relatively low speeds when approaching other vehicles. As rough readings of proximity data cannot be applied directly, an intelligent method has been designed to process distance readout of sensors in the form of appropriate cautionary signals and countermeasures.

There has been a center on controlling the directing maneuvering framework and warning systems that meddled with the drivers' capacity to lock in the braking framework in the automobile crash evasion framework. It is also very costly to buy such vehicles even for those who earn a middle-class income. Additionally, these approaches do not take into account the safety distance from start to stoppage. This always leaves room for human error. Therefore, this paper describes the development of an automatic microcontroller based crash avoidance system that employs ultrasonic sensors for obstacle detection and distance measurement in order to brake the car automatically without any human intervention.

The remainder of this paper is structured as follows: Previous related works are described in section 2, and section 3 presents the system's design and implementation. Sections 4 and 5 present data obtained during simulation and testing, as well as the conclusions drawn from the study

2. Related work

The collision evasion framework is a vehicle security system planned to decrease inescapable and the plausibility of an accident. These frameworks have advanced over time from the imbecilic systems to current shrewdly in operation and beneath research. They utilize electronic circuitry coupled with separate sensors and some of the time camera sensors to distinguish an inescapable crash. Once the discovery is done, these frameworks either give a caution to the driver when there's an inescapable collision or take activity independently without any driver input by automatic application of the brake .

The approach employs two run sensors, one for forward and another for the turn-around conclusion. It identified impediments when a least separate division is to come. The framework is however restricted to location of impediments and giving caution signals; no countermeasures are in any case naturally engaged to dodge collision.

Firstly, the framework gauges the position in which they will be in 1 seconds and ventures onto the street surface with laser pillars. Lasers are costly and nonstop operation will require great control supply, this may well be incomprehensible to implement in conventional reasonable cars and utility cars. The approach employs sensors that send and get signals from cars; impediments within the street activity lights and a central database is set inside the car to tell whether activity precautions should be taken. But the framework encompasses a tall cost of implementation and is constrained to electrical impedances which could influence the correct working of the framework. Within the framework, the plausibility of collision where speed is below 20 km/h additionally keeps the driver in alarm mode, to avoid collision. The actualized framework is without any counter degree to

dodge collision. Also utilizes the use of raspberry pi and ultrasonic sensors to identify and degree the removal with regard to moving or stationary objects. The sensors are embedded to detect a deterrent before the vehicle as well as a deterrent present within the dazzle spot of the vehicle. The framework is without any counter degree to dodge collision.
The employment radar finder which sends out speedy bursts of high frequency radar waves. These waves will bounce off the closest objects and return to the sensor, where it calculates the separate speed and relative speed nearly immediately. The framework is confined to the utilization of visual warning as it were to caution the driver. The approach utilizes rudimentary mechanical autonomy, advanced imaging, picture preparation and fake insights to accomplish its operational exercises, such as controlling speed control circuits and collision location frameworks. Too displayed the approach that's actualized by Laser sensor, which recognizes vehicles by utilizing Laser beams, by transmitting and getting. The Laser transmitter is connected to the laser sensor and a Controller Zone Organize (CAN) which interfaces to all sides of the hub, and sends the information through Zigbee and transmits the message to the LCD output on the driver side. The framework is confined to transmitting and accepting without counter action to avoid collision. The framework employs an arrangement of sensors to screen the environment of a vehicle, so as to degree the separations to other vehicles and check the conceivable deterrents. The key issues that have moderated the advance of this field incorporate: software complexity, Vehicle modeling framework fetched and Sensor integrity.
The framework recognizes objects or deterrents utilizing sonar sensors which produce the sound waves and gets the waves reflected back from the impediment, counting avoidance algorithms as the Essential reflexive collision shirking framework. The system's impediment as appeared within the usage is the sensor integrity

3. Prototype Implementation

The framework employs an ultrasonic module interface to the microcontroller board Arduino Uno. An ultrasonic transducer comprising a transmitter and receiver is utilized for the project. Arduino Uno sends a trigger beat to the Ultrasonic sensor which at that point transmits ultrasonic waves. The transmitted waves are reflected back from the question &received by the transducer again. Ultrasonic sensor sends a resound beat to the Arduino Uno. The Ultrasonic sensor changes over the sound flag to an electrical signal which is handled in a microcontroller to measure distance. The entire time taken from sending the waves to receiving it is calculated by taking into thought the velocity of sound. At that point the separation is calculated by a program running on the microcontroller. The measured separation can be used as a control parameter by the client to produce an audio-visual caution as well as to trigger programmed control outputs for deceleration and programmed brakes depending on the threshold parameters set agreement.
The common block diagram comprises of Control supply unit (a DC battery which can supply up to 12v and the circuit takes up 7-12V and supplies 5V DC to the microcontroller), sensors and other Yield gadgets, run detecting unit (forward and turn around ultrasonic extend sensors) for remove measurement, warning unit - comprising of Buzzer, LCD and Driven shows to supply caution signals to driver of vehicle or street clients and braking unit for braking purposes. The stream chart of the framework is shown.

Circuit stick associations of the different components are implemented using the Proteus computer program

- **Power supply unit:**The control supply system designed in this inquiry supplies therequired voltages to the microcontroller and the buzzer, LCD and LEDs. The framework operates at a voltage of 5V DC. In this manner, from a voltage source of (7-12V) DC in this case, a 12V battery will be utilized to power the model, and a voltage controller is utilized to provide steady power.

- **Range detecting unit :**The separate detection mechanism is made up of ultrasonic sensors. The HC- SR04 ultrasonic sensor modules are utilized in this inquiry. The range sensor employs sonar to decide to remove the sensor. It is expressed that SR04 ultrasonic sensor modules are utilized in this inquiry. The range sensor employs sonar to decide between the two. It is expressed that HC-SR04 offers an amazing run exactness and stable readings in an easy-to-use Bundle. Besides, the operation of HC- SR04 isn't affected by sunshine or dulltexture like IR run sensors, the ultrasonic sensor can extend up to a greatest separation of400cm and a least separate of 3cm.

- **Warning unit** :This subsystem gives reliable warning to drivers around a conceivable collision earlier to their reaching a risky position or area. The composition of the warning framework comprises the buzzer, Driven and LCD. The mode of operation of the caution framework could be a ruddy Driven light upon identifying a protest, in the event that the protest is 3 meters away while being shown on the LCD, the buzzer begins buzzing.

- **Design and interfacing for LEDs :**LEDs are operated from a moo voltage DC supply, with an arrangement resistor to constrain the forward current to a reasonable esteem of almost 5- 6mA.

- **Distance calculation :**The time of Input Output duration is captured, which speaks to the time from sending ultrasonic vibrations to the time it takes for it to hit an object and bounce back. Sound voyages at a speed of 343m/s in air or 1130 feet per second. Division by two is since the tall time incorporates sending time to protest and getting time for the resound. Temperature adjustments are calculated utilizing (7). $v = 331.5 + 0.6 \times Tair$ (7) where v is the speed of sound in discussion and Tair is the air temperature in degrees Celsius. At 20°C, the speed of sound in discuss is = $331.5 + 0.6 \times 20 = 343.5$ m/s

- **The Microcontroller selection:**In this work, a mega 328p Arduino microcontroller was utilized. The choice of the controller is since of the taking after reasons- Simple to program with tall level dialect programming utilizing C, C++ and Java, it has moderately 13 computerized and 5 analog pins, in this way more inputs and yields taken, has 6 PWM channels, thus coordinate output into risk and braking subsystems, has generally high memory capacity and inbuilt ADCs which makes it simple to interface with analog inputs band on board encoders.

- **Working configuration :**The DRV883x family of devices gives a coordinated engine driver arrangement for cameras, toys, and other low-voltage or battery-powered motion control applications. The gadget can drive one DC motor or other gadgets like solenoids. An insidecharge pump generates required entryway drive voltages and can supply up to 1.8 A of yield current to

function with the engine. The power supply voltage utilized is from to 11 V. The gadget incorporates a PWM (IN1-IN2) input interface and a PH-EN input interface both interfaces are congruous with industry-standard gadgets as shown in Table I. Inside shutdown capacities are given for overcurrent security, short-circuit assurance, beneath voltage lockout, and over temperature.

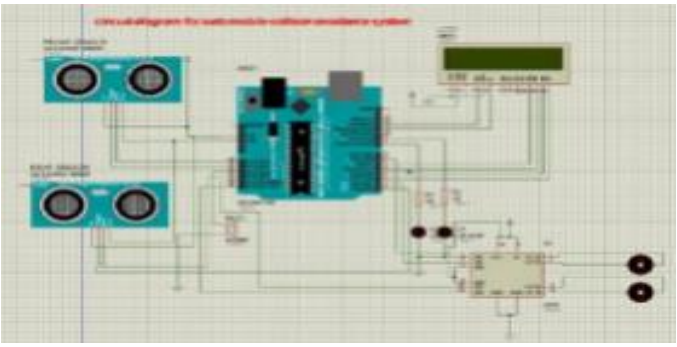

Figure: 1 Automatic braking system using ultrasonic sensor

4. Conclusion:

The improvement of vehicle collision evasion by implementing an ultrasonic sensor based collision avoidance system is displayed. The objective was to decrease collisions so as to diminish passing of people, passing of natural life, automobile damages and harms to property upon collision and thus eliminate the related costs. For the framework to perform this desired capacity, it was executed as a programmed system, based on the Atmega328 microcontroller. The actualized system was able to decide the partition separations between automobile and impediment suitably, gives caution by means of on board caution frameworks, and lock in braking at a minimum partition separate that's given with an average response time of 0.86s and a rate mistake of 12.8% during operation. The goals were met as craved. The following directions will be considered within the future:

- The framework may well be executed on an automobile as restricted to a model.
- The consolidation of fuel infusion control can be used which in combination with braking control will be able to supply more exact car speed control.
- A conceivable combination of ultrasonic sensors and radar based sensors will give an advanced safe system that can be executed in cars.

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