

# Automatic Braking System Using Ultrasonic Sensors

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**Abstract** - Now-a-days usage of automobiles is increasing. As Automobiles increasing the death rate due to road accidents is also rising. On an average, 450000 accidents take place every year in our country. accidents are mostly caused by delay of the driver to late applying of brakes or by the negligence by the driver. Due to brake failure so many accidents are occurring so when we control the brake by automatically we can reduce the effect of accident. A mechatronic braking system discussed in this paper is developed and designed in such a way that, when it is active it can apply break automatically encountered by any object sensed by the ultrasonic sensor. Ultrasonic emitter always emits the ultrasonic waves, whenever a obstacle is detected then wave gets reflected and receiver receives the signal. Reflected wave sends the signal to the Arduino Nano microcontroller from that based upon distance of object it actuates the brakes. in this modern era speed is a major factor and leads to catastrophic incidents. So, by using Ultrasonic braking system we can prevent the death rate of road accidents.

**Key Words:** Ultrasonic sensor, Obstacle detection, arduino, microcontroller.

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Date of Submission: 12-05-2022

Date of acceptance: 26-05-2022

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## I. INTRODUCTION

The main objective of this paper to design speed control & automatic braking system in the vehicle. This project describes an automatic braking system using ultrasonic sensors and controlled by ultrasonic sensors. The Arduino microcontroller controls the robot, which is loaded with the ultrasonic sensor. The forward end of the vehicle is equipped with an ultrasonic sensor. Sensors get data from the surrounding environment by placing sensors on the robot. When the sensor catches the obstacle, it detects the intended road to stop it. The sensor will send data to the micro-controller, which will be sent to the micro-controller to determine the movement of the robot vehicle. The ultrasonic sensor along with the wheel encoder will be used for detecting the movement and direction of the Vehicle. The purpose of this vehicle is to detect obstacles and avoid collisions.

### 1.1. ULTRASOUND TECHNOLOGY

One of the most effective methods to identify obstacles is ultrasonic sensors. The ultrasonic sensor module "HCSR04" is based on the "Echo" principle, which describes what happens when sound bounces off a surface. Instruction is given to the Arduino. The speed of ultrasonic waves is 343 meters per second. The use of a microcontroller in a microcontroller is necessary to achieve this level of speed. The waves are reflected on a surface 4 meters away in 15 nanoseconds. Ultrasonic waves do not affect humans. Ultrasonic sensors are mainly used to measure distances. These sensors can identify and avoid obstacles in their path. Ultrasonic sensors generate sound waves at frequencies higher than those that can be heard by humans, making them ideal for use in quiet environments. They are energy efficient, have a simple design, and are inexpensive. In Modern culture, Increasing the robotics and exciting field. This is the simplest approach to keeping pace with the development of technology.

### 1.2. Literature Survey

This project involves an automatic braking system based on ultrasonic waves. The vehicle is controlled by an Arduino microcontroller has a built-in IC ultrasonic sensor. The ultrasonic sensor is mounted on top of the robot vehicle. By placing sensors on the vehicle, the sensor will send data from the near environment. The auto vehicle detects the obstacle and sends rays from the original trajectory to stop it. The sensor gives the data to the controller, which will be connected to the controller to get the direction of the robot wheel's movement.

## II. WORKING PRINCIPLE

Each carmaker has its own automatic braking system technology, but all of them believe some sort of sensor input. The ultrasonic sensor contains transmitter and receiver units, and the ultrasonic transmitter detects the obstacle by transmitting the signals and reflects back to the ultrasonic receiver unit. The ultrasonic sensor input is then used to determine if there are any objects present in the path of the vehicle. If an object is detected, the system can then

determine if the speed of the vehicle is bigger than the speed of the thing ahead of it. By which through Arduino dumped C Program the calculations will take place through PIC microcontroller according to the given maximum distance, and distance between the automatic system and obstacle. The DC gear motor rotates uniformly at a set rpm and gradually decreases speed while automatically breaking the system through servomotor braking mechanism phenomena. A significant speed differential may indicate that a collision is probably going to occur, during which case the system is capable of automatically activating the brakes.

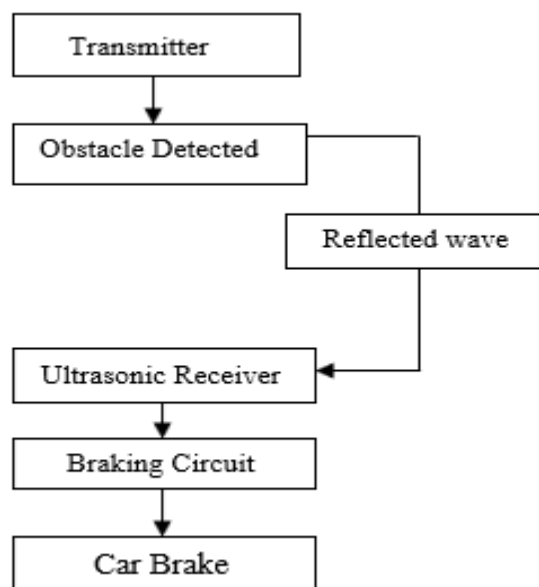


Fig 1. Ultrasonic Braking system block diagram

#### COMPONENTS USED IN THE ULTRASONIC BRAKING SYSTEM:

- Ultrasonic Sensor (transmitter and receiver)
- Arduino UNO
- Electric motor (DC gear motor)
- Servomotor
- Mechanical Braking system

**Ultrasonic Sensor**:- Ultrasonic sensor is a ranging and detecting devices which make use of high-frequency sound waves to detect the presence of an object and its range.[5] These systems either measure the echo reflection of the sound waves from objects or detect the interruption of the sound beam as the objects pass between the transmitter and receiver. An ultrasonic sensor typically utilizes a transducer that produces an electrical output pulse in response to the received ultrasonic energy.

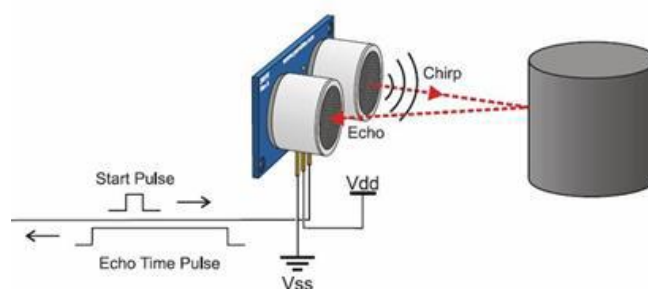


Fig 2. Ultra-Sonic transmitter and receiver

#### ARDUINO UNO

Arduino is an open-source platform used for producing electronics projects. Arduino consists of both a microcontroller and a bit of software, or IDE (Integrated Development Environment) that runs on your computer, accustomed write and upload code to the physical board. The Arduino doesn't need a separate piece of hardware (called a programmer) so as to load new code onto the board – you'll be able to simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to find out to program.



Fig -3:Arduino UNO

### DC GEAR MOTOR

A DC gear motor may be a fairly simple electric gear motor that uses electricity, gearbox, and magnetic flux to supply torque, which turns the motor. At its most simple, the DC gear motor requires two magnets of opposite polarity and an electric coil, which acts as an electric magnet. The repellent and attractive electromagnetic forces of the magnets provide the torque and cause the DC gear motor to turn. A gearbox is present just after the DC motor and a rotary shaft are connected to it, with the help of this DC gear motor setup the vehicle wheels can be rotated in this project

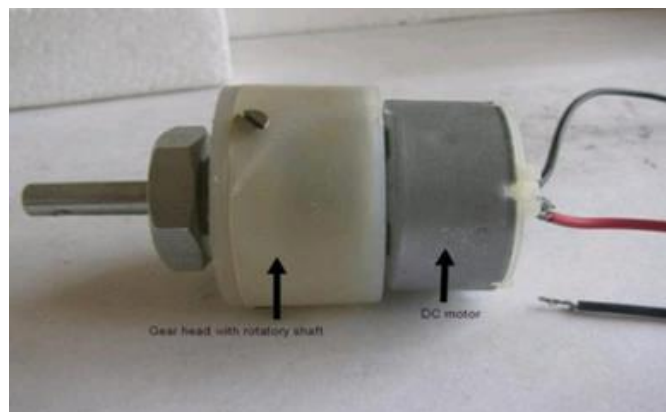


Fig 4. DC gear motor

### III. CONCLUSIONS

A mechatronic braking system discussed in this paper is developed and designed in such a way that, when it is active it can apply break automatically encountered by any object sensed by the ultrasonic sensor. Intelligent braking is one of the smart options which can be instigated in various automobile applications for stopping a moving body without spasmodic motion. Design of intelligent brake applications basically depend upon effectiveness of Ultrasonic sensor and microcontroller (motor driver),and controlling the speed of vehicle accordingly to programmed distance is revealed in the study done by our team. Our present work comprehended us that enactment of this smart system can achievable and of real time use.

### REFERENCES

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