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# Design and Construction of a Four-Wheeled Vehicle's Automatic Brake System

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**ABSTRACT:-**In a conventional braking system when the pedal is pressed wheels tend to stop rotating which leads to lockup and results in skid, in order to avoid such situation a sophisticated vehicle technology has emerged know as automatic braking system. This project proposes the design and fabrication of “Automatic Braking System” using ultrasonic sensor measures the distance between the vehicle and the obstacle, where in an alarm message is delivered to driver and automatic emergence break is applied automatically . This project proposes the validation through experimentation.

**KEYWORDS:** sensors, Emergency, Autometic, Braking System

## I. INTRODUCTION

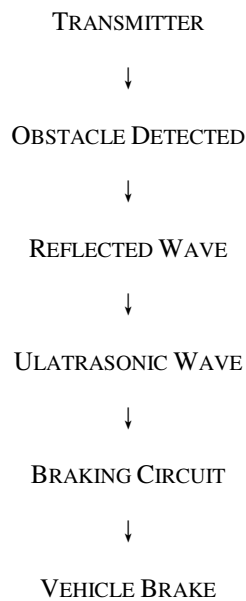
Nowadays, people's most frequent pastime is driving. Today's technology has seen the biggest modifications, which has accelerated improvement. The vehicle can be stopped without a driver thanks to the autonomous braking system. We are employing ultrasonic sensors in this, and the sensor's primary function is to measure the distance between the vehicle and any impediments. The ultrasonic wave emitter and ultrasonic wave receiver are two of the ultrasonic sensors used in this system. The wheels of the car are attached to the DC gear motor, which is powered by an Arduino board. Using information from the detecting pulse, the PIC microcontroller operates the servo motor, which in turn automatically regulates the vehicle's braking. so that this new

## II. RELATED WORK

### PROBLEM DEFINITION :-

In olden days, so many accidents occurred because of driver negligence. We have to overcome it by introducing the automatic braking system. This reduces accidents and improves driver safety. It also improves vehicle efficiency.

## III. METHODOLOGY



## IV. DESIGN OF SYSTEM AND COMPONENTS

### WORKING PRINCIPLE:-

This system combines sensors, such as radar, video, ultrasonic sensors to scan for possible objects in front of the vehicle, and then use brake control to prevent collision if the object is, in fact, detected.

### 3D MODEL:-



Fig.(1) 3D Model.

## COMPONENTS:-

### SENSORS:-

A sensor is an electrical device that converts a qualitative description of the environment into a numerical measurement. Every sensor operates under the principle of transduction, which is the conversion of energy from one form to another.

### GEAR

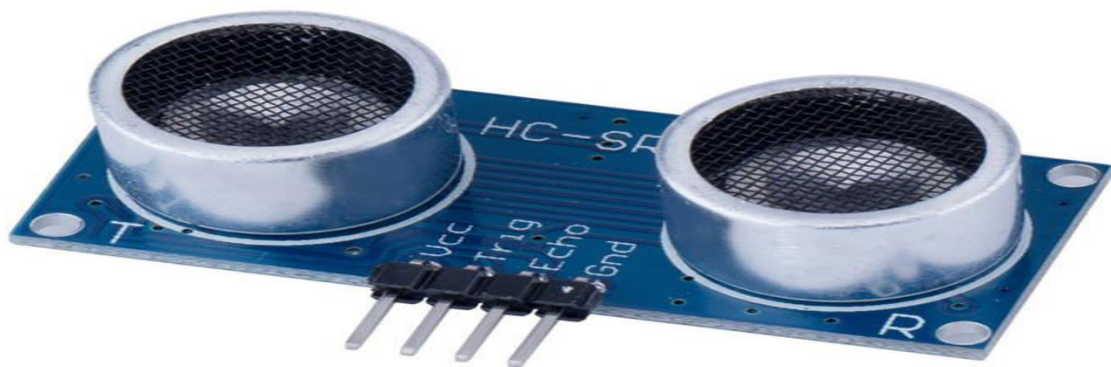


Fig.(2) Sensors

### TRANSDUCER :-

A transducer is a an energy conversion device which converts one form of energy into another. In the ultrasonic sensors they are used to convert the electrical energy into ultrasonic energy and vice-versa.

### ULTRASONIC SENSOR:-

Ultrasonic ranging and detecting equipment makes use of high frequency sound waves, often known as ultrasonic waves, to identify the presence and location of an object. The typical human ear can hear frequencies between 20Hz and 20,000Hz. Ultrasonic sound waves have a frequency of 20,000 Hz and are therefore above the audible range of humans.

### ULTRASONIC TRANSMITTER:-

There is a component called an ultrasonic wave generator that generates ultrasonic waves prior to transmitting them. There are temporal instruction mechanisms for producing an instruction signal for intermittently dispensing ultrasonic waves in that section.

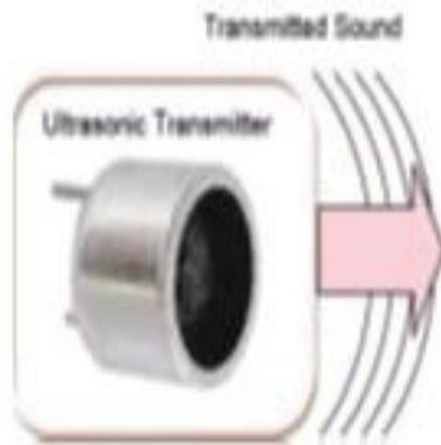


Fig.(3) Ultrasonic transimtter.

#### UTLRASONIC RECEIVER:-

The ultrasonic wave will create a reflected wave if it encounters the obstruction. To create a reception signal, an ultrasonic receiver collects the ultrasonic waves reflected from the road surface.



Fig.(4) Ultrasonic receiver

#### OPERATIONAL AMPLIFIER AND ADC:-

A high gain voltage amplifier having differential inputs and a single output is an operational amplifier, sometimes known as an op-amp. There are two differential inputs available to the amplifier: an inverting input and a non-inverting input.

#### BRAKING CIRCUIT:-

- The digital signal that has been processed and amplified is supplied to the brake circuit.
- Microchip technology is used to create PIC microcontrollers, often known as peripheral interface controllers or programmable interface controllers.
- This system uses PICs since they are inexpensive and widely available.

#### DC GEAR MOTOR:-

A DC gear motor is a relatively straightforward electric gear motor that generates torque by using electricity, a gearbox, and a magnetic field. In this project, the vehicle wheels can be turned using a DC gear motor arrangement that includes a gear box that is located immediately after the DC motor and a rotary shaft that is attached to it..



Fig.(5) DC gear motor.

**SERVO MOTOR:-**

Through mechanical devices, including a pair of crossed helical gears and a grooved cylindrical component, the servo motor regulates the braking.

**SOLAR PANEL:-**

A solar panel, also known as a photovoltaic (PV) module, is a collection of PV cells installed on a support structure for installation. Sunlight is the energy source used by solar panels to produce direct current electricity.



Fig.(6) Solar panel

**MODELLING:-**



Fig.(7) Complete model

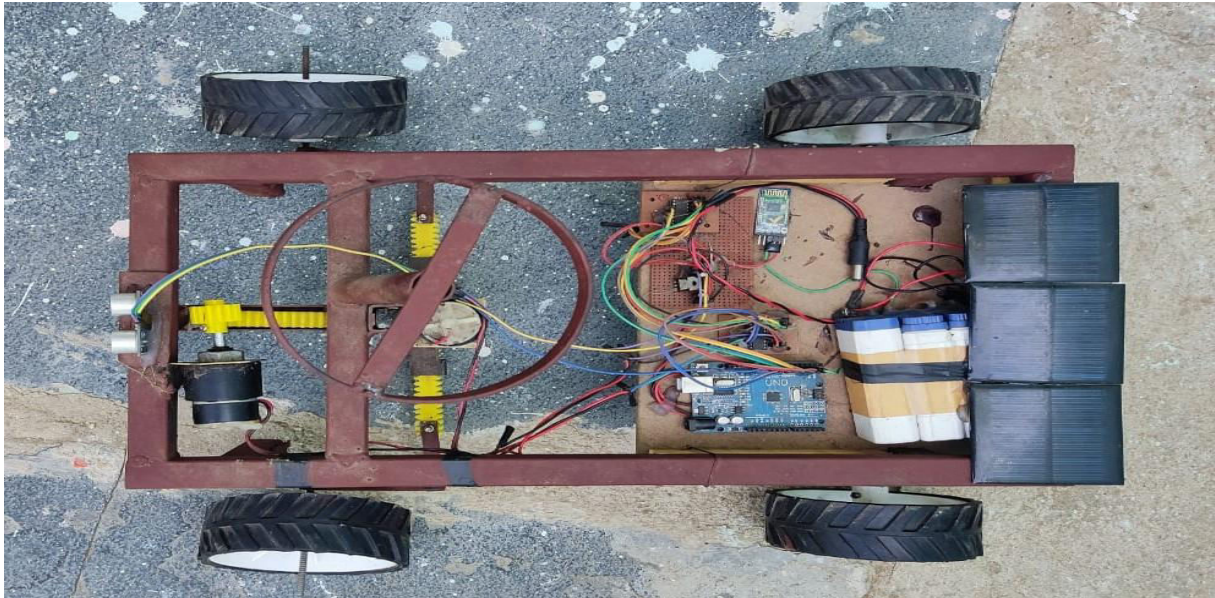


Fig.(8) complete model full view

#### V. EXPERIMENTAL RESULTS

As a result of this automatic braking system, each component's function is effective, and the overall goal of the system is achieved. When an obstacle is recognised, the safety distance is established before the vehicle system is braked.

This prototype's ultrasonic sensor has a ranging accuracy of around 2 cm to 1 m and performs well within the allowed range.

#### VI. FUTURE SCOPE

The "Automatic Braking System" is a control system that will be designed and developed in the future. It is based on an automotive braking system. When the distance between the vehicle and the obstruction is within the sensing range zone, the automatic braking system with an ultrasonic sensor will sound an alert to the driver before applying the brakes. This is a brand-new feature in this prototype design that might be applied to all automobiles.

#### VII. CONCLUSION

This project presents the implementation of an Automatic Braking System for Forward Collision Avoidance, intended to use in vehicles where the drivers may not brake manually, but the speed of the vehicle can be reduced automatically due to the sensing of the obstacles. We have successfully finished the fabrication of the automatic braking system model prototype. It tends to save a great deal of lives and lower accident rates. Therefore, we think that including every component in an automatic braking system will maximise safety, as well as give that system a wider market and a competitive advantage in the marketplace.



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