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Braking System using Ultrasonic Transmitter and Receiver Indicator with a Buzzer

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Abstract *- In the fast moving world it is very difficult to keep distance between vehicle.If a vehicle is going on the road, suddenly the driver loses the vehicle's control, an accident may occur. Death rate due to accidents is increasing due to the drastically increasing usage of vehicles.Automotive vehicles are increasingly equipped with collision avoidance and warnings systems to avoid accident mishaps. This braking system uses an innovative technique for the purpose of preventing accidents happens in the restricted roadways or during emergency.The conventional braking system never prevents the collision during critical situation during sudden braking and the vehicle tends to impact. The statistics describe that near miss accidents are huge. The autonomous braking system plays wide role today to prevent the accidents and sadly the system is used only in expensive vehicles. The proposed design and system can use in the low end vehicles to reduce the fatality rate using ultrasonic sensors help to detect obstacles in the way of vehicles to void accidents. The sensors give the signal to the microcontroller which signals the vehicle motor to stop. The aim is to design and develop an automatic braking system that is automatically controlled. The sensors detect possibility of collision but will not take an immediate action. A warning will be sent to the driver in the form of a signal. There is threshold distance calculated by the system and if the driver fails to respond even when the vehicle crosses that region , then only brake will be applies automatically.*

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I. INTRODUCTION

Safety is one of the most essential factors that one should consider while driving a vehicle. Nowadays road accidents are becoming common every day and many people loose their lives in road accidents. Its the vehicle owners responsibility to avoid any type of distraction while driving and keep the vehicle in best condition to avoid road accidents. Safety while driving is important as any thing could happen within the fraction of second if the driver is not paying attention while driving. Over past years the rate of accidents is increased eve though there is growth in infrastructure and technology. Nowadays people have become obsessed with fast cars , they drive on road like they are on the race track . Not only that they also forget about the other people while driving which leads to harm and injury not only to them but also to other people. Most common reason for accidents is the failure of application of brakes in time, due to drivers lack of concentration, sleepiness, distraction, weather condition, heart attacks/seizure and sudden road obstructions, technical problems within vehicle and due to drivers mistake. Not many people follow traffic rules especially in big cities. Moreover, road are becoming narrower and cites are becoming more populated everyday. Whenever we feel conscious about our safety while driving , one thing flashes our mind i.e, brakes. So a braking system is a vital system that is needed in the vehicle for its safety.A vehicle brake is used to slow down a vehicle by converting its kinetic energy into heat. Most commonly brakes used friction between two surfaces pressed together to convert the kinetic energy of the moving object into heat , though other method of energy conversion may be employed . A braking system reduces the kinetic energy of the vehicle, slows it down , and finally stops the vehicle. Thus making sure that the passengers and the pedestrian on the road are safe. India has an increased rate of accidents, this system is created to prevent the injury to drivers and pedestrians. Types of brakes are :- friction brakes and electromagnetic brakes. This system involves ultrasonic transmitter and receiver , amtel microcontroller, arduino uno , servomotor, dc gear motorcrystal oscillator, voltage regulator, and a buzzer.

Automatic Braking System uses ultrasonic sensors to sense the obstruction in the path of the vehicle. The ultrasonic sensors transmit the signal continuously towards the obstacle. After the transmission by transmitter, the waves are reflected when the obstacle is detected and are received by the receiver. The reflected waves sends the signal to arduino uno from that based upon the distance of object it acutates the buzzer or the brakes. The receiver sends this signal to microcontroller for control system purposes . The controller warn the drivers about the obstruction and reduces the speed of the vehicle as per the distance between the vehicle and obstruction. Accidents could occur at anytime and anywhere, and it could take everything from us, or cause serious damage. The focus of this research has been on the benefits relating to human factor issues.

II. LITERATURE REVIEW

The literature survey is carried out to understand the state of art behind sensor technology used in automotive engineering. Below are the following journal reviews.

The literature survey comprises of the use of inserting sensors for obstacle detection with the help of P.I.C. microcontroller. This supported microcontroller technology for delegation information associated with speed and transmitter information and takes applicable choices associated with regulation and management necessities. The paper comprises of the use of ultrasonic sensor with the help of P.I.C. microcontroller, transducers and servo motor braking mechanism. It is supposed to use in vehicles wherever the drivers minor break manually, however the speed of the vehicle is the reduced mechanically thanks to the sensing of the obstacles.The revolutionary invention is made in the field of brake . The proposed system can be easily implemented near different populated area . The power of proposed system lie in its flexibility and capability of development with little hardware changes such as changing the speed limit and speed control method using the software of the base station in negligible amount of time.

Automatic braking system using sensor was proposed to prevent front and, rear and, right turn and left turn accidents on roads. This module can detect the distance between front vehicle and driver's vehicle to keep a constant distance using sensor and operate the brake system.All the above proposed design models contributed to safety of vehicles and pedestrians. It prevented real and crashes, provided a bi s for sharp turns or slippery roads. But all these are applicable for vehicles running in conventional direction so we need to develop systems which enhances the performance and safety of vehicles when it moves in reverse direction. R model design on reversing of vehicles provided detection of obstacle, speed control mechanism based on Binocular cameras. In this paper we propose automatic reverse Braking System to prevent collision by using sensors to detect obstacles full stop the automatic reverse braking system is processing the sensor data and controlling the vehicle to prevent accidents.

The number of vehicles is increasing day by day and proportionally the numbers of accidents are also increasing. These accidents are mostly caused by the delay of the driver to hit the brake. To prevent the accidents caused by this delay, ultrasonic braking psystem is used in automobiles. The main target of the ultrasonic braking system is that, cars should automatically brake when the sensors sense the obstacle. This is a technology for automobiles to sense an imminent forward collision with another vehicle or an obstacle, and to brake the car accordingly, which is done by the braking circuit. This system includes two ultrasonic sensors viz. ultrasonic wave emitter and ultrasonic wave receiver. The ultrasonic wave emitter provided in front portion of an automatic braking car, producing and emitting ultrasonic waves in a predetermined distance in front of the car. Ultrasonic wave receiver is also provided in front portion of the car, receiving the reflected ultrasonic wave signal from the obstacle. The reflected wave (detection pulse) is measured to get the distance between vehicle and the obstacle. Then microcontroller is used to control the geared motor based on detection pulse information and the geared motor in turn automatically controls the braking of the car. Thus, this new system is designed to solve the problem where drivers may not be able to brake manually exactly at the required time, but the vehicle can still stop automatically by sensing theobstacles to avoid an accident. In this system we can adjust the distance manually at which ultrasonic sensors sense the obstacle and avoid the collision.

In this project major part of work comes from electronics to actuate the solenoid valve. Because solenoid valve is an electromagnetic component which is used to actuate the brake cylinders. Analog electronic circuits are those in which current or voltage may vary continuously with time to correspond to the information being represented. Analog circuitry is constructed from two fundamental building blocks: series and parallel circuits. In a series circuit, the same current passes through a series of components. A string of Christmas lights is a good example of a series circuit: if one goes out, they all do. In a parallel circuit, all the components are connected to the same voltage, and the current divides between the various components according to their resistance.

III. WORKING PRINCIPLE

Automatic Braking System relies on the use of sensors for detecting the obstacles.When the sensors identify the obstacle and the potential for collision the braking system gets activated. They stop the vehicle from the severity of the accident. Sensors detect and deliver the data to the microcontrollers which calculates what is needed to apply the brakes in time, in activating brakes which avoid or mitigate a collision. Being an important part of safety technology in automobiles, Automatic Braking System is an advanced solution, specifically designed to either prevent collision or mitigate an accident.

WORKING:- Each car manufacturer has it's own automatic braking system technology, but they all rely on some type of sensor input.Ultrasonic sensor contains transmitter and receiver units, and as ultrasonic transmitter detects the obstacle by transmitting the signals and reflects back to ultrasonic receiver unit.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 greater than the speed of the object in front of it.By which through Arduino dumped C Program the calculations will takes place through PIC microcontroller according to given maximum distance, and distance between automatic system and obstacle.The DC gear motor rotates uniformly at a given rpm and gradually reduces speed while automatically braking the system through servomotor braking mechanism phenomena.A significant speed differential may indicate that a collision is likely to occur, in which case the system is capable of automatically activating the brakes.

The design model consist of :- 1. Wheels 2. Ultrasonic Transmitter. 3. Ultrasonic Receiver 4. D.C Motor 5. Servo Motor 6. Arduino Uno 7. Battery 8. Buzzer

3.1 Wheels: The wheel is a circular component that rotates on an axle bearing where it is one of the key component of the braking system with a diameter 7 cm.

Fig. 1 Wheels

3.2 Ultrasonic Transmitter: Before transmitting the ultrasonic wave, there is a part which is ultrasonic wave generator that function to generate ultrasonic wave. In that part, there is timing instruction means for generating an instruction signal for intermittently providing ultrasonic waves.This signal will send to an ultrasonic wave generator for generating ultrasonic waves based on the instruction signal from said timing instruction means (transform electrical energy into sound wave). After ultrasonic wave was produced, ultrasonic transmitter transmits the ultrasonic waves toward a road surface to find out the obstacle. The range that obstacle detected is depends on the range of ultrasonic sensors that used.

Fig. 2 Ultrasonic Transmitter and Receiver

3.3 Ultrasonic Receiver: If the ultrasonic wave detect the obstacle, it will produce a reflected wave. An ultrasonic receiver is used for receiving the ultrasonic waves reflected from the road surface obstacle to generate a reception signal. There is ultrasonic transducer that will transform back the sound wave to electrical energy. This signal amplified by an amplifier. The amplified signal is compared with reference signal to detect components in the amplified signal due to obstacles on the road surface. The magnitude of the reference signal or the amplification factor of the amplifier is controlled to maintain a constant ratio between the average of the reference signal and the average of the amplified signal.

3.4 D.C Motor: A DC motor is a fairly simple electric gear motor that uses electricity, gear box and magnetic field to produce torque, which turns the motor. At its most simple, DC 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 causes the DC motor to turn. A gear box is present just after the DC motor and a rotary shaft is connected to it, with the help of this DC motor setup the vehicle wheels can be rotated in this project.

Fig. 3 DC motor

3.5 Servo Motor: The output shaft of servo motor is capable of travelling somewhere around 180 degrees. A normal servo motor is used to control an angular motion between 0 and 180 degrees, and it is mechanically not capable of turning any farther due to a mechanical stop built on to the main output gear. The angle through which the output shaft of the servo motor need to travel is determined according to the nature of the signal given to the motor as input from the PIC. Due to rotation of servomotor in 180 degrees, the brakes can be applied and released through given brakes mechanism.

Fig. 4 Servomotor

3.6 Arduino Uno: Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your Uno without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

Fig.5 Arduino UNO

3.7 Battery: Battery is a device that converts chemical energy directly to electrical energy where it is used to power up the whole system especially to the circuits. It consists of a number of voltaic cells; each voltaic cell consists of two half cells connected in series by a conductive electrolyte containing anions and cations.
3.8 Buzzer: It is an electric sounding device that generate sound .Typically powered by d.c voltage . It is used to alert the driver about the incoming obstruction.
3.9 Headlights: Headlight or headlamp is a lamp attached to the vehicle to illuminate the way ahead.
4.0 Solar panels: Solar panels are the panels that are run by light energy or solar energy to generate electricity by conversion of energy to run the headlights in this project.

Fig.6 Solar panels

IV. METHODLOGY

To fabricate the model it all begins with a systematic plan where the fabrication is of following steps:-
4.1 ANALYSING THE RESEARCH PAPERS:
Collect all the relevant data about the problems and the research programs which are happening around and the outcomes of them and evaluate them by comparing with the other research programs where to sort out the demerits of the conventional types of braking systems in a more effective.
4.2 SELECTION OF THE AUTOMATIC TO OVERCOME THE PROBLEMS:
Selection of the braking system is to minimize the problems which normally occur in the conventional type of braking system where to overcome some problems like efficiency, maintaining parameters, safety. Hence to overcome these problems the ultrasonic braking system is been selected for the further process.
4.3 ANALYSIS OF THE AUTOMATIC BRAKING SYSTEM: To study and analyze about the system where by focusing on to the working principle and the fabrication materials and design required for the model to be done and even a study towards the functioning of the braking system according to the design planned.
4.4 PREPERATION OF DESIGN: In this step it is more concentrated on to the design part where looking on to several alternatives of designs according to the installation specifications as planned in the previous steps. The steps are as follows:
• Take a plywood plank and cut it according to the measurements of the wheels distance.
• Fix the plank to the wheels to 2 wheels at the frontside and 2 wheels at the rear end.
• Attach the DC gear motor at the backside of the plank.
• Arduino UNO is mounted on the plank and screwed to it.
• Wires are connected with Arduino UNO.
• Sensor holder is placed on the top front side of the vehicle and Ultrasonic Transmitter and Receiver is mounted on top of it.
• A battery is mounted on the backside of the car.
• The wires are connected with the arduino to the Ultrasonic Transmitter and Receiver and Buzzer.
• Program code to be executed is inputted in the Microcontroller.
• Now the car can run.

V. RESULT

Hence the ultrasonic braking system by using manual method take place according to the braking distance.
Calculations:

The main factor considered in this system is braking distance. Braking distance for a particular speed is the distance between the application of the brakes and the point of stopping of vehicle.
Braking distance = V/2ųg (meters)
Where V = velocity of the vehicle in m/sec
ų = coefficient of friction = 0.8
g = acceleration due to gravity = 9.81 m/sec²

Velocity (km/hr)	Braking distance (m)
60	17.69
50	12.28
40	7.86
30	4.42

Speed of vehicle:
Speed= Distance/ time
When,
D= 86 cm= 0.86 m
T= 5 sec
S= 0.172 m/s
When,
D= 88 cm= 0.88 m
T= 5 sec
S= 0.176 m/s
When,
D= 210 cm =2.1 m
T= 8 sec
S= 0.2625 m/s
When,
D= 274 cm =2.74 m
T= 8 sec
S= 0.342 m/s

Fig 6 Working model

VI. APPLICATIONS

- Controlling Automobiles
- Automated Guide Vehicles in industries
- Production Line
- Military Spy Service

VII. CONCLUSIONS

The implementation of the automatic braking system using sensors with a buzzer, can mitigate collision and accidents can be averted.This system is used to enhance safety in automobiles with the addition of automation to it. The future of Automatic braking system lies in the safety of vehicle occupants and prevention of accidents. Apart from that it also adds a new technology to future. Project presents the implementation of an

Automatic Braking System using Ultrasonic sensors, 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.With this future study and research, we hope to develop the system into an even more advanced speed control system for automobile safety, while realizing that this certainly requires tons of work and learning, like the programming and operation of microcontrollers and the automobile structure.We believe that the incorporation of all components in Automatic Braking System will maximize safety and also give such system a bigger market space and a competitive edge in the market.

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