Automatic Emergency Braking System

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Abstract- *An automatic Braking system is an intelligent mechatronic system includes an Ultrasonic wave emitter provided on the front portion of a car producing and emitting Ultrasonic waves. An Ultrasonic receiver is also placed on the front portion of the car operatively receiving a reflective Ultrasonic wave signal. The reflected wave (detected pulse) gives the distance between the obstacle and the vehicle. Then a microcontroller is used to control the speed of the vehicle based on the detection pulse information to push the brake pedal and apply brake to the car stupendously for safety purpose. Mostly people prefer using cars and four wheelers for efficient transportation. Vehicle Technology is increasing to a wide extent especially in braking systems and sensing systems. Vehicles equipped with modern braking technology is designed with simple collision avoidance system, which will help to detect a collision which is likely to occur and applying emergency brake to avoid it. Such technologies will reduce the number of accidents which causes worst damages, serious injury, and even death. In this automatic braking system.*

Keywords- ARDUINO, Automatic Braking System, Buzzer, LED, Ultrasonic sensor.

I. INTRODUCTION

Nowadays, the number of accidents is so high and uncertain. Accident will occurs every time and every where and cause worst damage, serious injury and dead. These accidents are mostly cause by delay of the driver to hit the brake.

This project is designed to develop a new system that can solve this problem where drivers may not brake manually but the vehicles can stop automatically due to obstacles. Using ultrasonic as a ranging sensor, its function based on ultrasonic sensor. After transmission by transmitter, the wave can reflect when obstacle detected and received by receiver.

The Arduino board is used by creating and dumping the required C Program, which consists the PIC microcontroller in it. Then PIC (Programmable Interface Controller) microcontroller is used to control the servo motor based on detection pulse information and the servo 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 the obstacles to avoid an accident.

II.METHODOLOGY

To meet the proposed objectives of the project we will follow the following procedures:

i.Information gathering

IEEE journals
Science Direct

ii.Design of the control system

iii.Selection of electrical components

Range detector
Microcontroller

iv.Circuit construction

v.Programming the microcontroller

vi.Testing

PROBLEM FORMULATION: As we know car accident is the leading cause of fatalities in India. We as an engineers wanted to address this nationwide problem that takes millions of lives and damages assets in millions of birrs every year. As a result by installing a collision avoidance system that detects proximity of the vehicle towards obstacles and when the predetermined minimum gap is attained it signals the driver to take action then if the driver fails to do so an emergency brake will be applied to avoid collision.

SCOP OF PROJECT: The extent of our work in this project is to design a microcontroller based collision avoidance system and prototype its functionality using two ultrasonic sensors, Arduino UNO, solenoid actuator, relay and car battery. The ultrasonic sensors have a range of 2 meters to detect obstacles around and our system can avoid collision

both in front driving and also reverse gear driving by applying brakes automatically. The system also avoids wheel locking during emergency braking by programming the microcontroller to act in ABS manner for cars without ABS. The system can be installed on any light or heavy duty vehicle.

LITERATURE REVIEW:The development of forward collision avoidance systems has a rich history, dating back to the 1950s. Cadillac's Cyclone prototype was one of the first attempts at incorporating radar technology to detect objects and prevent collisions. Although the project was ultimately deemed too costly and abandoned, it paved the way for future innovations. It wasn't until 1995 that a functional forward collision avoidance system was successfully demonstrated by Hughes Research Laboratories. This breakthrough technology, labeled "Forewarn," utilized radar to detect objects and provide critical visual, audio, and tactile feedback to drivers. Since then, regulatory bodies have taken notice, considering making such systems mandatory to enhance road safety and reduce accidents.

III. ANALYSIS, CONCLUSION AND RECOMMENDSTIONS

FABRICATION: With the application of appropriate processes, resources and tools, a prototype of the mechanical Automatic emergency brake will be fabricated with the selection of suitable material.

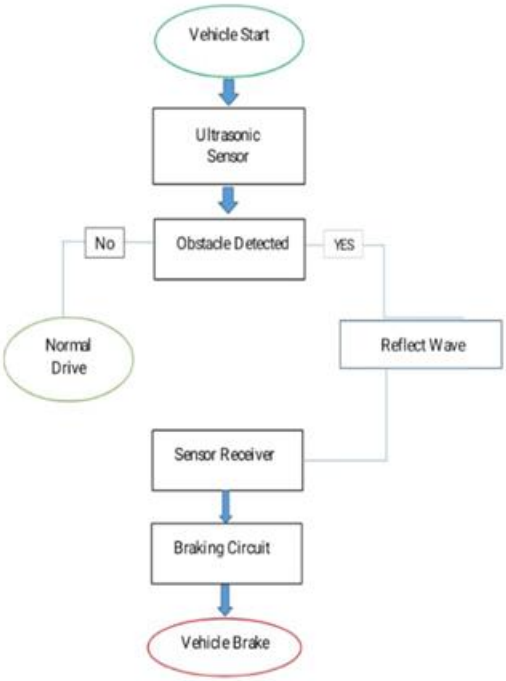
WORKING

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 toultrasonic receiver unit.Ultrasonic sensor input is then used to determine if there are any objects presenting the path of the vehicle. If an object is detected, the system can then determine if the speed of the vehicleis 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 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.

COMPONENTS USED IN THE PROJECT

Square Section, Dimension (1x1) 20 fits
pedestal bearing
Disc brake plate & caliper
Actuators 12v electric linear
Wheel and tyre 14 inch
Solar plate 10WATT (O/P)
Charge controller 12v DC
DC Motor wheels



Processing unit (Arduino)
DC gear Motors 12v
IR sensor
L293D Motor Driver
HCSR04 Ultrasonic Sensor
Battery 12v
Some components like point pcb, nut bolts, screws & Washer. Wire(jumpers) etc.

ADVANTAGES

- Discrete distances to moving objects can be detected and measured.
- Resistance to external disturbances such as vibration, infrared radiation, ambient noise, and EMI radiation.
- Measures and detects distances to moving objects.
- Impervious to target materials, surface and color.

- Solid-state units have virtually unlimited, maintenance free lifespan.
- Detects small objects over long operating distance.
- Ultrasonic sensors are not affected by dust, dirt or high moisture environments.

APPLICATIONS&FUTUREASPECTS

1. Passenger Vehicles: Cars, SUVs, trucks
2. Commercial Vehicles: Buses, trucks, trailers
3. Heavy-Duty Equipment: Construction equipment, agricultural vehicles
4. Public Transportation: Buses, trains, taxis
5. Ride-Hailing Services: Uber, Lyft, etc.

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. 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 leaming, 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.

IV. ACKNOWLEDGMENT

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[2] http://www.aalcar.com/this website contains technical articles, books and manuals that help us find what's wrong with our vehicle and what needed to fix it.
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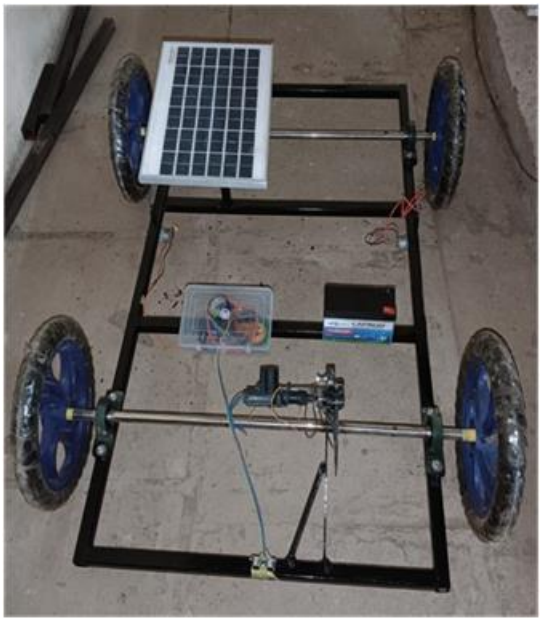

Fig. Automatic Emergency Braking System