Emergency Breaking System

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CONTEXT

- Introduction
- Working
- Components Used
- Advantages and Disadvantages
- Conclusion

INTRODUCTION

- Nowadays, the rate of occurrence of accidents is very high and mostly happens merely due to human error. The consequences and aftermath of accidents are so dangerous and devastating, that usually results in life threatening outcome such as human death, severe injuries, vehicle and environment damage etc.

- The primary causes for such accidents are uncontrollable speed by the drivers and more predominantly the delay in reflection time to hit the brakes.

- This project is designed to develop a new system that can solve the problem where drivers may miss to hit the brakes manually but the vehicles can stop automatically when encounter the close proximity of obstacles (other vehicles or people or animals etc.) in front of them.

- The project under proposal uses ultrasonic technology as a ranging sensor, in which ultrasonic sensor works based on the wave reflection of the transmitter when an obstacle is detected during the course of collision.

- A micro processor based Arduino board is used which consists the PIC microcontroller in it. An algorithm written in C language controls the logic. Also, a 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 vehicle.

- 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.

WORKING OF AUTOMATIC BRAKING SYSTEM

- 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 presenting the path of the vehicle.
- If an object is detected, the system can then determine if the speed of the vehicles 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 obstacles.
- 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.

COMPONENTS USED

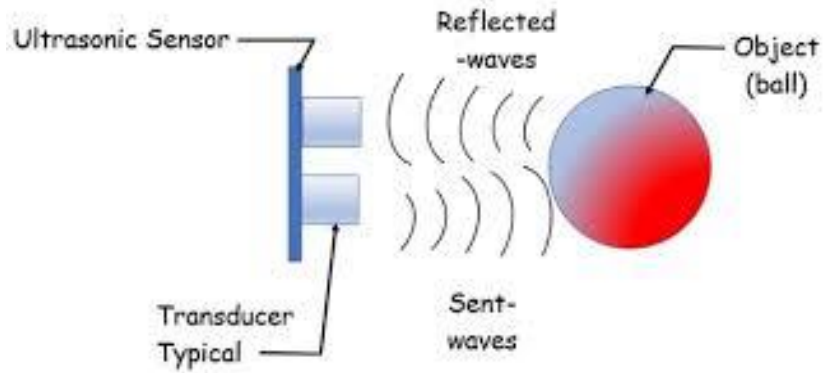
- Ultrasonic Sensor (transmitter and receiver)
- Electric motor (DC gear motor)
- ARDUINO UNO R3
- L298N motor drive

Ultrasonic Transmitter:

Before transmitting the ultrasonic wave, there is a part which is ultrasonic wave generator that functions to generate ultrasonic wave.

In that part, there is timing instruction to generate 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.

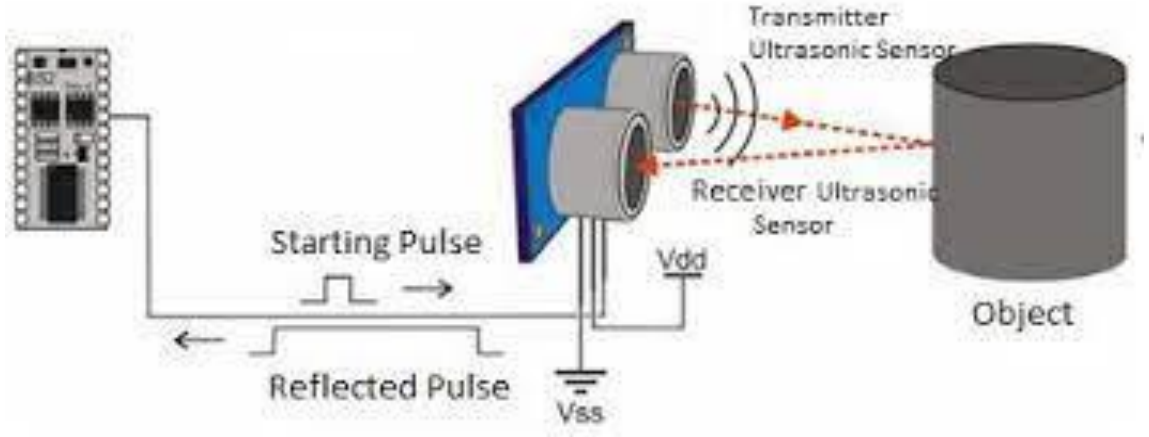


ULTRASONIC RECEIVER:

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.



DC GEAR MOTOR

A ‘DC’ gear motor is a fairly simple electric gear motor that uses electricity, gear box and magnetic field to produce torque, which tums the motor.

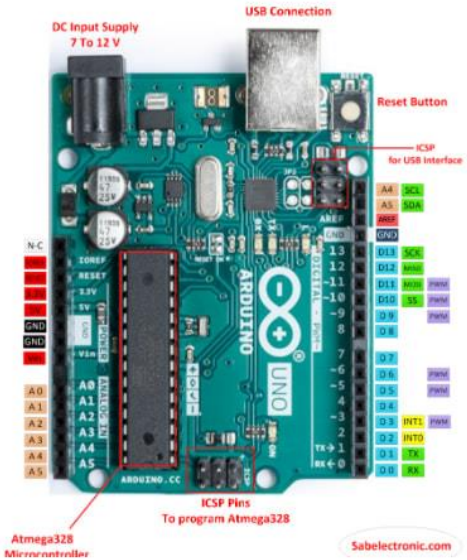
At its most simple, DC gear motor requires two magnets of opposite polarity and an electric coil, which acts as an electric magnet. The repellent and attractive electromagnetic forces of the magnets is provide the torque and causes the DC gear motor to turn.

A gear box is present just after the DC motor and a rotary shaft is connected to it, with the help of this DC gear motor setup the vehicle wheels can be rotated in this project.

10V Motor

ARDUINO UNO

- Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects.
- This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, servos, and motors as an output.
- Arduino UNO features AVR microcontroller Atmega328, 6 analogue input pins, and 14 digital I/O pins out of which 6 are used as PWM output.
- Arduino UNO is easy to program and a person with little or no technical knowledge can get hands-on experience with this board. The Arduino UNO board is programmed using Arduino IDE software which is an official software introduced by Arduino.cc to program the board.



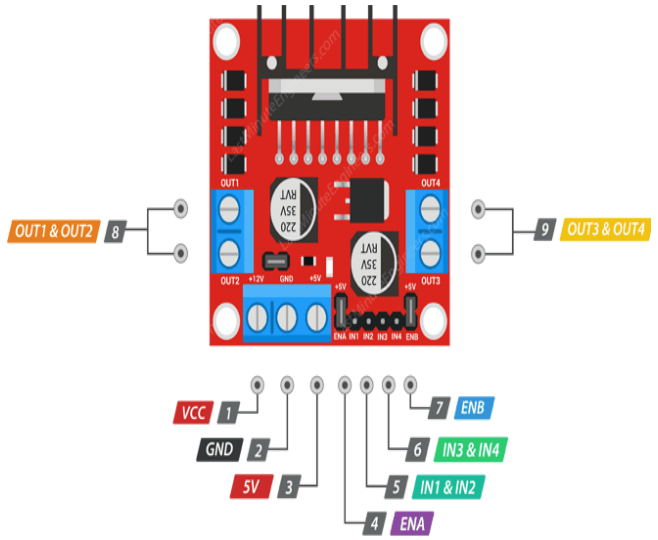
Arduino UNO Pinout

L298N DRIVER

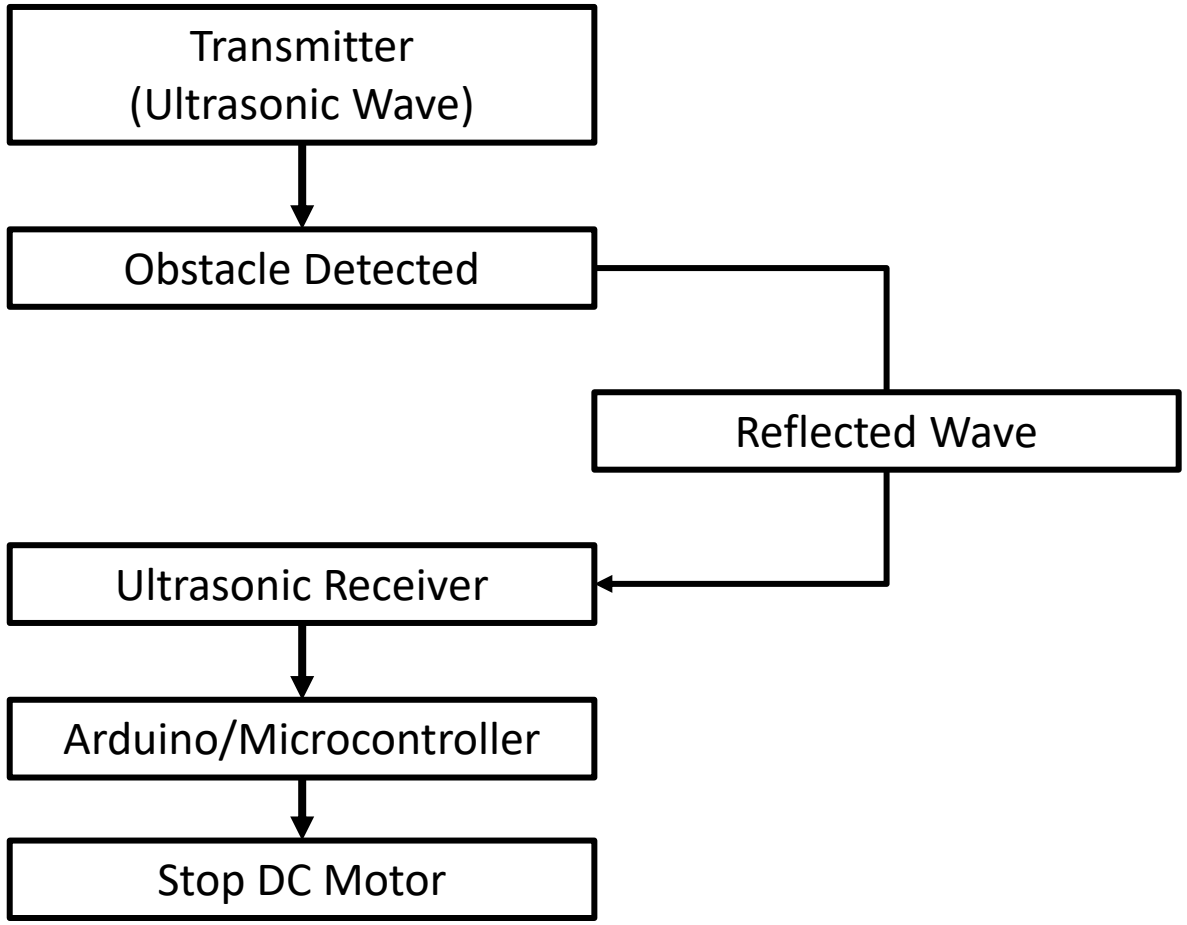
- The L298N is a dual H-Bridge motor driver which allows speed and direction control of two DC motors at the same time. The module can drive DC motors that have voltages between 5 and 35V, with a peak current up to 2A.

- A closer look at the pinout of L298N module and explain how it works. The module has two screw terminal blocks for the motor A and B, and another screw terminal block for the Ground pin, the VCC for motor and a 5V pin which can either be an input or output.

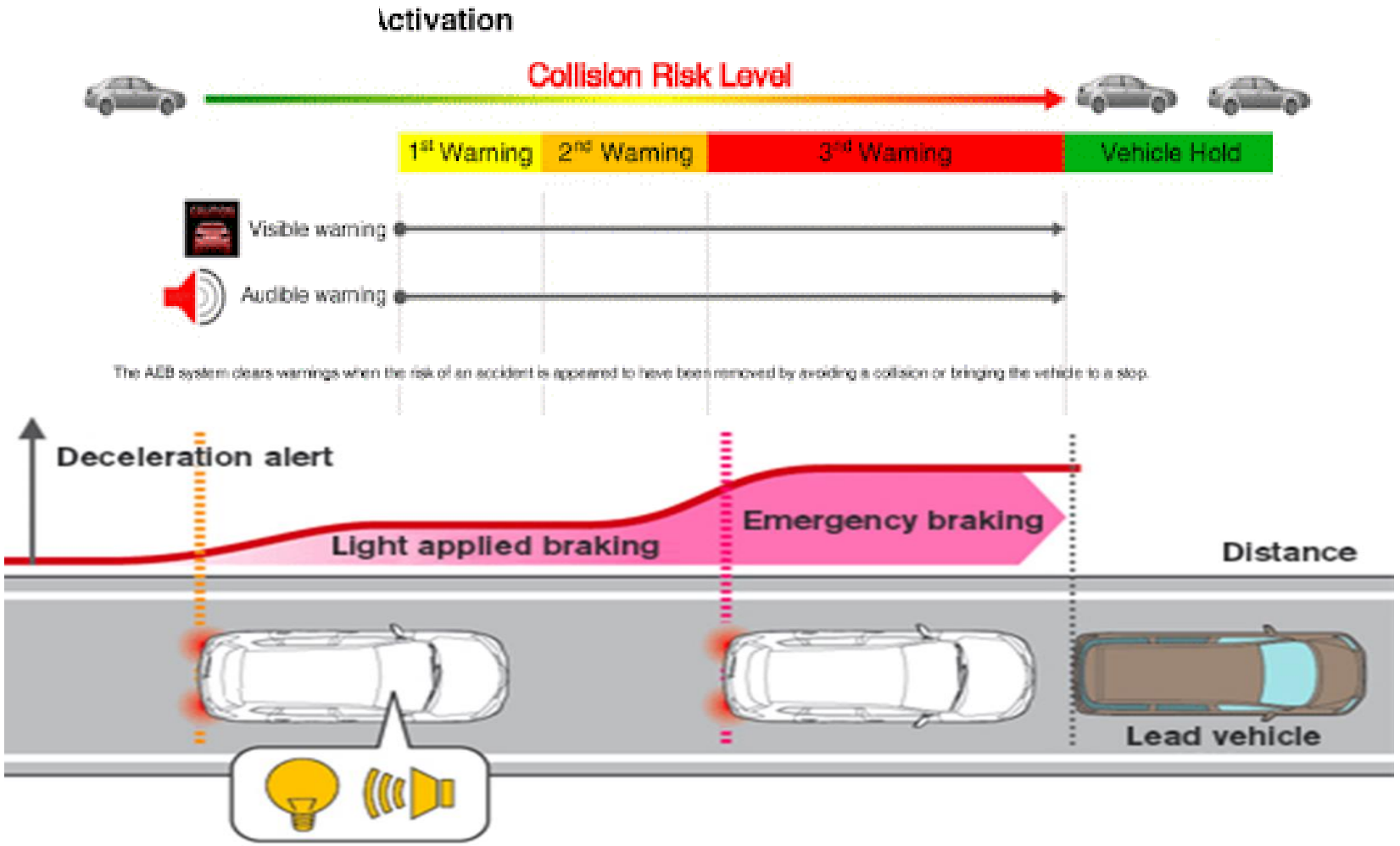
- This depends on the voltage used at the motors VCC. The module have an onboard 5V regulator which is either enabled or disabled using a jumper. If the motor supply voltage is up to 12V we can enable the 5V regulator and the 5V pin can be used as output, for example for powering our Arduino board



BLOCK DIAGRAM OF AN AUTOMATIC BREAKING SYSTEM



OVERVIEW OF EMERGENCY BREAKING SYSTEM



ADVANTAGES

- Discrete distances to moving objects can be detected and measured
- Speed of the vehicle can be controlled and stopped if necessary in order to avoid collision of vehicles
- By using IOT we can communicate with the other vehicles and avoid the accidents
- 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
- In future we can see every 4 wheeler and even 2 wheelers will have this system to avoid accidents

DISADVANTAGES

- Interference between the projected waves and the reflected waves takes place, and development of standing waves provides adverse effects.
- It is impossible to discern between reflected waves from the road surface and reflected waves from other places or objects.
- The 4 wheeler should be capable for this kind of system to be installed on it, its is useless for the old cars with old breaking system.
- This emergency breaking system is still under development so it needs to be tested and then release into the market.

CONCLUSION

- This project presents the implementation of an Emergency 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 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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ANY QUESTIONS


Thank You