KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

KUET

COURSE NO: **ECE-3200**

COURSE NAME: **ELECTRONICS PROJECT DESIGN**

PROJECT NAME

"Smart Emergency Vehicle Control System"

Project Supervisor:	**Submitted By:**
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OBJECTIVES:

- To avoid vehicle collision
- To ensure safety of passengers
- To support advance emergency braking system
- To develop low-cost safety prototype

INTRODUCTION:

At least 1,329 people, including 291 women and 381 children, were killed and 2,361 others injured in 2,159 Vehicle accidents across Bangladesh in the first half of 2019, says a new report. Our prototype model of Emergency vehicle control does the job of braking and avoiding front & side collision between two vehicles. In this world of telecommunication and technology, a prototype named "Smart Emergency Vehicle Control System" is introduced. To do an efficiency testing we used Arduino and Sonar sensor for the response.

THEORY:

This is Arduino based collision detection warning system. This kind of system is fastest growing safety feature in automotive industries. Such system enables vehicles to identify the chances of collision and give visual and audio warning to driver. So that driver can take necessary action to avoid collision. This project idea is based on Arduino controller and the whole system will give you very good understanding that how this system works. The step-by-step method is explained so that you can make this system. The hardware connection, pin information and Arduino program is explained clearly.

"Smart Emergency Vehicle Control System" – here, Smart defines the use of microprocessor or Arduino, Emergency means it is when the vehicle detects the emergency situation, Vehicle represents that it is used for road transport, Control defines it can start and brake the vehicle and at last System presents the overall idea.

Arduino UNO - The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.[2][3] The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits.

Sonar sensor - HC-SR04 Ultrasonic (US) sensor is a 4-pin module, whose pin names are Vcc, Trigger, Echo and Ground respectively. This sensor is a very popular sensor used in many applications where measuring distance or sensing objects are required. The module has two eyes like projects in the front which forms the Ultrasonic transmitter and Receiver. The sensor works with the simple high school formula that is-

$$\text{Distance} = \text{Speed} \times \text{Time}$$

Motor Driver- The L298N is an integrated monolithic circuit in a 15- lead Multiwatt and PowerSO20 packages. It is a high voltage, high current dual full-bridge driver de-signed to accept standard TTL logic level sand drive inductive loads such as relays, solenoids, DC and stepping motors. Two enable inputs are provided to enable or disable the device independently of the in-put signals.

Piezo Buzzer: Piezo buzzer used to make audio warning.

LED: Two types of led which is used to yellow & red. Yellow led used for 'need to pay attention' & Red is for 'necessary action required'.

APPARATUS REQUIRED:

No. of Apparatus	Apparatus Name	Ratings	Quantity
01	Car chassis		01
02	Breadboard		02
03	Motor	5V	02
04	Wheel		02
05	Motor driver	L298N	01
06	Arduino	ATMega 2560	01
07	Sonar Sensor	HC-SR04	03

08	LED	5V	02
09	Buzzer	5V	01
10	Non-Rechargeable Battery	9V	01
11	Rechargeable Battery	3.7V	04
12	Battery Case		01
13	Ball Caster		01
14	Arduino Power input jack(5.5mm)		01
15	Connecting Wires		As required

BLOCK DIAGRAM:

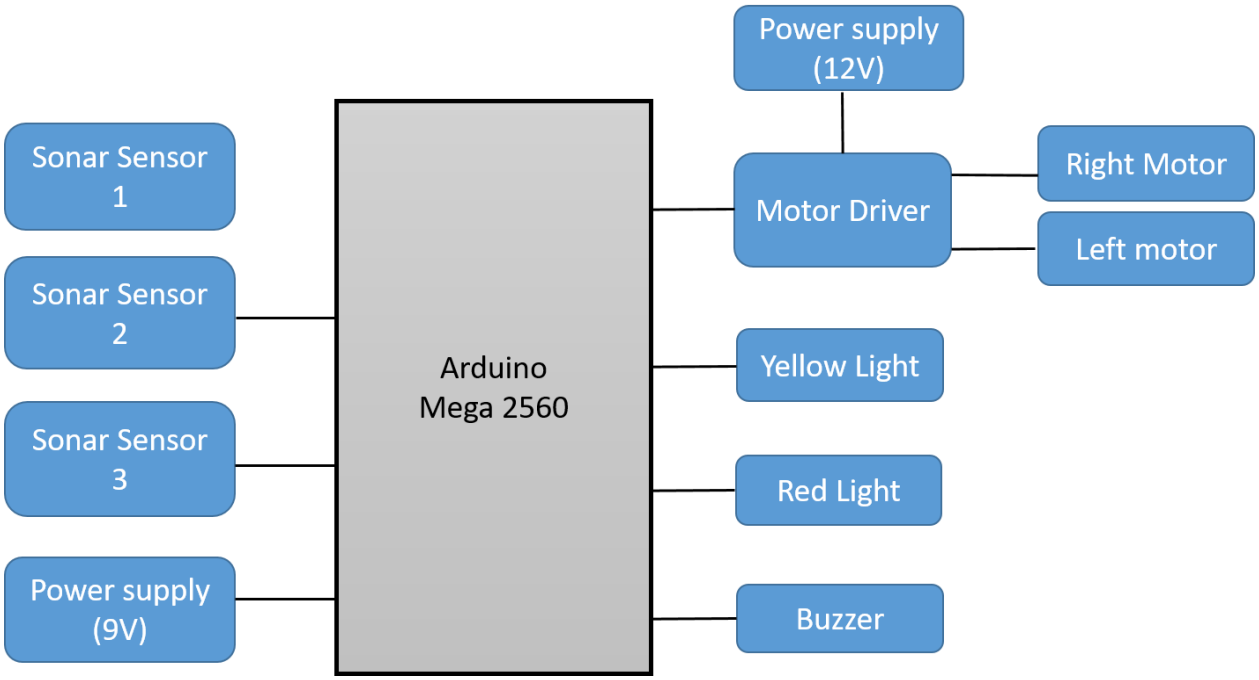

Fig 1: Block Diagram of the prototype

WORKING PROCEDURE:

Fig 2.1: Working Procedure

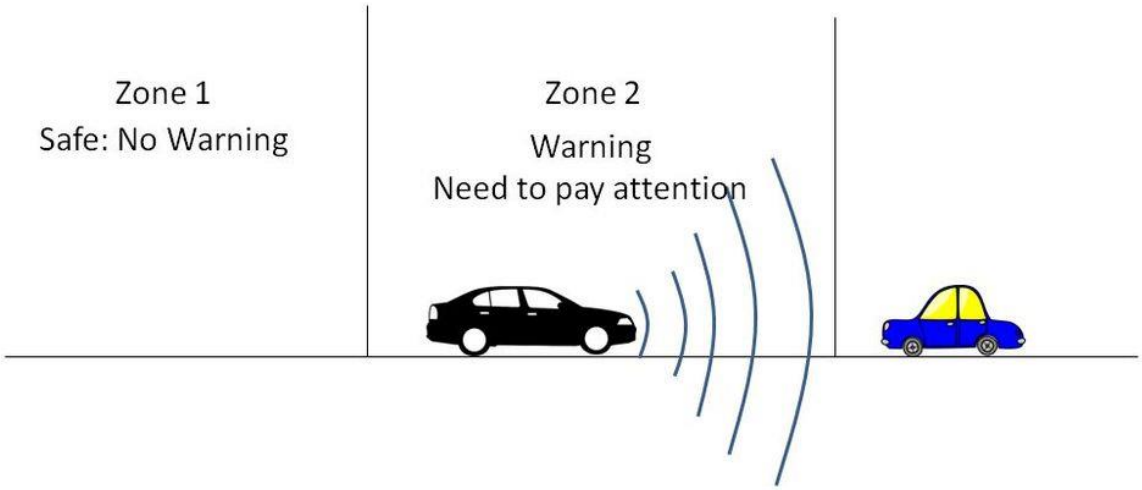

Fig 2.2: Working Procedure

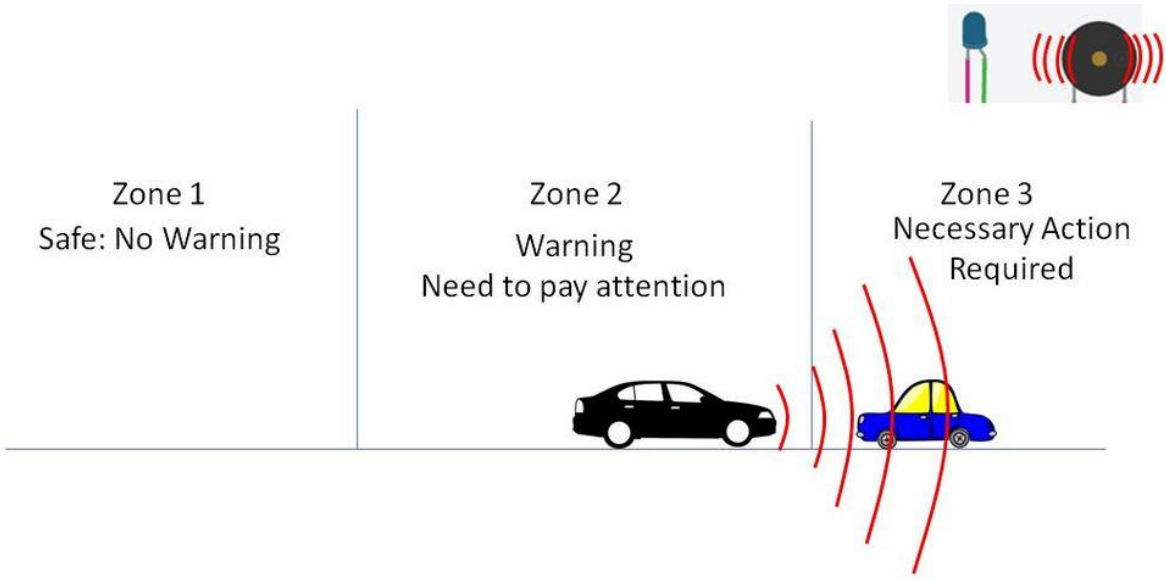

Fig 2.3: Working Procedure

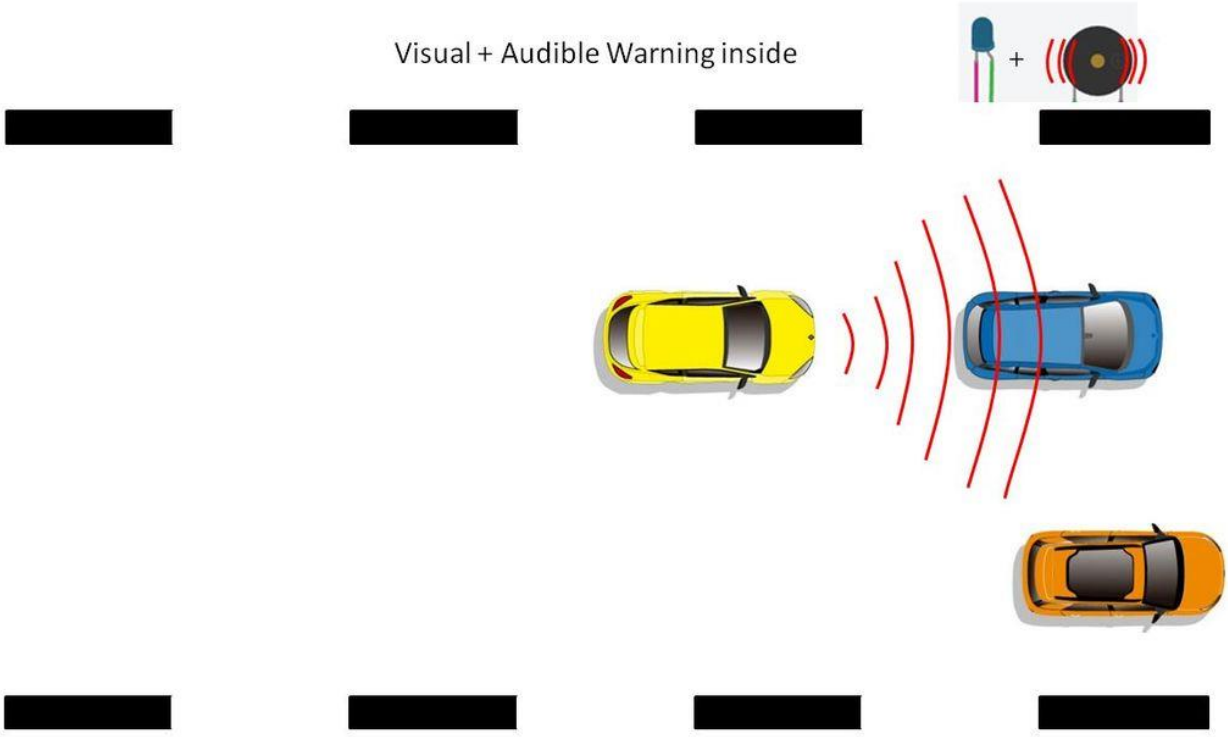

Fig 2.4: Working Procedure

Fig 2.5: Working Procedure

COST ANALYSIS:

Apparatus Name	Quantity	Cost (Taka)
Car chassis	01	300
Breadboard	02	100
Motor	02	80*2=160
Wheel	02	60*2=120
Motor driver	01	300
Arduino	01	900
Sonar Sensor	03	100*3=300
LED	02	5*2=10
Buzzer	01	20
Non-Rechargeable Battery	01	40
Rechargeable Battery	04	4*70=240
Battery Case	01	50

Ball Caster	01	60
Arduino Power input jack(5.5mm)	01	20
Connecting Wires	As required	60
Glue Gun	01	300
Glue Sticks	02	15*2=30
Screw	As required	70
Battery Charger	01	250
		Total = 3330 taka

FEATURES:

- Identify front vehicle
- Blinking when the vehicle enters at medium safe zone
- Buzzing alarm & blinking As The vehicles enters at NO Safe zone
- Notify the driver to brake the vehicle immediately
- Automatic brake before impact
- Can work directly with the on-board computer of electric vehicle
- Can be modified to work with autonomous vehicle

MARKET VALUE:

Currently Audi, BMW, Volvo, Mercedes Benz, Toyota etc. vehicle manufacturing companies are using the same type technology to ensure Safety from front vehicle collision, which are cost Around 50 to 1000 USD. But our prototype cost only 30 USD at most. The overall achievement is to ensure safety and avoid collision with front vehicle.

DISCUSSION:

This is merely a prototype with less precise equipment but by doing certain research and recreating it with more precise sensors & modules and a rigid structure it could cause a huge impact in automobile industry. Here, the Sonar

we used here has a Maximum range of detecting Object up to 200 cm. So, for our Prototype can be modified to Work up to 150cm. Our designed Model works perfectly at less than 30 cm. Here the prototype notified and did brake the vehicle every time we tested a trail run. The lowest length was less 30 cm. The efficiency of the prototype significantly reduces as we increase the number of sonar sensors.

The overall cost was very efficient compared to the regular collision system. The idea can easily be converted to a business idea if proper help is given.

CONCLUSION:

We can make the system more stable and test it for a long length if the cost is 10 USD more. Using of Sonar sensor cut the cost to half. Electric Vehicle is getting famous in Bangladesh day by day. The prototype can easily be implemented and front collision of two vehicle can be avoided. We can save thousands lives by creating a technological idea.

REFERENCES:

[1]. https://en.wikipedia.org/wiki/Collision_avoidance_system

[2]. https://www.tutorialspoint.com/arduino/arduino_ultrasonic_sensor.htm

[3]. https://howtomechatronics.com/tutorials/arduino/arduino-dc-motor-control-tutorial-l298n-pwm-h-bridge/