ICEST-2K24 [International Conference on Engineering, Science and Technology]
In Association with
International Journal of Scientific Research in Science, Engineering and Technology
Print ISSN - 2395-1990 | Online ISSN : 2394-4099 (www.ijsrset.com)

Emergency Breaking System with Wireless EV Charging

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ABSTRACT

An emergency braking system is a critical safety feature that automatically applies the brakes of a vehicle in case of an emergency. This system can help prevent accidents or reduce the severity of collisions by slowing down or stopping the vehicle when a driver is unable to do so in time. There are various types of emergency braking systems, such as automatic emergency braking (AEB) and electronic stability control (ESC), which use sensors to detect potential collisions and help prevent skidding and loss of control in slippery road conditions. The use of emergency braking systems has become increasingly common in modern vehicles, and they have been shown to greatly improve safety on the road. However, it is important to remember that these systems are not infallible, and drivers should always remain alert and ready to take action in case of an emergency. Overall, emergency braking systems play a crucial role in ensuring the safety of drivers, passengers, and other road users, and their continued development and implementation are essential for further reducing the number of traffic accidents and fatalities.

I. INTRODUCTION

The rise of vehicle technology has been rapid in recent years. This is especially true in relation to sensing and braking systemsThe prevalent introduction of anti-lock braking systems (ABS) has provided the erection blocks for a wide-ranging variety of braking control systems. Additional hardware that allows brakepressuretobeincreasedabovehandledemandaswellastobeabridged,mutualwithadditional software control processes and sensors allow traction control (TC), electronic brake forcedistribution (EBD), brake assist (BAS) and electronic stability control (ESC) utilities to be added. In parallel to the expansion of braking technologies, sensors have been established that are capable of detecting physical obstacles, other vehicles or foot-travelers around the vehicle. Many luxury, mid- size and small cars in Europe, and in Japan even verysmall cars, are now built-in with an adaptive cruise control (ACC) system that is capable of calculating and maintaining a driver-preset movement to the vehicle ahead by automatic modulation of the engine control, and if required, automatically applying brakes up to a maximum deceleration of 0.3g (as per ISO standard).If not any vehicle is forward, the vehicle upholds the preferred “set-speed”. ACC can be well-ordered as an option for new vehicles. At least three heavy truck companies offer this feature on their vehicles. Ideally, a vehicle armed with new

braking technology and adaptive cruise control is prepared with all of the essential hardware to allow a simple crashpreventionsystem that would be capable of identifying when a crash is likely to happen and applying emergency braking to avoid it. Crash alleviation systems are already on the market, providing limited braking ability.

II. LITERATURE SURVEY

McCarthy et al (2004) carried out research that magnificently established a proof of concept sensor system that was capable of detecting foot-travelers in front of a vehicle. This project found that such a system could potentially be used to brake the vehicle and/or to implement active secondary safety features such as a pop-up bonnet and that this could offer substantial benefits in pedestrian accidents. The prototype system was developed by fusing a high resolution 24 GHz short range radar with a passive infra-red sensor. The basic functions were that the radar was used to identify distance and relative velocity accurately and the infra-red sensor was used to decide whether or not the object detected by the radar was a pedestrian or not.

Kalhammer et al (2006) also identified the possibility of developing systems capable of detecting pedestrians using a long-wave infra red camera. It was listed that this would be capable of making part of an better brake assist function and/or as part of an independently braking system. The authors concluded that it was feasible to develop such a system in time to meet the proposed requirements for complementary measures included in the second phase of the pedestrian protection Directive.

Walchshausl et al (2006) describe the development of a multi-sensor recognition system capable of detecting vehicles, objects and pedestrians. The system consisted of a far-infrared imaging device, a laser scanner and several radar sensors, integrated into a BMW passenger car. They state that the reason for developing a multi-sensor approach was that robust collision mitigation requires a perception performance of unprecedented reliability and that “current off-the-shelf single sensor approaches can hardly fulfil the challenging demands”.

Elliott *et al* (2003) showed that a large proportion of killed and seriously injured motorcyclistsresulted from a collision with a car. Some of the AEBS currently in production are claimed to be capable of detecting a large motorcycle in the centre of the lane (Nitsche and Schulz, 2004).

III.DESIGN AND IMPROVEMENT

The Design and improvement is distributed into three fields. The hardware implementation, System Architecture, and Circuit development.

A. Objectives

The objective of emergency braking systems is to enhance road safety and prevent or reduce the severity of accidents by automatically applying the brakes in emergency situations. These systems are designed to assist drivers and help them avoid collisions when they are unable to react in time, such as when they are distracted, fatigued, or faced with unexpected obstacles on the road.

The main goal of emergency braking systems is to reduce the number of traffic accidents and fatalities, which is a major public health concern worldwide. These systems are part of a broader effort to improve road safety through technological innovations and driver education.

In addition to preventing accidents, emergency braking systems can also reduce the severity of crashes and injuries when accidents do occur. By slowing down or stopping the vehicle before impact, these systems can help reduce the force of the collision and the resulting damage to the vehicle and its occupants.

Overall, the objective of emergency braking systems is to make driving safer and reduce the human and economic costs associated with traffic accidents. These systems have the potential to save lives and improve the quality of life for individuals and communities around the world.

B. Hardware Implementation

The Block diagram is shown below in the figure.1 depicts the entire robot system which illustrates the operation of the entire system.

Ultrasonic Sensor

Like radar, lidar and active infrared systems, ultrasound can be used in detection and ranging applications using the time of flight principle to estimate the distance to an object. Ultrasonic radiations are effectually sounds waves with frequencies higher than that audible to the human ear, proper for short to medium range applications at low speed. A scanning sonar sensor based on a phased array of ultrasonic sensors facilitates gathering information on the distance, angular position, velocity and nature of surrounding obstacles. Ultrasonic sensors provide a good signal of vehicle toobstacledistances,arelessinclinedtobeingaffectedby abuildupofremains,havegoodresponse times and are low cost. However their performance is only suitable for short and medium range applications, fluctuations in operating voltage reduces performance and the accuracy of object detection is sometimes affected by reflected signals.

ESP8266 Controller

ESP8266 is a very low cost & user-friendly WiFi module, which improves a simple TCP/IP connection and can simply be interfaced with microcontrollers via Serial Port. The first chip in this series was ESP-01 that gained a sheer attention in the market.

Motor Driver-L298D

L-298 is an Integrated Circuit (IC) existing in dual type of setscurrently a days which will be given later. L 298 is a double full bridge driver that has a ability to tolerate high voltage as well as high current. It obtains basic TTL (Transistor Transistor Logic) logic levels and is capable to operate the different loads such as DC motors, stepper motors, relays etc.L-298 has dual enable input to handle any device by enabling or disabling it. L 298 IC is most frequently used to create motor drivers or motor controllers. These motor controllers can be handled by any micro controller e.g Arduino, PIC, Raspberry Pi etc.They obtains input from micro controllers and control the load dedicated to their output terminals respectively. L-298 motor driver (H-Bridge) is able to control two different DC motors instantaneously.

Battery-Lithium Iron 3S

The 3S 40A Lithium Ion BMS is a high current Battery Management System for Lithium Ion Battery Packet. The BMS offers Overcharge, Over Discharge, and Short Circuit Protection. This BMS is for a 3 Series Battery Pack i.e 11.1V Lithium Iron Battery Pack.This 3S 40A Lithium Ion BMS should not be used with Drill Motor, as this does not offer Stability charging of the Battery Pack, and might damage the battery as well the BMS.

Wires/Jumpers

Jumper wires, also known as jumper leads or simply jumpers, are electrical cables used to make temporary connections between two points in an electronic circuit. They are typically made of insulated wire with alligator clips or other types of connectors on each end Jumper wires are commonly used in a variety of

electronics applications, such as prototyping and testing circuits, repairing or modifying electronic devices, and troubleshooting electrical problems. They allow for quick and easy connections between components without the need for soldering or other permanent connections.

Wireless Charging Module-5V/1A

The Wireless Charging Module can be useful in electronic equipment in common use for close wireless charging or power supply. Contained of a transmitter and isolation coil, it could serve as a spare for the Wireless Power Supply with stable 5V output voltage and maximum 1.2A output current. Its small size and isolation coil is more appropriate for using in wireless project.

Power Bank Module with Display

The 5V 2.4A Twin USB + Type-C + Micro + Lightning/Apple USB Power Bank module With LED Display is suitable for a DIY moveable backup power supply with a charging input that matches the 5.0V adapter. the system will deliver an exact battery indication. However charging, the LED digital screen displays the current battery charge status.

C. Methodology

Sensors detect a potential collision and take action to avoid it entirely, takingcontrolaway fromthedriver.Inthecontextofbrakingthisislikely toincludeapplying emergency braking sufficiently early that the vehicle can be brought to a stand still before a collision occurs. Formerly the sensing system has detected that the impact has become certain irrespective of braking or steering actions then emergency braking is automatically applied (independent of driver action) to reduce the collision speed, and hence injury brutality, of the collision. This type of system has lower potential benefits but is lower risk because it will not take control away from the driver until a point very close to a collision where the sensing system is likely to be more dependable. We can operating our car with remote control using ESP8266 WIFI Robot Car application on smartphone.

1. Block Diagram

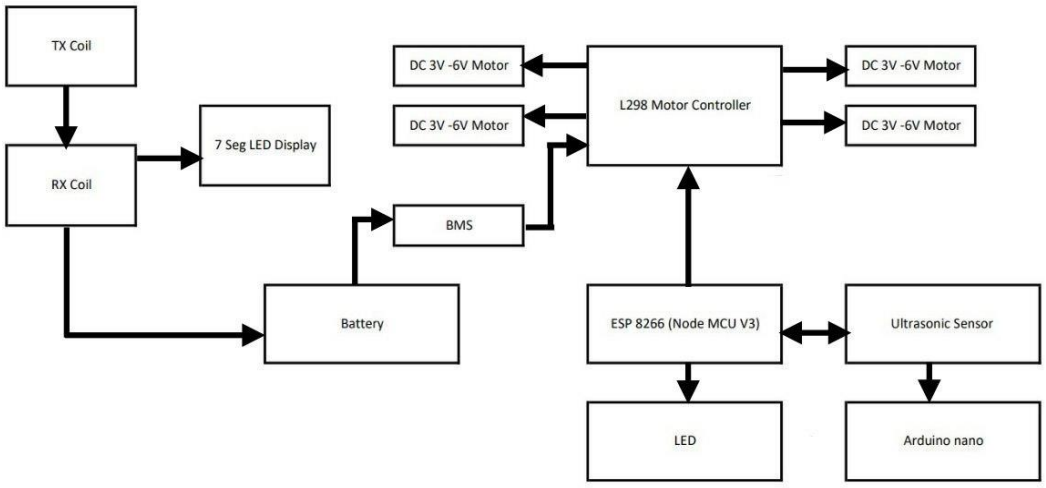

Figure 1 Block diagram of the proposed system

2. Flow Chart:

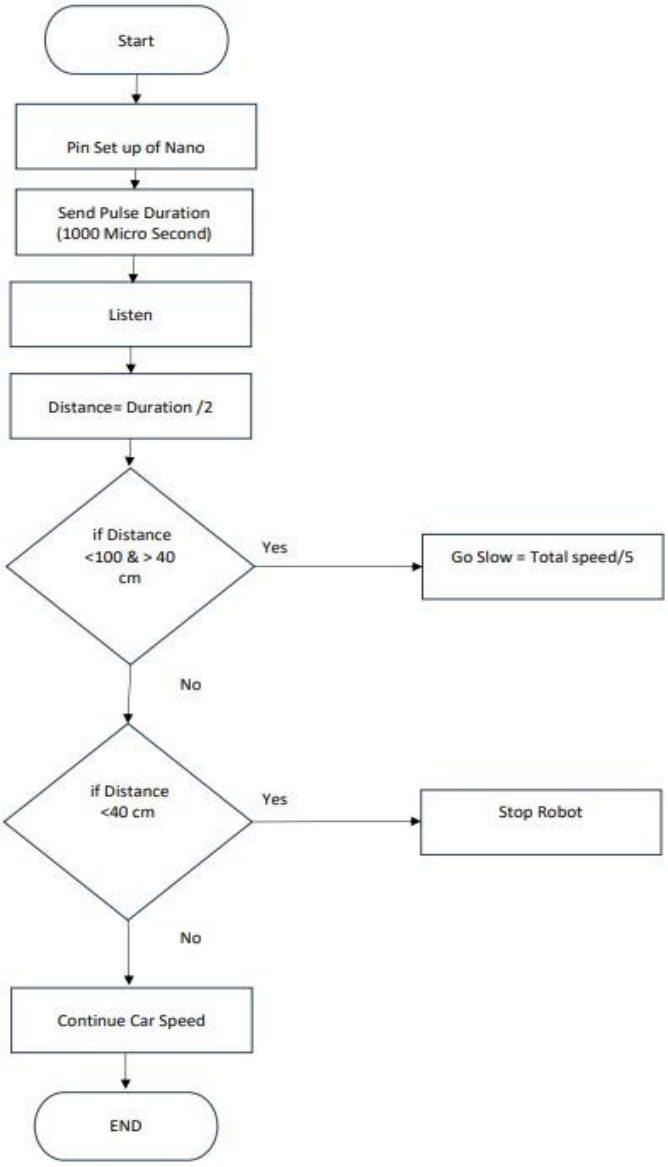

Figure.2 Design flow of the Arduino Nano working

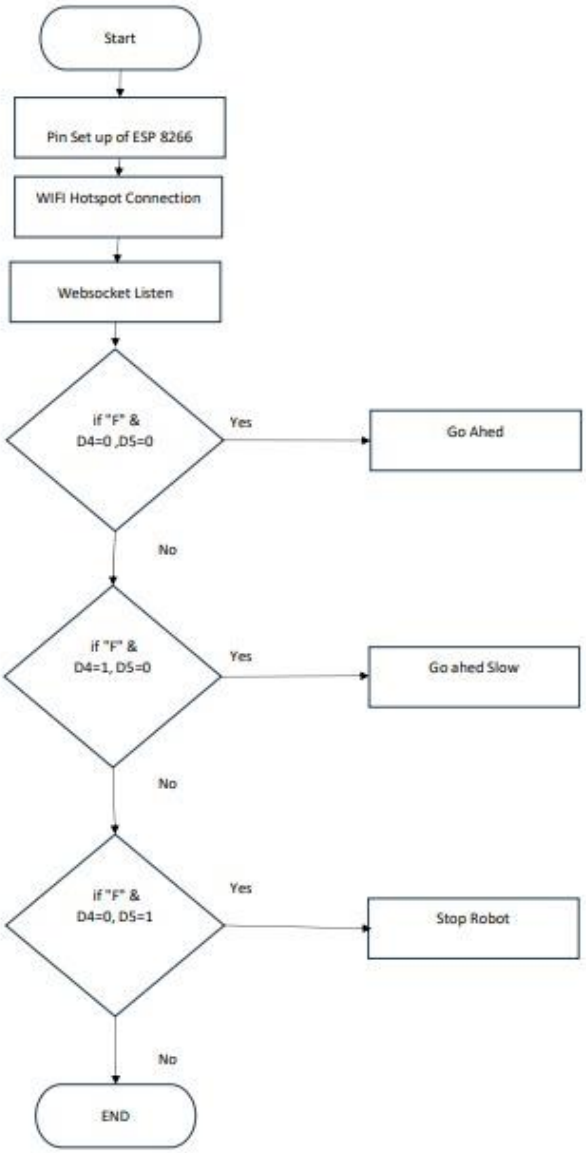

Figure.3 Design flow of the ESP8266 working

IV. RESULTS

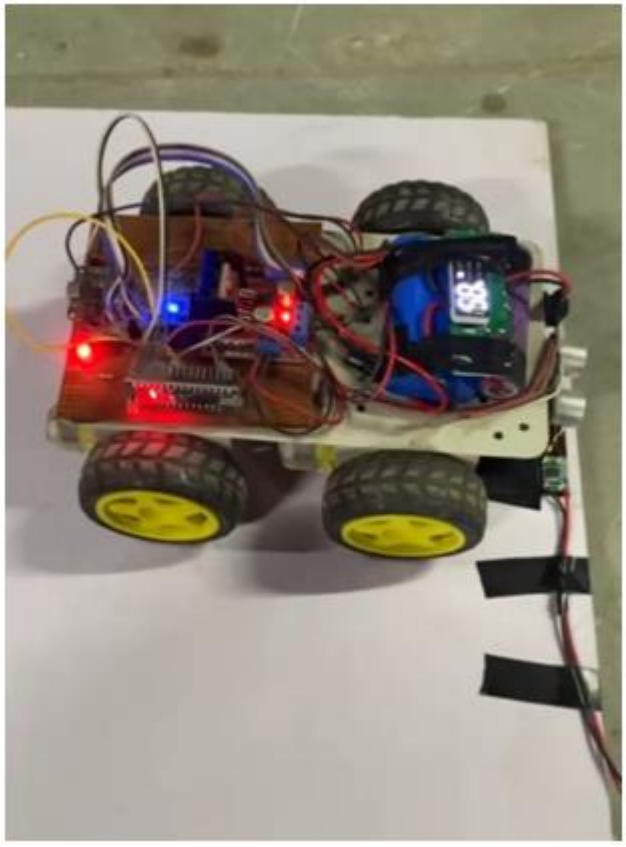

Figure.4 Hardware

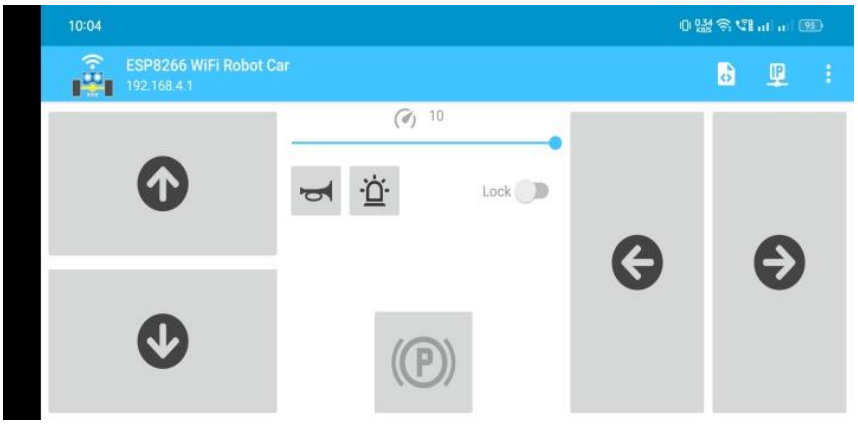

Figure.5 Remote Control Application

This section provides details on the evaluation results of this project. The purpose of our article is clear. As far as we know, our robot model does not create any interference, the movement of the robot depends on the information we give to the remote control. Control of the circuit Customers can better use it directly, he main conclusion we get is that Arduino cannot work at the same time, but in our system we used ESP8266 module and Arduino Nano so that everything performs many functions. Android app installed on your phone. These features make our robots simple and easy to use in our daily lives.

Result Calculations:

Parameters	Calculations
Charge	Battery Charging 10% in one hour.
Speed Of Car	Assign Speed/5
Yellow LED	If obstacle away from 100cm then blink yellow LED. (Distance<=100)
Red LED	If obstacle away from 40cm then blink Red LED.
Reduced Speed when blink yellow led	Current Speed of car/2.
Emergency Breaking when blink red led	If obstacle away from 40cm then automatically stop the car.(distance> =40)

V. CONCLUSION

Automatic emergency braking systems (AEBS) were in manufacture on a number of current vehicles at the top end of the market in the initial stages of this work and are capable of autonomously mitigating two-vehicle front to rear shunt accidents as well as some collisions with fixed objects and motorcycles. Such systems were fitted together with ACC and forward collision warning systems that mutual the same hardware.

Systems are presently in various stages of development that will also act in pedestrian collisions and towards the end of the project at least one system offering some pedestrian functionality was released on a assembly vehicle. There is also a strong study base that aims to develop systems skilful of acting in other vehicle to vehicle impact configurations.

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