WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Avoiding Runover Accidents A Large Vehicle Safety Solution

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DOI : https://www.doi.org/10.56726/IRJMETS35918

ABSTRACT

The aim of the project "AVOIDING RUNOVER ACCIDENTS A LARGE VEHICLE SAFETY SOLUTION ". The project focuses on developing safety solutions for large vehicles to prevent rollover accidents. Large vehicles such as trucks and buses have blind spots that prevent drivers from seeing pedestrians and other vehicles. Solutions include the development of sensor systems that can detect objects in the blind spot and alert drivers. The system will be tested using simulated and real-world conditions to ensure proper functioning.The project aims to reduce the number of accidents with large vehicles and increase overall safety. The working principle of the test model of our device is based on a passive infrared detector (PIR) (used to detect humans and animals by receiving infrared radiation) and a V-shaped foam shield around the engine. They block nearby wheels. An Arduino uno helps move the Passive Infrared (PIR) sensor and the V-shaped foam shield panel in the right direction. The L298N motor driver between the Arduino and the wheel is used to convert the voltage the needs to move the wheel.

Keywords: V-shaped foam sheets, Arduino, PIR Sensor, L298N Motor Drivers.

I. INTRODUCTION

Runover accidents involving large vehicles, such as trucks and buses, have become a significant concern for road safety in recent years. According to the National Highway Traffic Safety Administration (NHTSA), around 4,000 people are killed and thousands more are injured every year due to runover accidents involving large vehicles. The size and design of these vehicles make it difficult for drivers to see pedestrians and other vehicles, particularly in blind spots. To address this issue, this project proposes a safety solution for large vehicles to prevent runover accidents. The solution includes the development of a sensor system that can detect objects in blind spots and provide warnings to the driver. This project aims to reduce the number of runover accidents involving large vehicles and improve overall road safety. The sensor system will be designed to detect objects in the blind spots of large vehicles and provide real-time warnings to the driver. The system will use a sensor to detect the presence of pedestrians, cyclists, and other vehicles. The system will also be integrated with the vehicle's existing safety features, such as the braking system, to automatically slow down or stop the vehicle if an object is detected in its path. The proposed safety solution will be tested using simulations and real-world scenarios to ensure its effectiveness. The simulations will enable the project team to evaluate the system's performance under different conditions and make necessary adjustments before testing the system in real-world settings. The project team will work with industry partners and stakeholders to ensure the system meets industry standards and regulations. The outcomes of this project will contribute to the development of innovative safety solutions for large vehicles and improve road safety for all road users. By the proposed approach, described in this paper, the low-cost, simple and friendly solution for avoiding the runover accidents.If we feel that the alignment of the system is not properly done then also with the help of this app, we can fix the alignment of the panel. This could be done using the ESP8266, a wifi module which is connected to any wifi server. Once the module is connected to any server, then we can operate the system using this app from anywhere around the world.

II. SYSTEM DESCRIPTION

In this system we use PIR sensor placed near to front wheels, this sensor will detect the people or animal from a distance.

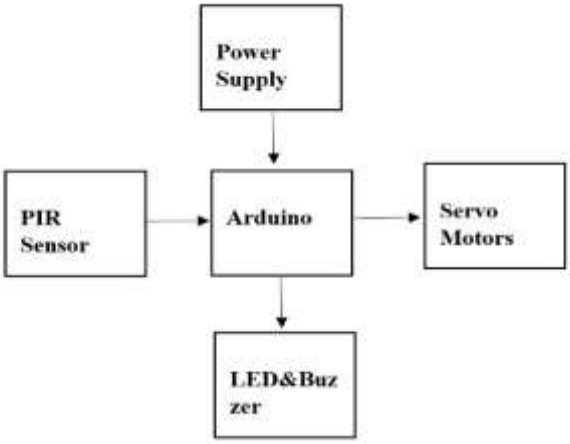

Fig 1. Block Diagram

Figure above shows the block diagram of System. It consists of the servo; Arduino Uno along with ATmega328 which is a micro-controller; PIR sensors to detect the persons/animals in front of the vehicle; LED & Buzzer are act as an alert system for the driver. After arranging all these components, a power supply is applied to the system in order to start the working of the system.

2.1 Microcontroller

Figure 2. Arduino Uno

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, 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 an AC-to-DC adapter or battery to get started.

2.2 PIR Sensor

Fig 3. PASSIVE INFRARED SENSOR

A PIR (Passive Infrared) sensor is an electronic device that detects the presence of a person or object by measuring the infrared radiation emitted by the person or object. PIR sensors are often used in motion detection applications such as security, automatic lighting, and HVAC control. The sensor contains a pyroelectric element that generates a small charge when exposed to infrared radiation. The sensor is designed to detect changes in the level of infrared radiation in the field of view. When a person or object enters the field of view, the sensor detects the change in electrical level and causes a signal output. PIR sensors are passive, meaning they do not emit electricity and only respond to electricity emitted by objects in their field of view. They are very powerful and can detect motion even in pitch dark. PIR sensors are widely used in the field of security due to their low cost, reliability, and ease of installation.

2.3 Servo Motor

Fig 4. SERVO MOTOR

The servo motor is controlled by PWM (pulse modulation) provided by the control line. It has a minimum impact, maximum impact, and repetition rate . The servo body can rotate 90 degrees in both directions from its middle position. The servo motor expects to see a pulse every 20 milliseconds (ms), a nd the length of the pulse determines how fast the motor rotates. As we know work = FORCE X DISTANCE, in DC motor the force is smaller andthe d istance (speed) is higher in servo the force is high and the distance is short.The potentiometer that calculates the angle and stops the DC motor at the de sired angle is connected to the output shaft of the servo.

2.4 Motor Driver

The L298N is a dual Hbridge driver integrated circuit (IC) that allows you to control the speed and direction of two DC motors or a stepper motor. It is often used in robotics and other applications that require precise control of motor movements. The L298N has two Hbridges, which are essentially four switches that can be turned on and off in different configurations to control the current flowing through the motor. Each Hbridge can control the directi on and speed of a motor.

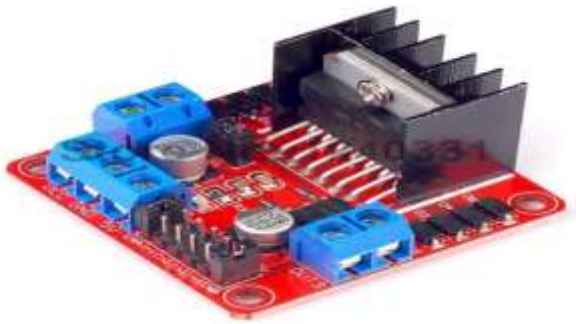

Fig 5. L298N MOTOR DRIVER

2.5 V-SHAPED FOAM SHEETS

Fig 6. V-SHAPED FOAM SHEETS

Vfoam fenders are a protective material often used for a variety of applications, including protecting vehicles and equipment from damage. Foam fende rs are usually made of a soft, durable foam material designed to absorb impacts and prevent damage to the underside. Vshaped foam guards provide gre

ater width than flat panels for better protection against impacts from various angles. The shape also helps diffuse the impact over a wider area, reducing the possibility of damaging the protected area.

III. METHODOLOGY

when the person or an animal enters within the sensors range limit in front of vehicle the sensors will be active and send the information to the motor, here the motor will immediately release the v shaped fabricated foam sheet (near to ground level), so if suddenly the human body fall near the bus wheel, then the v shaped foam sheets push him away, So the person cannot lie or roll under the wheels and save his life.

After the person is out of the sensor limit imminently the V-shaped foam sheets will rise up to its original position. And also, during festivals there will be a lot of crowds on the roads at that time unfortunately some people may stuck under the wheels due to crowd if the foam sheets are behind the wheels then the people will not injure.

Overall Circuit Diagram

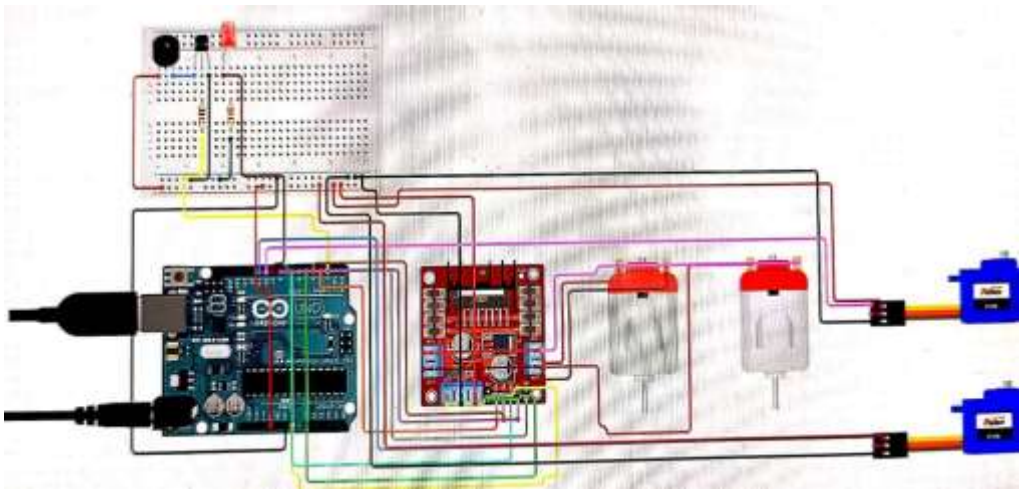

Fig 7. Circuit Diagram

The overall circuit diagram is illustrated in Figure 7.

IV. SOFTWARE IMPLEMENTATION

For the project implementation we need ARDUINO software and whole hardware setup The project designed using the development of code in the Arduino.

Fig 6.3 Arduino Uno IDE

6.1 ARDUINO SETUP

Steps for implementing the project code in Arduino software-

Step 1 Connect the circuit as shown in block diagram

Step 2 Download Arduino IDE Software

Step 3 Power up your board

Step 4 Launch Arduino IDE

Step 5 Open your pseudo code

Step 6 Select your Arduino board

Step 7 Install the libraries of Bluetooth and Motor drivers and include them in code

Step 8 Test the code by compiling and running the program

Step 9 After successful execution of program dump the code into Arduino using USB

Step 10 Now pair the mobile Bluetooth and Bluetooth module HC-05 using BT App

Step 11 Then click on "Select Device" icon to select paired BT Device.

Step 12 Then Tilt the mobile "FORWARD", "BACKWARD", "LEFT", AND "RIGHT" to control the direction of robot.

Step 14 Then the user can easily move anywhere, anytime easily using mobile app.

V. RESULT

After proper set up with hardware and code. This project elaborates the design and construction of Avoiding runover accidents: A large vehicle safety solution with the help of PIR sensor and V-Shaped foam guard sheets. The circuit works properly to move foam sheets as per the sensor detection. After designing the circuit that enables to reduce the pedestrians /vehicle runover accidents.

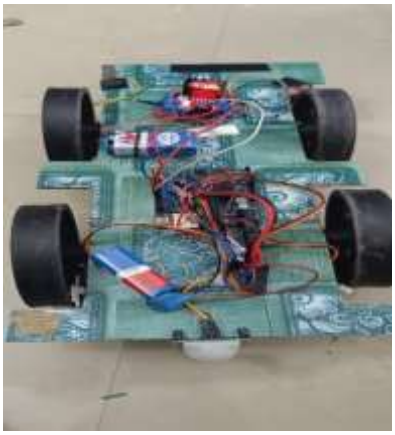

Fig 12. Final Assembly of the System

The system is a combination of mechanical, electrical and communication systems. The main objective is to design a system capable of reducing overtaking accidents and saving lives of pedestrians/vehicles. This project is a major initiative in India aimed at improving road safety and reducing the risk of rollovers involving large vehicles. The project aims to tackle the high number of pedestrian and cyclist fatalities by implementing a safety solution that uses technologies such as passive infrared sensors, warning devices to warn drivers/pedestrians of potential hazards and prevent accidents by using V-shaped foam boards. Using V-shaped foam skid plates also adds an extra layer of protection to larger vehicles, reducing the likelihood of damage and potential accidents. By combining these technologies, the project can help prevent accidents and improve road safety for all road users. Overall, the project is to address a major public health and safety issue in India and ensure that large vehicles can travel safely and responsibly on the roads. Through continued effort and investment in road safety solutions, we can work towards a future where rollovers and other road accidents are a thing of the past and all road users can travel safely and securely. trust. The system has undergone some tests and has successfully completed the basic performance.

VI. FUTURE SCOPE

The project has significant future significance du e to the growing need to address road safety iss ues in India and other countries. Some potential future directions for this project include:

- ✓ Integration with autonomous vehicle technology: As autonomous vehicles become more common, there may be opportunities to integrate the security Solutions proposed in this project with these vehicles. It could improve the safety of self-driving cars by providing additional s safety measures to prevent accidents.
- ✓ Extension to other countries and vehicle types: The security solution offered by this project is applicable to large vehicles in many countries, not just India. There may also be opportunities to expand the project to other countries.
- ✓ Integration with smart city infrastructure: As cities become more connected an d smart, there may be opportunities to integrate the security solutions propose d in this project with other smart city infrastructure such as traffic lights and pedestrian crossings. This increases the o verall safety of the road network and reduces the risk of accidents.
- ✓ Advanced Warning and Avoidance Systems: There may be opportunities to de velop advanced warning and avoidance systems that use artificial intelligence and machine learning to predict and pre vent accidents. These systems could provide drivers and pedestrians with mor e accurate and timely warnings, potentially further reducing the number of accidents.

This significant future scope, with potential applications in a range of countries and contexts. Ongoing research and development in this area is helping to improve road safety

VII. CONCLUSION

The system is a combination of mechanical, electrical and communication systems. The main objective is to design a system capable of reducing overtaking accidents and saving lives of pedestrians/vehicles. This project is a major initiative in India aimed at improving road safety and reducing the risk of rollovers involving large vehicles. The project aims to tackle the high number of pedestrian and cyclist fatalities by implementing a safety solution that uses technologies such as passive infrared sensors, warning devices to warn drivers/pedestrians of potential hazards and prevent accidents by using V-shaped foam boards. Using V-shaped foam skid plates also adds an extra layer of protection to larger vehicles, reducing the likelihood of damage and potential accidents. By combining these technologies, the project can help prevent accidents and improve road safety for all road users. Overall, the project is to address a major public health and safety issue in India and ensure that large vehicles can travel safely and responsibly on the roads. Through continued effort and investment in road safety solutions, we can work towards a future where rollovers and other road accidents are a thing of the past and all road users can travel safely and securely. trust. The system has undergone some tests and has successfully completed the basic performance.The goal was achieved because the software and hardware implementation worked as expected. From the research that has been done, it is clear that there is a lot to be done to “avoid runover accidents”. It has great potential to improve performance, reliability and safety, so it should be continued and developed in the future.

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