

# Road Safety Alert System

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## ABSTRACT

In the realm of technical research, the Internet of Things (IoT) has sparked considerable interest due to its potential applications. While IoT is often associated with smart homes and vehicles, its significance extends far beyond these realms. A prime example of its practical application lies in addressing pedestrian safety through smart crossing systems. In countries like India, with dense populations and extensive road networks, pedestrian safety is a pressing concern. Daily, countless individuals navigate hazardous roadways, facing the risk of accidents due to heavy traffic and lax enforcement of crossing laws. Given India's status as a developing nation, the need for innovative solutions is particularly acute. Implementing IoT-based smart crossing systems could significantly enhance pedestrian safety, mitigating the risks associated with crossing wide roads and bustling lanes. By leveraging IoT technology, such systems offer a promising avenue for minimizing accidents and ensuring safer streets for all pedestrians.

Accidents, especially involving school children and elderly pedestrians, are distressingly common occurrences. Addressing this issue, the paper proposes a cost-effective solution centered around Arduino UNO R3 and servo motor technology. This simple framework offers a promising approach to enhance pedestrian safety. Particularly in India, where road safety is a critical concern, this program assumes heightened importance. By leveraging the proposed solution, the risks associated with road crossings can be significantly mitigated, benefiting vulnerable pedestrians and contributing to overall road safety.

**Keywords:** Arduino Uno R3; Servo Motor; Pedestrian Crossing.

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## INTRODUCTION

The Road Safety Alert System is a project aimed at addressing the significant issue of pedestrian crossing safety in India. Pedestrian crossings can take various forms, including zebra crossings, signal-controlled crossings, and pedestrian bridges. The type of crossing used depends on factors such as traffic flow, pedestrian volume, and road design.

Since individuals and vehicle are sharing the road, crosswalk expands effectiveness of utilizing the road in exceedingly thought region. Be that as it may, as the populace expands, this brings more incessant accidents and more genuine wounds and subsequently, nationals are attempting to diminish these accidents by making advancements and legitimate approvals. Such activities pull down the aggregate number of lethal accidents yet sadly, number of pedestrian fatalities does not diminish for 10 years. To be particular, this casualty does not have a comparative trademark thinks about to others. An examination around 2014 in India demonstrates fatalities in 78% happened in urban, 71% happened at non-crossing points and 72% happened oblivious. Through this examination, pedestrian fatalities are inferring vigorously populated territory makes more shot make a mischance and a mediocre acknowledgment makes less opportunity to distinguish a pedestrian or a vehicle. IoT-based automation

IoT-based automation are now-a-days rapidly been implemented for security purposes, but still there are no such application used in the traffic control or for road safety purpose.

Arterial roads are highly prone to accidents which lead to above 50% of pedestrian death.

As per statistics, road accident rate in **Delhi is 20% followed by Mumbai with around 18%.**

To overcome this problem we must implement it in this IoT based project which will help in reducing accident and save thousands of lives.

**Top 10 States of Number of Accident**

States	2022	2021	2019	2020
Tamil Nadu	64,105	55,682	17,633	15,269
Madhya Pradesh	54,432	48,877	16,181	13,695
Kerala	43,910	33,295	13,363	11,230
Uttar Pradesh	41,746	37,637	10,440	9,866
karnataka	39,762	34,277	7,682	7,167
Maharashtra	33,383	29,928	7,352	6,820
rajasthan	23,624	20,951	9,459	6,594
telegana	21,619	21,315	8,360	6,501
Andhra Pradesh	21,249	21,556	6,883	5,764

**Number of Accident due to Traffic Rules Violation**

Traffic Rules violation	2022		2021	
	No. of accidents	Persons Killed	No. of accidents	Persons Killed
Over-speeding	440,000	168,491	3,19,028	1,01,723
Jumping red light	5,441	2,220	4,443	1,797
Driving on wrong side/ Lane indiscipline	25,781	10,764	24,431	9,201

**LITERATURE REVIEW**

Person on foot crossing is a way for vehicles and individuals to cross the street.

The chance of mishances is expanding with the populace. The add up to number of mishaps diminishes each year due to activity to diminish accidents Pedestrian fatalities show up to be affected by arranged reasons. In any case, unimaginably, a few highlights that may see like to impact, for illustration, put driver or energetic driver, was not the critical issues in mishaps. It will likely affect by the thickness and number of the people and light.

To diminish the amount of person on foot fatalities, there are a few techniques, which lead driver to back off, take care of this issue. In the to begin with put approach is to authorize the affirmation of crosswalk locale utilizing light transmitting black-top marker, in this way vehicle driver can be successfully taught where the honest to goodness crosswalk is on the street . For all that, this not one or the other keeps any sudden reactions from people on foot nor drivers to see person on foot easily.

Second approach is lighting up the crosswalk domain that the driver sees a person on foot from long division. This is amazingly palatable against a sudden advancement of person on foot. Suddenly, This uses unreasonably essentialness to keep up each single dim hour for insufficient people on foot moreover the shoreline of imperativeness isn't miserable if illuminators are presented more to bring down the shot of incident . For all that, if the incident happens, there is fair accepting the vehicle driver to call emergency unless the person on foot has its mindfulness.

## WORKING OF PROJECT

Before connecting the Arduino to a battery or computer/laptop, ensure that all connections are securely in place. The servo motors should be properly attached and calibrated.

The system operates with three servo motors: two on each side of the road to create a barrier when the signal is red, and one in the middle to control the pedestrian crossing.

### 1. Servo Motors for Road Barrier:

- The two servo motors placed on either side of the road are responsible for creating a physical barrier when the traffic signal turns red.
- When the signal is red, these servo motors will spin to a 45-degree angle on both sides, effectively blocking any vehicle from crossing the road.
- This action acts as a bumper to prevent vehicles from violating traffic signals, ensuring pedestrian safety.

### 2. Servo Motor for Pedestrian Crossing:

- The third servo motor, positioned in the middle of the road, is dedicated to controlling pedestrian crossing.
- When the traffic signal turns green for pedestrians, this servo motor rotates 90 degrees, allowing a safe passage for pedestrians to cross the road.
- Similarly, when the signal switches to red for pedestrians, this servo motor returns to its initial position, blocking any further pedestrian crossing.

By incorporating a third servo motor specifically for managing pedestrian crossing, the system ensures comprehensive control over both vehicle and pedestrian movements at the intersection. This setup maximizes safety by preventing any unauthorized crossing during red signals while facilitating smooth pedestrian movement during green signals.

## SYSTEM REQUIREMENT SPECIFICATION

### 1. Arduino:

Arduino is an open-source platform renowned for its versatility in building electronic projects. It comprises a programmable circuit board, often termed a microcontroller, and an Integrated Development Environment (IDE) software that facilitates writing and uploading code onto the board from a computer. Unlike its predecessors, Arduino eliminates the need for additional hardware like a programmer, enabling code upload via a simple USB cable. This accessibility has made Arduino immensely popular among electronics enthusiasts, from beginners to seasoned developers.



Figure 1-arduino

### 2. Servo Motor:

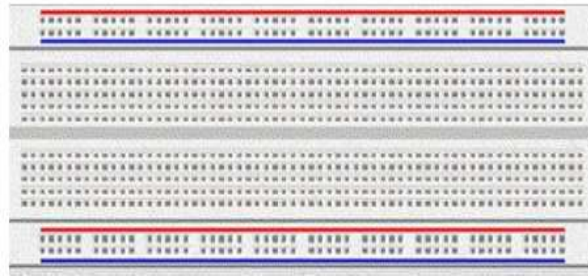
A servo motor, also known simply as a servo, is a precision device used for rotating or pushing components within a machine to specific angles or positions. Unlike traditional DC motors, servos operate by rotating to a designated angle and then halting, offering precise control over movement. Servo motors find applications in various fields where accuracy and control are paramount, such as robotics, automation, and model-making.



**Figure 2-Servo motor**

### 3. Breadboard:

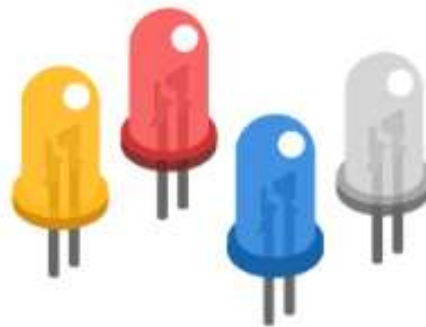
The breadboard is an essential tool in the realm of do-it-yourself (DIY) electronics. It serves as a platform for creating and testing circuits without the need for soldering, making it ideal for beginners and experienced electronics enthusiasts alike. Breadboards provide a convenient way to prototype electronic circuits, allowing components to be easily inserted and connected with jumper wires. They are versatile and reusable, serving as a foundational element for projects of all scales.



**Figure 3-Breadboard**

### 4. LED:

LED, short for light-emitting diode, represents a revolutionary advancement in lighting technology. LED lighting products offer unparalleled efficiency, emitting light up to 90% more efficiently than traditional incandescent bulbs. The operation of LEDs involves passing an electrical current through a microchip, which illuminates tiny light sources within the diode, resulting in visible light. LEDs have become ubiquitous in various applications, from household lighting to automotive lighting and electronic displays.



**Figure 4-LED**

## 5. Jumper Wire:

Jumper wires are essential components in electronics prototyping, featuring connector pins at each end for easy connection between two points without the need for soldering. Typically used in conjunction with breadboards and other prototyping tools, jumper wires facilitate the creation and modification of circuits with simplicity and flexibility. Their basic yet crucial role in circuitry makes them indispensable tools for electronic enthusiasts, enabling rapid iteration and experimentation in project development.

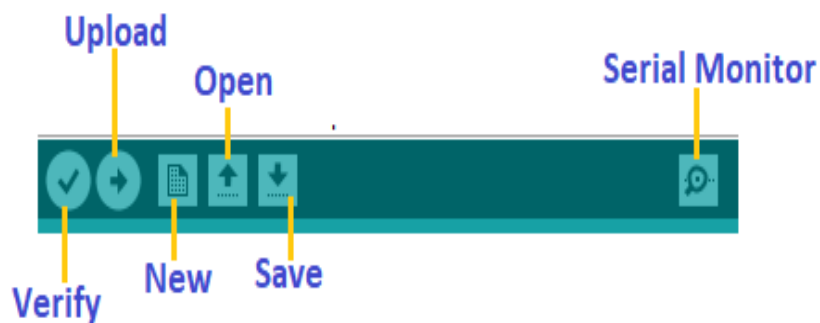


Figure 5-Jumper wire

### 4.2) Software requirement:

#### 1. Arduino IDE:

The Arduino Integrated Development Environment (IDE) - or Arduino Software (IDE) - consists of a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them. The program or code written in the Arduino IDE is oftentimes called as sketchin'. To upload the sketch created in the Arduino IDE software, we must connect either the Genuino or Arduino board to the IDE. The sketch, typically saved with the extension '.ino,' contains the code instructions for the board to execute. The toolbar in the IDE features icons for various functions, including New, Open, Save, Upload, and Verify. These icons facilitate the process of creating, editing, and uploading sketches to the connected board, allowing users to develop and deploy their projects seamlessly.



Toolbar

SYSTEM DESIGN

5.1) Flow Chart:

---Road Safety Alert System:

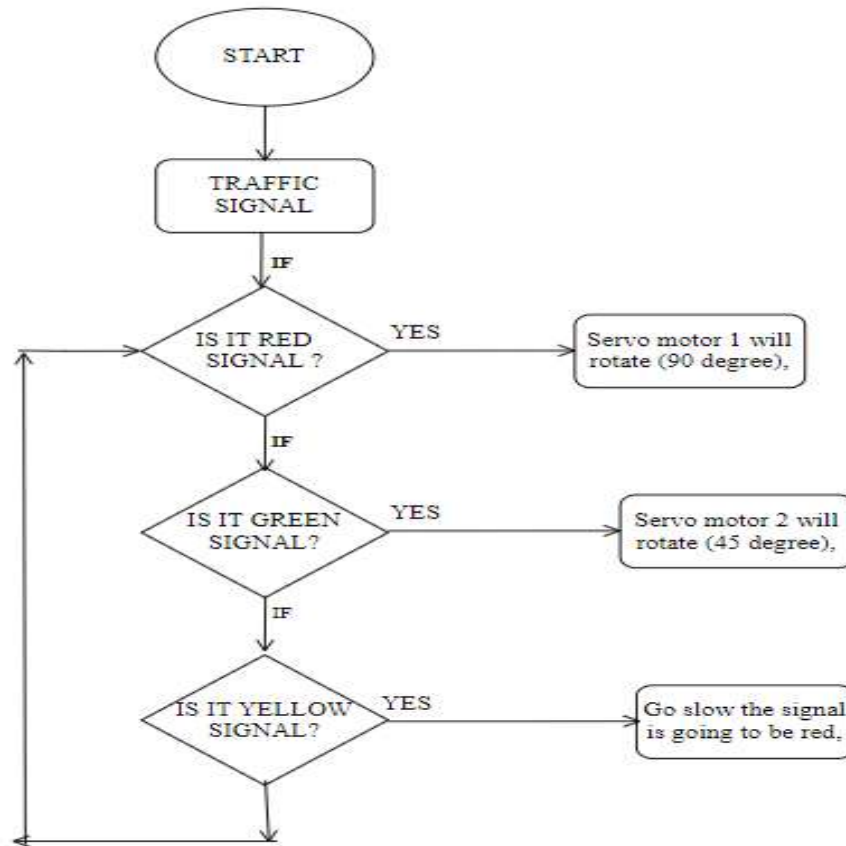


Figure 6- flow chart of road safety alert system.

5.2) Block Diagram:

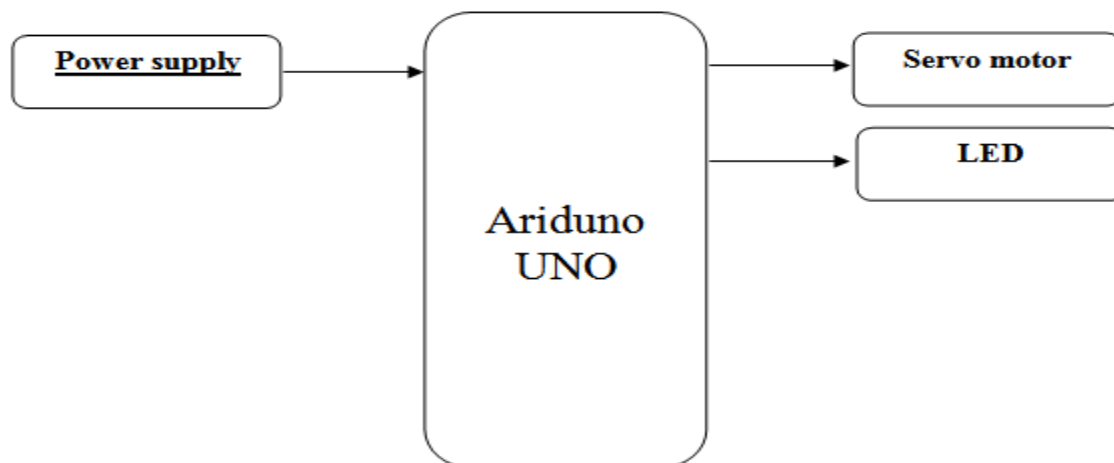


Figure 7- block diagram of road safety alert system.

5.3) Circuit Diagram:

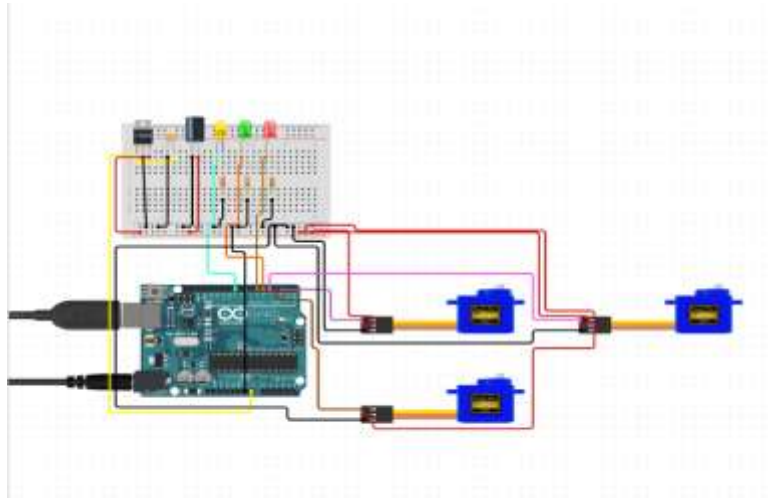


Figure 8- circuit diagram of road safety alert system.

RESULT

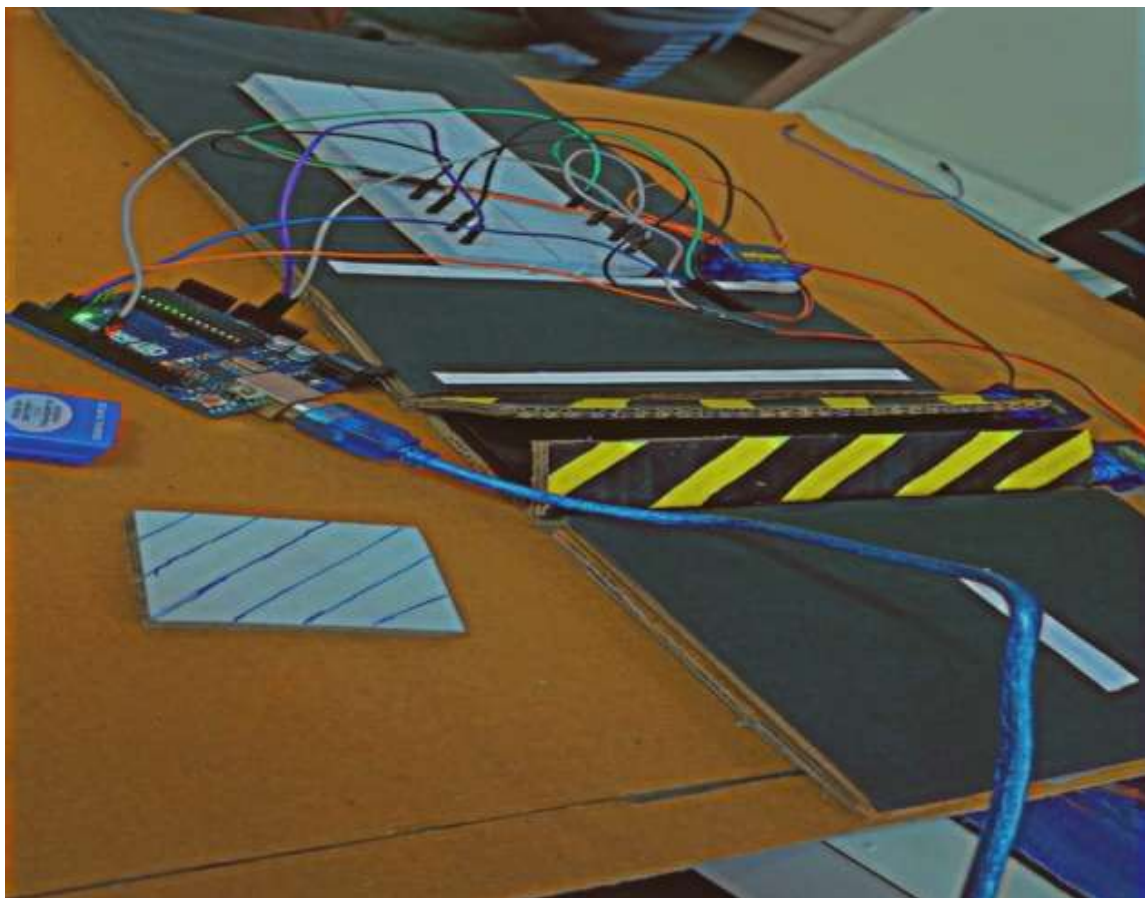


Figure 6- Result of road safety alert system.

## CONCLUSION

.In conclusion, the project focused on addressing the critical issue of pedestrian safety, particularly in urban areas where a significant percentage of accidents occur. Through the development of the Road Safety Alert System, which integrates IoT-based mechatronics, a prototype for pedestrian crossing has been successfully designed. The proposed solution introduces a new type of crossing system aimed at enhancing pedestrian safety and alerting drivers to potential dangers in advance, thereby mitigating the risk of accidents.

By implementing illuminators, the system provides extended notice to pedestrians, allowing drivers sufficient time to reduce vehicle speed and avoid hazardous situations. The project addresses various aspects of pedestrian safety, including automated zebra crossing systems and emergency accident notification. It is anticipated that the implementation of this system on busy roads in both developed and developing countries will significantly reduce road accidents, ultimately saving lives.

To ensure the effectiveness of the project, a systematic performance matrix could be developed to compare the performance of various research and applications. Standardized datasets would be instrumental in achieving this goal, facilitating rigorous experimental validation under different environmental conditions. Additionally, the project highlights the importance of privacy and security considerations in the development of safety systems, emphasizing the need for early-stage guidance in this regard.

Overall, the Road Safety Alert System underscores the critical importance of pedestrian safety and presents a comprehensive solution to address this pressing issue. By leveraging IoT-based technologies and mechatronics, the system offers a cost-effective and efficient means of enhancing road safety and protecting vulnerable road users.

## FUTURE SCOPE

**Smart Traffic Management Integration:** Integrate pedestrian crossing systems with smart traffic management infrastructure to optimize traffic flow and enhance pedestrian safety. This can involve real-time communication between pedestrian crossing signals and traffic lights to prioritize pedestrian crossings during peak times and adjust signal timings based on pedestrian demand.

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