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Review on Road Safety Alert System

Prof. Pradnya Patange[1], Mangesh Lomte[2], Ganesh Tambale[3], Prathmesh Girulkar[4]

[1]Prof. Pradnya Patange Information Technology & G.S.Moze College of Engineering
[2]Mangesh Lomte Information Technology & G.S.Moze College of Engineering
[3]Ganesh Tambale Information Technology & G.S.Moze College of Engineering
[4] Prathmesh Girulakar Information Technology & G.S.Moze College of Engineering

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Abstract

India is a populous country and a lot of wide roads are to be crossed in different parts of the country. A lot of people cross the street every day and due to large number of vehicles on the street, risk of road accidents increases. Some even lead to death. As the laws of road crossing are not very strict in India, it becomes important to use IoT- based road safety system. A cost effective solution to this is using a system based on Arduino UNO R3. These devices are fully autonomous and can work as per the pedestrian crossing and traffic signal rules. This device will alert and take necessary actions to prevent damage to the life.

Key Words: Arduino UNO R3,Servo Motor, LED , Jumper Wires,Breadboard.

1.INTRODUCTION

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

Our major arterial roads are highly prone to accidents which lead to above 50% of pedestrian death. Even the blind curve is also riskier as drivers cannot see approaching traffic. And it would be tedious and difficult for a person to concentrate and handle traffic 24/7. Even if a person meets with an accident, there are no such solutions implemented to send emergency responder for fast recovery.

In last 5 years (2016-2020), more than 24 lacs of road accidents have occurred. In 2020, number of accident reported are 3,66,138, number of person killed are 1,31,714 and number of injuries are 3,48,279.

This paper introduces with a road safety system based on IoT, to provide solution to the problem faced in the road safety issue. The main concern are as follows:

- Pedestrians doesn't notice the traffic approaching while crossing the street.
- Vehicle struck in the traffic signal tries to break the rule and escape the signal.
- The roadblock will appear to stop the vehicles to pass or break the signal when it is red. The roadblock will only appear if the signal is red for the same time and will go under the ground when the signal turn green.

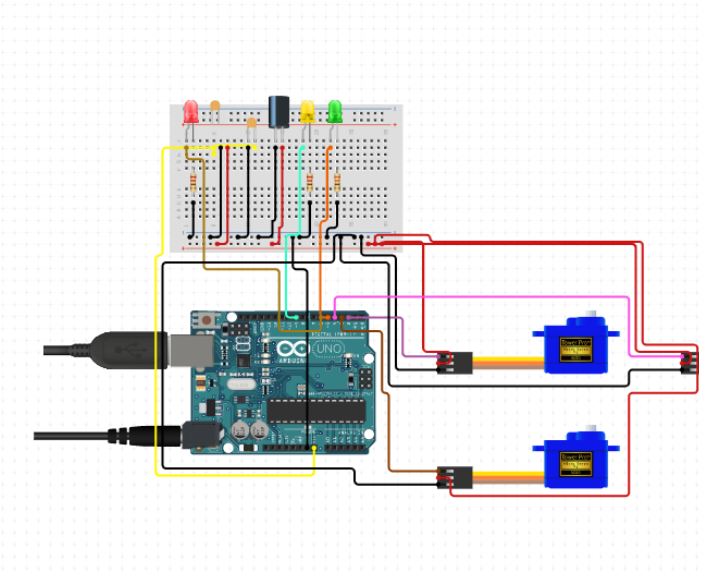
2. Number of Accident due to Traffic Rules violation

Traffic Rules violation	2022		2021	
	No. of accidents	Persons Killed	No. of accidents	Persons Killed
Over-speeding	440,000	100,588	3,99,028	1,71,723
Jumping red light	4,441	1,989	6,443	1,997
Driving on wrong side/ Lane indiscipline	28,781	9,764	24,431	9,201

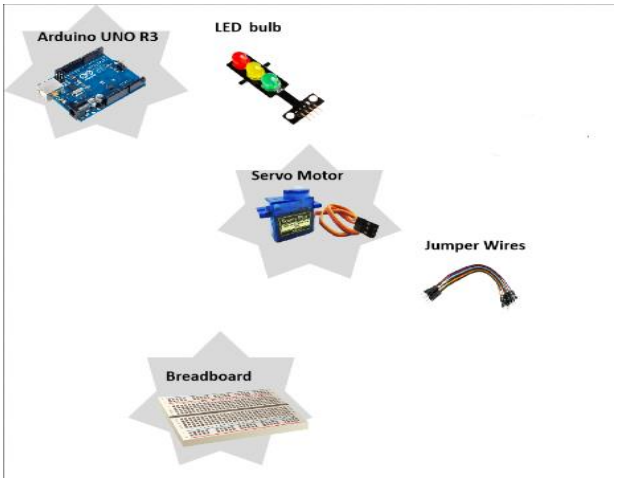
3. Top 10 States in Number of Accidents

States	2016	2017	2018	2019	2020
Tamil Nadu	22,573	20,696	19,583	17,633	15,269
Uttar Pradesh	13,078	14,333	16,198	16,181	13,695
Karnataka	14,933	14,217	13,638	13,363	11,230
Madhya Pradesh	10,709	11,150	9,967	10,440	9,866
Andhra Pradesh	8,171	8,544	8,122	7,682	7,167
Telangana	6,166	6,211	6,487	7,352	6,820
Kerala	9,209	8,993	9,161	9,459	6,594
Maharashtra	10,369	9,237	9,355	8,360	6,501
Rajasthan	6,567	6,851	6,746	6,883	5,764
Bihar	3,138	3,883	4,016	4,526	4,101

4.Circuit Diagram



5.Hardware



The hardware required to complete road safety measures as follows:

A.Servo Motor

A servo motor is a specialized rotary actuator designed for precise control of angular position. It operates within a closed-loop system, integrating a feedback mechanism like an encoder or resolver to continually monitor the motor's actual position. This feedback is crucial for achieving accurate and stable control by allowing the motor to compare its real-time position with the desired position sent by an external controller. The closed-loop configuration enables the controller to make instantaneous adjustments, ensuring the motor moves with precision. Servo motors are widely utilized in applications demanding meticulous control over position, velocity, and acceleration, such as robotics, CNC machinery, and automated manufacturing systems. Known for their high precision and accuracy, servo motors offer variable speed and torque capabilities, adapting to diverse operational requirements. Additionally, they are often compact and lightweight, making them suitable for installations where space is limited. The combination of these features makes servo motors indispensable in applications requiring dynamic and controlled rotational motion.

B.Arduino

The Arduino UNO R3 serves as a fundamental component in an road Safety alert system, a sophisticated traffic management solution. This system integrates the versatility of the Arduino UNO R3 micro controller to precisely control the operation of traffic lights and roadblocks, optimizing traffic flow and enhancing road safety. The Arduino UNO R3, equipped with its user-friendly interface and an array of digital and analog input/output pins, allows for seamless integration with sensors and actuators. In this context, the micro controller processes real-time data from sensors monitoring traffic conditions and strategically triggers the traffic lights and roadblocks accordingly. Through programmable logic, the Arduino UNO R3 coordinates the synchronization of traffic light signals, considering factors such as vehicle detection and pedestrian crossings. Simultaneously, it manages the deployment and retraction of roadblocks to regulate the flow of vehicles in specified directions. The result is an intelligent and automated traffic management system that enhances efficiency, safety, and overall traffic control, showcasing the adaptability and programmable capabilities of the Arduino UNO R3 in real-world applications**.**

C.LED

Light Emitting Diodes (LEDs) are semiconductor devices that emit light when an electric current passes through them. These compact and energy-efficient light sources have revolutionized illumination technology. Comprising a semiconductor material, the LED operates on the principle of electroluminescence, wherein the movement of electrons within the semiconductor generates light. Unlike traditional incandescent bulbs, LEDs do not rely on a heated filament to produce light, making them more energy-efficient and durable. LEDs come in various colors, and their intensity can be easily controlled, offering versatile applications in lighting, display panels, indicators, and more. Due to their efficiency, longevity, and environmental benefits, LEDs have become a dominant technology in modern lighting solutions,

contributing to energy conservation efforts and providing innovative possibilities in various electronic devices and lighting systems.

D.Jumper Wires

Jumper wires are short, insulated wires with connectors at each end, commonly used in electronics and prototyping. These wires facilitate the creation of electrical connections between components on a circuit board or a breadboard. Their flexibility and ease of use make them essential for quickly and temporarily linking various elements in electronic projects, enabling efficient testing, debugging, and experimentation without the need for soldering.

E.Breadboard

A breadboard is a crucial instrument for electronics prototyping and experimentation, serving as a platform to construct and evaluate electronic circuits without resorting to soldering. Typically rectangular and crafted from plastic, the board features a grid of holes with internal connections following a specific pattern. This setup facilitates the insertion of electronic components like resistors, capacitors, and integrated circuits into the grid, allowing them to be interconnected using jumper wires. The interconnected holes on the breadboard adhere to a standardized layout, often arranged in rows and columns, providing a convenient and reusable workspace for the design and modification of circuits. Engineers, hobbyists, and students extensively utilize breadboards to rapidly construct and refine electronic designs, establishing them as indispensable tools for learning and prototyping within the realm of electronics.

6. CONCLUSIONS

Our proposed solution aims to address persistent issues in the Indian traffic system, including accidents caused by faulty lights, illegal crossings during red signals, and severe traffic jams. This comprehensive approach seeks to create a dynamic traffic crossroad capable of efficiently managing a variety of challenges. Key elements of our solution include density-controlled traffic lights, integrated roadblocks, and an advanced Internet of Things (IoT) based vehicle recognition and management system.

To achieve density-controlled traffic lights, we suggest employing infrared sensors, inductive loops, or specialized density calculator software, as recommended by previous scholars. What distinguishes our system is its seamless integration with roadblocks and IoT technology. Roadblocks are strategically designed to deploy when a vehicle attempts an illegal crossing during a red light. These roadblocks are precisely timed to ensure the safety of moving traffic during the transition from green to yellow.

Moreover, our proposed solution offers a versatile framework that can be easily interfaced with various other methods, providing an effective and user-friendly system for future authorities. Collectively, these integrated features make our solution a comprehensive and adaptable traffic crossroad solution.

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