**Automatic Traffic Control (Crossroad)**

A circular emblem with a shield and gears on it

Description automatically generated

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**Abstract**

To improve urban traffic management and safety, this project introduces an Automatic Traffic Control System intended for crossroads. Using sensors, LEDs, Arduinos, and proprietary software, the Automatic Traffic Control System maximizes traffic flow and automates signal control. The system exhibits its potential to enhance efficiency and safety in urban transportation networks by providing real-time responses to changing traffic conditions, which is made possible by careful hardware integration and software programming. This is an automatic traffic control system based on I2C communication.

**1. Introduction**

**1.1 Brief introduction to the project**

Automatic control system is used for a systematic flow of traffic avoiding accidents and problems. This automatic traffic system is also used for the very same purpose and for this both hardware and software work has been done on it. This project required both software acknowledgment for the codes of LEDs and sensors and hardware knowledge for the electrical connections.

* 1. **Objectives**

The main objectives of this project are as follows:

* Efficient flow of traffic that maximizes the timing and coordination of traffic signals to enable the smooth movement of vehicles through intersections and along roadways.
* Reducing the congestion by dynamically modifying signal timings in response to demand and traffic conditions in real time, bottlenecks can also be relieved.
* Accidents and collisions can be reduced through this controlled traffic system.
* Creating systems and algorithms that can modify signal timings in response to shifting traffic circumstances.
  1. **Goals**

First and foremost, the main goal is to improve safety by effectively controlling traffic flow and lowering the likelihood of collisions at intersections. This entails putting sensors and algorithms into practice to identify the presence of vehicles and adjust signal timing accordingly.

Second, by cutting wait times and congestion, the project aims to improve overall transportation infrastructure and traffic efficiency. The overall objective is to develop a clever, dependable, and scalable solution that prioritizes efficiency and safety while addressing the many difficulties associated with urban mobility.

**1.4 Scope**

The scope of a project centered on an Automatic Traffic Control System, particularly at a crosswalk, includes a broad range of components necessary for its effective operation. In order to detect the presence of a vehicle, a network of sensors must be built and put into place. Advanced algorithms must also be used for processing data in real time and making decisions. To enable smooth coordination between various intersections and dynamically adjust to changing traffic conditions, the project also entails integrating traffic signals, signage, and communication infrastructure. Furthermore, an essential part of the project's scope is taking scalability and future smart city initiatives into account.

Additionally, the scope includes designing user interfaces for monitoring and control in addition to thorough testing and optimization to guarantee dependability and effectiveness in operation.

In general, the scope includes an all-encompassing strategy for developing a strong and intelligent system to improve cross-roads safety and traffic management.

* 1. **Overview**

Road safety and traffic congestion are becoming more and more urgent problems as cities expand. By utilizing cutting-edge technologies like sensors, data analytics, and algorithms to automate traffic signal control and improve traffic flow at intersections, the Automatic Traffic Control System project seeks to transform traffic management.

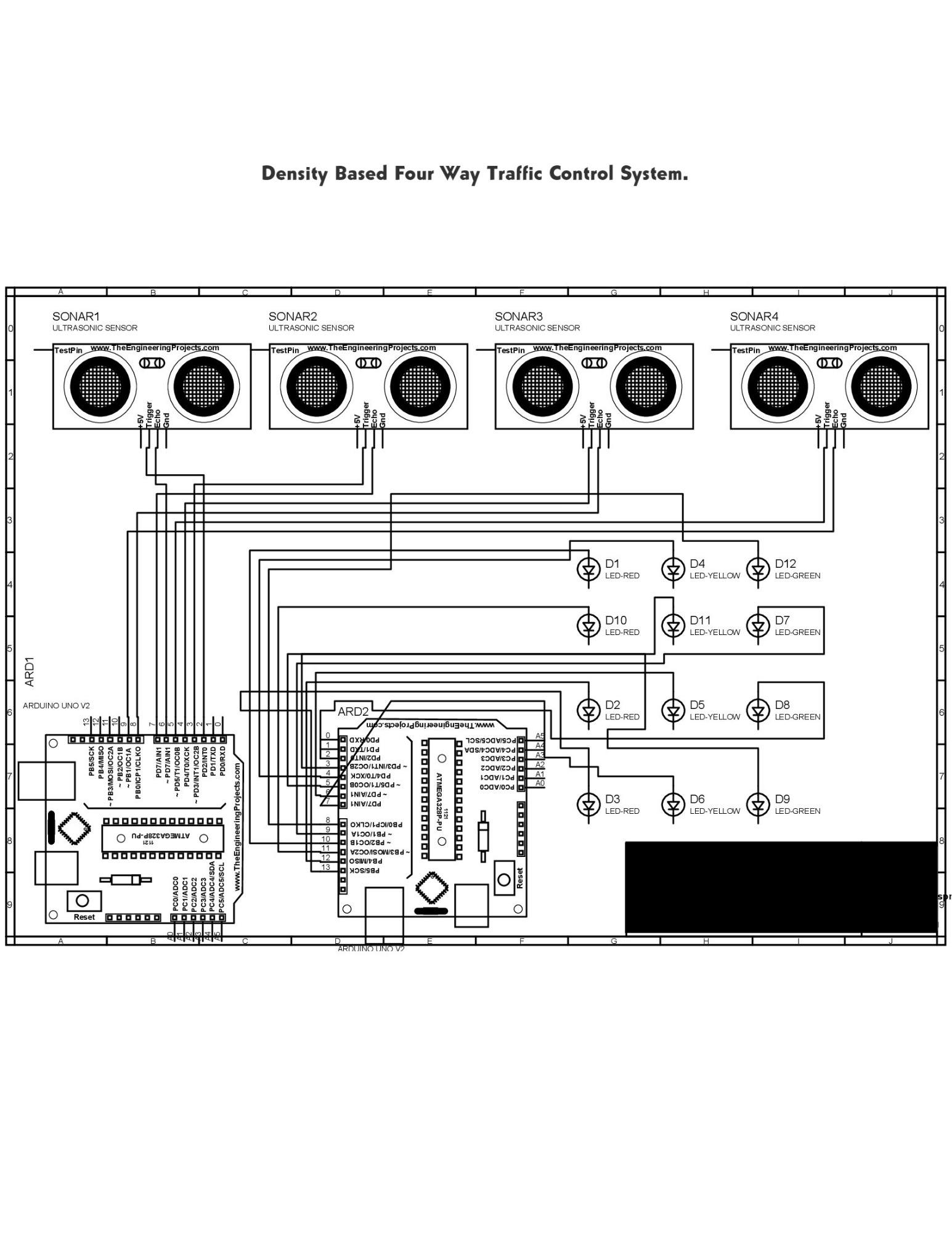
The main elements of the Automatic Traffic Control System, such as sensor networks, signal control algorithms, communication infrastructure, and user interfaces, are covered in detail in this overview. It also looks at the advantages of putting such systems in place, like increased efficiency, decreased traffic, and safety in urban transportation. In summary, this outline provides a thorough overview of the revolutionary potential of automated traffic control systems to reshape urban mobility in the future.

**1.6 Significance**

The significance of creating an automatic traffic control project at crosswalks, given the current state of urbanization and transportation issues, cannot be emphasized. First off, a project like this tackles the crucial problem of road safety by lowering the likelihood of collisions and accidents at intersections, which are well-known hotspots for traffic incidents. The project improves pedestrian and driver safety by automating signal control and streamlining traffic flow, which ultimately prevents fatalities and reduces injuries. Second, the project helps to lessen traffic congestion in urban areas and enhance overall traffic efficiency. It reduces traffic jams and delays by dynamically modifying signal timing and giving priority to the orderly flow of vehicles, improving commuters' overall mobility experience.

In addition, the project establishes a standard for innovation in urban infrastructure and creates the framework for upcoming smart city projects by utilizing cutting-edge technologies and data-driven methodologies. All things considered, the importance of installing an automated traffic control system at intersections rests in its ability to improve urban transportation's sustainability, efficiency, and safety all of which will benefit locals.

**2. Design/Circuit Diagram**



**3. Implementation**

We started by choosing a thermocol sheet with the appropriate measurements to use as the base for this project's model. After that, this sheet was painstakingly constructed and decorated to look like a realistic representation of a road network, complete with crossroads and traffic lights placed at key intersections.

Before being integrated onto the thermocol sheet, every hardware component sensor, LEDs, Arduinos, jumper wires, and the UNO board was painstakingly assembled one at a time. On all four roads, sensors were placed in strategic locations, and signals were installed at the appropriate intersections. To add to the setup's realism, tiny cars were also purchased and positioned on the roads as needed.

After that, unique software codes were created to coordinate the operation of the sensors and LEDs. These codes made sure that the automated traffic control system ran smoothly, which made it easier to manage traffic and safety at fictitious intersections.

**4. Operation**

This project is based on I2C communication. When a sensor detects a car or car density on a road it detects through trig pin and sends the signal back through the echo pin. It is based on the formula S=VT where S is the distance, V is the speed of sound and T is the time to reflect. The echo pin sends the data to the slave Arduino board from where SDA transfers the data to the master Arduino board and SLA controls the time synchronization.

The already set default time for red signal is 1 sec, yellow signal is 2 sec and the green signal is for 5 sec. When a sensor detects a car, the code automatically increases the time for the green signal to 10 sec.

**5. Conclusion**

In conclusion, the development and implementation of the automatic traffic control system presented in this project signifies a significant step towards enhancing road safety, efficiency, and sustainability in modern urban environments. Through meticulous planning, innovative design and rigorous testing, we have successfully created a system that effectively manages traffic flow, reduces congestion, minimizes accidents and optimizes travel times.

**6. References**

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