Coal Lab Project Report
Traffic Light Controller

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1 Introduction

The Traffic-Light-Controller project addresses the challenge of managing traffic flow efficiently in a busy square experiencing high traffic volume. By implementing a smart traffic light system, the project aims to regulate traffic effectively, thereby reducing congestion at the intersection. This report provides an overview of the project, its components, traffic light sequence, control logic, implementation using Arduino Uno, and concludes with the project's significance.

2 Project Overview

The intersection under consideration comprises four roads from all directions: East, West, North, and South. Each road is equipped with a traffic light pole featuring three LEDs - Red, Yellow, and Green. The traffic lights operate in a sequence where only one direction has a green light at any given time, while others display red or yellow lights.

3 Components Used

The following components were utilized in the project:

- Arduino Uno R3
- Breadboard
- 12 LED's (4 Red, 4 Yellow, 4 Green)
- 12 1kΩ resistors
- 25 Jumper Wires for Connections

4   Traffic Light Sequence

The traffic light sequence implemented is as follows:

1. Green light: Glows for 10 seconds.

2. Yellow light: Glows for 4 seconds as a transition phase.

3. Red light: Indicates a stop.

5   Traffic Flow Control

The flow of traffic is controlled according to the following sequence:

- Initially, the South direction has a green light, allowing traffic from that direction.

- After 6 seconds, the Yellow light on the East starts to glow for 4 seconds to signal a transition.

- Subsequently, the West and North lights turns Red, and the West direction light turns Green, enabling traffic from the West side.

- This sequence continues for all directions, ensuring smooth traffic flow.

6   Implementation

The traffic light controller logic is implemented using Arduino Uno and programmed in C++ language. The Arduino code includes:

- Defining pin configurations for LED's and resistors.

- Implementing a traffic light sequence algorithm with appropriate delays for Green and Yellow lights.

- Controlling the flow of traffic lights based on predefined timings.

7   Significance

The project showcases the practical application of Arduino in traffic management systems. Its contributions include:

- Facilitating safer and smoother urban transportation by efficiently controlling traffic flow and reducing congestion.

- Leveraging Arduino's versatility and programmable to develop innovative solutions for modern-day challenges like traffic management.

8 Conclusion

The Traffic Light Controller project demonstrates the efficacy of using Arduino in traffic management systems. By regulating traffic flow effectively, it contributes to improving urban transportation safety and efficiency. Arduino's flexibility makes it an ideal platform for developing smart systems like traffic light controllers, with the capability for customization and adaptation to specific traffic patterns or requirements.

9 Recommendations

Further enhancements to the project could include:

- Integration of sensors for real-time traffic monitoring.

- Implementation of adaptive traffic control algorithms based on traffic density.

- Incorporation of wireless communication for centralized control and monitoring.