

## **Interactive Traffic Light System: A Study on Arduino-Based Delayed Lighting Control**

**Abstract:** This study presents the design and implementation of an interactive traffic light system using Arduino, focusing on its application in areas with sparse pedestrian traffic. The system is designed to maintain a red light for vehicles, ensuring smooth traffic flow, and only activates the pedestrian crossing lights when a button is pressed by a pedestrian. The project encompasses the creation of a delayed lighting system and an interactive traffic light system, both of which are crucial for energy conservation and efficient traffic management.

**Introduction:** The "Smart Life" project revisits the basics of Arduino software editing environment, the Arduino IDE, and delves into the programming of a delayed lighting system. Understanding the significance of functions like `setup()` and `loop()`, along with the use of `pinMode()`, `digitalWrite()`, and `delay()`, forms the foundation of this project. The study extends to creating custom functions to control hardware with precision.

**Project 3.1: Delayed Lighting System** The delayed lighting system is widely used in public lighting and plays a significant role in energy saving and emission reduction. This project involves the functionality of an LED light that turns on upon button press and remains lit for a delay of 3 seconds before turning off.

### **Materials:**

- Arduino Uno
- LED
- Color ring resistor
- Switching element
- Dupont wire/jump wire

**Methods:** The project involves analyzing the functionality, connecting hardware, programming, and debugging. The hardware connections are detailed in the accompanying diagrams. The program is written in Arduino IDE, focusing on the interaction between the button press and the LED's on/off states with a delay.

**Project 3.2: Interactive Traffic Light System** This project addresses the need for traffic control in areas with infrequent pedestrian crossings. The system is designed such that vehicle traffic lights are 常绿, and pedestrian crossing lights are activated only when necessary.

### **Functional Description:**

- Pedestrian lights (Red/Green)

- Vehicle lights (Red/Yellow/Green)
- Initial state: Red light on for vehicles, setup detection for button press.
- Upon button press: Green light for pedestrians, followed by a sequence of yellow and red lights for vehicles, with a delay for safe crossing.

#### **Materials:**

- Arduino Uno
- LEDs (Red\*1, Green\*4, Yellow\*2)
- Color ring resistors
- Switching element
- Dupont wire/jump wire
- Breadboard

**Methods:** The hardware connections are detailed in the diagrams provided. The program logic involves an if statement to check for button press and control the sequence of light changes accordingly.

**Conclusion:** The interactive traffic light system project demonstrates the practical application of Arduino in creating energy-efficient and responsive traffic control mechanisms. It showcases the potential of delayed lighting systems in public infrastructure, contributing to smarter urban planning and sustainability.

