

Traffic Light Demo Project

Project Description:

The "Traffic Light System Study" project demonstrates a basic traffic light control system using an Arduino board. The system uses three LEDs (red, yellow, and green) to simulate the traffic light sequence. A push-button is used to trigger the LEDs, which glow in a specific sequence with time delays. This project helps to understand the working of traffic light circuits and introduces concepts such as interfacing LEDs, buttons, and using delays for timed operations in embedded systems.

Components Used in This Project:

1. Arduino Board (e.g., Arduino Uno)

- **Basic Description:** Arduino is an open-source microcontroller board that can be programmed to control hardware components like LEDs, motors, sensors, etc.
- **Working Principle:** The Arduino processes the program written in its IDE and generates appropriate output signals to control connected devices.
- **Applications:** Used in DIY projects, robotics, home automation, and embedded systems.

2. Red LED

- **Basic Description:** A red LED is a diode that emits red light when current flows through it.
- **Working Principle:** When voltage is applied in the forward direction, the LED emits light due to the movement of electrons.
- **Applications:** Indicators in traffic lights, displays, status lights, and many other signaling applications.

3. Yellow LED

- **Basic Description:** A yellow LED works similarly to the red LED but emits yellow light.
- **Working Principle:** It follows the same principle as the red LED, with the specific material emitting yellow light.
- **Applications:** Traffic lights, warning signals, and indicator lights.

4. Green LED

- **Basic Description:** A green LED emits green light when current flows through it.
- **Working Principle:** Like other LEDs, it emits light when a voltage is applied in the forward direction.
- **Applications:** Used in traffic signals, status indicators, and displays.

5. Push-Button

- **Basic Description:** A push-button is a simple switch that is either open or closed when pressed.

- **Working Principle:** When the button is pressed, it closes the circuit, allowing current to flow through.
 - **Applications:** Used for user input in various electronic projects, such as turning on/off devices, triggering events, or making selections.
6. **220Ω Resistor**
- **Basic Description:** A resistor limits the current flowing through a circuit to prevent damage to components.
 - **Working Principle:** It resists the flow of electrical current and drops voltage proportionally to the current.
 - **Applications:** Used in LED circuits to limit current, in voltage dividers, and in signal conditioning.
7. **1000Ω Resistor**
- **Basic Description:** This resistor is used in the button circuit to ensure proper current flow and avoid excessive current.
 - **Working Principle:** Resistors resist the flow of current and reduce the voltage in a circuit.
 - **Applications:** Used in button circuits, voltage dividers, and current limiting.
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Working Principle of the Project:

When the push-button is pressed, it sends a signal to the Arduino, which then activates the LEDs in a sequential manner—first red, then yellow, and finally green. The LEDs stay on for a fixed duration, simulating the behavior of a traffic light. The Arduino uses a delay function to manage the time each LED stays on.

Applications of the Project:

1. **Traffic Management:** This system simulates the behavior of traffic lights, which are used to control the flow of traffic at intersections.
2. **Embedded Systems Education:** It provides an educational platform for learning about interfacing components like LEDs, push-buttons, and microcontrollers.
3. **Automation Projects:** This simple project can be adapted for more advanced automation systems.
4. **Basic Electronics Understanding:** It helps students and hobbyists understand basic electronic components and their working principles.