KIET Group of Institutions

(MSE – 1)

Traffic Light Control System

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Introduction :

Traffic Light Control Systems are integral to modern cities, allowing for the management of vehicle and pedestrian flow at intersections. By efficiently regulating the transitions between red, yellow, and green lights, these systems ensure safety, minimize traffic congestion, and maintain order in busy traffic areas. With the increasing complexity of urban traffic, it is essential to design and simulate an effective traffic light control system.

This report explores the design and implementation of a simple **Traffic Light Control System** using Python. The goal of the system is to simulate real-world traffic light cycles while allowing user interaction for control. Through this system, users can manually switch between red, yellow, and green lights, learning how traffic management works.

Methodology :

The methodology of the Traffic Light Control System involves designing a user-interactive simulation to control the flow of traffic using a traffic light system. The following steps outline the process and the essential components involved in building the system.

System Design

The system consists of:

1. Traffic Lights: Red, Yellow, and Green, which are used to control the movement of vehicles and pedestrians.
2. Control Unit: The control logic that ensures the proper switching between lights and provides a user-based interaction system.

3. User Interface: A console-based interface where the user can select which light to activate, simulating real-time traffic light control.

Traffic Light Cycle

The cycle of a traffic light typically follows these states:

- Red Light: Vehicles must stop, and pedestrians may cross.
- Green Light: Vehicles may proceed, while pedestrians must wait.
- Yellow Light: A transitional phase between red and green, warning vehicles that the light is about to change.

The system includes a timing mechanism, which is controlled by the user's input. The light durations can be adjusted as needed. In the simulation:

- Red Light: 5 seconds
- Yellow Light: 2 seconds
- Green Light: 5 seconds

User Interaction

The user is prompted with a menu to select which light to activate. The system waits for user input and switches to the corresponding light. If the user inputs an invalid choice, they are prompted again.

The Python code uses the time.sleep() function to control the duration for which each light stays on.

Error Handling

The system ensures that only valid input is accepted (numbers 1-4). If an invalid input is provided, the program prompts the user to enter a valid choice again.

Code Typed :

```
import time


def display_menu():
    print("\nTraffic Light Control System")
    print("1. Red Light")
    print("2. Yellow Light")
    print("3. Green Light")
    print("4. Exit")


def traffic_light_control():
    while True:
        # Display menu
        display_menu()


        # Get user input
        try:
            choice = int(input("Enter your choice (1-4): "))


            # Red Light - Stop
            if choice == 1:
                print("Red Light: STOP")
```

```
            time.sleep(5)  # Red light for 5 seconds

        # Yellow Light - Get ready
        elif choice == 2:
            print("Yellow Light: GET READY")
            time.sleep(2)  # Yellow light for 2 seconds

        # Green Light - Go
        elif choice == 3:
            print("Green Light: GO")
            time.sleep(5)  # Green light for 5 seconds

        # Exit the system
        elif choice == 4:
            print("Exiting Traffic Light Control System.")
            break

        else:
            print("Invalid choice. Please enter a number between 1 and
4.")

    except ValueError:
        print("Invalid input! Please enter a valid number.")
```

```
# Run the traffic light control system
if __name__ == "__main__":
    traffic_light_control()
```

Explanation of Code:

1. The display_menu() function displays the available choices to the user.
2. The traffic_light_control() function runs an infinite loop, awaiting user input to control the traffic lights.
3. The time.sleep() function is used to simulate the time each light stays on (5 seconds for Red and Green, 2 seconds for Yellow).
4. The system includes error handling to ensure valid input is entered by the user.

Screenshot of output :

```
Traffic Light Control System
1. Red Light
2. Yellow Light
3. Green Light
4. Exit
Enter your choice (1-4): 3
Green Light: GO

Traffic Light Control System
1. Red Light
2. Yellow Light
3. Green Light
4. Exit
Enter your choice (1-4): 4
Exiting Traffic Light Control System.
```