

***ICT215 PROJECT***

***TRAFFIC LIGHT SIMULATION PROJECT REPORT***

Group 5:

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**Project Objective**

The goal of this project was to simulate a real-world traffic light system using MATLAB Simulink and Stateflow. The simulation mimics a typical traffic light cycle: **Red → Yellow → Green**, with defined timing transitions and logic-based outputs.

## Tools Used

* **MATLAB R2024**
* **Simulink**
* **Stateflow**
* **Simulink Blocks**: Lamp, Clock, Scope (optional)

## Design Overview

The system consists of:

### 1. **Stateflow Chart**

Used to define the logic and timing of the traffic lights.

* **States**:
  + red
  + yellow
  + green
* **Transitions**:
  + red → yellow: after(10, sec)
  + yellow → green: after(3, sec)
  + green → red: after(30, sec)
* **Output Signals**:
  + red, yellow, green (all defined as outputs from the chart)

## Logic Implementation

Each state sets the appropriate signal HIGH (1) and the rest LOW (0). This is done via **entry actions**:

### State: red

entry:

red = false;

yellow = true;

green = true;

exit:

red = true;

### State: yellow

entry:

red = true;

yellow = false;

green = true;

exit:

yellow = true;

### State: green

entry:

red = true;

yellow = true;

green = false;

exit:

green = true;

**Errors and Solutions**

| **Error** | **Cause** | **Solution** |
| --- | --- | --- |
| 'red' is defined, but not used in the Stateflow chart | Output variable declared but not assigned in any state | Add entry: actions in each state to assign values |
| Lamp not lighting up | Lamp not connected to the output signal properly | Ensure output ports are connected to Lamp blocks |
| No state transition occurs | Missing transition condition (e.g., after(...)) | Double-check transition conditions between states |
| Chart not updating in Simulink | Chart has no active path or entry | Add a default transition arrow to the initial state |
| Output not reflecting state changes | Variables not defined as output ports | Right-click chart → Add output → Name them accordingly |
| Simulation stops too early | Stop Time too low | Set Stop Time (e.g., 100s) to observe full cycles |

## Results and Observations

When the simulation is run:

* The **red light** is on for 10 seconds.
* The system then transitions to **yellow** for 3 seconds.
* Then the **green light** is on for 30 seconds.
* The cycle repeats continuously.

All Lamp blocks accurately represent the current traffic signal state, allowing for an intuitive and real-world-feeling simulation.

## Challenges Faced

* Initially, not assigning output values in states caused warnings and no Lamp response.
* Misconfigured transitions caused logic loops or no transitions.
* Some members were new to Stateflow, so initial setup was slow.

## Conclusion

This project effectively demonstrated how MATLAB Simulink and Stateflow can be used to simulate real-world control systems. By defining states, transitions, and output actions, we modeled a functional traffic light system. The process deepened our understanding of event-driven systems, timing logic, and model-based design in MATLAB.