THE OPEN UNIVERSITY OF SRI LANKA

DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING

BACHELOR OF SOFTWARE ENGINEERING HONOURS

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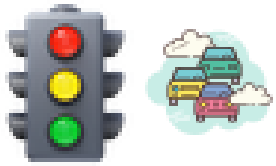
EEX5362

PERFORMANCE MODELING



Mini Project Deliverable 01

"A smart traffic light system"

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Contents

1. High-Level Problem

Crossings for vehicles and people can often get traffic in big towns. Red, yellow, and green signals had fixed times on older traffic lights. This isn't always the case. There are times when cars and people must wait longer than necessary, and traffic jam or pollution may get worse.

The problem is resolved via a smart traffic light system. Sensors and real-time data are utilized to determine the number of cars or people in the area. The light timings are then changed to keep up with the current traffic. This may improve everyone's safety, cut down on unnecessary delays, and shorten waiting times. Smart signals are being installed in many cities to reduce pollution, enhance traffic flow, and make it easier for emergency vehicles to pass.

This project examines a smart traffic signal at a crossroads and verifies:

- How to reduce waiting times for vehicles and people.
- How to prevent the development of lengthy waits,
- How to increase the number of vehicles that can cross the intersection (throughput),
- How to speed up the passage of fire engines and ambulances
- How to reduce pollution and fuel waste.

Drivers, passengers, pedestrians, emergency services, and local officials are among those who gain from smart signals. The study will measure factors like throughput, waiting time, and line length to uncover solutions to improve city traffic.

2. Data Set

The simulation tested under three scenarios. These are baseline traffic, heavy traffic, and faster service. Using average wait time, maximum queue length, and total vehicles crossed intersection,

- **For 500 seconds of simulation**

Scenario	Average wait time (s)	Max queue length	Vehicles passed
Baseline traffic	26.66	8	51
Heavy traffic	29.59	5	23
Faster service	25.43	8	45
Improved service	28.11	9	52

- **For 900 seconds (15 minutes) of simulation**

Scenario	Average wait time (s)	Max queue length	Vehicles passed
Baseline traffic	24.05	10	89
Heavy traffic	27.97	6	46
Faster service	25.11	8	96
Improved service	27.49	10	85

- **For 3600 seconds (1 hour) of simulation**

Scenario	Average wait time (s)	Max queue length	Vehicles passed
Baseline traffic	24.04	10	340
Heavy traffic	24.43	7	173
Faster service	25.61	12	347
Improved service	26.19	11	389

Scenario Name	Arrival Rate	Service Time	Green Time (s)	Yellow Time (s)	Red Time (s)	Description
Baseline Traffic	10	1.5	30	3	50	Normal traffic with average vehicle arrivals and standard signal timings.
Heavy Traffic	20	1.5	30	3	50	Increased arrival rate simulating peak hour congestion.
Faster Service	10	1	30	3	50	Reduced service time representing faster vehicle processing and clearance.
Improved Service	10	1.5	40	3	50	Increased green light duration to improve traffic flow and reduce delays and queues.

Simulation Scenario Parameters

3. Performance Objectives

1. To reduce average waiting time for vehicles and people.
2. To increase the number of vehicles passing through the junction (throughput).
3. To locate and decrease traffic congestion and bottlenecks.
4. To improve traffic flow by adjusting the time of green, yellow, and red lights.
5. To give emergency vehicle movement priority to speed up response times.
6. To decrease waiting times to lower vehicle emissions and fuel consumption.