**THE OPEN UNIVERSITY OF SRI LANKA**

**FACULTY OF ENGINEERING TECHNOLOGY**

**THE DEPARTMENT OF ELECTRICAL & COMPUTER ENGINEERING**

**EEX5362 – Performance Modelling**

**Deliverable 01**

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**Introduction**

This document briefs the simulation of a model of a bus stop and the data set used for the model. This model simulates people queuing at the bus stop randomly, standing in FIFO line and boarding the next bus that is available. Every bus arrives at a fixed interval (bus interval) and every bus has a fixed capacity (bus capacity). The objective of this simulation model is to measure the impact of this **bus interval** and **bus capacity** on performance metrics.

**Model Context**

* Buses are arrived to the bus stop with a fixed interval.
* Passenger are arrived to the bus stop randomly (Poisson process – random inter arrival times) and wait in a queue.
* The buses board passengers First-Come-First-Serve (FCFS) basis.
* The passengers are boarded to the buses up to the bus capacity. (No standing passengers)
* The passenger who are left, should be wait until the next bus arrives.

**Performance Objectives**

* Minimize the average waiting time of passengers. (minutes)
* Minimize the average queue length (passengers waiting)
* Gather useful bus occupancy statistics (average passengers per bus) to help to obtain balanced service utilization and the comfort of the passengers.
* Identify the bottlenecks which cause long queues and higher waiting time.
* Examine how system cost and passenger experience are affected by trade-offs between bus interval and bus capacity.

**Simulation Parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | **Notes** |
| Passenger arrival procedure | Poisson | Random intervals |
| Passenger arrival rate | 2 passengers per minute | Mean inter-arrival = 0.5 minutes |
| Simulation time | 8 hours | Simulation horizon used for the simulation |
| Boarding procedure | FCFS | First came passenger boards first |
| Boarding time | Neglected (0) | Immediate boarding is assumed |
| Queue capacity | Unlimited | Passengers do not leave the queue |
| Bus arrival procedure | Fixed interval | No assumption of random bus arriving |

**Experiment Scenarios**

|  |  |  |
| --- | --- | --- |
| **Scenario** | **Bus Interval (minutes)** | **Bus Capacity (passengers)** |
| A | 20 | 40 |
| B | 15 | 40 |
| C | 15 | 30 |

**Performance Metrics**

* Average passenger waiting time (minutes)
* Average queue length (passengers)
* Average bus occupancy (passenger per bus)

**Assumptions**

* Over time, passengers arrive to the bus stop randomly and independently.
* No delays or variations in bus arrivals.
* The passenger who came to the bus stop first, will be boarded first to the bus (No priority)
* Queue capacity is unlimited.
* Passengers never leave the queue.
* Passenger boarding time is neglected.
* After 8 hours, simulation ends though the passengers are still waiting.