CS 6830 – Systems Simulation, Spring 2020

Assignment 1: Drive-Thru Simulation

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For this assignment, the Python library Simpy 3.0.11 was used to simulate the two drive-thru scenarios as outlined in the project document. Once successfully simulated, experiments were conducted to determine the maximum acceptable value for the mean interarrival time of customers that could be maintained at a steady state for each scenario. Experiments for each scenario involved running the simulation using interarrival times between 1 and 10 minutes over 0.5 minute, or 30 second, intervals. Each interarrival time was ran using 5 different random number seeds and the averages for attempted customers, balked customers, and served customers were computed. The results were then compared between the scenarios to determine whether the addition of human servers had any effect on the customer throughput.

1. Scenario 1:

|  |  |  |  |
| --- | --- | --- | --- |
| Scenario 1 Results | | | |
| Mean Interarrival Time [min] | Balk Average | Attempted Average | Served Average |
| 10 | 0 | 41 | 41 |
| 9.5 | 0 | 41.8 | 41.8 |
| 9 | 0 | 44.2 | 44.2 |
| 8.5 | 0 | 47.6 | 47.6 |
| 8 | 0 | 47.6 | 47.6 |
| 7.5 | 0 | 51 | 51 |
| 7 | 0 | 54.8 | 54.8 |
| 6.5 | 0 | 60.4 | 60.4 |
| 6 | 0 | 63.6 | 63.6 |
| 5.5 | 1 | 69.2 | 68.2 |
| 5 | 1 | 74.2 | 73.2 |
| 4.5 | 8.2 | 88.2 | 80 |
| 4 | 14 | 96 | 82 |
| 3.5 | 17.8 | 101.2 | 83.4 |
| 3 | 49.2 | 131.2 | 82 |
| 2.5 | 69.2 | 153.8 | 84.6 |
| 2 | 111.2 | 183.2 | 72 |
| 1.5 | 172.4 | 255.4 | 83 |
| 1 | 285 | 370.6 | 85.6 |

1. Scenario 2: