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Bus Simulation Project

Analysis of Bus Simulation

Analysis

This report will include information about the efficiency of the Bus Simulation. We analyzed how the number of regular and express buses and passenger miles per gallon (PMPG) affect the wait and ride times for riders. We will discuss this in terms of how our numbers compare for the two variables. We will also describe the number of regular vs express buses and the efficiency of the simulation in terms of equilibrium or not. The travel time will be related to the number of express buses that are present.

We predicted that if there are no express buses and only regular buses, the company will be running at a low efficiency, causing them to lose money. Having all express buses and only one regular bus exemplifies the opposite extreme. Too many people would not have access to the stops in between the express stops, creating the same problem as the first. We know that the bus takes 240 seconds to move between stop to stop. We had to scale this time up to account for the express bus because it usually stops once every four stops. We are predicting that there will be a mix of express and regular buses to minimize the travel time of the riders. When considering the travel time, we accounted for both the time waited at the stop along with the time on the bus, accounting for board and debeard times.

The data shows an interesting relationship that occurs within our simulation. We are expecting the number of riders in line and average time to decrease as express buses get added but out simulation does not show the same results. As express buses increase, the number of riders and average time in service increases linearly. This is very unexpected and shows in both the tests with 14 buses and the tests with 10 buses. We also ran tests to model rush hour and low peak rider loads. A higher inter-arrival rate represents less riders are created into the simulation each second. A lower rate can be used to represent busy traffic times. As we decreased the inter-

arrival rate (increased rider traffic), the lines at the bus stops and travel time both increased. This is expected as more riders are entered into the simulation wait time and lines should increase.

According to our data collection, the bus company should not run express buses, as it shows that the average travel time for riders is minimized when all buses are running at the regular stops. It does not make business sense to run buses that are skipping stops and getting riders to their stops faster, if the rest of the bus company's customers have increased wait and ride times.

Data

				Off-Peak Load			Average Load			Rush Hour Load		
Simulation	**# of Buses**	**# of Regular Buses**	**# of Express Buses**	**Inter-Arrival Rate**	**Average Riders in Line**	**Average Time**	**Inter-Arrival Rate**	**Average Riders in Line**	**Average Time**	**Inter-Arrival Rate**	**Average Riders in Line**	**Average Time**
1	14	14	0	180	4	262	120	11	270	60	50	281
2	14	11	3	180	6	304	120	13	313	60	67	327
3	14	8	6	180	6	362	120	15	372	60	83	382
4	14	4	10	180	13	478	120	29	491	60	115	490
5	14	1	13	180	36	613	120	56	628	60	137	631

				Off-Peak Load			Average Load			Rush Hour Load		
Simulation	**# of Buses**	**# of Regular Buses**	**# of Express Buses**	**Inter-Arrival Rate**	**Average Riders in Line**	**Average Time**	**Inter-Arrival Rate**	**Average Riders in Line**	**Average Time**	**Inter-Arrival Rate**	**Average Riders in Line**	**Average Time**
6	10	10	0	180	7	271	120	12	277	60	83	288
7	10	8	2	180	6	307	120	33	312	60	98	325
8	10	6	4	180	14	362	120	31	369	60	111	377
9	10	4	6	180	16	430	120	39	438	60	127	444
10	10	1	9	180	32	592	120	58	604	60	147	613