Thomas Dourgarian
Dourg004@umn.edu
Csci 1933

The most important factor in a public transit system is managing the efficiency of each bus in the transit. To optimize the efficiency of each bus within the system I mainly looked at the average time a rider waits in line, the average travel time of a rider (including wait time), and the bus capacity of both normal busses and express busses during different parts of any given day, e.g. rush-hour, off-hour and normal.

Default amount of normal busses: 11
Average busyness (5 hour simulation):

Avg travel time	30 min	32 min	34 min	35 min
Avg wait time	10 min	12 min	13 min	14 min
Avg normal bus capacity	43 riders	44 riders	44 riders	45 riders
Avg express bus capacity	22 riders	28 riders	32 riders	N/A
# of express busses	7 express busses	4 express busses	2 express busses	0 express busses

Analyzing the data here, we see that minimizing the number of express busses during an average day of busyness does only a little damage in regards to the overall efficiency of the transit system. Having a large amount of express busses seems to really bring down the average efficiency of each express bus. In conclusion, during this level of busyness there is a clear benefit to the rider with the presence of the express busses, but too many results in a drastic loss to the efficiency of each express bus.

Now what about if we increase the average rate of rider spawning by 4 to simulate the rush-hour period of the day.

Rush-hour (3 hour simulation):

Avg travel time	31 minutes	32 minutes	34 minutes	40 minutes
Avg wait time	18 minutes	18 minutes	18 minutes	20 minutes
Avg normal bus capacity	45 riders	47 riders	47 riders	48 riders
Avg express bus capacity	38 riders	40 riders	41 riders	N/A
# of express busses	7 express busses	5 express busses	2 express busses	0 express busses

Analyzing the rush-hour simulation data, the number of express busses seems to have a significant effect on the efficiency of the transit system. With no express busses present there is travel time increase of about 9 minutes versus when all 7 are present. But there is a similar difference in efficiency when only maybe 3 or 4 express busses are present. You can also see the capacity of each bus doesn't decrease by much given the increase of express busses. In conclusion, the presence of only a few express busses is critical in maintaining the efficiency of the transit system during rush-hour.

Then I gathered data from an off-hour time of day, where the average rate of rider spawning is half of that during normal hours.

Off-hours(7 hour simulation) :

Avg travel time	29 minutes	29 minutes	29 minutes	30 minutes
Avg wait time	4 minutes	4 minutes	5 minutes	7 minutes
Avg normal bus capacity	33 riders	36 riders	37 riders	38
Avg express bus capacity	8 riders	11 riders	12 riders	N/A
# of express buss	7 busses	4 busses	2 busses	0 busses

Analyzing the off-hour simulation data, the number of express busses present in the transit system seems to have little to no effect on the efficiency of the transit system. The average capacity of each express is really low in comparison to the 2 previous simulations. Because of the lack of capacity of the express busses along with the maintaining of efficiency, the presence of express busses during the off-hour part of the day seems unnecessary.