

I run the simulation for four different densities, and two different size grids to compare results and find the factors that influence the results. I run 15x15 grid with density 0.1, and I observe this system never has traffic jams within 10000 steps. For the 15x15 grid with density 0.4, the free flowing traffic system is more likely, but there are still some traffic jams. For the 15x15 grid with density 0.6, the possibility of traffic jams is much higher. Also, I change the size of grid to be 5x5, and keep the density (0.6), but the possibility of traffic jams is much lower. If we change the density of the 15x15 grid to be 0.9, the traffic jams always occur. If the grid is 5x5 with density 0.9, the free flowing traffic is still possible within 10000 steps. Therefore, I assume that the traffic transitions depend on both of the size of grids and the density of grids.

BML Simulations Questions:

1. For what values of p , the density of the grid, did you find free flowing traffic and traffic jams? Did you find any cases of a mixture of jams and free flowing traffic?

After many trials, I have assumptions about the traffic system. If P is less than 0.38, It will be a free flowing traffic (15x15 matrix). If P is bigger than 0.56, the traffic jams will always appear (15x15 matrix). If the density is between 0.38 and 0.56, a mixture of jams and free flowing traffic will occur (15x15 matrix).

2. How many simulation steps did you need to run before observing this behavior?

For the 15x15 grid with density 0.6, it will take average 80 steps to hit gridlock approximately. However, for the 15x15 grid with density 0.9, it will take only average 12 steps to hit gridlock approximately. In addition, for the 5x5 grid with density 0.6, the frequency of free flowing traffic is bit higher than the frequency of traffic jams.

3. Does the transition depend on the size or shape of the grid?

Yes, the transition not only depends on the size of the grid, but also depends on the density. I have compared the 15x15 grid with density 0.6 to the 5x5 grid with density 0.6, It seems that the bigger grid sizes (15x15) tend to create more jams than the smaller ones (5x5). In conclusion, the higher the density (p) is, the more frequent the traffic jams are, and when p is small, the free flowing traffic is more frequent. In addition, the bigger the grid size is, the heavier the traffic jams are.