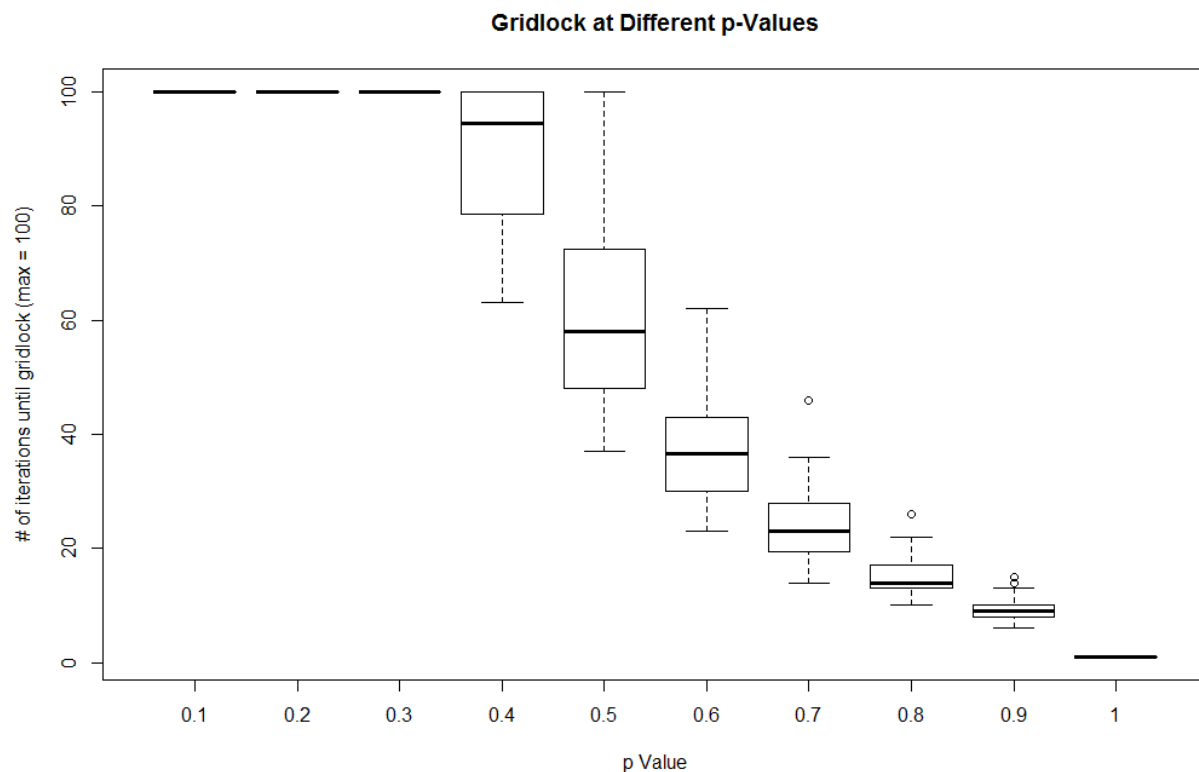


The following results all show a 50x50 car grid, moving it at 100 steps through blue and red cars. The test was run through 60 different simulation trials.

For p-values 0.1 through 0.3 it seems to be completely free flowing. In other words, during the 60 trials that were run, not one case wasn't free flowing with those p-values. However, at $p=0.4$ and $p=0.5$, there were cases showing both gridlock and free flowing traffic. For $p=0.4$, 25 out of the 60 trials reported free flowing, which was 41.67% of the time. While, $p=0.5$, had 6 out of the 60 trials report free flowing, which was 10% of the time. $P=0.6, 0.7, 0.8$, and 0.9 , there was never a free flowing case, meaning all hit gridlock at some point. And of course, at $p=1$, it showed gridlock after 1 iteration, as expected.

p-Value	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Average # of steps until gridlock	100	100	100	89.22	62.3	37.6	23.75	14.93	8.95	1
SD	0	0	0	11.88	18.9	8.99	5.91	3.01	1.78	0



Below is a matrix of 60 simulations I did for different p-values. The number in each cell represents at what iteration (number of steps red & blue) it hit gridlock. Note this is still for a 50x50 car grid with 100 steps through red & blue.

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
[1,]	100	100	100	100	56	48	28	21	8	1
[2,]	100	100	100	100	58	25	29	19	10	1
[3,]	100	100	100	84	70	40	16	19	7	1
[4,]	100	100	100	71	51	30	23	13	13	1
[5,]	100	100	100	71	42	28	23	10	7	1
[6,]	100	100	100	100	64	44	16	15	12	1
[7,]	100	100	100	89	49	26	29	14	8	1
[8,]	100	100	100	100	72	46	28	16	8	1
[9,]	100	100	100	63	51	37	31	15	8	1
[10,]	100	100	100	75	37	38	22	10	8	1
[11,]	100	100	100	95	49	34	22	14	8	1
[12,]	100	100	100	100	100	39	25	16	12	1
[13,]	100	100	100	100	58	27	22	15	10	1
[14,]	100	100	100	72	59	57	23	13	8	1
[15,]	100	100	100	100	59	40	20	14	9	1
[16,]	100	100	100	100	49	29	29	12	7	1
[17,]	100	100	100	100	41	36	18	17	9	1
[18,]	100	100	100	71	54	23	24	13	9	1
[19,]	100	100	100	68	46	59	23	15	9	1
[20,]	100	100	100	100	41	33	20	14	8	1
[21,]	100	100	100	74	52	43	29	12	8	1
[22,]	100	100	100	100	50	50	21	16	7	1
[23,]	100	100	100	76	47	24	29	22	9	1
[24,]	100	100	100	65	96	38	19	17	7	1
[25,]	100	100	100	100	39	30	22	13	8	1
[26,]	100	100	100	86	84	27	24	12	8	1
[27,]	100	100	100	70	50	30	27	14	10	1
[28,]	100	100	100	92	43	34	21	13	10	1
[29,]	100	100	100	100	56	62	22	26	8	1
[30,]	100	100	100	85	49	36	22	12	9	1
[31,]	100	100	100	100	53	42	25	17	9	1
[32,]	100	100	100	100	46	46	15	20	11	1
[33,]	100	100	100	97	43	54	18	13	9	1
[34,]	100	100	100	100	78	31	21	16	14	1
[35,]	100	100	100	78	39	34	16	15	8	1
[36,]	100	100	100	100	47	35	31	14	10	1
[37,]	100	100	100	78	46	26	14	15	9	1
[38,]	100	100	100	98	88	40	18	13	9	1
[39,]	100	100	100	100	86	27	17	20	8	1
[40,]	100	100	100	80	73	33	30	15	10	1
[41,]	100	100	100	98	62	29	21	12	9	1
[42,]	100	100	100	86	79	43	17	14	8	1
[43,]	100	100	100	86	96	51	28	17	6	1
[44,]	100	100	100	80	100	36	18	12	11	1
[45,]	100	100	100	100	41	43	35	18	7	1
[46,]	100	100	100	97	65	41	25	20	15	1
[47,]	100	100	100	100	47	32	36	15	11	1
[48,]	100	100	100	90	67	47	24	13	7	1
[49,]	100	100	100	100	100	24	22	13	8	1
[50,]	100	100	100	79	63	41	24	17	9	1
[51,]	100	100	100	74	77	40	18	11	9	1
[52,]	100	100	100	94	100	35	46	11	6	1
[53,]	100	100	100	100	62	41	22	12	9	1
[54,]	100	100	100	76	61	44	27	12	9	1
[55,]	100	100	100	88	100	29	16	13	10	1
[56,]	100	100	100	100	67	36	30	17	7	1
[57,]	100	100	100	85	61	36	29	18	10	1
[58,]	100	100	100	100	66	49	19	13	8	1
[59,]	100	100	100	100	53	39	32	15	8	1
[60,]	100	100	100	82	100	39	24	13	11	1

The transition does depend on the size of the grid. I ran it for a 100x100 car grid, through 100 steps through blue and red and the results were very different. By the matrix below, at $p=0.4$ it was free flowing 90% of the time, also $p=0.5$ hit grid lock 40% of the time with an average of 84.5, significantly more than a 50x50 grid.

```

      0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1
[1,] 100 100 100 100 100 66 29 24 13 1
[2,] 100 100 100 100 95 61 35 15 11 1
[3,] 100 100 100 100 82 42 36 21 20 1
[4,] 100 100 100 100 89 39 36 20 9 1
[5,] 100 100 100 100 100 40 22 18 13 1
[6,] 100 100 100 100 77 36 48 19 13 1
[7,] 100 100 100 100 100 38 32 16 12 1
[8,] 100 100 100 87 47 38 55 17 10 1
[9,] 100 100 100 100 100 76 32 18 13 1
[10,] 100 100 100 100 55 38 26 18 10 1

```

p-Value	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Average # of steps until gridlock	100	100	100	98.7	84.5	47.4	35.1	18.6	12.4	1
SD	0	0	0	4.11	19.52	14.52	9.86	2.59	3.06	0

Gridlock at Different p-Values

