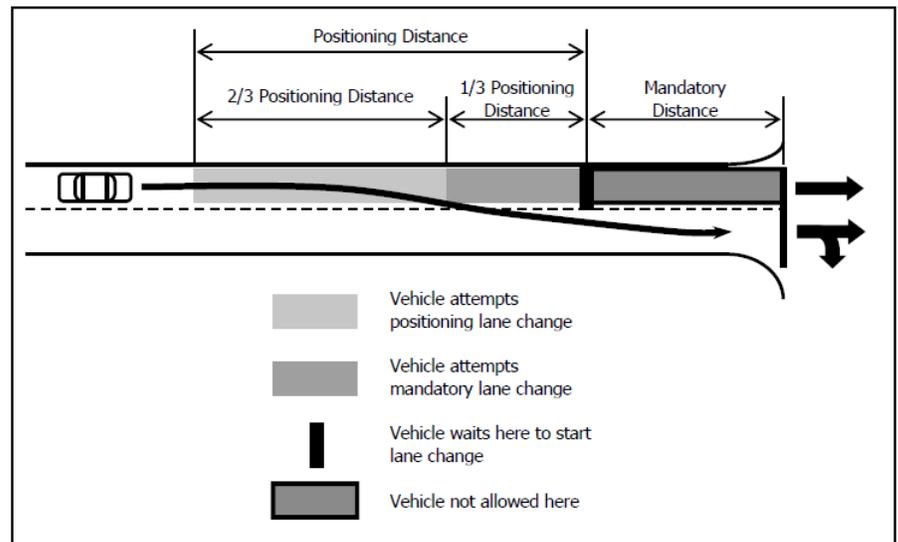


Synchro Snippets

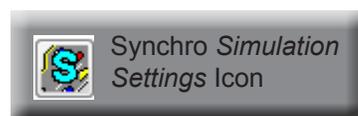
April 2013 | Volume 3 | Positioning and Mandatory Distances



Traffic flow within SimTraffic is based on a series of lane changing and car following algorithms. The variation in flow among vehicles can be attributed to their driver type as they enter the roadway network. As vehicles are added to the network, they have a pre-determined path and already know several of their upcoming movements. The decision on when a vehicle changes lanes is based on two key parameters. The first is the **mandatory distance** and is defined as the distance from an intersection that a vehicle must have already changed lanes to complete a required movement. If the vehicle has not changed lanes by this point, the vehicle will stop and wait for a gap. The second parameter is the **positioning distance** and is defined as the distance from the mandatory distance that a vehicle will attempt to make a lane change to avoid being forced to complete a mandatory lane change. The figure on the right highlights the relationship between these parameters.



Adjustment to these parameters can be made at the local link or global network levels. Refinements at the local level can be made by pressing the Synchro Simulation Settings icon after selecting either a node or link. The figure on the bottom-left illustrates an example screen highlighting the default calculated distances (within red square) upon selecting a typical intersection. Adjustments to these values will only affect the links at the selected intersection node. It is important to note that this is not the final distance used within SimTraffic. Another set of factors included within SimTraffic's Drivers Parameters screen also impacts all roadway links within the model. Notice that in the bottom-right figure, each driver type has a percentage adjustment value (within green square).

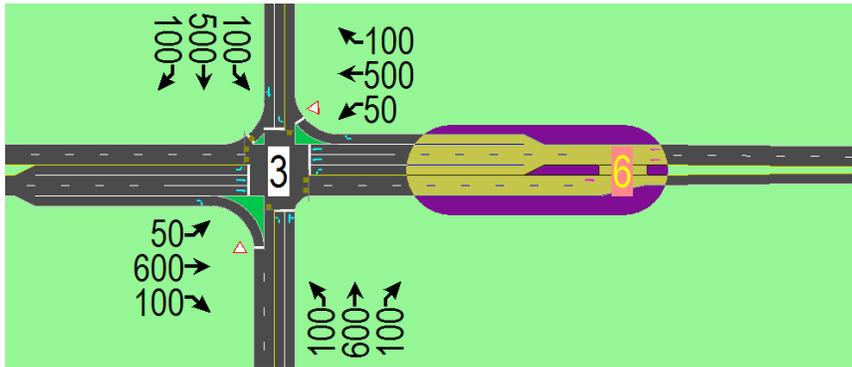


These percentages are multiplied by the distances listed in the Simulation Settings screen to arrive at the actual distance used while traveling through a model. Adjustments to these percentages affect all vehicles within the SimTraffic model.

SIMULATION SETTINGS		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Shoulder (ft/L)		50	600	100	50	50	100	100	600	100	100	500	100
Traffic Volume (vph)		250	250	250	250	250	200	0	200	0	200	0	0
Storage Length (ft)		1	1	1	1	1	1	1	1	1	1	1	1
Storage Lanes (#)		25	25	25	25	25	25	25	25	25	25	25	25
Taper Length (ft)		12	12	12	12	12	12	12	12	12	12	12	12
Lane Alignment		Left	Left	Right									
Lane Width (ft)		12	12	12	12	12	12	12	12	12	12	12	12
Enter Blocked Intersection		No	No	No									
Median Width (ft)		12	12	12	12	12	12	12	12	12	12	12	12
Link Offset (ft)		0	0	0	0	0	0	0	0	0	0	0	0
Crosswalk Width (ft)		16	16	16	16	16	16	16	16	16	16	16	16
TW/TL Median													
Headway Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Truck Speed (mph)		15	15	15	15	15	15	15	15	15	15	15	15
Mandatory Distance (ft)		208	208	208	208	208	208	208	208	208	208	208	208
Positioning Distance (ft)		1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320
Mandatory Distance 2 (ft)		880	880	880	880	880	880	880	880	880	880	880	880
Positioning Distance 2 (ft)		1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760	1760

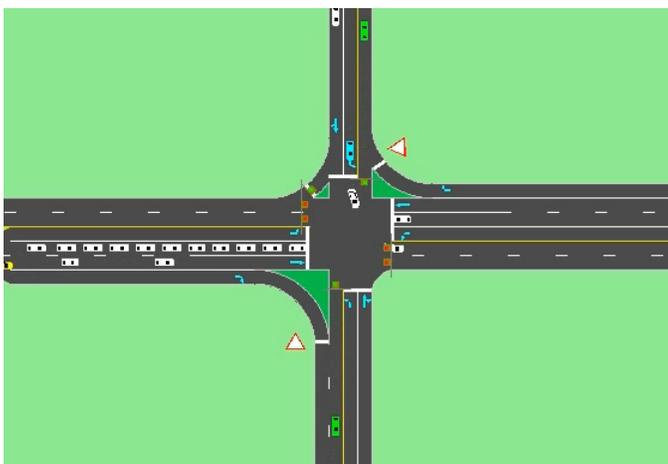
SimTraffic Parameters		Driver Types									
Vehicle	Driver Type	1	2	3	4	5	6	7	8	9	10
Yellow Decel (ft/s ²)		12.0	12.0	12.0	12.0	12.0	11.0	10.0	9.0	8.0	7.0
Speed Factor (%)		0.85	0.88	0.92	0.95	0.98	1.02	1.05	1.08	1.12	1.15
Courtesy Decel (ft/s ²)		10.0	9.0	8.0	7.0	6.0	5.0	4.0	4.0	3.0	3.0
Yellow React (s)		0.7	0.9	1.0	1.0	1.2	1.3	1.3	1.4	1.4	1.7
Green React (s)		0.8	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.2
Headway @ 0 mph (s)		0.65	0.63	0.60	0.58	0.55	0.45	0.42	0.40	0.37	0.35
Headway @ 20 mph (s)		1.80	1.70	1.60	1.50	1.40	1.20	1.10	1.00	0.90	0.80
Headway @ 50 mph (s)		2.20	2.00	1.90	1.80	1.70	1.50	1.40	1.30	1.20	1.00
Headway @ 80 mph (s)		2.20	2.00	1.90	1.80	1.70	1.50	1.40	1.30	1.20	1.00
Gap Acceptance Factor		1.15	1.12	1.10	1.05	1.00	1.00	0.95	0.90	0.88	0.85
Positioning Advantage (veh)		15.0	15.0	15.0	15.0	15.0	2.0	2.0	1.2	1.2	1.2
Optional Advantage (veh)		2.2	2.2	2.2	1.0	1.0	1.0	1.0	1.0	0.5	0.5
Mandatory Dist Adj (%)		200	170	150	135	110	90	80	70	60	50
Positioning Dist Adj (%)		150	140	130	120	110	95	90	80	70	60
Avg Lane Change Time (s)		30	30	40	40	30	20	20	20	15	10
Lane Change Variance +/- (%)		10	10	10	20	20	20	30	30	30	30

In order to better understand these parameters, let's examine how vehicles within SimTraffic react to a lane drop just downstream of Intersection 3. First, we select the eastern segment of Link 3-6 and press the Simulation Settings icon.

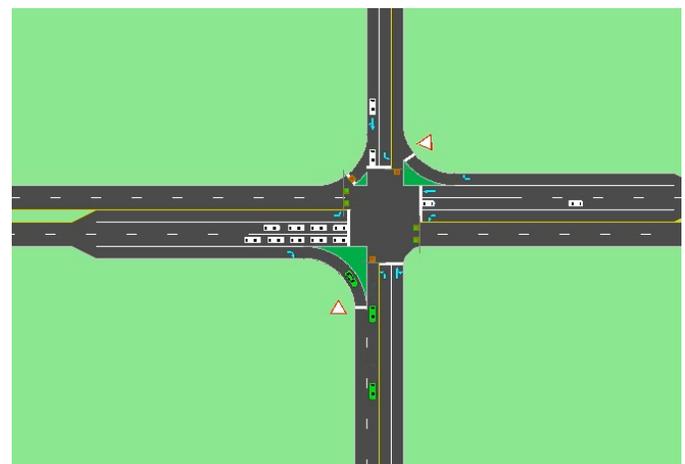


SIMULATION SETTINGS		→ EBT	← WBT
Lanes and Sharing (#RL)		↑↑	↑↑
Traffic Volume (vph)		—	—
Storage Length (ft)		—	—
Storage Lanes (#)		—	—
Taper Length (ft)		—	—
Lane Alignment		Left	Left
Lane Width (ft)		—	—
Enter Blocked Intersection		—	—
Median Width (ft)		12	12
Link Offset (ft)		0	0
Crosswalk Width (ft)		16	16
TWLT Median		<input type="checkbox"/>	<input type="checkbox"/>
Headway Factor		1.00	1.00
Turning Speed (mph)		—	—
Mandatory Distance (ft)		100	100
Positioning Distance (ft)		1320	1320
Mandatory Distance 2 (ft)		880	880
Positioning Distance 2 (ft)		1760	1760

Notice the mandatory distance for EB vehicles is 100 ft., while the positioning distance for EB vehicles is 1,320 ft. (within red square). Using the default values within SimTraffic's Drivers Parameters for Driver Type 1, we can calculate the positioning distance to be $1,320 \times 200\% = 2,640$ ft. This means that most vehicles will begin making lane changes over 0.5 mile from the lane drop. With this in mind, the queuing shown within the figure in the lower left seems reasonable. However, this queuing may not match what might be observed in the field. Since our goal is to somewhat balance lane utilization, we can adjust this value, for example, to 200 ft. This results in more realistic queuing (bottom right figure). This change allows even a driver Type 1 to wait until just 400 feet from the lane drop to being making lane choices.



Lane Utilization with Default Parameters



Improved Lane Utilization by Adjusting Positioning Distance

Through adjusting either the mandatory and/or positioning distances, calibrating SimTraffic can be completed rather quickly. Calibration of these parameters can be conducted at either the Local Link or Global Network levels.