Lab 12
Synchro Basics

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CEGE-3201: Transportation Engineering

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Announcements

- Report 5 due on May 3rd.
- No lab on May 2nd.
- Office hour: May 2nd 3:30-4:30 pm Room 175.

Synchro Project

Test the effect of new signal timing to the intersection

- Build a Synchro model representing the target intersection with current signal timing (need data collection)
- Get the level of service (LOS) and delays of the intersection
- Add a phase for pedestrian and optimize the signal timing of the intersection
- Get the level of service (LOS) and delays of the intersection with new signal timing
- Compare two signal timing schemes

Leading/Lagging phase

- Left turn phase is activated before the phase for the through movement. Otherwise, it is a lagging left turn phase.

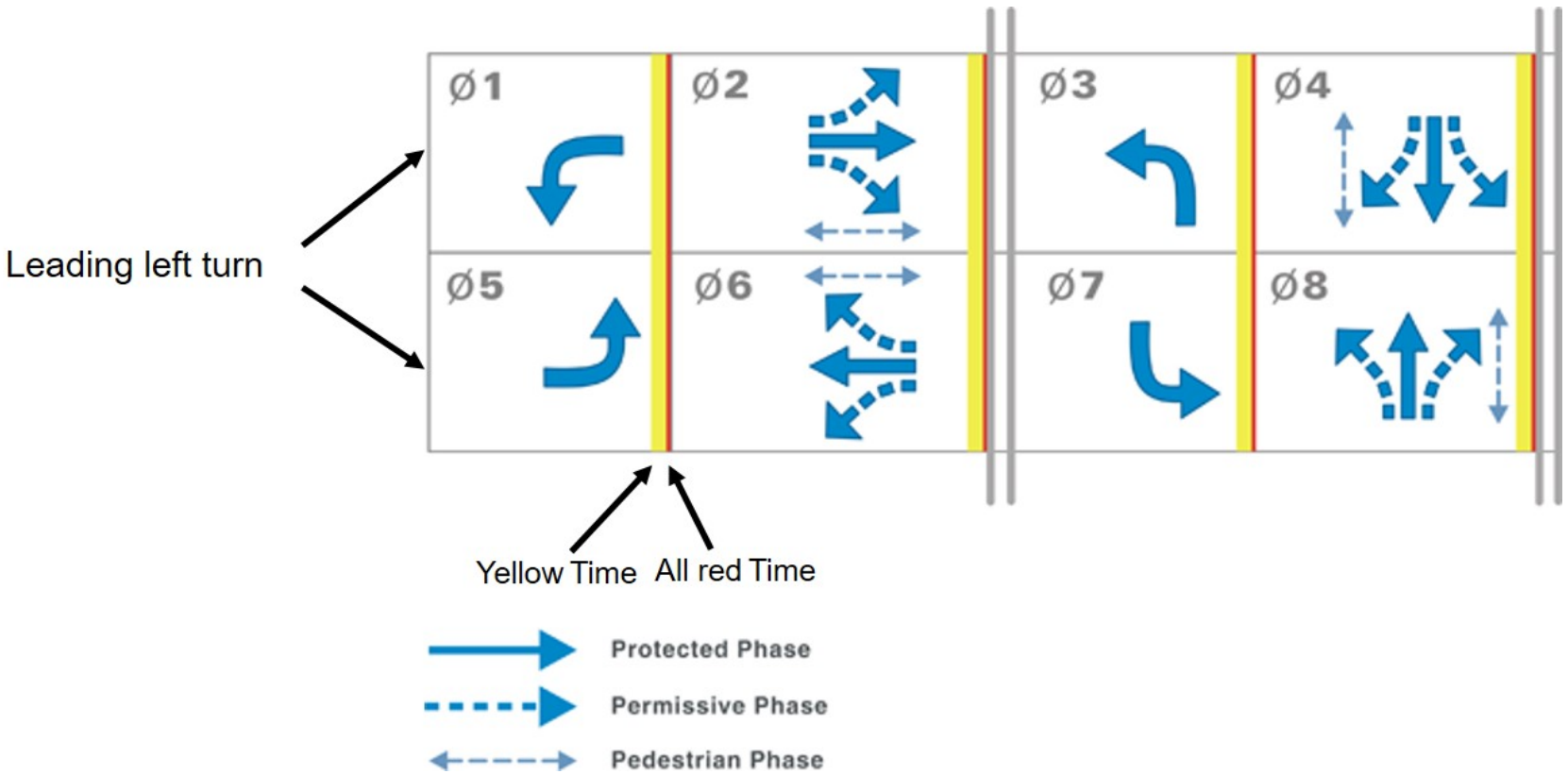


Figure: Signal phasing

Turning lane pockets

- Short, reserved lanes for turning vehicles
- Measure length in Google Maps to input into Synchro model

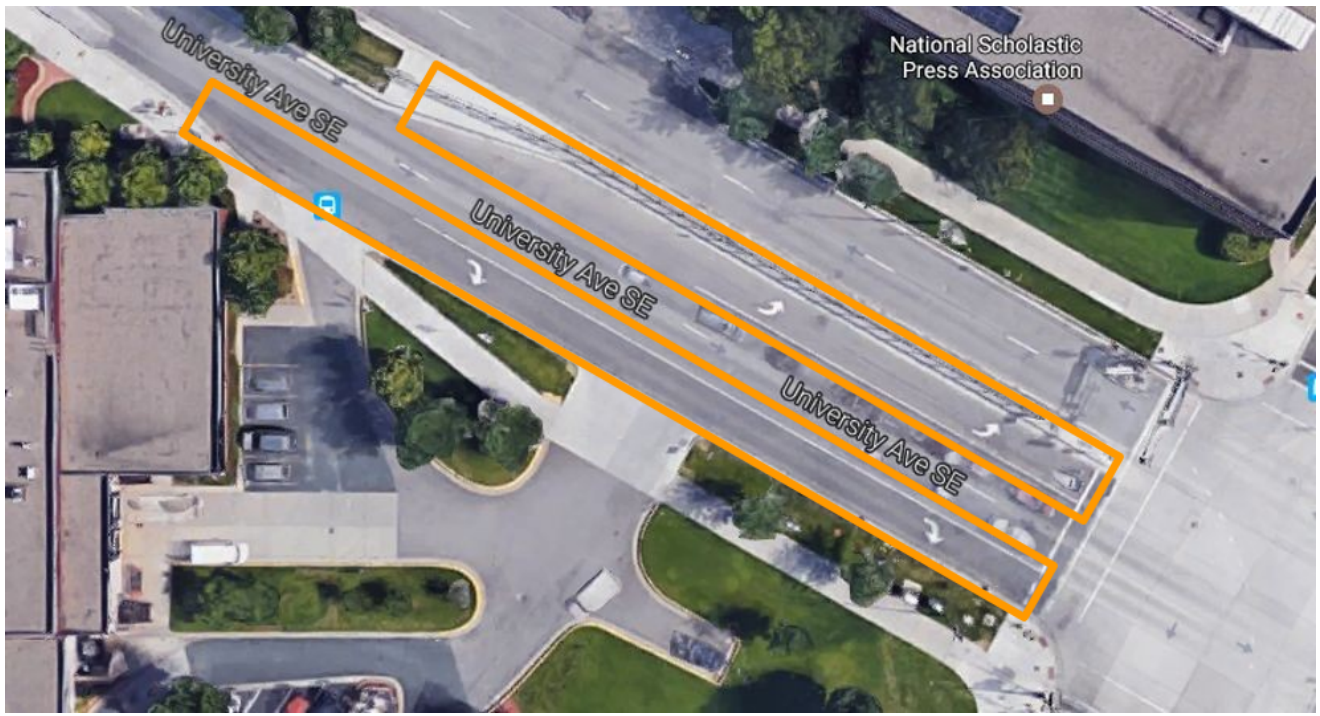


Figure: Lane pockets

Synchro Hints

- Timing window: adjust timing, phasing, left turns

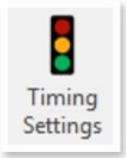
- Draw lanes

- Adjust lane configuration: add lanes, turn pockets

- Run SimTraffic simulation

Figure: Useful icons

Timing Settings



NODE SETTINGS	
Node #	3
Zone:	
X East (ft):	9994
Y North (ft):	11071
Z Elevation (ft):	0
Description	
Control Type	Pretimed
Cycle Length (s):	100.0
Lock Timings:	☐
Optimize Cycle Length:	Optimize
Optimize Splits:	Optimize
Actuated Cycle(s):	100.0
Natural Cycle(s):	65.0
Max v/c Ratio:	0.46
Intersection Delay (s):	22.3
Intersection LOS:	C
ICU:	0.36
ICU LOS:	A
Offset (s):	0.0
Referenced to:	Begin of Green
Reference Phase:	2+6 - NBT SBTL
Master Intersection:	☐
Yield Point:	Single
Mandatory Stop On Yellow:	☐

TIMING SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	PED	HOLD
Lanes and Sharing (#RL)													—	—
Traffic Volume (vph)	50	100	50	50	100	50	100	100	50	50	100	50	—	—
Future Volume (vph)	50	100	50	50	100	50	100	100	50	50	100	50	—	—
Turn Type	pm+pt	—	Perm	Perm	—	—	Prot	—	Perm	Perm	—	Perm	—	—
Protected Phases	7	4			8	—	5	2			6			
Permitted Phases	4		4	8		—			2	6		6	—	—
Permitted Flashing Yellow	☐	—	—	—	—	—	—	—	—	—	—	—	—	—
Detector Phases	7	4	4	8	8	—	5	2	2	6	6	6	—	—
Switch Phase	0	0	0	0	0	—	0	0	0	0	0	0	—	—
Leading Detector (ft)	20	100	20	20	100	—	20	100	20	20	100	20	—	—
Trailing Detector (ft)	0	0	0	0	0	—	0	0	0	0	0	0	—	—
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	—	5.0	5.0	5.0	5.0	5.0	5.0	—	—
Minimum Split (s)	9.5	22.5	22.5	22.5	22.5	—	9.5	22.5	22.5	22.5	22.5	22.5	—	—
Total Split (s)	18.0	49.0	49.0	31.0	31.0	—	18.0	51.0	51.0	33.0	33.0	33.0	—	—
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	—	3.5	3.5	3.5	3.5	3.5	3.5	—	—
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	—	1.0	1.0	1.0	1.0	1.0	1.0	—	—
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	—	0.0	0.0	0.0	0.0	0.0	0.0	—	—
Lagging Phase?	☐	—	—	☑	☑	—	☐	—	—	☑	☑	☑	—	—
Allow Lead/Lag Optimize?	☑	—	—	☑	☑	—	☑	—	—	☑	☑	☑	—	—
Recall Mode	Max	Max	Max	Max	Max	—	Max	Max	Max	Max	Max	Max	—	—
Speed limit (mph)	—	30	—	—	30	—	—	30	—	—	30	—	—	—
Actuated Effct. Green (s)	44.5	44.5	44.5	26.5	26.5	—	13.5	46.5	46.5	28.5	28.5	28.5	—	—
Actuated g/C Ratio	0.44	0.44	0.44	0.26	0.26	—	0.14	0.46	0.46	0.28	0.28	0.28	—	—
Volume to Capacity Ratio	0.10	0.07	0.07	0.16	0.34	—	0.46	0.13	0.07	0.14	0.23	0.10	—	—
Control Delay (s)	16.5	16.1	3.5	29.9	27.4	—	46.8	15.7	3.3	28.1	28.9	0.4	—	—
Queue Delay (s)	0.0	0.0	0.0	0.0	0.0	—	0.0	0.0	0.0	0.0	0.0	0.0	—	—
Total Delay (s)	16.5	16.1	3.5	29.9	27.4	—	46.8	15.7	3.3	28.1	28.9	0.4	—	—
Level of Service	B	B	A	C	C	—	D	B	A	C	C	A	—	—
Approach Delay (s)	—	13.1	—	—	28.0	—	—	25.7	—	—	21.6	—	—	—
Approach LOS	—	B	—	—	C	—	—	C	—	—	C	—	—	—
Queue Length 50th (ft)	19	20	0	26	71	—	65	38	0	24	57	0	—	—
Queue Length 95th (ft)	42	36	17	59	129	—	120	70	17	55	106	0	—	—
Stops (vph)	27	55	6	38	100	—	90	55	6	33	77	0	—	—
Fuel Used (g/hr)	1	1	0	1	3	—	2	1	0	1	2	0	—	—

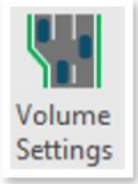
Figure: Timing settings

Lane Settings

LANE SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	50	100	50	50	100	50	100	100	50	100	100	50
Future Volume (vph)	50	100	50	50	100	50	100	100	50	100	100	50
Street Name												
Link Distance (ft)	—	874	—	—	1051	—	—	954	—	—	844	—
Link Speed (mph)	—	30	—	—	30	—	—	30	—	—	30	—
Set Arterial Name and Speed	—	EB	—	—	WB	—	—	NB	—	—	SB	—
Travel Time (s)	—	19.9	—	—	23.9	—	—	21.7	—	—	19.2	—
Ideal Satd. Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)	—	0	—	—	0	—	—	0	—	—	0	—
Area Type CBD	—	☐	—	—	☐	—	—	☐	—	—	☐	—
Storage Length (ft)	100	—	50	0	—	0	100	—	50	100	—	50
Storage Lanes (#)	1	—	1	—	—	—	1	—	1	1	—	1
Right Turn Channelized	—	—	None	—	—	None	—	—	None	—	—	None
Curb Radius (ft)	—	—	—	—	—	—	—	—	—	—	—	—
Add Lanes (#)	—	—	—	—	—	—	—	—	—	—	—	—
Lane Utilization Factor	1.00	0.95	1.00	0.95	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00
Right Turn Factor	1.000	1.000	0.850	—	0.963	—	1.000	1.000	0.850	1.000	1.000	0.850
Left Turn Factor (prot)	0.950	1.000	1.000	—	0.988	—	0.950	1.000	1.000	0.950	0.995	1.000
Saturated Flow Rate (prot)	1770	3539	1583	—	3367	—	1770	1863	1583	1681	1761	1583
Left Turn Factor (perm)	0.517	1.000	1.000	—	0.856	—	0.950	1.000	1.000	0.687	0.977	1.000
Right Ped Bike Factor	1.000	1.000	1.000	—	1.000	—	1.000	1.000	1.000	1.000	1.000	1.000
Left Ped Factor	1.000	1.000	1.000	—	1.000	—	1.000	1.000	1.000	1.000	1.000	1.000
Saturated Flow Rate (perm)	963	3539	1583	—	2917	—	1770	1863	1583	1216	1729	1583
Right Turn on Red?	—	—	☑	—	—	☑	—	—	☑	—	—	☑
Saturated Flow Rate (RTOR)	0	0	65	—	44	—	0	0	65	0	0	115
Link Is Hidden	—	☐	—	—	☐	—	—	☐	—	—	☐	—
Hide Name in Node Title	—	☐	—	—	☐	—	—	☐	—	—	☐	

Figure: Lane settings

Volume Settings



VOLUME SETTINGS	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lanes and Sharing (#RL)												
Traffic Volume (vph)	0	0	0	500	500	100	100	500	0	0	500	100
Development Volume (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Combined Volume (vph)	0	0	0	500	500	100	100	500	0	0	500	100
Future Volume (vph)	0	0	0	500	500	100	100	500	0	0	500	100
Conflicting Peds. (#/hr)	0	—	0	1000	—	1000	1000	—	1000	0	—	1000
Conflicting Bicycles (#/hr)	—	—	0	—	—	0	—	—	0	—	—	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth 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
Adjusted Flow (vph)	0	0	0	543	543	109	109	543	0	0	543	109
Heavy Vehicles (%)	2	2	2	2	2	2	2	2	2	2	2	2
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Adj. Parking Lane?	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Parking Maneuvers (#/hr)	—	—	—	—	—	—	—		—	—	—	—
Traffic from mid-block (%)	—	0	—	—	0	—	—	0	—	—	0	—
Link OD Volumes	—	—	—	—	—	—	—	—	—	—	—	—
Traffic in shared lane (%)	—	—	—	—	—	—	—	—	—	—	—	—
Lane Group Flow (vph)	0	0	0	0	1086	109	109	543	0	0	543	109

Figure: Volume settings

Phasing Settings

PHASING SETTINGS	2-NBTL	6-SBT	8-WBTL	9-Ped
Minimum Initial (s)	5.0	5.0	5.0	5.0
Minimum Split (s)	22.5	22.5	22.5	9.5
Maximum Split (s)	22.5	22.5	18.0	14.0
Yellow Time (s)	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0
Lagging Phase?	—	—	—	—
Allow Lead/Lag Optimize?	—	—	—	—
Optimize Phs Weights - Delays	1.0	1.0	1.0	1.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0
Minimum Gap (s)	3.0	3.0	3.0	3.0
Time Before Reduce (s)	0.0	0.0	0.0	0.0
Time To Reduce (s)	0.0	0.0	0.0	0.0
Recall Mode	Max	Max	Max	Max
Pedestrian Phase	☐	☐	☐	☐
Walk Time (s)	—	—	—	—
Flash Dont Walk (s)	—	—	—	—
Pedestrian Calls (#/hr)	—	—	—	—
Dual Entry?	☑	☑	☑	☐
Fixed Force Off?	☑	☑	☑	☑
90th %ile Green Time (s)	18 cd	18 cd	14 mr	10 mr
70th %ile Green Time (s)	18 cd	18 cd	14 mr	10 mr
50th %ile Green Time (s)	18 cd	18 cd	14 mr	10 mr
30th %ile Green Time (s)	18 cd	18 cd	14 mr	10 mr
10th %ile Green Time (s)	18 cd	18 cd	14 mr	10 mr

Figure: Phasing settings

General Tips

- Get all information you can from Google Maps/Street View, then verify in field (ie. left turn phasing, number of lanes, lane configuration)
- Treat this as if you have been hired to do so (read the project description carefully and turn in a nicely formatted and well written report.
- Refer to "CEGE Guidelines for Writing Lab Reports.pdf' for questions about report formatting.
- Use "User Guide" if you have questions about Synchro.
- Stay safe!

Thank you!