CE 572 – Spring 2015
Class 20

2015.03.06

Assignment 27 - Phase Duration Estimation for Actuated Control

The purpose of this assignment is to set up a computational engine to predict phase duration for a simple system (two intersecting one-way streets) under actuated control.

Task 1. Document all parameters, both input and calculated, required for this procedure under the simplified conditions for this scenario. This can be handwritten.

Task 2. Document the calculation sequence for phase duration in flow chart form. This can be handwritten.

Task 3. Create a spreadsheet with space for the input parameters that you identified in task 1. The space should include the parameter name, the value, and the units.

Task 4. Add to the spreadsheet the calculated parameters that you identified in task 1, again including the parameter name, the value, and the units. Use VBA functions as needed for the calculated parameters.

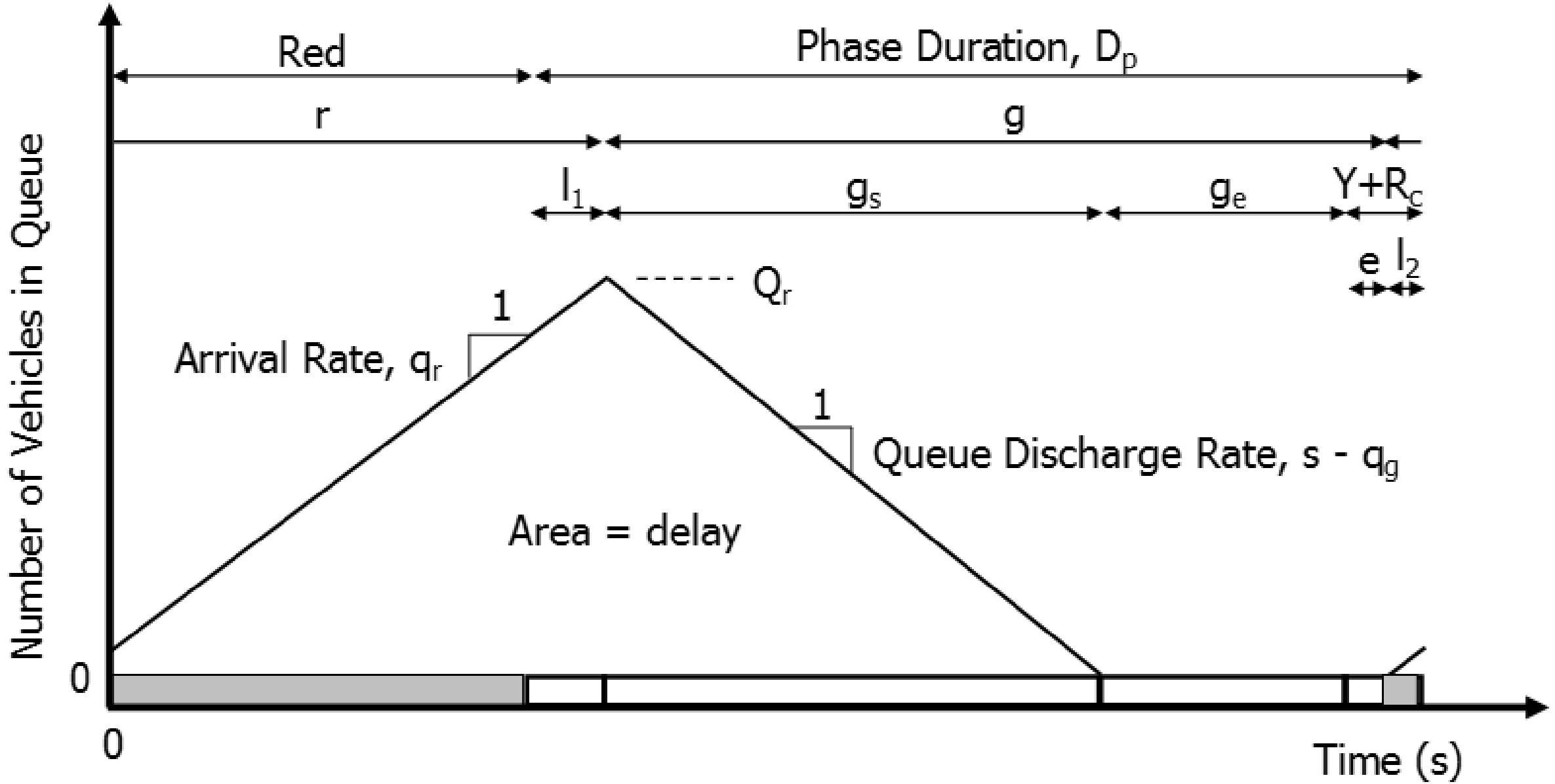

Exhibit 31-7
Time Elements Influencing
Actuated Phase Duration

Assignment 28 – Phase Duration Estimation for Actuated Control

The purpose of this assignment is to enhance the computational engine that you developed for Assignment 27 and directly calculate the phase durations for the two approaches (iteratively). Your completed computational engine should accept the input parameters (as per task 3 in Assignment 27) and calculate the required values for each of the two phases:

- queue service time, g_s
- green extension time, g_e
- Displayed green, G
- Phase duration, D_p
- Cycle length, C

The iteration process should be accomplished by constructing a VBA subprogram.

	A	B	C	D
1	**Input variables**	**Phase 2**	**Phase 4**	
2	Arrival rate, v	500	400	veh/hr
3	Proportion vehicles arriving on green, P	0.5	0.5	
4	Headway of bunched vehicles, Δ	1.5	1.5	veh/sec
5	Bunching factor, b	0.6	0.6	
6	Lost time, l_1	2	2	sec
7	Passage time, PT	2.5	2.5	sec
8	Detection zone length, L_{ds}	22	22	feet
9	Vehicle length, L_v	20	20	feet
10	Speed, S_a	30	30	mi/hr
11	Maximum green, G_{max}	50	50	sec
12	Minimum green, G_{min}	5	5	sec
13	Yellow time, Y	3	3	sec
14	Red clearance, R_c	2	2	sec
15	Saturation flow rate, s	1900	1900	veh/hr/green
16				
17	**Intermediate values**			
18	Cycle length, C	26.6	26.6	sec
19	Effective green, g	9.1	7.5	sec
20	Effective red, r	17.5	19.1	sec

	A	B	C	D
22	**Calculated variables**			
23	Arrival rate, q	0.139	0.111	veh/sec
24	Arrival rate during red, q_r	0.105	0.077	veh/sec
25	Arrival rate during green, q_g	0.204	0.197	veh/sec
26	Proportion of free vehicles, φ	0.882	0.905	
27	Flow rate parameter, λ	0.155	0.121	veh/sec
28	Queue at end of red, Q_r	1.845	1.476	veh
29	Queue service time, g_s	5.691	4.458	sec
30	Number of extension before max out, n	5.876	4.838	
31	ProbSubjectPhaseCalled, p_v	0.975	0.948	
32	MAH	3.452	3.452	sec
33	ProbGreenExtension, p	0.348	0.285	
34	Green extension, g_e	1.332	1.020	sec
35	Effective change interval, $Y + R_c$	5	5	sec
36	Average green interval duration, G	9.023	7.479	sec
37	Phase duration, D_p	14.023	12.479	sec
38				
39	**Final values**			
40	Cycle length, C	26.5	26.5	sec
41	Effective green, g	9.0	7.5	sec
42	Effective red, r	17.5	19.0	sec
43	Displayed green, G	9.0	7.5	sec
44	Displayed red, R	14.5	16.0	sec
45	Displayed yellow, Y	3	3	sec