

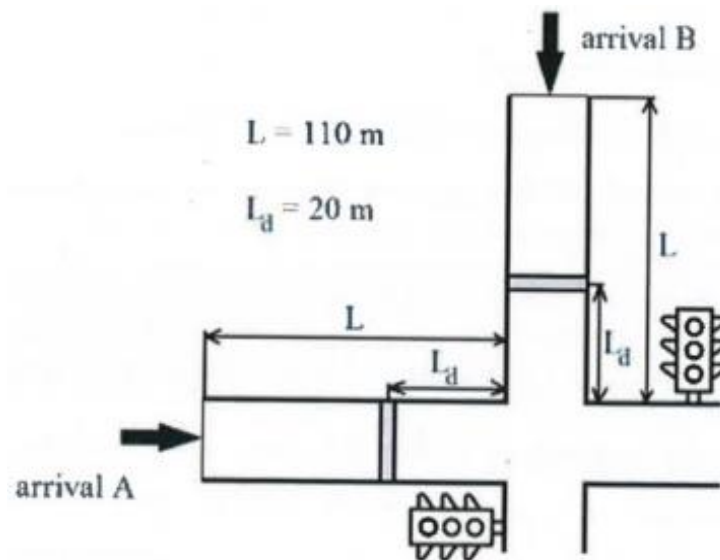
Fundamentals of Traffic Operations and Control

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Exercise

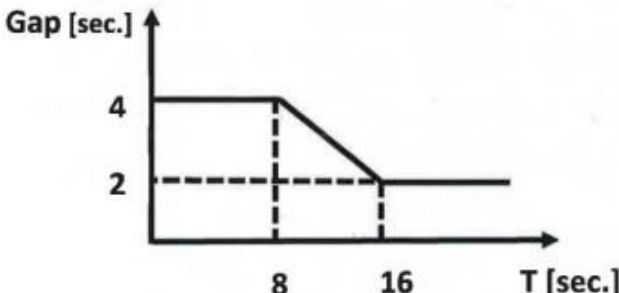
Adaptive Signal control

Consider the following intersection with two different approaches. The free flow speed for both approaches are $V_{\text{free}} = 15$ m/s. The average length of a vehicle is $L_v = 5$ m and the “minimum headway” between vehicles is 2 s/veh. The vehicles travel with free flow speed until they reach the queue. The acceleration and deceleration times are assumed to be zero (that is, the “conservative reaction time” is 0 seconds).



Two detectors (depicted in the above figure in grey) are located L_d meters upstream of the traffic lights and are utilized by an actuated controller. The controller has the following settings on Phase A and Phase B:

Minimum green	Time needed to clean the maximum undetected queue.
Maximum green	25 seconds
All red + Yellow	$2+1 = 3$ seconds

Extension policy	<p>Given the vehicle arrivals (A and B), the green time is extended based on a “Gap Reduction Strategy”. The green time is extended until the gap is strictly larger than the value indicated by the gap function below:</p> 
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The signal plans are operated based on known vehicle arrivals (A and B), which occur at the beginning of the links (note that all times in cumulative seconds). The green time of Phase A begins at T=0 seconds.

ARRIVALS (A)	ARRIVALS (B)
1.5	
5.2	
7.6	
	8.5
9.6	
	11.3
11.8	
	15.5
	22.0
23.0	
	25.2
	27.4
32.7	
	32.8
34.4	
	34.6
	37.3

Compute the green times for each phase and draw a diagram indicating the extension periods and times when the green is transferred to the next phase.