

QUEUE LENGTH AND DELAY ESTIMATION AT SIGNALIZED INTERSECTIONS USING DETECTOR DATA

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INTRODUCTION

- Measures of Performance for Signalized intersections
 - v/c ratio
 - Control delay
 - Max. queue length
 - Level of service
 - Fuel consumption
 - Number of stops



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METHODOLOGY

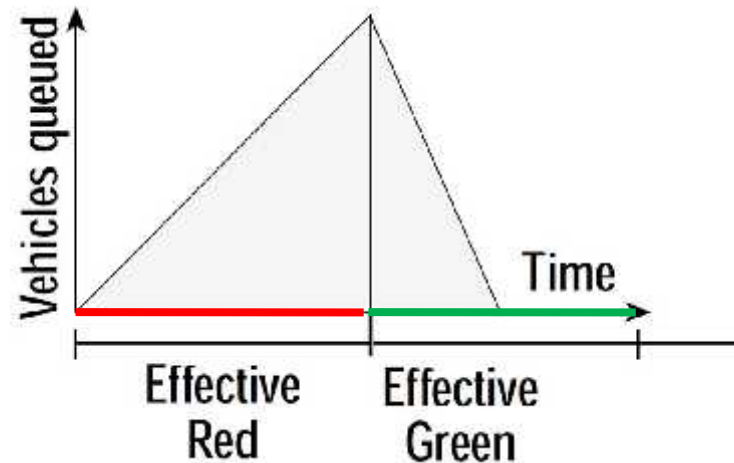
- INPUT

Stop bar detections

Signal timing information

- Development of Queue polygon

- Meas
for ea



h and delay

STUDY SITE

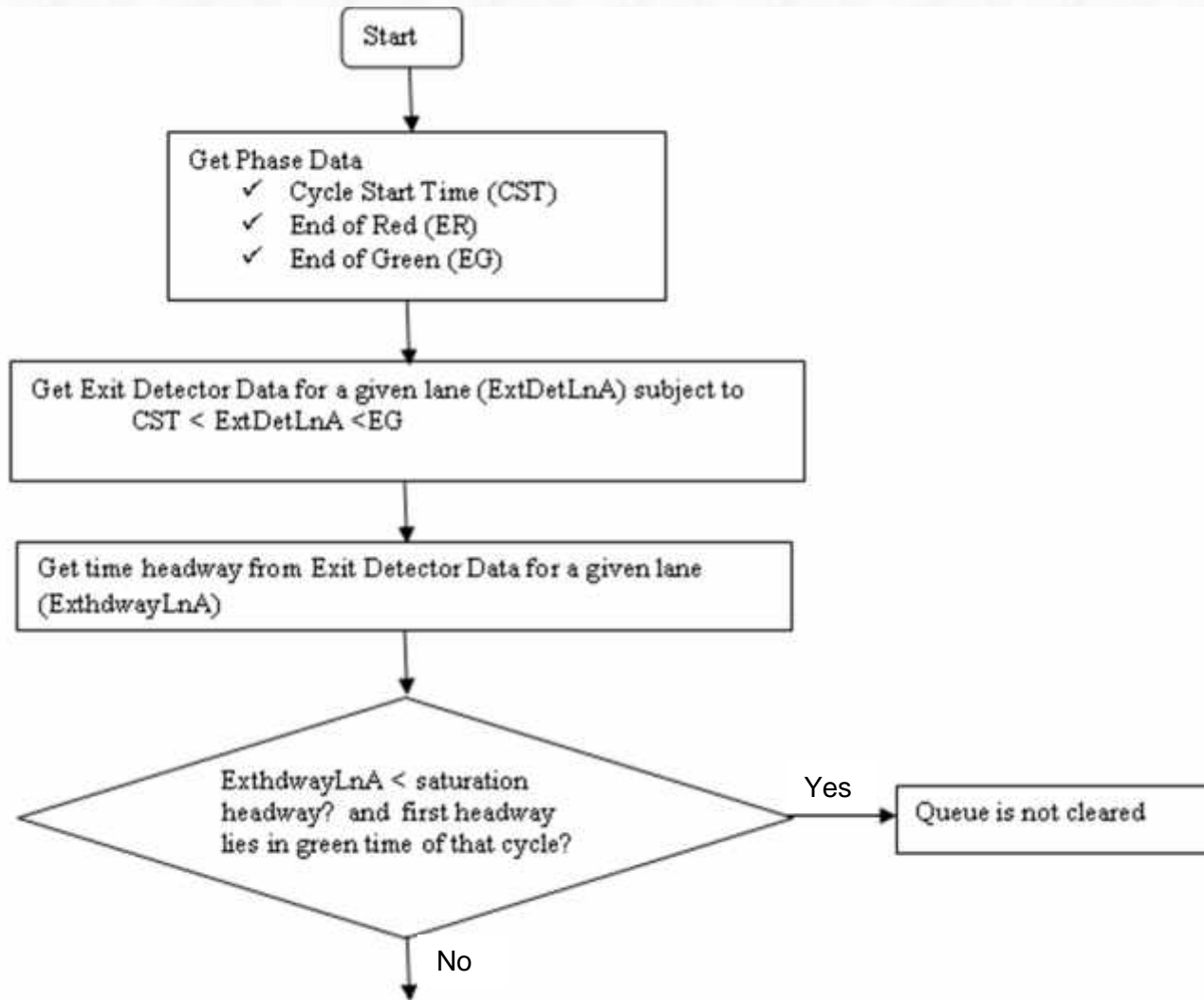
- This method requires signal timing information-
difficult to get in India
- Study sites selected are 17 G and 27G Cornhusker
in Lincoln, Nebraska, USA



DATA COLLECTION

- Micro loop detectors placed just after stop line
- Digitalized data generated as vehicles arrive and leave
- Signal timing information obtained
- Actual values extracted manually from video
- One hour each from 17G intersection and 27G Cornhusker in peak and off-peak hour

QUEUE POLYGON DEVELOPMENT



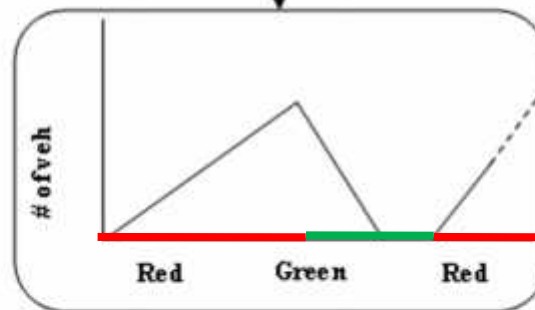
QUEUE POLYGON DEVELOPMENT (contd.)

Queue clearance time = Time stamp of start of green - time stamp of the first headway greater than saturation headway

Numqueue = Count of number of vehicles leaving before queue clearance time

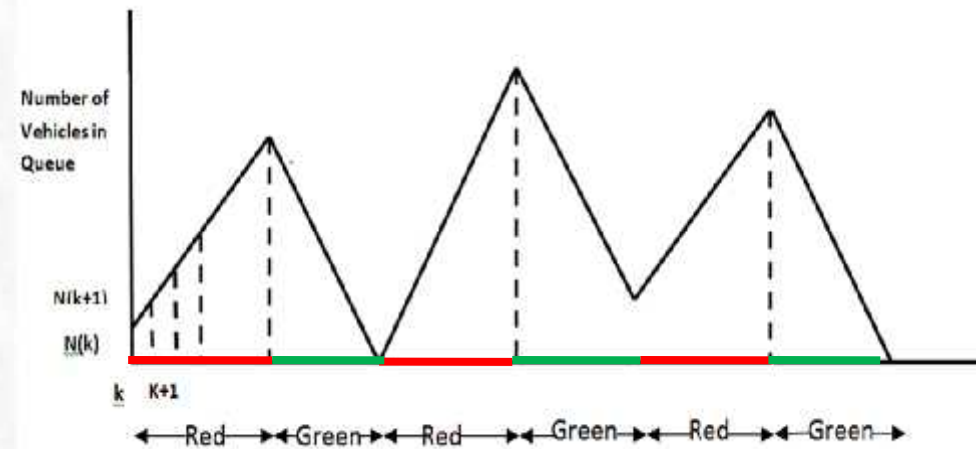
Generate queue polygon with
Arrival rate = Numqueue / Red duration
Departure rate = Numqueue / queue clearance time

Vehicles coming after queue clearance time in that cycle departs in green and so no queue



CALCULATION OF PERFORMANCE MEASURES

Delay t_d at a time instant $k+1$ is given as

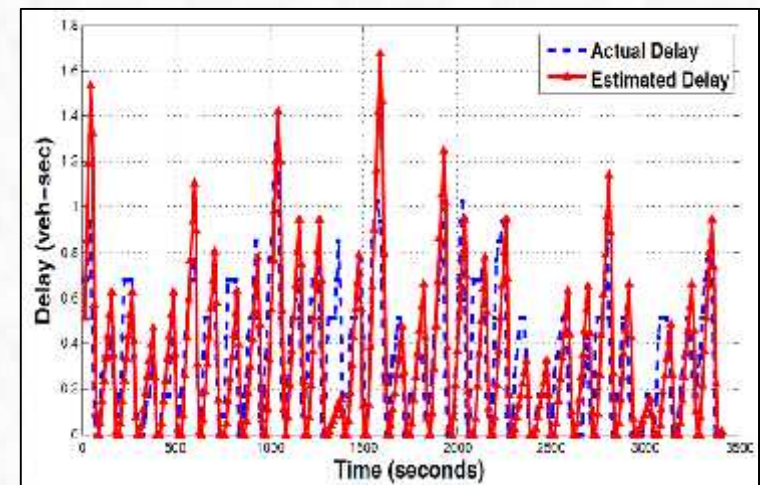
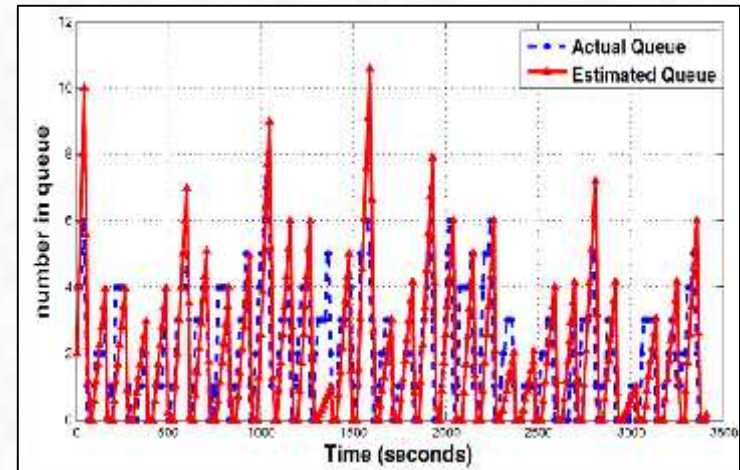


$$t_d(k+1) = \int_k^{k+1} N dt = \left(\frac{N(k) + N(k+1)}{2} \right) \times h$$

where $N(k)$ is the number in queue at k^{th} instant of time, h is the duration of analysis period from k to $k+1$

RESULTS

Intersection	RMSE	
	Queue (veh)	Delay (veh- sec)
17G off-peak	1.2	0.12
17G peak	1.3	0.18
27 G off-peak	1.5	0.32
27 G peak	1.3	0.2



CONCLUSION

- Simple and effective scheme to determine performance measures at signalized intersections
- Developed for under-saturated conditions
- Uses minimal data - stop bar detection and signal timing

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THANK YOU