Travel time and delay studies

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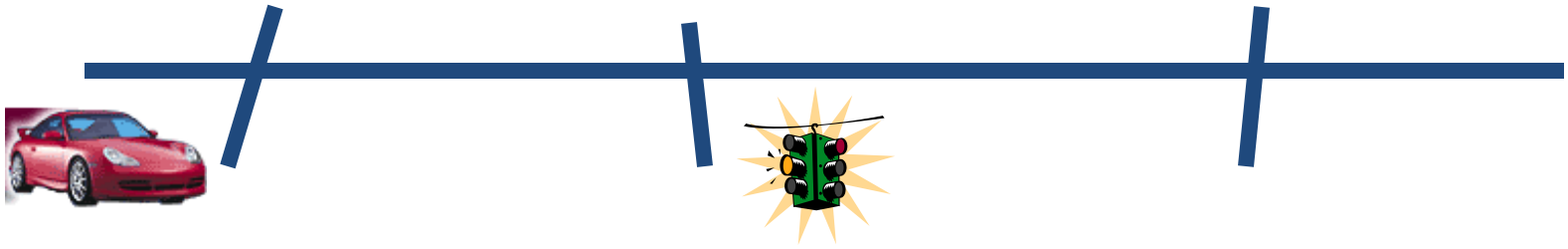
* Determines the amount of time required to travel from one point to another on a given route. Often, information may also be collected on the locations, durations, and causes of delays



- **Indicate the level of service**
- **Identify problem locations**

Applications of travel time and delay data

Many uses…

Efficiency check

Collection of rating data

Problem location identification

Model calibration

Evaluation of performance before and after improvement

Collect data for economic analysis (user costs)

DEFINITIONS

Acceleration Noise (AN):
Represents the degree of driver discomfort due to acceleration and deceleration

Control Point (CP):
A node at the beginning or end of a link, usually the stop line at a signalized intersection, but can be any physical feature, i.e., power pole

Delay (D):
The elapsed time (in seconds) spent driving at a speed less than 5 mph.

Operational delay

That part of the delay caused by the impedance of other traffic

Stopped-time delay

That part of the delay during which the vehicle is at rest

Fixed delay

That part of the delay caused by control devices such as traffic signals

Travel Speed (TS) or Average Speed (AS).
The test vehicle's average speed (in miles per hour) over a distance.

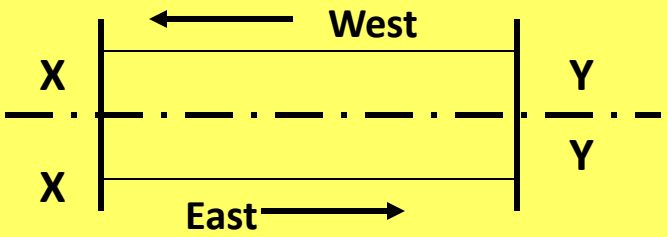
Travel Time (TT).
The total elapsed time (in seconds) spent driving a specified distance

Running Speed (RS):
The test vehicle's average speed while the vehicle is in motion (does not include delay time)

Running Time (RT):
The elapsed time (in seconds) excluding delay spent driving a distance.

Methods

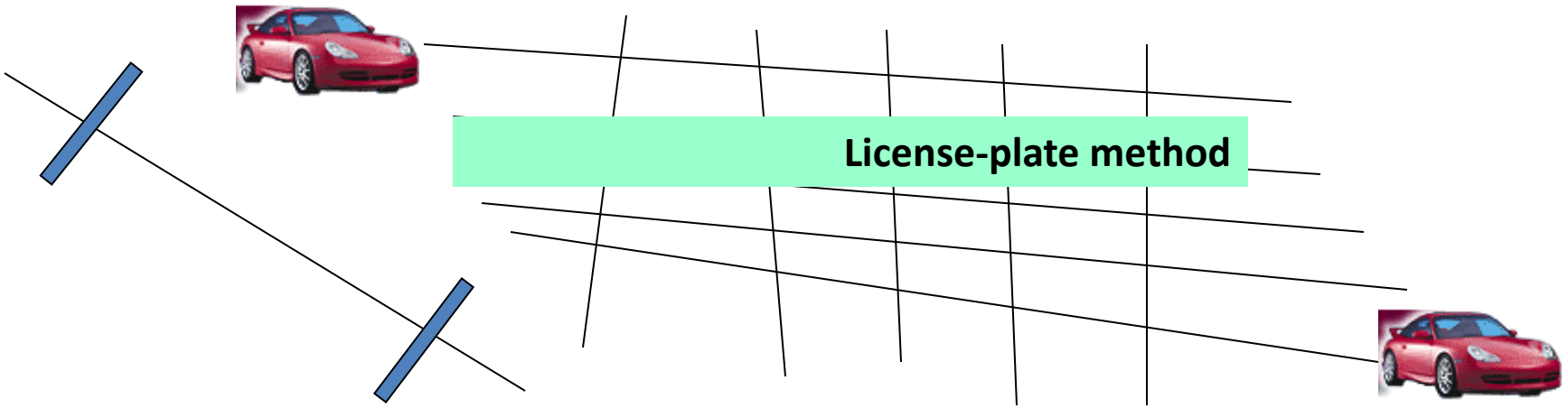
Methods requiring a test vehicle:

Floating-car technique	The test car "floats" with the traffic. Attempts to pass as many vehicles as those that pass the test vehicle.
Average-speed technique	Drive the test car at a speed that, in the opinion of the driver, is the average speed of the traffic streem
Moving-vehicle technique	Make a round trip on a test section and collect five pieces of information: T_e, T_w, N_e, O_w, and P_w 

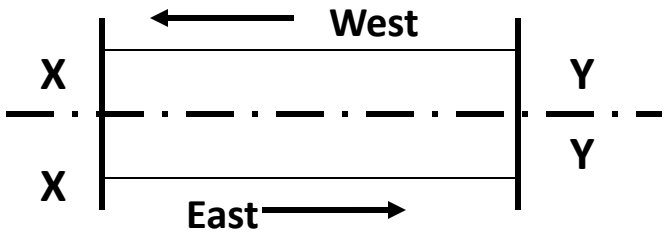
Methods (cont)

Methods not requiring a test vehicle:

License-plate observation	Each observer located at strategic points record last 3 or 4 digits of license plates. Need to synchronize the observer's watch.
Interviews	Ask the drivers!



Moving-vehicle technique



Volumes

$$V_w = \frac{(N_e + O_w - P_w)60}{T_e + T_w} \qquad V_e = \frac{(N_w + O_e - P_e)60}{T_e + T_w}$$

Average travel times

$$\bar{T}_w = T_w - \frac{60(O_w - P_w)}{V_w} \qquad \bar{T}_e = T_e - \frac{60(O_e - P_e)}{V_e}$$

- Requires one testing vehicle, one driver, and three observers on board.
- Observer #1: counts mean time the testing car takes to travel eastward and westward.
- Observer #2: counts the number of vehicles traveling in opposite direction
- Observer #3: counts the number of vehicles that overtook and are overtaken by the testing vehicle
- Driver: if possible try to balance the number of vehicles (overtaking vs. overtook)

- **Te**: The time it takes to travel east from X-X to Y-Y ,in minutes
- **Tw**: The time it takes to travel west from Y-Y to X-X ,in minutes
- **Ne:** The number of vehicles traveling west in the opposite lane while the test car is traveling east .
- ***Ow:*** The number of vehicles that overtake the test car while it is traveling west from Y-Y to X-X, that is, traveling in the westbound direction
- ***Pw:*** The number of vehicles that the test car passes while it is traveling west from Y-Y to X-X, that is, traveling in the westbound direction.

Example

Run Direction/ Number	*Travel Time (min)*	*No. of Vehicles Traveling in Opposite Direction*	*No. of Vehicles That Overtook Test Vehicle*	*No. of Vehicles Overtaken by Test Vehicle*
Eastward				
1	2.75	80	1	1
2	2.55	75	2	1
3	2.85	83	0	3
4	3.00	78	0	1
5	3.05	81	1	1
6	2.70	79	3	2
7	2.82	82	1	1
8	3.08	78	0	2
Average	2.85	79.50	1.00	1.50
Westward				
1	2.95	78	2	0
2	3.15	83	1	1
3	3.20	89	1	1
4	2.83	86	1	0
5	3.30	80	2	1
6	3.00	79	1	2
7	3.22	82	2	1
8	2.91	81	0	1
Average	3.07	82.25	1.25	0.875

Solution:

- From Eq. 4.9, find the volume in the westbound direction.

$$V_w = \frac{(N_e + O_w - P_w)60}{T_e + T_w}$$

$$= \frac{(79.50 + 1.25 - 0.875)60}{2.85 + 3.07} = 809.5 \qquad \text{(or 810 veh/h)}$$

- Similarly, calculate the volume in the eastbound direction.

$$V_e = \frac{(82.25 + 1.00 - 1.50)60}{2.85 + 3.07} = 828.5 \qquad \text{(or 829 veh/h)}$$

- Find the average travel time in the westbound direction.

$$\overline{T}_w = 3.07 - \frac{(1.25 - 0.875)}{810} 60 = 3.0 \text{ min}$$

- Find the average travel time in the eastbound direction.

$$\overline{T}_e = 2.85 - \frac{(1.00 - 1.50)}{829} 60 = 2.9 \text{ min}$$