Lecture 2: Stationary Detector Data

- 2.1. Stationary Detector Data (SDD) and How to Obtain Them
- 2.2. Single-Vehicle Data
- 2.3. Aggregated Data

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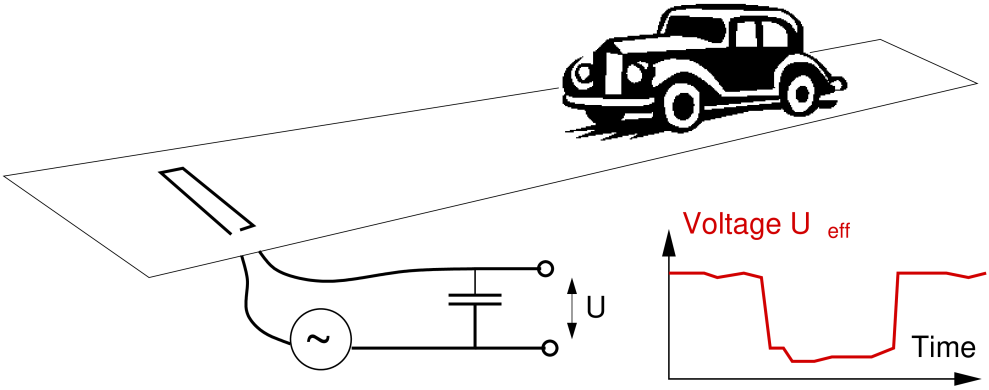

- Vehicle drives over a loop detector ⇒ inductance of the loop increased upon driving over it ⇒ circuit gets out of tune.
- Other means: pneumatic tubes, IR light barriers, radar/lidar

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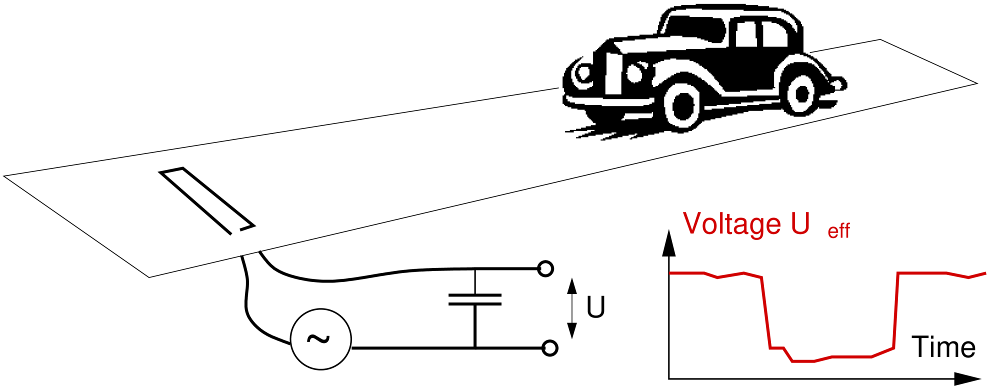

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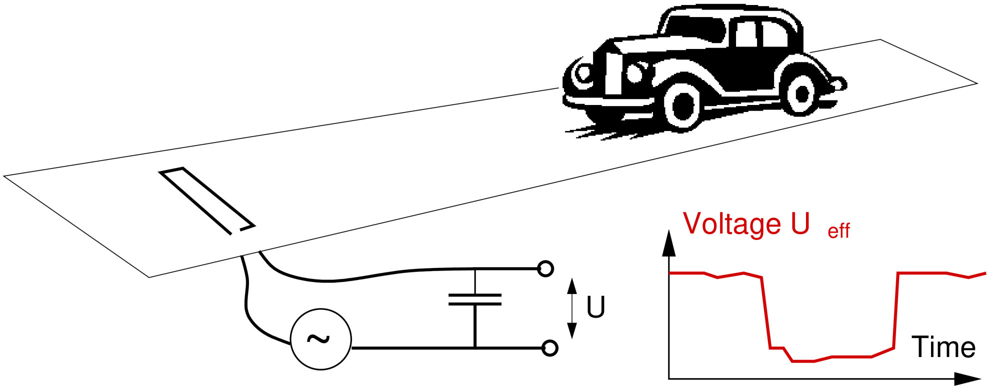

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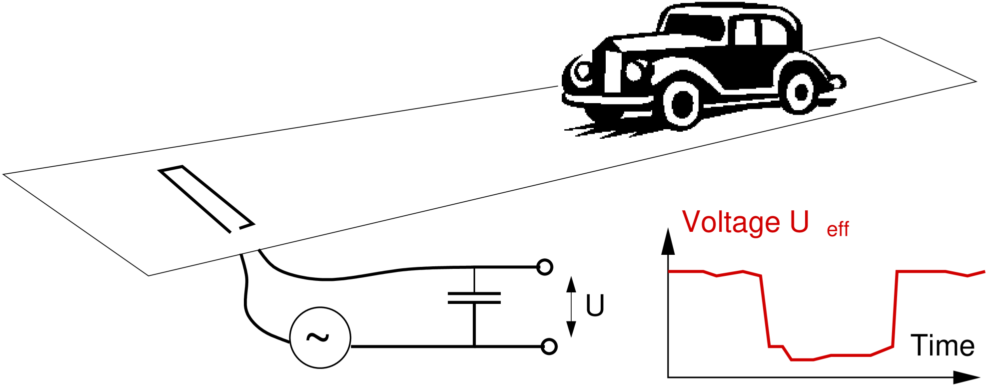

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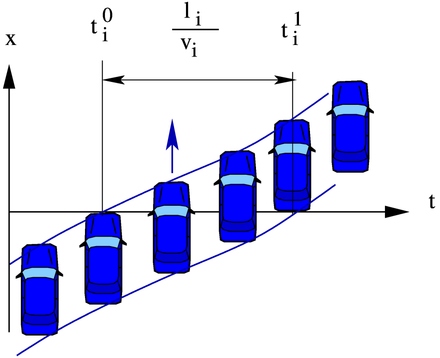
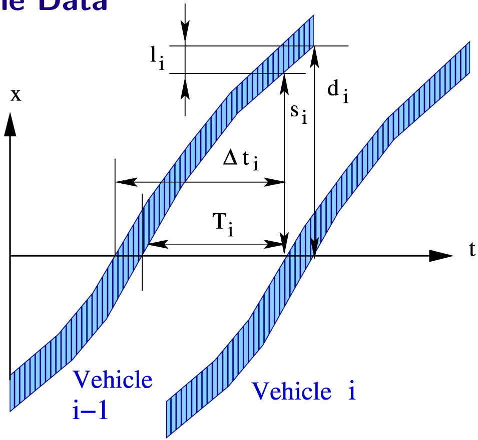
Loop/double loop detectors are everywhere ...

2.2. Single-Vehicle Data





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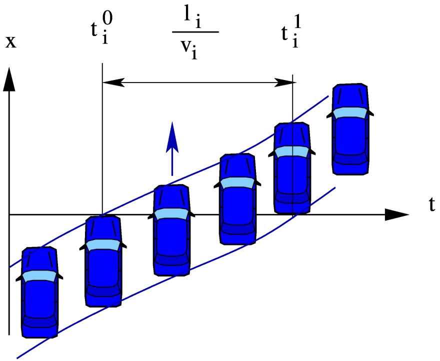

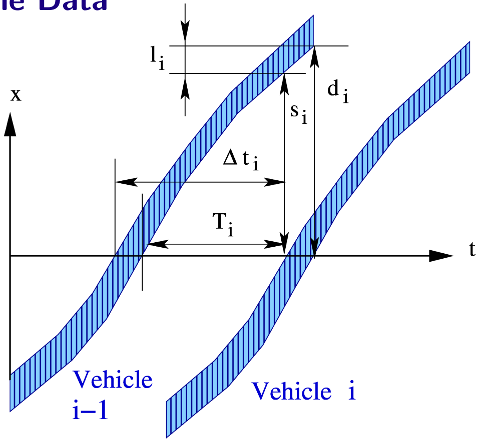

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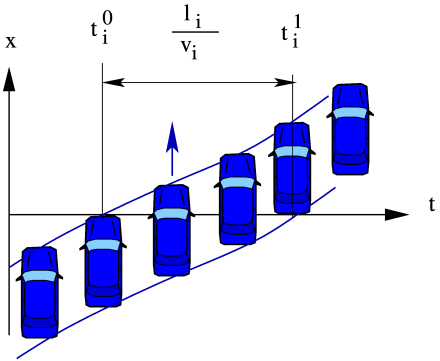

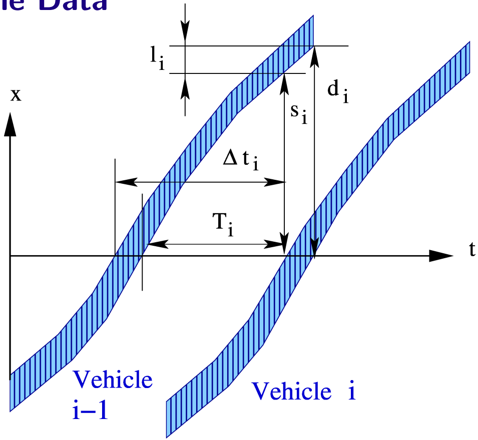

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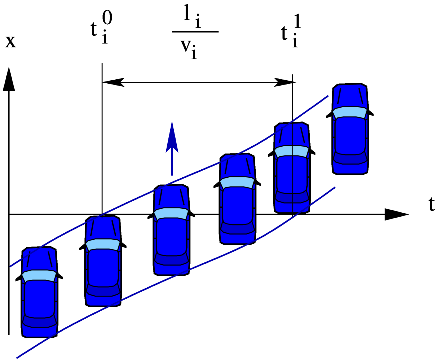

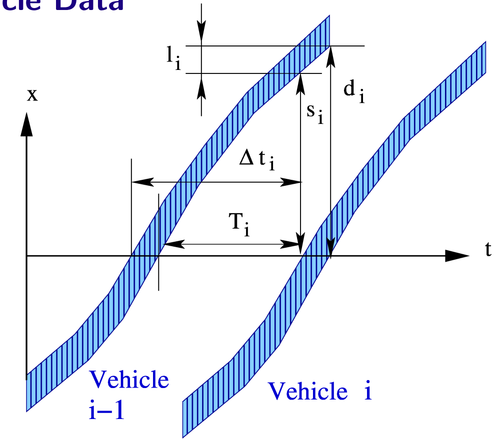

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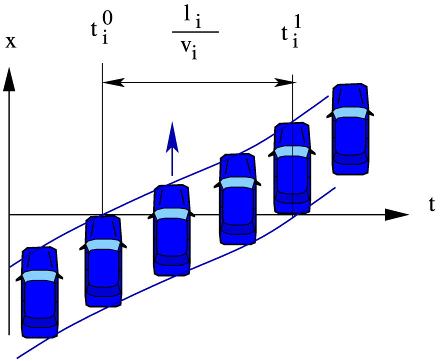

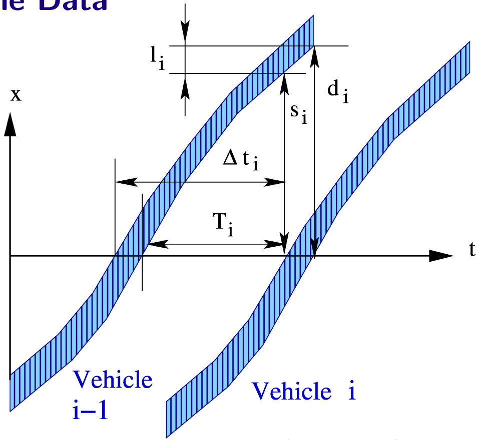

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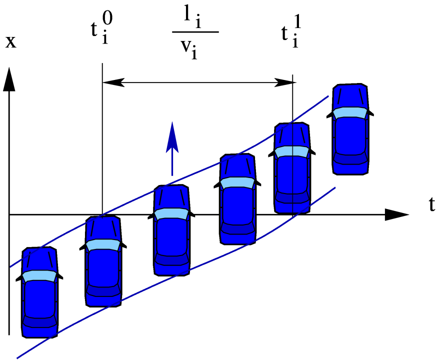

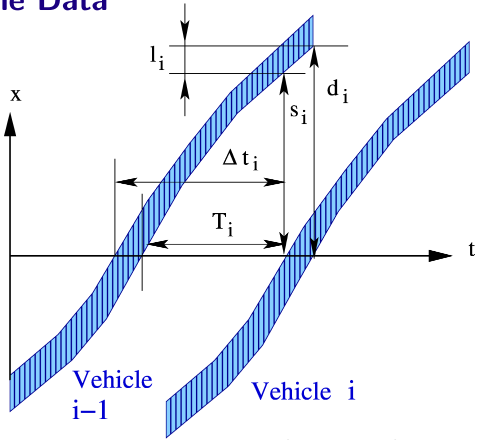

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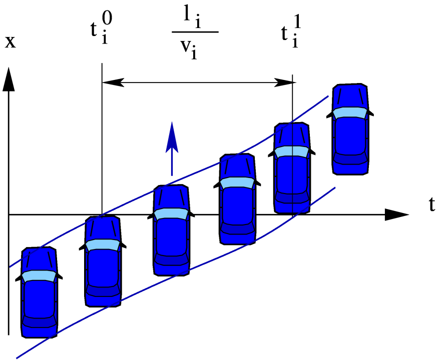

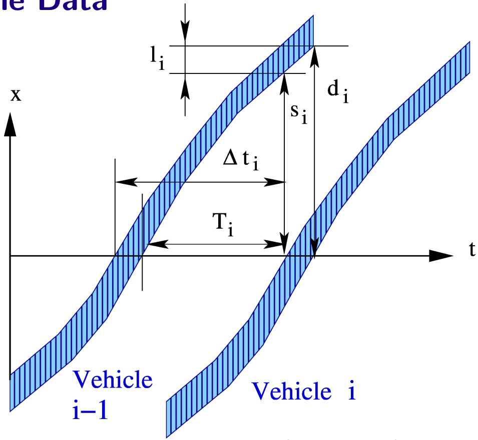

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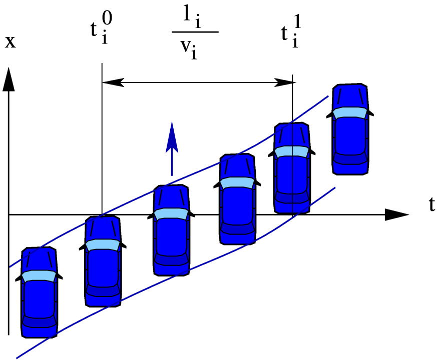

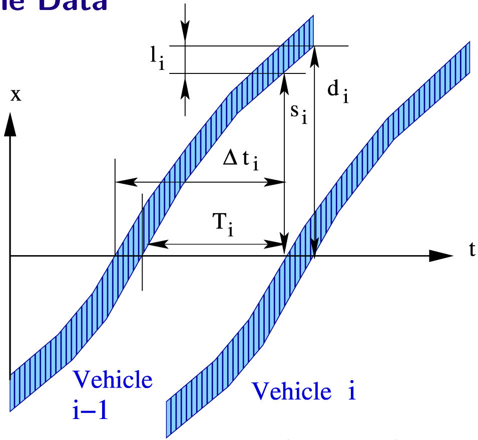

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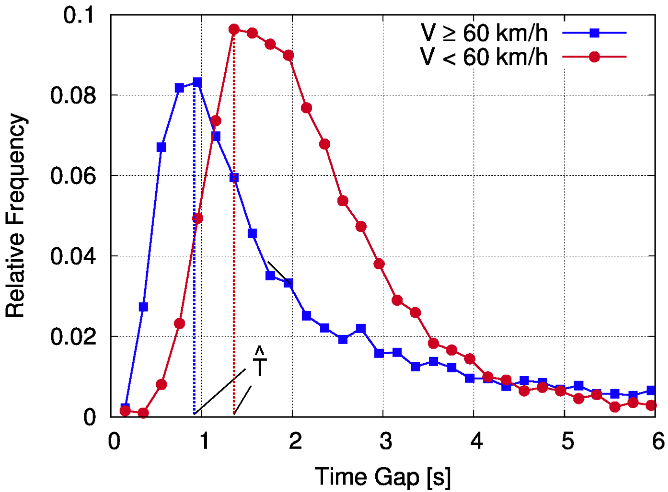
Application: Density functions of time gap distributions



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? Compare with the US rule "keep an additional vehicle length distance per 5 mph"

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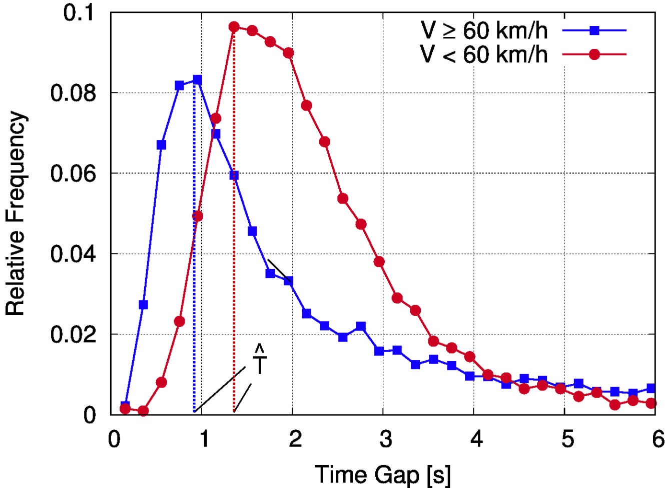

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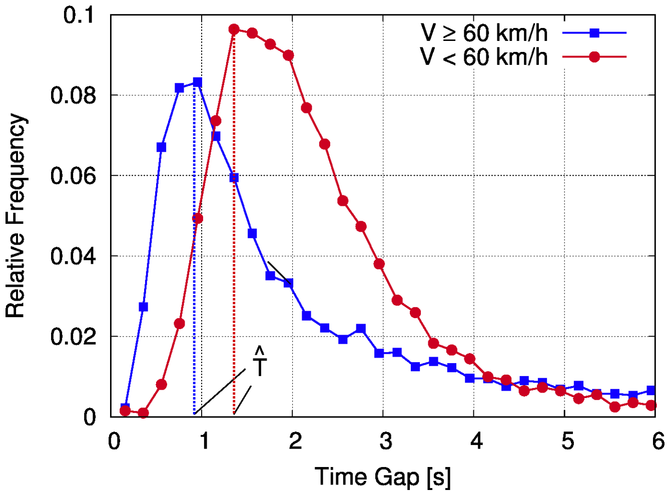

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Units: Germany $\rightarrow$ gap in meter, speedometer reading in km/h

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Keep an additional vehicle length distance per per 5 mph:

Assume a vehicle length of 5 m (US vehicles are big!):

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Most detectors stations *aggregate* the single-vehicle information over fixed **aggregation time intervals Δt** and transmit only the aggregated **macroscopic** data to the traffic control center.

- **Flow** $Q(x,t) = \dfrac{\Delta N}{\Delta t} = 1/E\left(\Delta t_i\right)$

  where the **expectation** $E\left(.\right)$ is just the arithmetic mean over the microscopic data y_i: $E(y_i) = \frac{1}{\Delta t}\sum_{i=i_0}^{i_0+\Delta N-1} y_i$

- **Occupancy** $O(x,t) = \dfrac{\Delta N \; E\left(t_i^1 - t_i^0\right)}{\Delta t} = Q(x,t) E\left(t_i^1 - t_i^0\right)$

- **(Arithmetic mean) Speed** $V(x,t) = E\left(v_i\right)$ (double loops)

Useful but generally not known:

- **Harmonic mean speed** $V_{\mathrm{H}}(x,t) = 1/E\left(1/v_i\right)$

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Fundamental Diagram from Traffic-simulation.de