Real-time estimation of travel times
Summary

I. The Model
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I. The Model

a. Delay of a single car at a traffic signal
Fig. 1: Delay of a single car at a traffic signal
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\[ d(t_1) = \begin{cases} 
  r - t_1 - T - \frac{uf}{2\delta} + \frac{uf}{2\gamma}, & \text{for } T + \frac{uf}{2\delta} < t_1 < r - \frac{uf}{2\delta} \\
  0.5 \left( \frac{\delta \gamma + \delta^2}{\gamma} \right) \frac{(r - T - t_1)^2}{uf}, & \text{for } r - \frac{uf}{2\delta} < t_1 < r 
\end{cases} \]
I. The Model

a. Delay of a signal car at a traffic signal
b. Treatment of queues
\[ \frac{\partial \rho}{\partial t} + \frac{\partial q}{\partial x} = 0 \]

Fig. 2a: the Lighthill-Whitham-Richards (LWR) equation

Fig. 2b: Triangular fundamental diagram
Fig. 3: Delay due to the formation of queues
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\[ d_n = \begin{cases} 
  d_{n-1} + L_s \left( \frac{1}{w} + \frac{1}{u_f} \right), & \text{if } nL_s \leq L_{qm} \\
  d_{n-1} + L_s \left( \frac{1}{w} - \frac{1}{u_w} \right), & \text{if } L_{qm} < nL_s \leq L_q
\end{cases} \]
Fig. 3: Delay due to the formation of queues
Fig. 4: Long queues and spillovers

detector
Fig. 5: Oversaturation
II. Implementation

Fig. 6: Lankershim Bvd., Los Angeles (source Cambridge Systematics Inc)
Fig. 7: fundamental diagram extrapolated from a detector’s data (lane 2 NB, detector 2)
III. Results

Fig. 8: Real vs Estimated travel times of lane 2 (Northbound)
Conclusion
References:


