Integration of Arterial Fundamental Diagram In Traffic Signal Control In Connected Vehicle Environment

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Arterial Fundamental Diagram (AFD)

• Unlike the typical fundamental diagram, AFD is suitable for signalized urban links
• Urban network is filled with traffic flow interruptions (e.g. traffic signals)
• Near traffic lights, a highly scattered AFD is generated
• AFD is mainly used for traffic state estimation

Main Activity

• Study influence of traffic signals on AFD
• Formulate methodology to construct usable AFD
• Evaluate accuracy of AFD traffic state estimation

Selected Input Parameters

• Signal control parameters
  ▪ Cycle time
  ▪ g/c ratio
  ▪ Band width of coordinated signals

• Aggregation interval
• Fixed detector position
• Traffic demand
• Truck percentage
• Turning movement

Results

Meaningful AFD was generated according to the following settings.

• Cycle-based method
• Aggregation Interval of 1-2 cycles for both inductive loop configuration and connected vehicle environment

• Detectors location at 100-200m from the traffic signal
  ▪ Detectors are outside the influence of cyclic queue

Application of well-defined AFD

• Estimate best values of signal parameters that achieve high intersection capacity
• Study traffic state improvement because of connected vehicle technologies (V2X communication)
• Determine suitable amount of truck in urban networks to maintain efficient traffic flow
• Study the relevance of turning movements in a signalized intersection etc.

Specific Activity

Microscopic Simulation

VISSIM

VISSIM-COM Interface

MATLAB

Sensitivity Analysis

Evaluating the impact of input parameters on dependent output variable (AFD)