HCM Perspective on Arterial Performance Measures

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HCM Principles

- Principles of Quality of Service
  - Set in series of motions in 1995
  - Foundation for Year 2000 HCM
HCM Vocabulary

- **Performance Measures**
  - Measures of traffic operations
  - Speed, density, queue, delay, etc.

- **Measures of Effectiveness**
  - Used to compute level of service

- **Level of Service**
  - Letter grade of quality of service
(95-14) LOS A to E included will be defined by a single measure of effectiveness (MOE) for each facility type.

(95-15) This single MOE will be related to the travelers’ perception of the quality of service.

(95-16) Los F shall be defined to occur when either the traveler perceived MOE exceeds some pre-defined threshold, or when demand exceeds capacity.
Desired MOE Characteristics

(95-17) Ideally, these MOE's will have the following attributes:

- Perceivable by the facility user (traveler)
- Measurable (in the field) or can be derived using measurable factors
- Well defined for HCM users
- Sensitive to changes in traffic, roadway, and control conditions.
(95-18) The chapter for each facility type should include as many additional performance measures as practical:

- to provide additional information about highway operations and
- to provide links to broader evaluation, such as environmental, economic, or safety analyses, and to demand forecasting.
(95-19) The MOE or at least one of the additional performance measures shall be a time-dimension related measure, such as travel time, speed, or delay.
(95-21) It is desirable that some of the performance measures or MOE's will allow route, network or other combined performance assessment.
HCM 2000 Urban Street LOS

- Streets and Intersections
- Streets:
  - Mean Speed of through traffic
  - LOS = Percent of Free-Flow Speed Without Signals
  - Missing: other system performance measures
- Intersections
  - Delays and Queues by lane group
  - LOS = Mean Delay (averaged over all moves)
  - >80 secs/veh unacceptable at signal
  - Weak: system effects on intersection operation
Research Urban Street Performance Measures

- NCHRP 3-70 –
  - Multimodal Level of Service for Urban Streets
- NCHRP 3-79 –
  - Measuring And Predicting The Performance Of Automobile Traffic On Urban Streets
  - Jim Bonneson - TTI
Objective: To determine urban street quality of service for auto, transit, bicycle, and pedestrian modes.

Approach:
- Conduct surveys of auto drivers, transit riders, bicyclists, and pedestrians.
- Build models of perceived QOS.
NCHRP 3-70 – Auto Drivers

- Aimee Flannery – GMU
- Top 6 Factors:
  - Average Speed **,
  - Median Presence,
  - Lane Width,
  - Stops **,
  - Landscaping,
  - Parking Lane Width.
NCHRP 3-70 – Transit Riders

- Paul Ryus – Kittelson Assoc.
- Top 6 Factors:
  - Average Speed **,
  - Frequency,
  - Reliability **,
  - Crowding,
  - Access (difficulty of accessing bus stop),
  - Span (Hours) of Service.
NCHRP 3-70 – Bicyclists

- Bruce Landis – Sprinkle
- Top 8 Factors:
  - Separation from vehicle traffic
  - Motor vehicles volume next to bicyclist
  - Pavement condition of bike lane
  - Motor vehicle speeds **
  - Percent trucks
  - Widths of cross-streets at signals
  - Driveway density
  - Signal delay for bike **
Theo Petritsch – Sprinkle

Top 8 Factors:
- Presence of a sidewalk
- Separation from vehicle traffic
- Motor vehicle speeds **
- Motor vehicle volume next to pedestrian
- Driveway density
- Signal delay for pedestrians **
- Average number of lanes crossed at signals
- Pedestrian density
Other Uses of the Street?

- Crossing the street
  - Auto
  - Bus
  - Bicycle
  - Pedestrians

- Non-Through Traffic
  - Lefts, Rights
  - Bus transfers
Conclusions

- HCM is silent (or weak) on many crucial signal system performance measures.

- HCM makes it easy to ignore many of the users of a street

- Research underway to address these weaknesses