2018 ITE Joint Western & Texas District Annual Meeting

Signal Control
Versatility in Microsimulation Modelling
Agenda

- Why We Model
- Straightforward Signals
- Transit Timing
- Complex Control
- Think Outside the Box
Signal Control Versatility in Microsimulation Modelling

Straightforward Signals
Fixed Time

- simple repeating cycle of constant length
- phases are the same every cycle
- all movements are served regardless of vehicle activity
Semi Actuated

- cycle maintains a constant length
- actuated phases may be shorter; recalled phases lengthen to compensate
- actuated movements are only served when vehicles are present and gap out when the minimum gap is exceeded
Fully Actuated

- cycle constantly changes length
- all phases fluctuate between min and max green times
- all movements are only served when vehicles are present and gap out when the minimum gap is exceeded
Signal Control Versatility in Microsimulation Modelling

Transit Timing
Preemption

- transit is detected well in advance
- preemption sequence interrupts normal signal operations
  - right-of-way transfer
  - track clearance
  - dwell
  - exit sequence
- requires gates on cross street
  - pre-programmed based on travel time
  - tied to signal operations
- no delay to transit, but vehicles on cross street are frequently disrupted
Transit Signal Priority

- appropriate for all kinds of transit
- different levels of priority
- advance detectors communicate transit presence
- signal operations are adjusted to help transit proceed with minimal stopping
  - early return to green
  - green extension
  - phase skipping
- serves transit as efficiently as possible while also minimizing impacts to other vehicles
Timed Release

- multi-step operation relies on communication between the traffic and transit detectors, the traffic signal controller, and the gate controller
  - the train is detected before reaching the holding signal upstream
  - at the appropriate point in the normal signal cycle, the gates close and the train is released
  - the gates are closed and the train crosses only during phases that do not conflict with the tracks
  - blank-out signs ensure that vehicles turning across the tracks are stopped
  - no phases are shortened or extended to accommodate the train crossing
- ideal for high-volume intersections where minimal impact to vehicle traffic is desired
Signal Control Versatility in Microsimulation Modelling

Complex Control
Clustered Signals

- one controller for multiple intersections
- just like in Synchro, but even easier!
- useful for:
  - ramp terminals
  - complex ring/barrier structures
  - unique intersection configurations
Time of Day Plans

- multiple timing plans in one modelling period
- controller will automatically change plans at user-defined times, just like in reality
- useful for:
  - long simulations
  - evaluating transition periods
  - quasi-adaptive traffic control
Adaptive Traffic Control

Part One
- high volume on main street, moderate volume on side street
- split phasing for side street due to geometry
- phase splits reflect volumes: long for main street, short for side streets
- side street phases are sufficient to serve demand
Adaptive Traffic Control

Part Two

- dramatic increase in volume on north leg
- phase splits have not yet adapted to volume change: still short for both north and south legs
- side street phase is not sufficient to serve demand on the north leg
Adaptive Traffic Control

Part Three

- volume on north leg remains heavy
- phase splits have adapted to volume change: still short for south leg, but north leg has lengthened to reflect the change
- main street phase shortens in exchange in order to maintain cycle length
Innovation is taking two things that already exist and putting them together in a new way.

Tom Freston