MMM GROUP

Traffic Analysis of Oversaturated Intersections

Authors:

Ismet Medic, Nemanja Radakovic, Christopher Tam

Presenter:
Christopher Tam, P.Eng.
Senior Project Engineer
MMM Group

COMMUNITIES
TRANSPORTATION
BUILDINGS
INFRASTRUCTURE

Agenda

Why

- Why do we care?
- Why do we need a method?

What

- What are oversaturated intersections?
- What do we look at to analyze these intersections?

How

- How does this work?
- "Show me" How – Sample calculation

Why do we care?

HCM and CCG are good up to the point where we reach capacity

Limited literature on what to do when the demand flows exceed the available capacity

Meanwhile…

MMM GROUP

Why?

MMM GROUP

Why do we need a method?

Congestion costs money, impacts the environment, and takes away precious time… we need to fix this

How do we measure the impacts of improvements? How do we judge which intersections need to be remedied first?

A technically sound, consistent approach is required

What are oversaturated intersections?

"Oversaturated conditions are defined as the presence of an overflow (defined as a minimum of one vehicle that is left over from a queue that could not be fully discharged during the previous green phase) queue on a traffic movement after the termination of the green time for the movement [...] A traffic movement is oversaturated when the traffic demand for the movement exceeds the green-time capacity such that a queue that exists at the beginning of the green time is not fully dissipated at the end of the green time for that movement."

-NCHRP

Oversaturated intersections are simply when there are more vehicles that want to enter the intersection than can leave

What should we be looking at?

Collect better and more data

Use the better data to calibrate the model

Develop a broader methodology, and (potentially) integrate it with HCM and CCG

How does this work?

Start of a wider, more comprehensive methodology

Focused mainly on adjusting parameters within the current traffic analysis software

Data required for parameter adjustment leads to broader questions on data collection

How to collect data?

Higher standard of data collection required to get more detailed information

Video data is good – leaves you with a record of your count

Field surveys are also important to get some information and to "get the big picture"

How to collect data?

Data	Purpose	Use in Analysis	Relative Cost
Video of intersection during time of counts	Saturation Flow Rate	Allows adjustment of the various factors and proper input and proof of pedestrian conflicts, a number of pedestrian calls, and/or abnormally behaving drivers	High
	Amount of Lost Time		High
	Lane Utilization		High
	Pedestrian Platoons		Medium
	Presence of any anomalous driver behavior		Low
Measured Lane Widths	Provides field measurement of lane widths	Allows adjustment of lane width in the software calculations	Low
Standing Queue Survey	Provides understanding of the level of oversaturation at the intersection	Practitioner is able to measure the queues in the field versus those modelled, choosing different calibration parameters as necessary and verifying the results of the calibration.	High
Signal Timing Field Measurements	Ensures signal is operating as expected	Allows for the accurate reproduction of signal timing in model	Low

How we calibrate Signalized Intersections

1. Lane Widths

2. Lost Time Adjustment

3. Peak Hour Factors

4. Signal Timing Coding or Field Issues

5. Saturation Flow (through and left turns)

6. Left Turn sneakers

7. Review of movement violations (left turn violations, lane designation violations)

8. Lane Utilization Factor

How we calibrate Unsignalized Intersections

1. Lane Widths

2. Peak Hour Factor

3. Critical Gap

4. Follow-up Time

5. Lane Utilization Factor

6. Number of Pedestrians and Pedestrian Gaps

7. Abnormal Behavior/Violations (two-stage left turns, courtesy gaps, lane designation violations)

MMM GROUP

Sample Calculation

Leslie Street and Sheppard Avenue, Toronto

- One of Toronto's 10 busiest intersections

- Adjacent to significant master-planned condominium complex (Concord Park Place) – 5,000 condominium units planned

- Constructed on top of the Don River – limited potential for additional widening

- Other major uses in area – Subway Station, Commuter Rail Station, Hospital, College

Sample Calculation

Intersection started at v/c 1.50 for some left turn movements

Video taken at intersection to verify counts and to conduct saturation flow surveys and other observations

MMM GROUP

Sample Calculation

Westbound left turn

- v/c = 1.01
- Observations indicated permissive left turn capacity was lower in model than in field
- Lost time was increased from -1.0 to -1.5 to increase the capacity of the movement

Southbound left turn

- v/c = 1.05
- Again, permissive capacity underestimated in model
- Lost time increased from -1.0 to -2.5, but only for existing conditions. Future improvements recommended pt/pm phasing instead of pm only.

Northbound left turn

- v/c = 1.03
- Model Capacity = 58 vph, Observed = 78 vph
- Observed "courtesy gap" behavior due to upstream queue spillback
- Modelled lane width was 3.0m, measured lane width was 3.1m
- Adjustment to lane width provided close to observed capacity