UF Transportation Institute UNIVERSITY of FLORIDA | McTrans
MONTHLY NEWS & UPDATES

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A Word from the Editor

When I accepted the challenge of editing the McTrans newsletter at the beginning of 2021, I realized that more than creating and editing articles, I had assumed the responsibility of taking care of a legacy of high-quality content spread over 68 past editions. This publication has served the transportation community as a source of information and technical reference for many years. As the year closes, we issued nine editions of our newsletter monthly, always featuring novel content.

We would like to thank our readers for keeping up and making use of this content. We are also appreciative of the contributions made by our friends and partners, in special Tom Creasey, chair of the TRB Highway Capacity and Quality of Service Committee (ACP40), and Chris Melson, vice-chair of the ITE Simulation and Capacity Analysis Committee (SimCap).

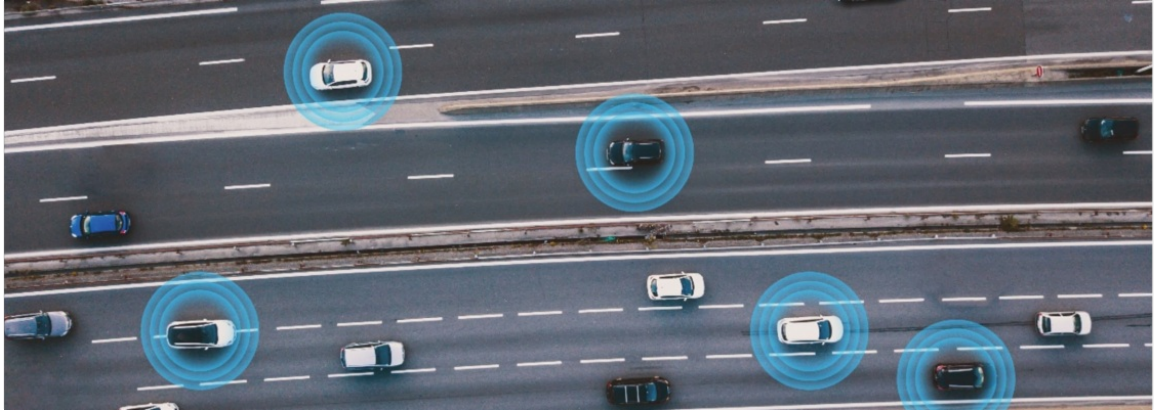
Watch the Word of the Editor here:

Sincerely,
Gustavo de Andrade

A Look Ahead at HCM 7.0 from Practitioners' Perspective

Estimating Capacity Impacts of CAVs on Highways and Freeways and Urban Roads

Dr. Fabio Sasahara



Connected and Automated Vehicles (CAVs) is a developing technology that holds great promise in reducing delays, crashes, and fuel consumption. CAVs can communicate with each other and with the roadside infrastructure, allowing their driving systems to navigate and make decisions more efficiently and safely than a conventional human driver.

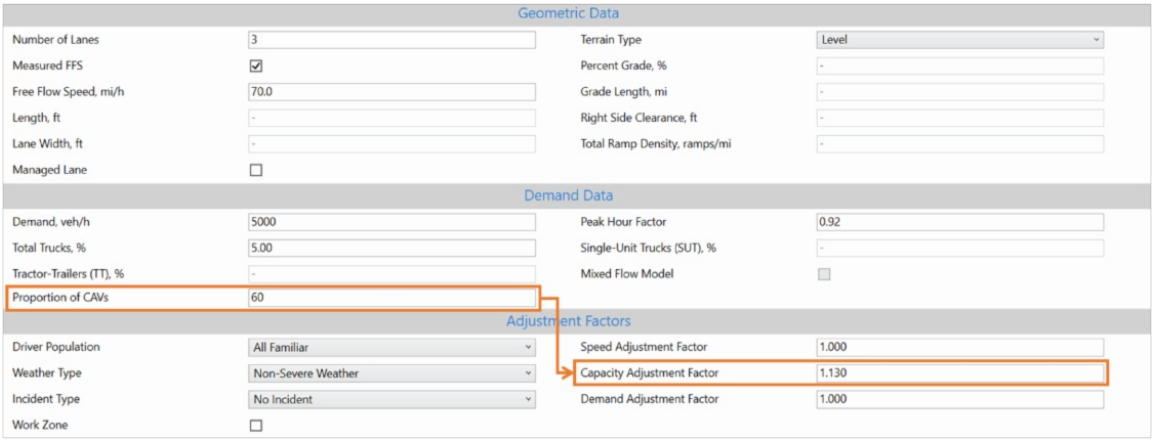
Given the early stage of CAVs deployment, the scarcity of field data requires multiple assumptions when modeling CAV impacts on highway capacity, which leads to projections ranging from very conservative to very optimistic. This results in a myriad of scenarios that pose a challenge for public agencies who need to plan for the deployment of CAVs over the following decades to develop their long-range transportation plans and make policy and investment decisions.

The Transportation Research Board (TRB) will release the upcoming 7th Edition of the Highway Capacity Manual, which will present, for the first time, methods to evaluate capacity effects of CAVs in the freeways, signalized intersections, and roundabouts. This is an invaluable resource for agencies that now can rely on a nationally recognized, peer-reviewed reference manual for their long-range planning-level decisions. The upcoming Highway Capacity Software (HCS 2022) incorporates HCM7 methods on CAVs analyses and will provide a user-friendly environment for practitioners to use these methods for long-range planning.

HCM 7 Methods on CAVs

The new methods can estimate capacity improvements as a function of the Market Penetration Rate – the percentage of vehicles in the traffic stream that has CAV capabilities. Higher penetration rates lead to higher capacity increases, consistent with research findings.

The HCM 7th Edition will provide capacity adjustments for CAVs on freeways, signalized intersections, and roundabouts. These methods are intended for planning-level purposes and can measure CAV effects through a Capacity Adjustment Factor (CAF). Service Volume Tables are also provided, allowing for quick estimates of traffic volumes that can be serviced for given sets of road characteristics and a target LOS.



HCS adjustments to segment capacity based on % of CAVs

CAV adjustment: **Freeways**

CAV effects on freeways are measured through a CAF applied to adjust the capacity of a given segment. Specific CAV tables are provided based on market penetration rate for basic, merge/diverge, and weaving segments. For example, with a 60% penetration rate of CAVs in the traffic stream, we can expect to gain 13% more capacity on a basic segment with a free-flow speed of 70 mi/h.

CAV adjustment: **Signalized Intersections**

The Signalized Intersections method will address the effects of CAVs by increasing the value of saturation flow rates as a function of the market penetration rate, with different adjustments applicable for the base saturation flow rate and protected and permitted movements. For example, with an 80% market penetration rate, the base saturation flow rate is expected to increase by 21%.

CAV adjustment: **Roundabouts**

CAV effects on the roundabout are modeled through adjustments on gap acceptance parameters that directly affect capacity: critical headway and follow-up headway. Higher market penetration rates should allow vehicles to accept smaller gaps and use them more efficiently, improving capacity values. For example, if there are 40% CAVs in a single-lane entry leg with a conflicting flow of 500 pc/h in a single circulating lane, the entry leg capacity will increase by 14%.

Conclusions

The HCM is the first widely recognized reference document to provide CAVs impact on various facility types. The Highway Capacity Software (HCS) will be ready to allow users to confidently model such a novel methodology, assuring accurate analysis faithful to the new HCM methods and facilitating the use of results and insights in the planning process of public agencies.

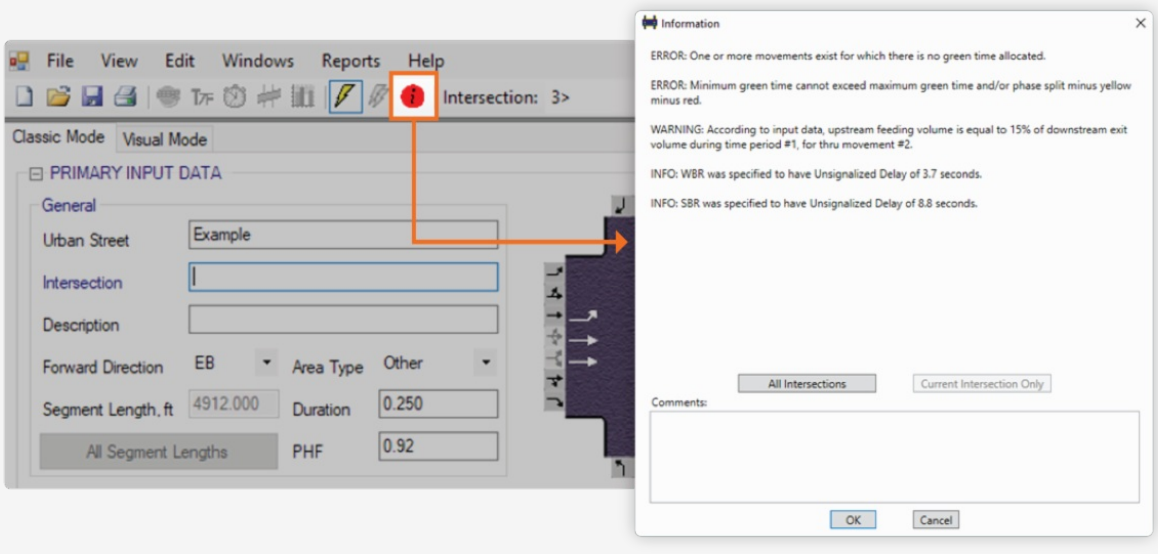
TIPS & HINTS

Information Box

All HCS modules include an information box tool to assist users in reviewing their inputs before analyzing results. The information box can be accessed through its button on the module interface or the reports. Three levels of messages are displayed, as shown in the example below:

- **ERROR:** there is an issue with the input data, which prevents the methodology from providing valid results.
- **WARNING:** this warns users that HCS procedures will adjust some input data to comply with HCM or software requirements. Users should use care when reviewing their results.
- **INFO:** provide additional support information. These include cases where default values are changed or optional inputs are used. Results are produced normally.

The message with the most critical level defines the color of the icon on the interface. A **Green Icon** means no warning or error exists.



Modeling the Case of Split-Phasing for two displaced T-Intersections

Two Intersections with One Controller

Dr. Gustavo de Andrade

This case study shows an intersection with offset approaches. The traffic signal operates on one controller, providing a split-phase scheme that prevents the minor street movements from being served simultaneously. The HCM does not have a methodology for addressing the specifics of two signals with one controller. The approach described below was suggested to model this configuration on HCS Streets Model.

I. Streets file with two intersections

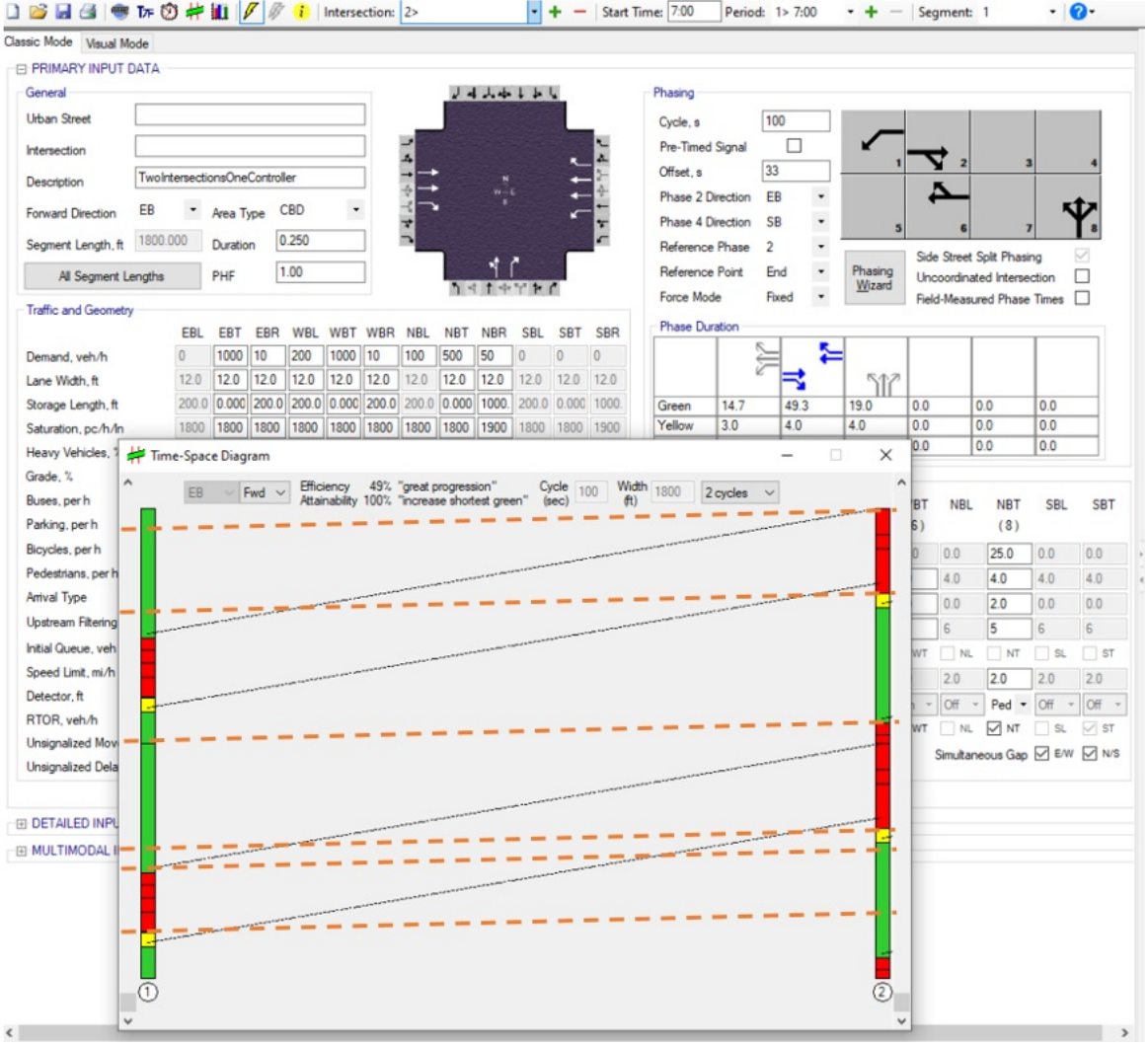
1. In the Geometry section, the lane configuration was set to represent a corridor with two alternate T-intersections and one short segment between the two.
2. The corridor control was configured as coordinated. The cycle length must be equal for both intersections.

II. Timing and Coordination

With the support of the space-time diagram tool, the timing for each intersection and an offset between them were manually calculated so that the red light is given to each intersection's main direction at different times, alternating between the two. Some all-red time is also programmed to provide a clearance period for traffic between the intersections. This configuration will emulate a split-phase scheme.

III. Microsimulation with TSIS-CORSIM

To confirm that the solution was working as intended, the HCS file was exported and simulated in TSIS-CORSIM. The simulation animations helped assess the split-phase scheme, ensuring each minor street approach is given green times sequentially, and flows don't conflict at any point.



HCS Streets Interface and Time-Space Diagram for the proposed solution

Microsimulation in TSIS-CORSIM

STAFF SPOTLIGHT

Pamela Johnson

Sales Specialist

Having worked in health insurance and healthcare most of my career, the opportunity to join McTrans Center opened up a whole new world for me. In the past two years that I have worked at McTrans, it has been a pleasure to collaborate and grow with the most dynamic team of experts in the highway transportation software industry.

I truly enjoy my daily interaction with our diverse clientele. I find it rewarding to be able to assist with purchasing and downloading the HCS and TSIS-CORSIM software products.

McTrans has given me a professional environment where I have cultivated positive relationships with my teammates and honed my knowledge and skills to provide customer service, sales, and support to our clients across the globe.

Upcoming Training Webinars

Highway Capacity Analysis Virtual Training

12 PDHs are provided for each series

Jan 25 - 27, 2022 1 - 5 PM ET

Mar 08 - 10, 2022 1 - 5 PM ET

Highway Safety Analysis Virtual Training

8 PDHs are provided for each series

Feb 22 - 23, 2022 1 - 5 PM ET

Apr 05 - 06, 2022 1 - 5 PM ET

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