Development of Operations Planning Toolbox (OPT) Software

The objective of this research is to produce a practical tool with a simple interface that can accept multiple data sources.

WHAT IS THE NEED?

This project will support the development of the Operations Planning Toolbox (OPT), a user-friendly, well-documented, open-source, multi-modal transportation modeling software for quick quantitative assessment of operational scenarios, provided as a desktop application developed and supported by the University California (UC) Berkeley Partners for Advanced Transportation Technology (PATH) program.

WHAT ARE WE DOING?

The OPT will be free of charge. It is designed within the Transportation Open Environment for Data and Simulation (TOEDS) paradigm that enables easy sharing and exchange of input and simulation data between transportation practitioners. TOEDS ensures that OPT is fully extensible and scalable.

Deliverables for this project will include:
1. OPT 1.0 (describing its capabilities);
2. An openly available user guide;
3. Instructional videos; and
4. A hands-on demonstration of OPT 1.0 at an open webinar.

Details are as follows:
1. OPT 1.0 will have a clean, accessible, and self-explanatory user interface.
2. OPT 1.0 will provide an easy and efficient way of building and modifying road networks.
3. OPT 1.0 will provide calibration capability for easy and efficient tuning of simulation parameters (e.g. freeway capacities) according to established criteria.
4. OPT 1.0 will be based on TOEDS – an open and extensible environment for processing heterogeneous traffic data and building hybrid transportation simulation models. TOEDS will include procedures for dealing with gaps and inaccuracies in data sources.
5. The user group will include Traffic Operations engineers and Transportation Planners from the California Department of Transportation (Caltrans), engineers and/or planners from Caltrans’s partner agencies, transportation researchers from UC Berkeley and practitioners from the consultant - System Metrics Group.

WHAT IS OUR GOAL?
This is a study to improve operational analysis tools. The goal is to produce a practical tool with a simple interface that can accept multiple data sources.

WHAT IS THE BENEFIT?
OPT 1.0 will be a revolutionary new product, developed with input from the transportation community, leveraging UC Berkeley’s previous work effort with Caltrans and taking emerging transportation technologies into account. It will be a fully open source, allowing for community support and upgrades, and UC Berkeley PATH has made a strong commitment to work with public agency users to ensure overall support.

WHAT IS THE PROGRESS TO DATE?
Created project website: https://opt.ucbtrans.org/ Released first module of test software for download Monday, August 19, 2019
Conducted first hands-on webinar Wednesday, August 21, 2019.

Follow-up hands-on webinars were conducted on October 24, 2019 and February 6. These can be accessed here: https://opt.ucbtrans.org/materials/webinars. Materials and software are accessible on the project website. Each of the webinar featured an updated software version.

PI conducted one-on-one meetings with engineers from Caltrans D3, D5, D7 collecting information about their projects involving modeling. D4 operations also expressed interest in the software. Specific emphasis was on the types of traffic control used in districts and performance metrics of interest. The idea is to help districts to jump-start their corridor planning projects using OPT. To that end, a dedicated person on the UC Berkeley team will be working on OPT model development starting in June 2020. This effort will also be directed at testing the software.

A no-cost time extension (NCE) was executed later than anticipated due to hold ups at DGS. The NCE was finally executed in early April 2020, so the PI has resumed work.

Present work entails:
• Route management
• Simulation engine
• Simulation data acquisition and display

User Group session was held on June 17.
As of June 2020, the OPT has simulation capability. A webinar was held on Tuesday, June 23rd to show how OPT can be used in Caltrans’ projects. The topics being presented are as follows:
• Simulation in OPT and reporting results
• What we be developed by September 2020
• OPT features
• Simulation models for districts
• Q&A
In addition, OPT models for US-101 in Bay Area, US-101 in San Luis Obispo, I-210, segment of I-405 were developed. The latest release was published on August 12: https://opt.ucbtrans.org/downloads
Current work is on HOV/HOT policies for managed lanes. In parallel, we currently develop tutorial material for OPT.

As of November 2, 2020, OPT Alpha version is ready for release. It is a fully functional traffic simulator with the following features:

- Configuration module with intuitive user interface that allows building the road network; setting up input demand and outgoing traffic flows; modeling different types of traffic (e.g., SOVs, HOVs, trucks) defining policies for managed lanes, including HOV and HOT; setting ramp metering.

- Simulation module that handles multimodal traffic, implements lane changing behavior, and accepts outgoing flows in two formats – as off-ramp flows and as split ratios that determine portions of traffic to be directed to off-ramps.

- Reporting of simulation results in the form of pie charts for summaries; timeseries charts; and contour plots for spatio-temporal data. Simulation results can be exported to Excel.

- User can set their preferences about simulation setup, duration, and reporting granularity.

The Alpha release is a finished product that enables Caltrans engineers to perform their freeway modeling tasks, and it is ready for testing by Caltrans.

Currently we are developing:

- Emissions’ calculation based on EMMFAC tables.

- Traffic events – allowing the user to assess the impact of accidents and temporary traffic control failures.

- Minor navigation/information features and context help - these features would make OPT more user friendly, but they do not affect the functionality.

On top of that, we are testing the software and preparing documentation.

Image 1: As of August 2020, OPT has reporting of simulation results on road-, route- and network level.