

A case study for the implementation of an integrated variable speed limit (VSL) control strategy in a freeway section of I-80 based on SUMO simulations Dataset

Dataset available at: <https://doi.org/10.25338/B8QD04>

(This dataset supports report **Get More Out of Variable Speed Limit (VSL) Control: An Integrated Approach to Manage Traffic Corridors with Multiple Bottlenecks**)

This U.S. Department of Transportation-funded dataset is preserved by the University of California in the digital repository Dryad (<https://datadryad.org>), and is available at <https://doi.org/10.25338/B8QD04>

The related final report **Get More Out of Variable Speed Limit (VSL) Control: An Integrated Approach to Manage Traffic Corridors with Multiple Bottlenecks**, is available from the National Transportation Library's Digital Repository at <https://rosap.ntl.bts.gov/view/dot/58710>.

Metadata from the Dryad Repository record:

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Abstract:

This project aims at reducing fuel consumption and greenhouse gas emission by applying variable speed control (VSL) strategies to the traffic corridors with multi-segment and multi-bottleneck. The dataset is composed of inputs and outputs of the SUMO simulation model via TraCI API. SUMO is a microscopic traffic simulation platform which allows to simulate a given traffic demand through a given network. Namely, the inputs consist of the vehicle trip data obtained from the PeMS database in a 10-mile long freeway section of Interstate-80 Eastbound where the outputs are simulation results of the aggregated average travel time, fuel consumption and carbon emissions under different VSL strategies with different optimal speed limit.

Methods:

The input data consists of the corridor structure and the traffic demand data:

- The traffic demand data is obtained based on the public database from PeMS. Details can be found in <http://pems.dot.ca.gov/>.
- The road network is constructed and modified by netedit. A 10-mile-long freeway section of Interstate-80 Eastbound, with 6 junctions across the city of Davis, CA is selected to evaluate our VSL control strategies. This section has a series of recurrent bottlenecks and severe congestion occurs almost every day in the afternoon peak hours. These multiple bottlenecks are all “critical” along the path. Junction 70 is interconnected with SR-113, another freeway from the north. It introduces heavy merging traffic without metering. A vast lane drop from 6 to 3 lanes exists between Junction 71 and 72. With saturated

mainline flow and extra ramp demand at Junction 75 and 78, the downstream traffic flow is sensitive to breakdown even with ramp metering activated in peak hours. Details can be found in <https://sumo.dlr.de/docs/netedit.html>.

The output data is generated through the SUMO simulation. In this simulation, traffic control interface(TraCI) uses a TCP based client/server architecture to build connection with sumo, which is accessible to retrieve values of vehicles and detectors and then construct the VSL control models to get simulation results analysis. Details can be found in <https://sumo.dlr.de/docs/TraCI.html>.

Usage Notes:

Input Data:

1. vsl_I-80.net.xml: Definition of the 10-mile-long freeway section of Interstate-80 Eastbound network file connecting the city of Davis and West Sacramento in California
2. vsl_I-80.additional.xml: Definition of induction loop detectors to capture the vehicle data in every simulation step
3. vsl_I-80.flow.xml: Definition of 5 hours' traffic demand data(OD pairs) with three typical demand sets(light, medium and heavy)
4. vsl_I-80.rou.xml: Vehicle routes and trip information using shortest path computation via dijkstra function
5. vsl_I-80.sumocfg.xml: Configuration file glues input files and makes it executable by SUMO

Output Data:

1. emissions_no_vsl.xml: The output which contains aggregated travel time, fuel consumption and pollutants without control strategy
2. emissions_static.xml: Output based on the flow-based control strategy
3. emissions_lqr.xml: Output based on the density-based LQR control strategy

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Dataset description:

This dataset contains 1 .zip file collection described below.

VSL_I-80_Simulation.rar:

A .rar file is a compressed archive format that can be opened with WinRAR, and other available software (for more information on .rar files and software, please visit <https://www.file-extensions.org/rar-file-extension>). NTL staff was able to open it using SecureZip.

National Transportation Library (NTL) Curation Note:

As this dataset is preserved in a repository outside U.S. DOT control, as allowed by the U.S. DOT's Public Access Plan (<https://ntl.bts.gov/public-access>) Section 7.4.2 Data, the NTL staff

has performed ***NO*** additional curation actions on this dataset. NTL staff last accessed this dataset at <https://doi.org/10.25338/B8QD04> on 2022-01-10. If, in the future, you have trouble accessing this dataset at the host repository, please email NTLDataCurator@dot.gov describing your problem. NTL staff will do its best to assist you at that time.