APPENDIX A. Performance Measures OF US-101 TESTBED

Download Data Zip file:
CV25 data: https://doi.org/10.21949/1500859
CV50 data: https://doi.org/10.21949/1500872

Identification Information

Citation

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Originator: Kittelson & Associates, Inc.
Publication Date: 20150616
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Geospatial Data Presentation Form: None

Publication Information

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Description

Abstract:

This project involved the assessment of the impacts of the INFLO Prototype Dynamic Speed Harmonization (SPD-HARM) and Queue Warning (Q-WARN) applications. The assessment was based on an extensive analysis of the INFLO Prototype using a VISSIM simulation model for the US 101 freeway corridor in San Mateo, CA. It should be noted that in the case of Q-WARN, there was–and still is–a lack of information or behavioral theory regarding how drivers would respond to advance notice of queues, one or more miles ahead. For this reason, the effects of Q-WARN were not tested in simulation.

This set of performance measure files was calculated based on the VISSIM outputs of 24 scenarios runs of the SPD-HARM application. The models covered various market penetration rates, incidient durations and weather conditions. Specifically, the following six scenarios were performed for each of the four CV market penetration rates (0%, 10%, 25%, 50%):

Scenario 1- Typical Day
Scenario 2- 30-minute incident
Scenario 3- 60-minute incident
Scenario 4- Rainy day

Scenario 5- Rainy day with 30-minute incident
Scenario 6- Rainy day with 60-minute incident
The following files are included in this package:

a) Performance measures calculated based on vehicle outputs of the 24 scenarios (.accdb format)

b) Performance measures calculated based on data collection outputs of the 24 scenarios (.xlsx and .pdf format)

The total size of the data environment is 5 GB.

Purpose: The purpose of the data set is to provide the performance measures of different scenarios to evaluate the impact of Dynamic Speed Harmonization.

Supplemental Information: None

Time Period of Content

Time Period Information

Range of Dates:

Beginning Date: 2014
Ending Date: 2014

Currentness Reference:

Ground condition (i.e., the previous dates refer to the time the information was collected)

Status

Progress: Complete
Maintenance and Update Frequency: None Planned

Spatial Domain

Bounding Coordinates

West Bounding Coordinate: None
East Bounding Coordinate: None
North Bounding Coordinate: None
South Bounding Coordinate: None

Keywords

Theme

Theme Keyword: Performance Meausres

Theme Keyword: US-101
Theme Keyword: Speed Harmonization
Theme Keyword: VISSIM

Place

Place Keyword: San Mateo
Place Keyword: Califonia

Temporal

Temporal Keyword: 2012

Access Constraints:

To access the dataset, users must register through the USDOT Research Data Exchange (RDE) portal (https://www.its-rde.net/). The registration process will include a request for contact information and agreement to terms of use for the data. What information is optional versus mandatory for registration has not been finalized ; however in order to encourage broad access and use, mandatory information will be kept to a minimum and ease of use maximized.

User Constraints:

Those who use data and data processing tools distributed by the Research Data Exchange have the following responsibilities:

APPENDIX A. Users are encouraged to report anomalies, errors or other questionable data elements using the Data Forum of the Research Data Exchange website, referencing the specific data or data processing tool by name and version number.

APPENDIX B. Users are encouraged to report anomalies, errors or other questionable data elements using the Data Forum of the Research Data Exchange website, referencing the specific data or data processing tool by name and version number.

APPENDIX C. Users are encouraged to report anomalies, errors or other questionable data elements using the Data Forum of the Research Data Exchange website, referencing the specific data or data processing tool by name and version number.

Point of Contact

Contact Information

Contact Organization Primary

Contact Organization: Kittelson & Associates, Inc.
Contact Person: Brandon Nevers
Contact Electronic Mail Address: bnevers@kittelson.com

Contact Organization Secondary

Contact Organization: Kittelson & Associates, Inc.
Contact Person: Anxi Jia
Contact Electronic Mail Address: ajia@kittelson.com

Security Information

Security Classification: Unclassified

Data Quality Information

Attribute Accuracy: The Kittelson & Associates, Inc. (KAI) extensively checked all the VISSIM outputs and the calculated performance measures. No errors were found in the VISSIM outputs and performance measure calculations.

Completeness Report: The VISSIM outputs were reported at 20-second intervals. The performance measures were aggregated hourly. No missing values were found in the VISSIM outputs and performance measure calculations. ***Lineage***

Process Step

Process Description: KAI aggregated the 20-second VISSIM outputs (volume, speed, and vehicle records) to 60-minute intervals for the corridor performance measures.

Process Contact:

Contact Information

Contact Organization Primary
Contact Organization: Booz Allen
Contact Person: Swick, Ryan
Contact Electronic Mail Address: Swick_Ryan@bah.com

Entity and Attribute Information

VISSIM output files

While the VISSIM output files were too large to include in this RDE package, the files featured the following attributes:

Attribute

Attribute Label: Measur.
Attribute Definition: Data Collection Segment Number.
Attribute Domain Values: Integer, ranging from 1 to 19

Attribute

AttributeLabel: from
AttributeDefinition: Start time of the Aggregation interval
AttributeDomain Values: Integer, ranging from 0 to 21580

Attribute

AttributeLabel: to
AttributeDefinition: End time of the Aggregation interval
AttributeDomain Values: Integer, ranging from 20 to 21600

Attribute

AttributeLabel: Number Veh
AttributeDefinition: Number of vehicles in interval
AttributeDomain Values: Integer

Attribute

AttributeLabel: Occup. Rate
AttributeDefinition: Occupancy rate [%] of the detector
Attribute Domain Values: Percentage, ranging from 0% to 100%

Attribute

AttributeLabel: Speed
AttributeDefinition: Speed [mph] measured at the detector
AttributeDomain Values: Decimal, ranging from 0.00 to 75.00

Attribute

AttributeLabel: Time
AttributeDefinition: End time of reporting interval (in simulation seconds) for travel time measurement
AttributeDomain Values: Integer, ranging from 7200 to 21600

Attribute

AttributeLabel: Trav Study Corridor
AttributeDefinition: Part 1 travel time in seconds - Part 1 is from link 545 at 458.0 ft to link 83 at 582.0 ft, Distance 43780.2 ft
AttributeDomain Values: Decimal

Attribute

AttributeLabel: # Veh Study Corridor
AttributeDefinition: Part 1 number of vehicles - Part 1 is from link 545 at 458.0 ft to link 83 at 582.0 ft, Distance 43780.2 ft AttributeDomain Values: Integer

Attribute

AttributeLabel: Trav Study Corridor 2
AttributeDefinition: Part 2 travel time in seconds - Part 2 is from link 83 at 611.1 ft to link 136 at 910.2 ft, Distance 12175.2 ft
AttributeDomain Values: Decimal

Attribute

AttributeLabel: # Veh Study Corridor 2
AttributeDefinition: Part 2 number of vehicles - Part 2 is from link 83 at 611.1 ft to link 136 at 910.2 ft, Distance 12175.2 ft AttributeDomain Values: Integer

Attribute

AttributeLabel: Average delay time per vehicle [s], All Vehicle Types

AttributeDefinition: Total delay time / (active + arrived vehicles)
AttributeDomain Values: Decimal

Attribute

AttributeLabel: Average number of stops per vehicles, All Vehicle Types
AttributeDefinition: Total number of stops / (active + arrived vehicles) A stop is counted if the speed of the vehicle was greater than zero at the end of the previous time step and is zero at the end of the current time step.
Attribute Domain Values: Integer

Attribute

AttributeLabel: Average speed [mph], All Vehicle Types
AttributeDefinition: Total Distance / total Travel Time
Attribute Domain Values: Decimal

Attribute

AttributeLabel: Average stopped delay per vehicle [s], All Vehicle Types
AttributeDefinition: Total stopped delay / (active + arrived vehicles). Stopped delay = time when vehicle is standing (speed is zero).
AttributeDomain Values: Decimal

Attribute

AttributeLabel: Total delay time [h], All Vehicle Types
AttributeDefinition: Total delay time of all active and arrived vehicles. The delay time of a vehicle in one time step is the part of the time step which is spent because the actual speed is lower than the desired speed. It is calculated by subtracting the quotient of the actual distance traveled in this time step and the desired speed from the length of the time step. Note: Dwell times of bus/trams stopping at a PT stop are not included. Parking in any type of parking lot is not included. Note: Delay time includes stopped delay (see below). AttributeDomain Values: Decimal

Attribute

AttributeLabel: Total Distance Traveled [mi], All Vehicle Types
AttributeDefinition: Total distance traveled by active and arrived vehicles.
AttributeDomain Values: Decimal

Attribute

AttributeLabel: Latent delay time [h], All Vehicle Types
AttributeDefinition: Summed up waiting time in vehicle inputs and parking lots of all vehicles which could not enter the network attheir original start time. This can include waiting time of vehicles which have entered the network before the end of the simulation.
AttributeDomain Values: Decimal

Attribute

AttributeLabel: Latent demand, All Vehicle Types
AttributeDefinition: Number of vehicles which could not enter the network (from vehicle inputs and parking lots) Number of vehicles at the end of the

simulation waiting to enter the network (in a parking lot or input). These are not counted as active vehicles.
AttributeDomain Values: Integer

Attribute

Attribute Label: Number of Stops, All Vehicle Types
Attribute Definition: Total number of stops of all active and arrived vehicles. A stop is counted if the speed of the vehicle was greater than zero at the end of the previous time step and is zero at the end of the current time step.
Attribute Domain Values: Integer

Attribute

AttributeLabel: Number of vehicles in the network, All Vehicle Types
AttributeDefinition: Total number of vehicles in the network at the end of the simulation. Does not include the already arrived vehicles or the latent demand (see below).
Attribute Domain Values: Integer

Attribute

Attribute Label: Number of vehicles that have left the network, All Vehicle Types Attribute Definition: Total number of vehicles which have already reached their destination and left the network during the simulation. Attribute Domain Values: Integer

Attribute

AttributeLabel: Total stopped delay [h], All Vehicle Types
Attribute Definition: Total stopped time of all active and arrived vehicles. Stopped delay = time when vehicle is standing (speed is zero).
Attribute Domain Values: Decimal

Attribute

AttributeLabel: Total travel time [h], All Vehicle Types
AttributeDefinition: Total travel time of all active and arrived vehicles
Attribute Domain Values: Decimal

Attribute

AttributeLabel: Emissions CO2 [kg], All Vehicle Types
AttributeDefinition: Only with Emissions add-on: Carbon Monoxide emissions in current simulation step AttributeDomain Values: Decimal

Attribute

AttributeLabel: Fuel Consumption [kg], All Vehicle Types
AttributeDefinition: Fuel consumption [mg/s] in the current simulation step
Attribute Domain Values: Decimal

Attribute

AttributeLabel: Simulation time
AttributeDefinition: All Network VISSIM outputs used
AttributeDomain Values: Integer, ranging from 3600 to 25200

VISSIM Connected Vehicle Record database

Attribute

AttributeLabel: Iteration
AttributeDefinition: Simulation run number
AttributeDomain Values: Integer, ranging from 1 to 10

Attribute

AttributeLabel: VehNr
AttributeDefinition: Vehicle identification number
Attribute Domain Values: Integer

Attribute

AttributeLabel: t
AttributeDefinition: Timestep in simulation seconds at the end of the reporting interval (20-sec increments)
Attribute Domain Values: Decimal, ranging from 20 to 21600

Attribute

AttributeLabel: Link
AttributeDefinition: Number of the Active Link
AttributeDomain Values: Integer

Attribute

AttributeLabel: v
AttributeDefinition: Vehicle speed (mph)
Attribute Domain Values: Decimal

Attribute

AttributeLabel: x
AttributeDefinition: location of the vehicle on the active link
Attribute Domain Values: Decimal

Attribute

AttributeLabel: dx
AttributeDefinition: Distance to the leading vehicle
Attribute Domain Values: Decimal

Attribute

AttributeLabel: QTm
AttributeDefinition: Vehicle in queue time
Attribute Domain Values: Decimal

Attribute

AttributeLabel: LCh
AttributeDefinition: Toal vehicle lane changes in the reporting interval
Attribute Domain Values: Integer

Attribute

AttributeLabel: Stops
AttributeDefinition: Number of vehicle stops
Attribute Domain Values: Integer

Result Analysis Spreadsheets

Attribute

AttributeLabel: 1a. Shockwave - Speed Difference between Adjacent Sublinks

AttributeDefinition: The maximum difference in 5-minute average speeds for adjacent freeway sublinks within the selected hour (h) observed across “N” simulation repetitions. Only decelerating speed differences are counted. Downstream speed increases are NOT counted. The distribution of maximum link speed differences by hour will be tabulated and the mean, max, standard deviation, and 95th percentile values will be reported for each hour of the simulation.
AttributeDomain Values: Decimal

Attribute

AttributeLabel: 1b. Shockwave - Speed Difference within Sublinks

AttributeDefinition: Following similar procedures as described above for between sublink speed differences, the speed variance for individual vehicles will be computed for each 5 minute period within each sublink. The results for all sublinks in the northbound direction will be reported for each hour of the simulation in terms of the mean, maximum, standard deviation (of the sublink variances), and the 95th percentile highest sublink result.
AttributeDomain Values: Decimal

Attribute

AttributeLabel: 2. Queues - Average Connected Vehicle Seconds in Queue

(sec/veh)
AttributeDefinition: Average system (freeway northbound only) vehicle-seconds in queue per connected vehicle during hour “h” across “N” simulation repetitions AttributeDomain Values: Decimal

Attribute

AttributeLabel: 3. Throughput - Vehicle Miles Traveled (VMT)

AttributeDefinition: Total vehicle miles traveled during hour h averaged across
"N" simulation repetitions
Attribute Domain Values: Integer

Attribute

AttributeLabel: 4. Speed Variance

AttributeDefinition: Performance Measure #1: Shockwave - Speed Difference

between Adjacent Sublinks
AttributeDomain Values: Decimal

Attribute

AttributeLabel: 5. Average Travel Time - Vehicle Hours Traveled (VHT)

AttributeDefinition: Average vehicle hours traveled during hour h across "N" simulation repetitions
AttributeDomain Values: Decimal

Attribute

Attribute Label: 6. Reliability Measure - 95th Percentile Travel Time Index (TTI)

Attribute Definition: 95th percentile travel time (seconds) of the study corridor during hour h, calculated based on the average of N simulation repetitions at a 20-second resolution / Free-Flow travel time (seconds) of the study corridor, assuming 65 mph free-flow speed Attribute Domain Values: Decimal

Attribute

Attribute Label: 7. Number of Lane Changes per 1,000 Connected Vehicles Attribute Definition: Average number of lane changes per connected vehicle during hour h across "N" simulation repetitions
Attribute Domain Values: Integer

Attribute

AttributeLabel: 8. Number of Stops per Connected Vehicle
AttributeDefinition: Average number of stops per connected vehicle during hour h across "N" simulation repetitions. AttributeDomain Values: Integer

Attribute

AttributeLabel: 9. Latent Demand and Delay

AttributeDefinition: The total number of unserved vehicles—those denied entry to the network
Attribute Domain Values: Integer