PORTAL: The Portland-Vancouver Multimodal Transportation Data Archive

Oregon SAE
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Outline

• USDOT - Intellidrive
• PORTAL overview
• Freeway performance
• Weigh-in-motion
• Arterial performance
• Conclusions
What is IntelliDrive℠?

- IntelliDrive℠ is a suite of technologies and applications that use wireless communications to provide connectivity:
  - Among vehicles of all types
  - Between vehicles and roadway infrastructure
  - Among vehicles, infrastructure and wireless consumer devices
Networked Environment

IntelliDrive℠ Networked Environment
DATA IN, ACTIONABLE INFORMATION OUT

- Vehicle Status Data
  - 65 mph...
  - Brakes on...
  - Two passengers...
- Weather Data
- Transaction Data
- Location Data
- Infrastructure Status Data
- E-Payment Service
- Real-Time Travel Info
- Signal Phase & Timing Adjusts Real-Time Conditions
- Safety Alerts and Warnings

Slide. G. McHale, USDOT
A Regional Approach: TransPort ITS Coordinating Committee
PORTAL Background

- PORTAL established 2004
  - NSF Funding for simple web interface, single data source
- Now - 2010
  - 1 TB data; large web site and data
- Customers (Users)
  - Transportation professionals
  - Regional Transportation Plan
  - Local news media
  - Research projects
What’s in the PORTAL Database?

Loop Detector Data
20 s count, lane occupancy, speed from 500 detectors (1.2 mi spacing)

Incident Data
140,000 since 1999

Bus Data
1 year stop level data
140,000,000 rows

Weather Data
Every day since 2004

VMS Data
19 VMS since 1999

WIM Data
22 stations since 2005
30,026,606 trucks

Crash Data
All state-reported crashes since 1999 - ~580,000

002417
Days
Since July 2004
About +700 GB
6.9 Million
Detector Intervals
Themes

Context

Raw data

Visualizations

Information
Freeway Performance
Performance Measures Used

- Volume
- Speed
- Occupancy
- Vehicle Miles Traveled
- Vehicle Hours Traveled
- Travel Time
- Delay
- Reliability
Interstate 5 Northbound

About 38.6 kilometers
Estimated Monthly Travel Time I-5 North September 2006

- Percent Congested
- Free Flow Travel Time
- Mean Travel Time
- 95th Percentile Travel Time

Lyman and Bertini, 2007
I-5 NB - Going St to Delta Park

![Graph showing speed, MPH for different years (2008, 2009, 2010)](image)
Average reported speeds excluding holidays

Each ring is a day of the week, Monday to Sunday

OR-217 SB at Beaverton Hillsdale Hwy, 2010

Average reported speeds excluding holidays

Each ring is a day of the week, Monday to Sunday
Systematically Identifying Bottlenecks

Bottlenecks recurring at least 50%, 75%, and 90% of the time in Feb. 2008

Systematically Identifying Bottlenecks

Bottlenecks recurring at least 75% and 90% of the time in Feb. 2008

Systematically Identifying Bottlenecks

Bottlenecks recurring at least 90% of the time in Feb. 2008

Weigh in Motion Systems
Axle Weight Sensors

• Single load cells
• Sensors weigh vehicles traveling at normal highway speeds
• Weight measurement affected by many factors
  – Site characteristics
  – Environmental factors
  – Truck dynamics
Data Almanac

• These WIM sites provide
  – Axle weights
  – Gross vehicle weight
  – Axle spacing
  – Vehicle class
  – Bumper-to-bumper length
  – Speed
  – Unique transponder numbers
Class 9 Steer Axle Weight

Lane 1

Mean = 9.75

Steering Axle (kips)

Expect 9,000-11,000 lbs

Lane 2

Mean = 9.07

Steering Axle (kips)
Class 9 Steer Axle Weight (March)

Lane 1:
Mean = 10.44

Lane 2:
Mean = 7.4
Class 9 Axle 2-3 Spacing

Expect 4.30-4.36 feet
RFID Tags - Transponders

• Three types of tags
  – Heavy Vehicle Electronic License Plate (HELP)’s PrePass program
  – North American Pre-clearance and Safety System (NORPASS)
  – Oregon Green Light Program

J. Lane, Briefing to American Association of State Highway and Transportation Officials (AASHTO), 22 February 2008
freight.transportation.org/doc/hwy/dc08/scoht_cvisp.ppt
Transponder Matching
Average Link Speed, by Day
Adding Length-Based Classification

- Manual (e.g. visual)
- Axle Sensors
- Vehicle Length
- Machine Vision
- Other Technologies
All Trucks
Mean = 63.28 n = 77935

Density

Length
Arterial Performance
Arterial Fusion Project

• Develop an automated way to report
  – Speeds
  – Travel times
  – Performance measures

• on arterials using
  – Transit Automatic Vehicle Locator (AVL) data
  – Existing ITS signal infrastructure
  – Matched vehicle identification
Adding Signal and System Detectors

- 1) count, speed, and calculated occupancy from system detectors;
- 2) cycle split logs
- 3) data from other detectors
  - advanced loops in bicycle lanes
  - pedestrian push-button activations.
Probe (MAC)

Trimet Data: SE Powell Blvd between SE 79th Ave and SE 9th Ave (ROUTE 9)
MAC Data: SE Powell Blvd between SE 77th Ave and SE 7th Ave
Speed Map from Transit AVL System
Bus Trajectories
EB 33rd 77th

WB 77th 33rd

EB 21st 33rd

WB 33rd 21st
Route 19, Direction 1, Trip Time-Distance Plot, with Estimated Load
June 6, 2007

Pattern Distance (mi)

Hour of Day

Est. Load
- [0,5]
- (5,10]
- (10,15]
- (15,20]
- (20,25]
- (25,30]
- (30,100]
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Questions?

Thank You!
www.its.pdx.edu