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TransPort Technical Advisory Committee

Wednesday, August 10, 2011

1:00 p.m. –2:30 p.m.

ODOT Region 1

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Meeting Notes

In Attendance

Peter Bosa (Metro), Amica Bose (Hillsboro), Kevin Chambers (Ride Connection), Jim Gelhar (Gresham), Kyle Hedspeth (ODOT), Tu Ho (Beaverton), Alan Hollen (Advanced Traffic Products), David Hurwitz (OSU), Tim Janes (Advanced Traffic Products), Craig Kairis (Global Traffic Technologies), Peter Koonce (PBOT), Mike Lemon (Global Traffic Technologies), Galen McGill (ODOT), Dennis Mitchell (ODOT), Chris Monsere (PSU), Pam O'Brien (DKS Associates), Adrian Pearmine (IBI Group), Deena Platman (Metro), Nathaniel Price (FHWA), Shaun Quayle (Kittelson), Bikram Raghubansh (Clackamas Co), Willie Rotich (PBOT), Stacy Shetler (Washington Co), Christian Snuffin (Clackamas Co), Tom Urbanik (Kittelson)

Introductions & Announcements

- Chris Monsere, PSU, updated members on the ITS and operations related papers submitted to the 2012 TRB Annual Meeting. Members may contact faculty individually for copies of the papers (see handout).
- Deena Platman, Metro, announced that the 2014-15 Regional Flexible Fund Allocation recommendations for TSMO will be available for public comment between September 13, 2011 and October 13, 2011 (see handout).
- Dennis Mitchell, ODOT, reviewed a new ODOT operations project at I-5/Carmen Drive southbound ramp. The on-ramp is being reconfigured to extend an auxiliary lane from Hwy 217 to Lower Boones Ferry Rd. ODOT request a TransPort letter of support for the project. Members voted to approve a letter of support. Deena Platman will prepare the letter for members review.
- Nathaniel Price, FHWA, invited TransPort members to participate in the annual Region 1 Traffic Incident Management (TIM) self assessment. Deena Platman will forward the invitation.

Oregon State University Driving and Bicycling Simulator

David Hurwitz, OSU, gave a presentation on the new driving and bicycling simulator housed at the university. Faculty member Karen Dixon is David's partner in developing the lab. Its mission is to advance transportation safety and operations for system users, infrastructure and vehicles. The two

main components are a visualization arena for simulation and an operator's station. The simulator replicates conditions to evaluate driver behavior in different situations.
The lab has recently completed a bicycling simulator. It is a completely mobile simulator and has been designed to accommodate different bicycle types – specifically male, female, and preteen – but can be used for any other bike type. Data is gathered off of the back wheel. A sound system provides noise.

An eye tracking system lets researchers figure out where and when people are looking in relation to infrastructure. It can be used for both the driving and bicycling simulators.

Research projects currently using data from the simulators include:

- Dilemma zone and intersection safety – understand driver decision making to better adjust signal timing for safety
- Pedestrian and flashing yellow arrow – research what factors lead to conflicts between vehicle left turns and pedestrian
- Work zone capacity – investigate driver behavior in relation to work zone design

TransPort questions included:
Q. Are you able to evaluate built environment based on field conditions?
A. Almost there. We are using mobile LIDAR to replicate very accurate models in the lab.

A copy of the presentation is included with meeting notes.

Opticom – Central Management Software

Jim Malnati, GTT, gave a demonstration of their centralized opticom management software. The software allows real-time monitoring of opticom system to allow detection of failure before it occurs. Users can monitor preemption and create activity reports. The software also sends alerts. It has compliance reporting and asset tracking. Includes event and disaster evacuation plans.

The software runs off the central signal server with work stations at each partner agency. Pricing is based on the number of signals in the system.

TripCheck.com Enhancements

Galen McGill, ODOT, gave an update on ODOT's efforts to enhance its TripCheck.com traveler information site. They are updating the current Speed Map for the Portland region. The map will move from a jpg to GIS and will be zoomable. Vancouver region data is also being integrated. Galen was looking for feedback on how best to describe arterial data on the map. He shared examples of speed map legends used in other regions and asked for feedback on styles.

TransPort questions/comments included:
Q. Are freeway and arterial shown on the same map?
A. Yes

Comment – Prefer using four bins to better accommodate arterial data
Comment – Concerned about accuracy

Q. Are you going to create a smart phone app?
A. Considering it. Private providers do this now but there is a lag in the data. TripCheck.com is very real time.

The updated speed map will be released in September 2011.

Meeting adjourned at 2:30 p.m.

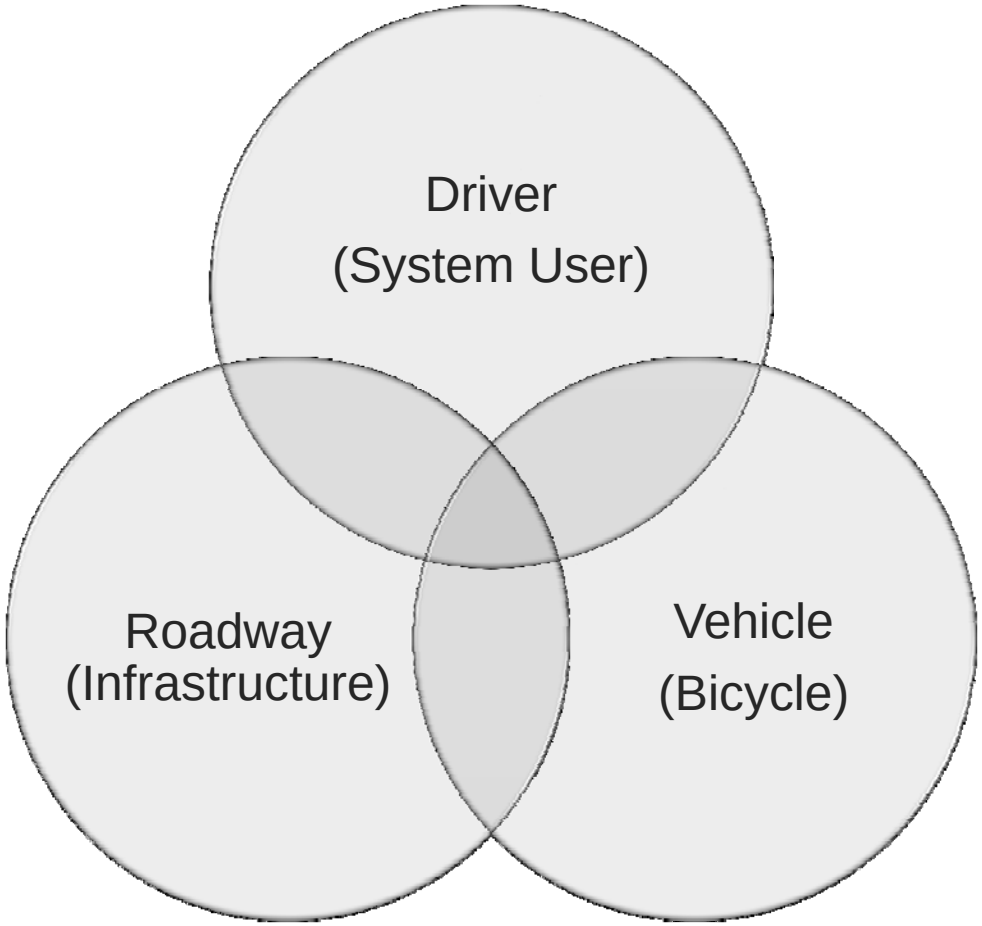
OSU Driving and Bicycling Simulator Laboratory: Infrastructure & Research

Presented by: David S. Hurwitz, Ph.D.
Assistant Professor
School of Civil and Construction Engineering

Contributors: Halston Tuss & Derek Moore
Graduate Research Assistants

Joshua Swake & Isaac Talley
Undergraduate Research Assistants

Mission:
Advance Transportation Safety & Operations Research



Research Topics of Interest

Roadway	Vehicles	System Users
•**Highway Design** •Alignment •Interchanges •High/Low Volume Roads •**Traffic Control Devices** •Innovative Designs •User Comprehension •User Compliance	•In-Vehicle Technology •Innovative Control systems •Human Factors Design	•Younger/Older Users •Vulnerable Users (Bikes & Pedestrians) •User Training •Distraction

Driving Simulator: Components

Forward Projection

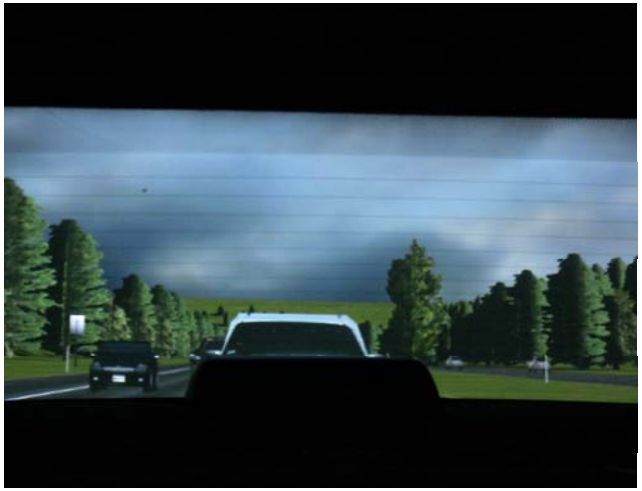
Rear Projection

Operators Station
(Graduate Students
Not Included)

Driving Simulator: Visualization

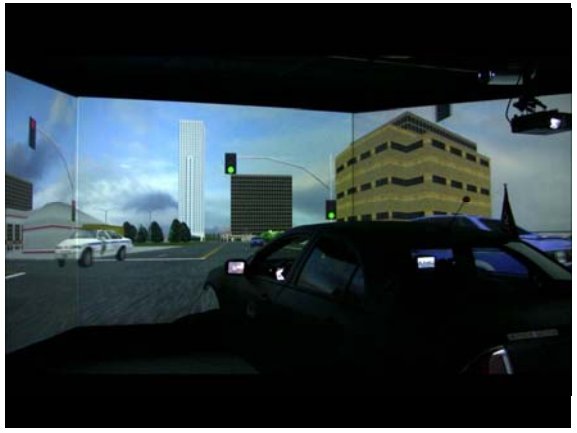
Scene View

Driver Mirror & Digital Dashboard



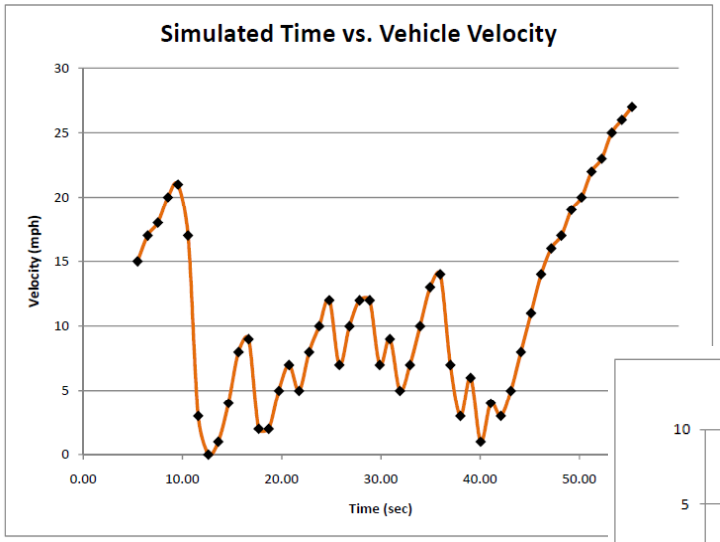
Rear Window

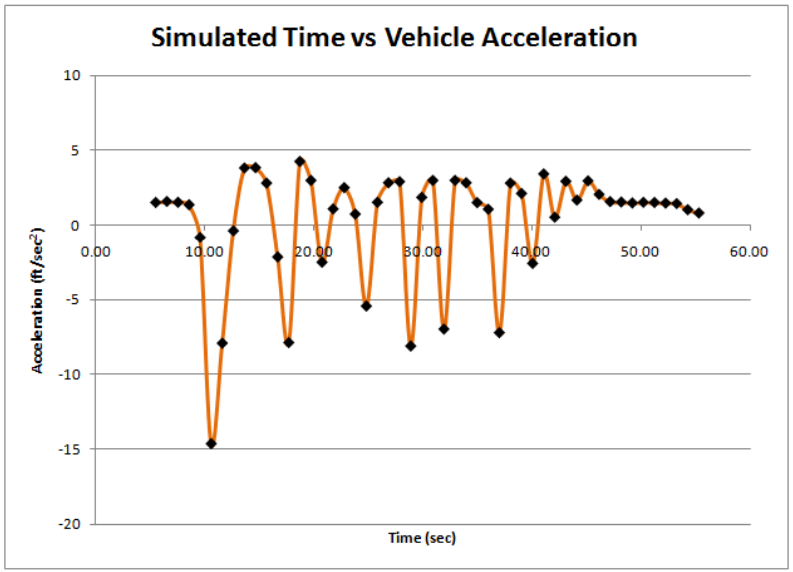
Driving Simulator: Running with Subject



Driving Simulator: Data Acquisition

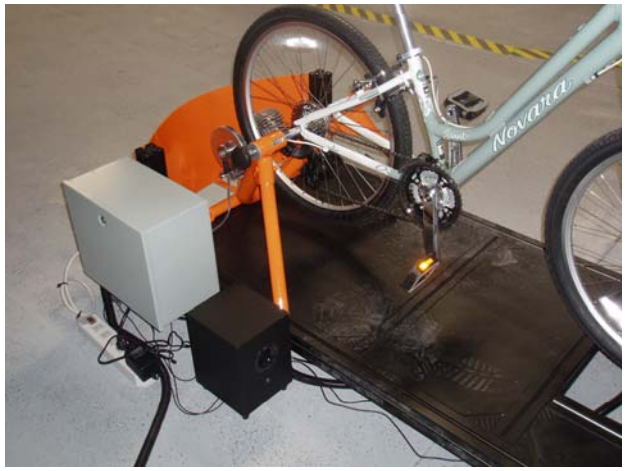
- Velocity
- Lateral Position
- Acceleration
- Deceleration
- Headway
  - Time
  - Space
- Tailway
  - Time
  - Space
- Steering wheel angle
- Brake angle
- Throttle angle





Bicycling Simulator: Components

Bicycling Simulator: Components



Speed + Tension at Rear Wheel

3 Bikes - Male, Female, Child

Turning Angle & Ambient Sound

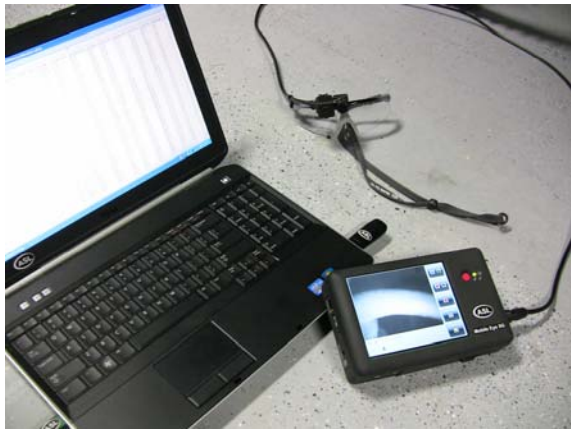
Bicycling Simulator: Visualization

Visual Field

Rear View Mirror

Bicycling Simulator: Running with Subject

Eye Tracker: Components



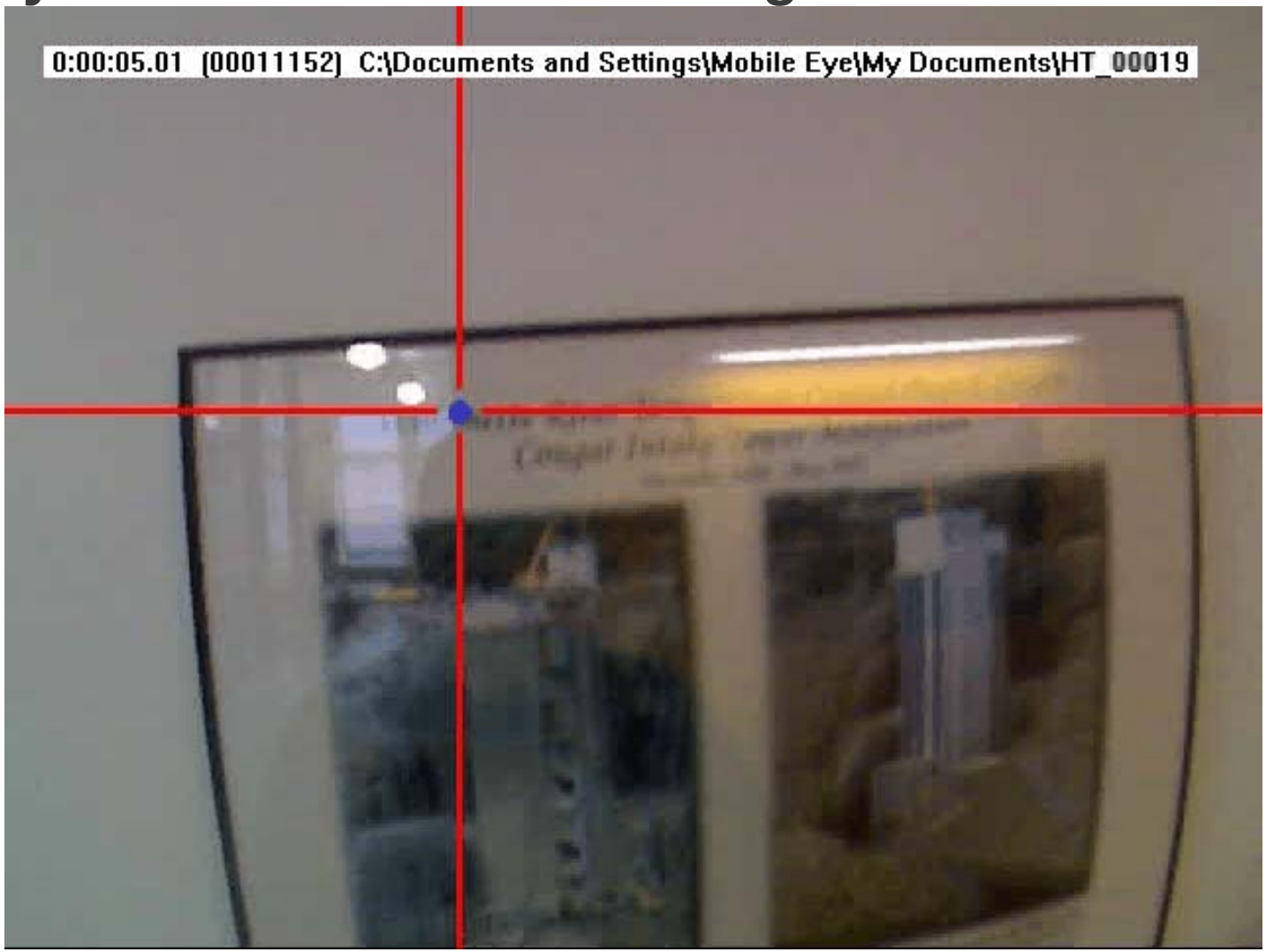
Computer & Control Unit

Scene & Eye Camera

Calibration w/IR lights

Eye Tracker: Field Driving w/ Cross Hairs

Eye Tracker: Poster Reading w/ Fixation Path



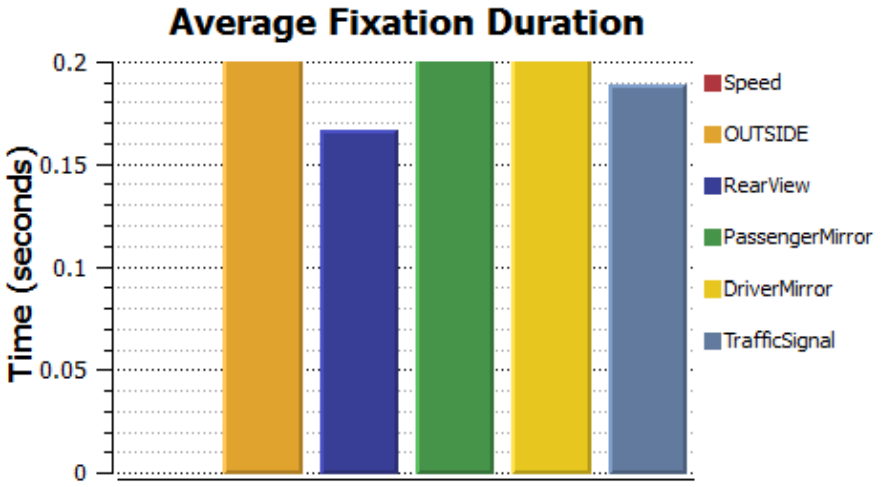
Eye Tracker: AOIs & Heat Maps in the Lab

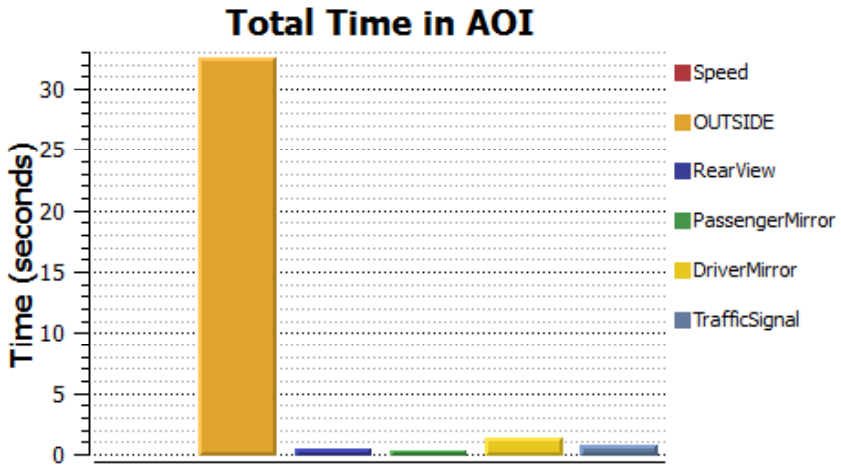
Eye Tracker: Reduced Data

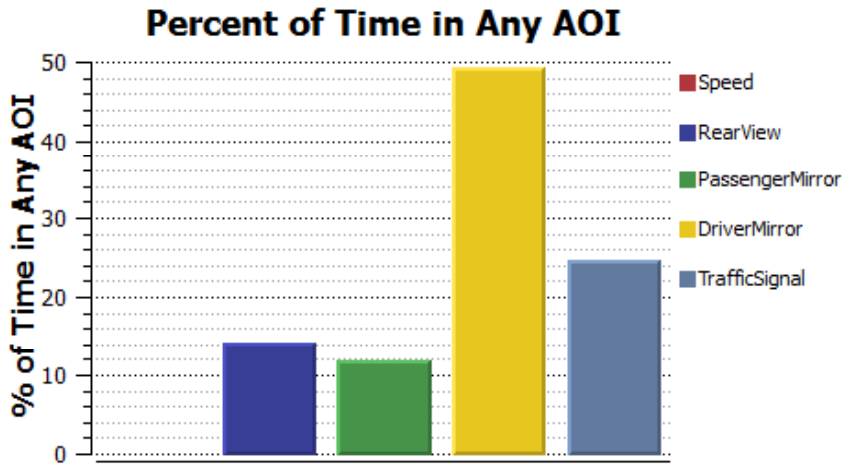
Fixation Summary

Data | More Info

AOI#	AOIName	FixCount	%FixCount	TotalFixDur	%TotalFixDur	AvgFixDuration
0	OUTSI...	67	85.897	24.160	90.964	0.361
1	RearView	2	2.564	0.340	1.280	0.170
2	Speed	0	0.000	0.000	0.000	0.000
3	Passen...	1	1.282	0.300	1.130	0.300
4	DriverM...	5	6.410	1.210	4.556	0.242
5	TrafficS...	3	3.846	0.550	2.071	0.183



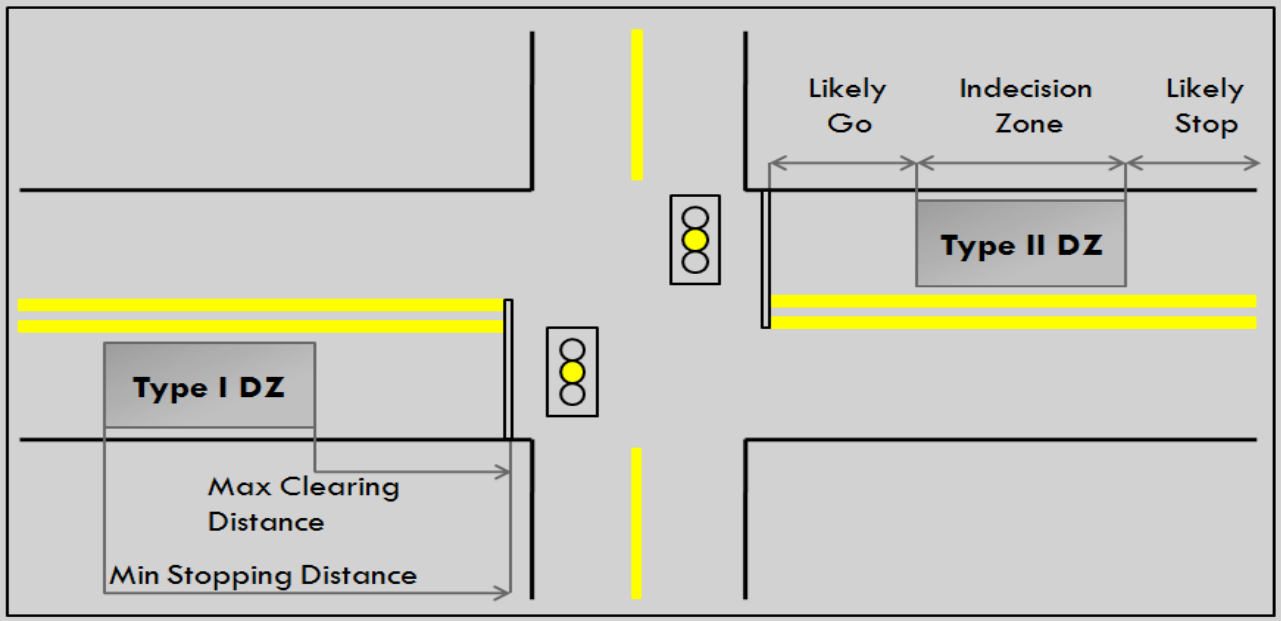




Modeling Driver Behavior in the Dilemma Zone to Improve Intersection Safety

What is the Dilemma Zone and Where Does it Occur?

- Accurate identification of boundaries critical to intersection safety
- Multiple definitions exist
  - Time to stop bar (2.5-5.5 sec)
  - Decision to stop (10/90 split)
- Research shows neither definition fully captures driver behavior



Data Acquisition of Driver Behavior

- Simulator experiment:
  - High speed (>45mph)
  - Isolated intersections
- Include several potentially significant variables
  - Speed
  - Position
  - Approach grade
  - Intersection width
  - Presence of conflicting vehicles

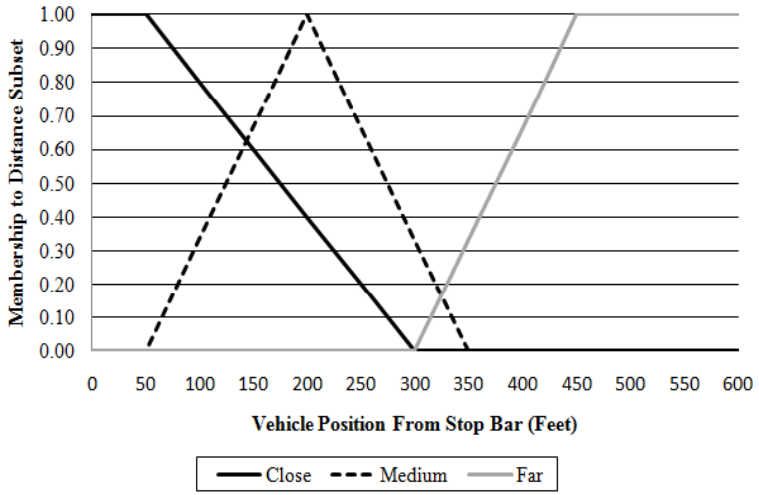
Development of a Fuzzy Model

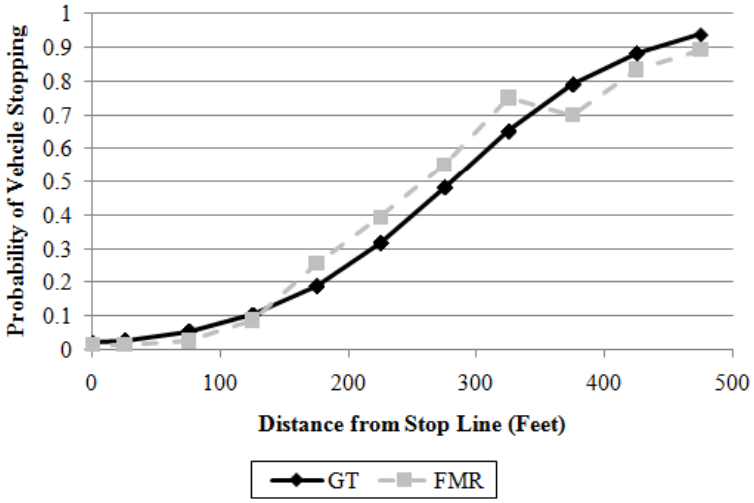
- Why fuzzy logic?
  - Imprecision in driver's perception of speed and distance
- Use outputs from fuzzy model in a probability-to-stop equation

$$P_i(stop) = \frac{1}{1 + e^{-\beta_i}}$$

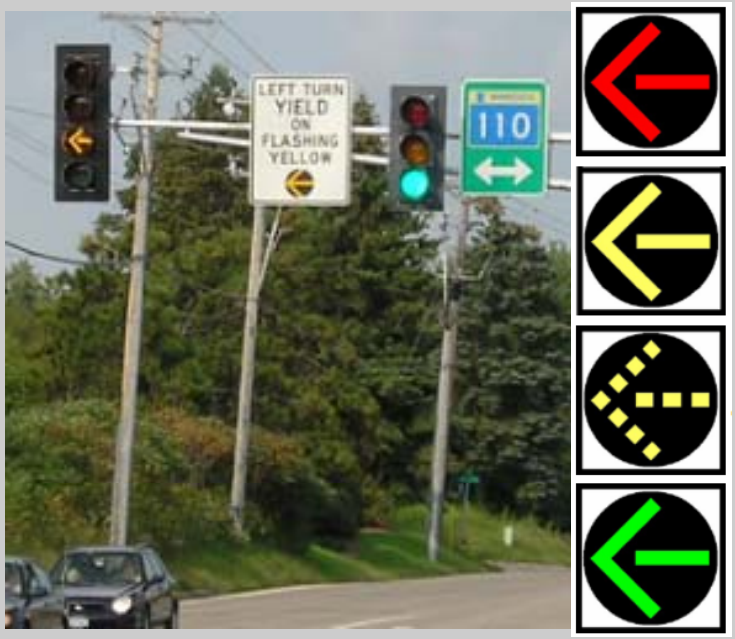
$$\beta_i = a + b_0 Z_0$$

- Compare and validate using data from field observations





Pedestrian Safety at Signalized Intersections Operating the Flashing Yellow Arrow



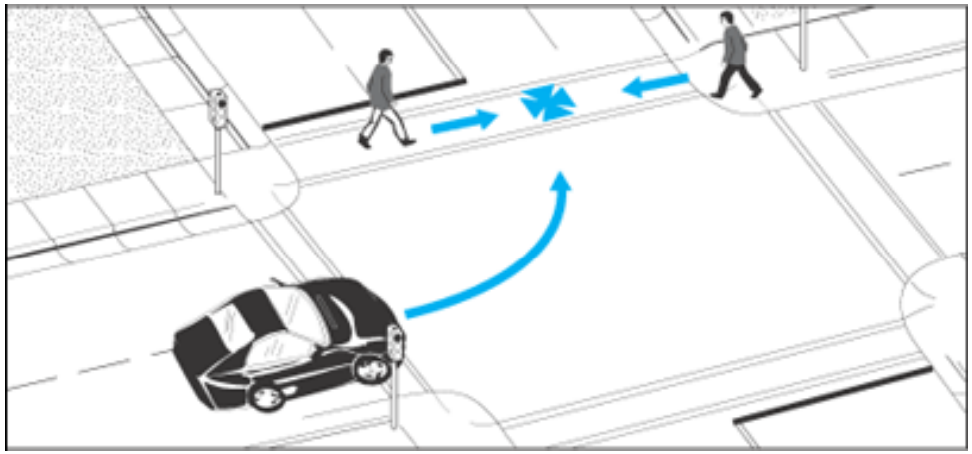
Pedestrian Safety at Flashing Yellow Arrows

- Why Flashing Yellow Arrow?
  - Green arrow and circular green
  - FYA replaces circular green
  - Improved comprehension = reduced LT crashes

- What is the issue?
  - Some FYA have been halted in OR due to pedestrian and vehicle conflicts
  - It has been hypothesized that drivers do not understand they must yield pedestrians during the FYA phase

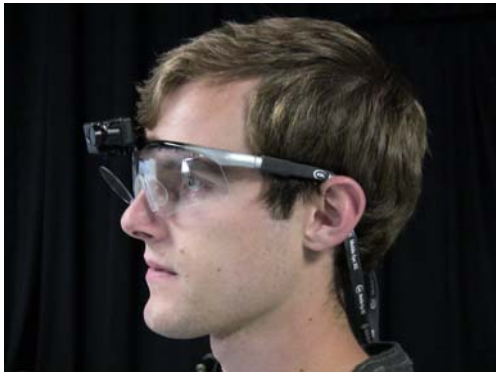
Pedestrian Safety at Flashing Yellow Arrows

- Project Goal
  - Determine what conditions at intersections lead to an increase in pedestrian and left turning vehicle conflicts
  - Do drivers “look but not see” or are they not even looking when presented with an FYA
  - Provide addition guidance as to where FYAs should be installed



Pedestrian Safety at Flashing Yellow Arrows

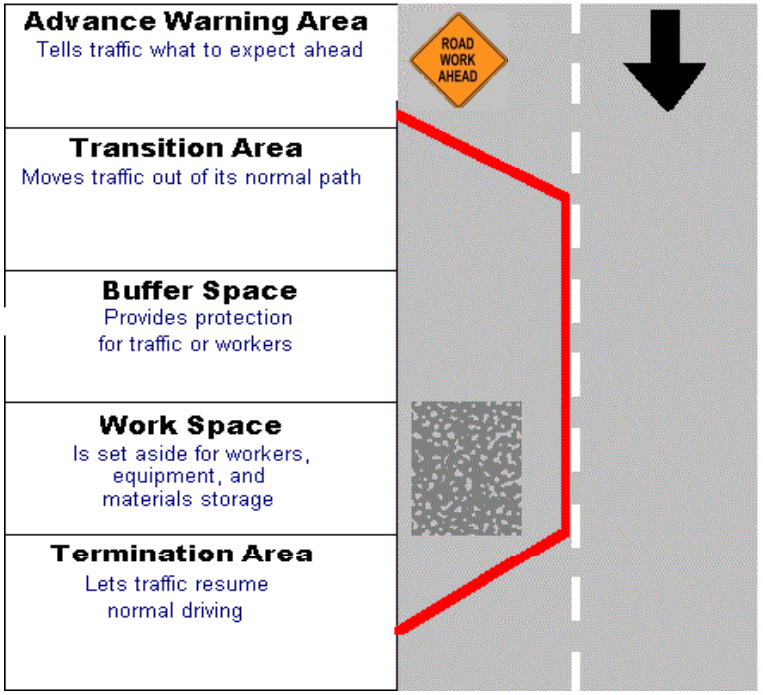
- Methodology
  - Crash data analysis
  - Conflict study
  - Simulator study
  - Model intersections operating FYA
  - Eye Tracking & other measures



Driving Simulation: A Mechanism for Understanding the Effects of Driver Behavior on Work Zone Capacity

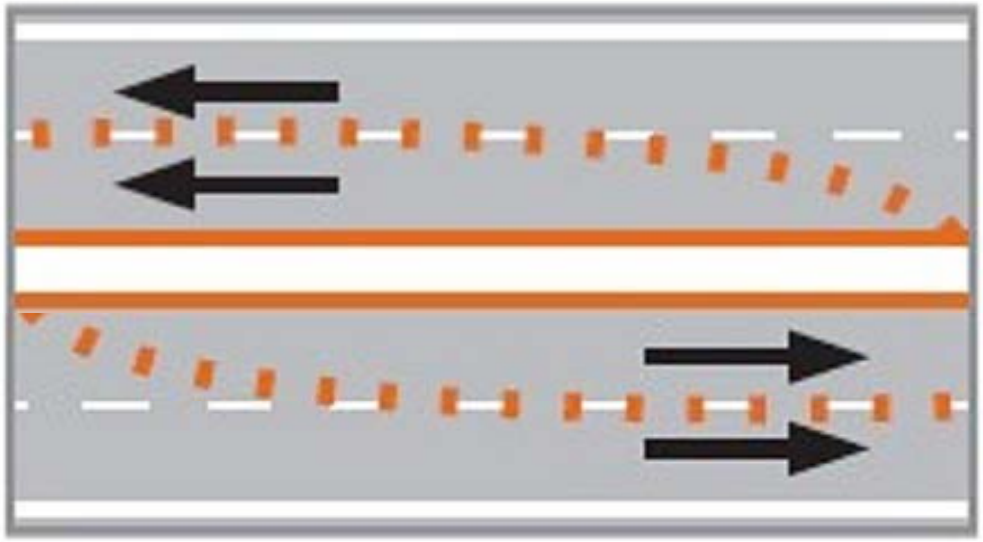
Motivation

- 20 percent of Highways effected by construction annually
- 24 percent of non-recurring delay is attributed to WZs
- Current WZ capacity models guess at driver behavior
- Validation of a simulator can occur on one of two levels:
  - Absolute Validation
  - Relative Validation



Field Data

- Selected work zone:
  - Median divided four-lane freeway
  - Quarter of a mile in length
  - 65 mph speed limit
  - Closure of one lane in each direction for each phase of the project, leaving one lane of travel in each direction
  - Falls on a tangent section of roadway with negligible vertical grade



Simulator Data

- Oregon State University Simulator:
  - Full 2009 Ford Fusion cab mounted on top of a high performance electric pitch motion system allows for on set cues for acceleration and braking events
  - Three LCOS projectors with resolution of 1400 x 1050 are used to project a 180˚ x40˚ front view
  - DLP projector is used to display a rear image for the driver's center mirror
  - Two side mirrors have embedded LCD displays
  - Surround sound speakers capable of 500 watts

Questions?

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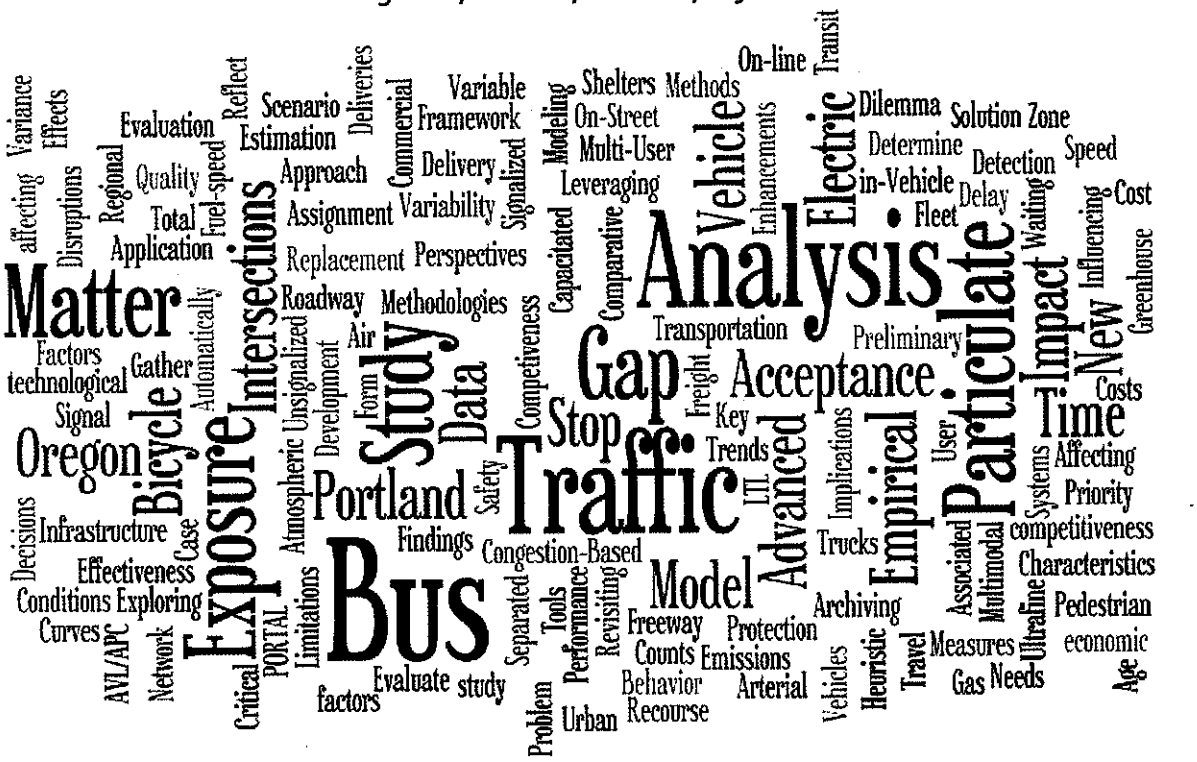
OSU Oregon State UNIVERSITY

ITS-Operations Related Papers Submitted to the TRB Annual Meeting.

August 1, 2011

Figliozzi, Hurwitz, Monsere, Tufte



(1) Albright, E. M. Figliozzi,. **Leveraging AVL/APC Bus Data to Determine Factors Influencing Transit Signal Priority Effectiveness.**

(2) Bigazzi, A. Clifton, K. Gregor, B., **Advanced Vehicle Fuel-speed Curves For Regional Greenhouse Gas Scenario Analysis.**

(3) Bigazzi, A. Figliozzi, M., **Do Congestion-Based Roadway Performance Measures Reflect Emissions Trends?**

(4) Bigazzi, A. Kendrick, C. Figliozzi, M., **An Empirical Study of the Impact of Freeway Traffic on in-Vehicle Exposure to Ultrafine Particulate Matter.**

(5) Boudart, J. and M. Figliozzi, **A Study of the Key Variable Affecting Bus Replacement Age Decisions and Total Costs.**

(6) Davis, B. and Miguel A Figliozzi, **A Model to Evaluate the Cost Competiveness and Limitations of Electric Delivery Trucks in LTL Deliveries.**

(7) Feng, W. Figliozzi, M. **Electric Commercial Vehicles: A study of economic and technological factors affecting their competitiveness.**

(8) Gladhill, K. Monsere, C. ,**Exploring Traffic Safety and Urban Form in Portland, Oregon.**

(9) Hurwitz, D. Knodler, M. Tuss, H. Swake, J. Moore, D. **An Evaluation of the Effects Associated with Advanced Vehicle Detection Systems on Dilemma Zone Protection.**

(10) Kothuri, S. Reynolds, T. Monsere, C. Koonce, P. ,**Preliminary Development of Methods to Automatically Gather Bicycle Counts and Pedestrian Delay at Signalized Intersections**.

(11) Monsere, C. N. McNeil, J. Dill. **Multi-User Perspectives on Separated, On-Street Bicycle Infrastructure**

(12) Moore, A, Figliozzi, M. Monsere, C. ,**Bus Stop Air Quality: An Empirical Analysis of Exposure to Particulate Matter at Bus Stop Shelters**

(13) Nabaee, S. Hurwitz, D. **Gap Acceptance Behavior at Unsignalized Intersections: Waiting Time Implications**.

(14) Olson, C. Kothuri, S. Monsere, C. Koonce, P. Tufte, K. **A Framework for Multimodal Arterial Data Archiving**.

(15) Shahabi, M. A. Unnikrishnan, M. Figliozzi. **A Model and Heuristic Solution Approach for the Capacitated Freight On-line Network Assignment Problem with Transportation Disruptions and Recourse.**

(16) Slavin, Figliozzi, Moore.**The Impact of Traffic, Bus Fleet Characteristics, and Atmospheric Conditions on Particulate Matter Exposure: a Case Study in Portland, Oregon**.

(17) Tufte, K. Matthews, S. Colish, D. **User Needs and Enhancements to PORTAL.**

(18) Tupper, S. Knodler, M., Hurwitz, D. **Comparative Analysis of Critical Gap Analysis Methodologies**.

(19) Tupper, S. Knodler, M. Hurwitz, D. **Revisiting Gap Acceptance – New Tools, New Findings**.

(20) Wang, H. Li, Z. Hurwitz, D. **Traffic Speed Variance Modeling with Application in Travel Time Variability Estimation**.

2014 – 2015 TSMO Regional Flexible Funds Allocation Recommendation

Project	Benefits	Description	Funding
Regional arterial traffic management	Investing in a 21st century traffic management system yields reductions in vehicle emissions, fuel consumption, travel time and delays. This investment in traffic management infrastructure builds on previous investments made across the region.	Updates the regional traffic management system to a new base of functionality. Investment is focused on high priority multimodal corridors throughout the region. Components (where appropriate) include: new traffic signal controllers, flashing yellow turn lights, pedestrian countdown heads, multimodal detection, opticom, variable message signs. The target facilities include: (to be developed by TransPort)	$2,000,000
Regional ITS architecture	The regional ITS architecture is the roadmap for partner agencies to plan, coordinate, and integrate the deployment of ITS technologies. The region's architecture was last updated in 2005 and is out of date with the National ITS architecture and Regional TSMO plan. FHWA requires ITS projects using federal highway funds conform to the regional ITS architecture.	Updates Regional ITS Architecture document for consistency with 2035 RTP and TSMO plan, national ITS architecture, and current software. Develops a web-based ITS architecture portal to improve access to information.	$80,000
PORTAL	The Portland Oregon Regional Transportation Archive Listing (PORTAL), housed at Portland State University, archives a wide variety of transportation-related data including the freeway loop detector data from the Portland-Vancouver metropolitan region, weather data, incident data, transit data and freight data. PORTAL supports performance measurement, planning, and research.	Supports maintenance and enhancements to the Portland OR Regional Transportation Archive Listing (PORTAL).	$200,000
ITS communications master plan	The communications network is the backbone for a robust intelligent transportation system. It supports the traffic signal system, transit operations, incident and emergency response, and traveler information. The master plan will guide investment in the communications network to address deficiencies and gaps, explore new technologies, and leverage other capital investments.	Creates regional master plan for enhancing and maintaining the region's ITS communication network.	$100,000
ITS communications infrastructure	Provides a source of funding to complete key infrastructure identified in the ITS communications plan.	Supports implementation of the regional ITS communications master plan	$620,000
		Total	**$3,000,000**