Moving Ahead with Vehicle Automation

SIP-adus: Human Factors
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Virginia Automated Corridors

Virginia Connected Corridors

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Virginia Tech
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Human Factors Evaluation of Level 2 and Level 3 Automated Driving Concepts

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Project Sponsors:

National Highway Traffic Safety Administration and
Intelligent Transportation Systems Joint Program Office
Paul Rau, COTR for DTNH22-11-D-00236, #11

Project Vehicle Partners:

General Motors and Google

VirginiaTech
Transportation Institute

Acknowledgments

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Are we there yet? Are we there yet? Are there yet?

Overview of Three Experiments

Experiment 1 – L2

Alert Type (within subject)
- Cautionary
- Staged
- Imminent

Alert Modality (within)
- Unimodal
- Multimodal

25 participants

One 90-min session

Experiment 2 – L2

Driving Session (within)

Event Type (within)
- Alert
- No Alert
- No Lane Drift

Prompt Condition (between subjects)
- 2-s
- 7-s
- No prompt

56 participants

Three 60-min sessions

Experiment 3 – L3

Driving Session (within)

Alert Type (within)
- Staged
- Imminent – External Threat
- Imminent – No External Threat

25 participants

Three 30-min sessions

Vehicles and Partners

Experiment 1
(L2 ADS)

2009 Chevy Malibu

GM

Experiment 2
(L2 ADS)

2010 Cadillac SRX

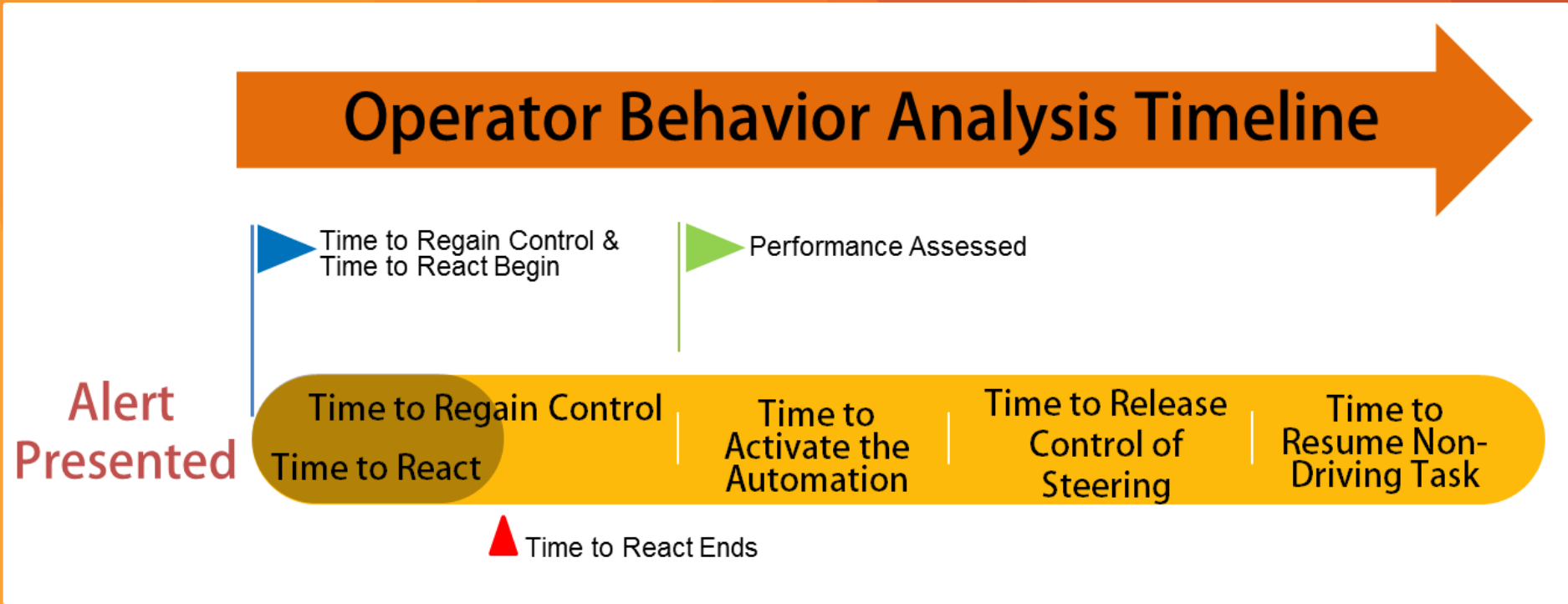
GM

Experiment 3
(L3 ADS)

2012 Lexus RX450h

Google

Dependent Variables



Vehicle Automation Theories

- Primary Task Reversal
- Alert Annoyance Habituation

Primary Task Reversal

- Full-priority shift from driving-related task to non-driving tasks
  - Non-driving tasks becomes primary task demoting controlling the vehicle to secondary task
  - Readiness to respond to driving-related prompts and alerts can be delayed because operators feel obliged to complete non-driving task first

Alert Annoyance Habituation

- Operators can weigh non-driving task as more urgent if the TOR alert's urgency is low
- Operators can weigh the non-driving task as less urgent if the TOR alert urgency is high
- Need HMIs that balance conspicuity, urgency, and annoyance

Trust in Automation

Courtesy of www.cnbc.com

Need for Naturalistic Research

Potential for Misuse & Abuse

Virginia Open for On-Road Testing

Governor Terry McAuliffe | Building a *New* Virginia Economy

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Support for Virginia Tech Transportation Institute and Automated and Autonomous Vehicles

Archive

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WHEREAS, the Commonwealth of Virginia is on the cusp of the next revolution in the automobile industry with automated and autonomous vehicles, also known as "self-driving" cars; and

WHEREAS, the Commonwealth has an unparalleled higher education system with world recognized research facilities and a mission to be leaders in innovation; and

WHEREAS, the Commonwealth is in a position to be a leader in welcoming, supporting and developing the automated vehicle industry, the emerging technologies used in such vehicles, and the business that will provide the support necessary to make the innovations a reality; and

WHEREAS, the Virginia Tech Transportation Institute Center for Automated Vehicle Systems is providing the necessary leadership to study all aspects related to automated and autonomous vehicles, and to develop partnerships with groups involved in researching, planning, and producing automated vehicles;

NOW, THEREFORE, I, Terence R. McAuliffe, do hereby declare that the **COMMONWEALTH OF VIRGINIA** supports the mission of the Virginia Tech Transportation Institute Center for Automated Vehicle Systems and its self-driving on-road studies, and is open for business for the vehicle and technology manufacturers and researchers committed to the development, testing and deployment of automated and autonomous vehicles, and I call this observance to the attention of all our citizens.

Virginia Automated Corridors

- Provide automated driving system migration path from test-track to real-world operating environments
- VTTI handles logistics, insurance, and legal matters
- Licensing and insurance provided by Commonwealth
- HERE™ high definition mapping
- Operational testing environments
  - Test tracks with intersections + connected vehicle communications
  - Transurban toll lanes provide open operational environment with dedicated limited access
  - VDOT dedicated to maintaining lane markings

VDOT Virginia Department of Transportation
DMV www.dmvNow.com
transurban
here Maps for Life
Virginia Tech Transportation Institute

Smart Road Test Track & All-Weather Testing

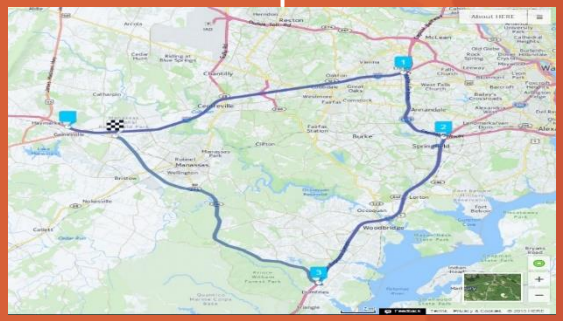
Virginia Connected Corridor

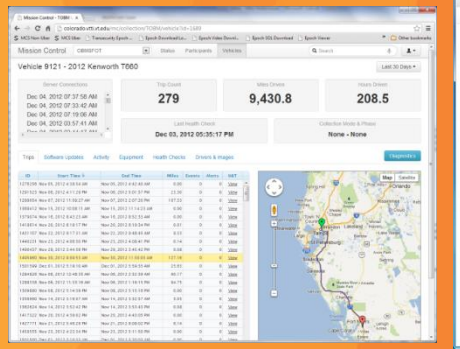
Virginia International Raceway

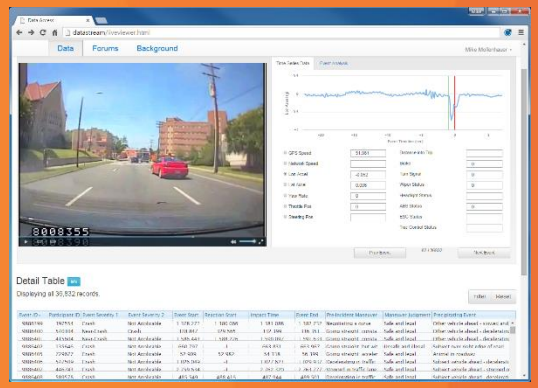
NextGen DAS

MiniDAS

Virginia Automated Corridor Sample Test Route







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Thank You!

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