Using Technology
To Prevent and Mitigate
Driver Distraction

A Presentation To

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Forum on Distraction

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VTTI

Driving Transportation with Technology

Integration of Technology with The Driver and Driving Tasks Is Critical

Excellent Example	Poor Example

Voice-Based Route Guidance Support

Turn-by-turn instructions given by voice, as they are needed
Eyes forward on the road, hands on the wheel, mind on driving

- System **is** designed **specifically** for use while driving
- System **does** meet industry guidelines which limit distraction
- System **is** designed to support the driver's needs in keeping eyes on road, attention forward on traffic & route, and hands-on-wheel
- System was **tested for use** while driving (in a driving environment) **before** released

Small, Handheld, Carried-In Device

Needing Two Handed Operation, Unconnected to Vehicle
Tiny Screen -- Needing Frequent Glances Away From Road

- Device **not** designed specifically for use while driving
- Does **not** adhere to guidelines which limit distraction
- Device **not** designed to support driver's needs to keep eyes and mind on road – or hands on wheel
- **Not tested for use while driving** during product development

Voice Says:
"In half a mile, turn right on Oak Street."

BETTER THAN PAPER MAPS: Also, FHWA-sponsored Travtek research (1995) (and other studies) have shown that underlined turn-by-turn instructions significantly reduce eyes-off-road–time and improve safety-related measures (relative to paper maps and other nav. aids). Use of voice leads to further improvements.

To Prevent Distraction,
The Role of Emerging Technology:

⬇

To safeguard and actively support "target behaviors" of drivers that are central to attentive driving:

- Frequent glances toward the road
- Only short glances away from the road, well-timed ones
- Active scanning of the road, with a 'healthy' percentage of glances toward road center
- Active formation, maintenance & use of Situation Awareness

See also: Victor & Dozza (2011)

TARGET BEHAVIORS—Look at / Attend to Road

~ Technology can be used to give "nudges" toward attentive behavior ~

Distraction Prevention Techniques
For Use in Normal Driving, Prior to Conflict

TECHNOLOGY

De-Cluttering Techniques	**Embedded Training & Safety Coaching**	**Lockouts**	**Simple Workload & Dialog Managers**
Remove unneeded info from cluster		Hard Lockouts Soft, Adaptive Lockouts	Info Prioritization Control of Timing Use of Delays Modality Changes

PURPOSE

| Improve driver focus on key Information | "Teach" smart choices during driving | Block usage of certain devices, tasks, &/or 3rd-party "apps" | Monitor workload on driver & control info flow |

EXAMPLES

Introduced – 93/94 Saab 900

Feedback

Function Locked Out

ComSense, Dialog Manager Saab 9-3

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More Advanced Technology for Actively Assisting Drivers with Distraction

[For Use in Pre-Conflict, Conflict, Imminent Crash, & Crash Periods]

TECHNOLOGY

ACTIVE MONITORING & SUPPORT OF DRIVER ATTENTION

+

ACTIVE DRIVER ASSIST TO AVOID CRASH

PURPOSE

Track driver attentiveness to road
+
alert driver to moments of distraction
+
cue shift of driver attention back to road

Prepare & engage a sequence of vehicle systems to help driver avoid crash
(e.g., Lane Departure Warning & Collision Imminent Braking, etc.)

EXAMPLES

Volvo prototypes studied-- with NHTSA

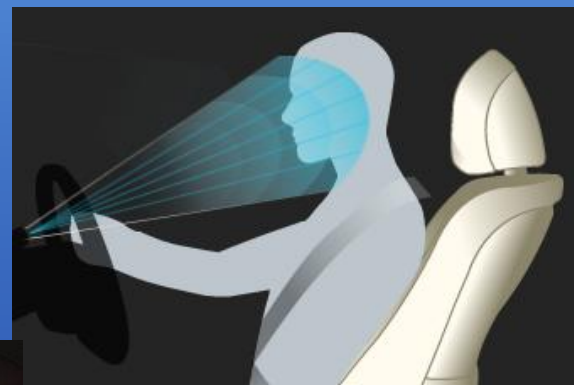Real-Time Distraction Mitigation: Visual Distraction Alert

Volvo Technology
14 2010-09-11

From: Trent Victor: (2009); Volvo: Driver Impairment: Distraction and Drowsiness; Volvo Technology.

VOLVO

Driver Attention Monitor –2006 Lexus (Japan)

+ Pre-Collision System

Adapted from:
http://en.wikipedia.org/wiki/Driver_Monitoring_System
http://creativecommons.org/licenses/by-sa/3.0/

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Steps For Harnessing Technology

Work is needed to:

1. **Support development of technology solutions to prevent distraction**

   - **Encourage innovation, development**
   - **Evaluate technology solutions carefully to find those that are effective** ⭐
   - **Optimize them to deliver benefits & to minimize/eliminate unintended consequences**
   - **Incentivize deployment (when solutions are ready)**

2. **Integrate technology effectively with the driver and driving task**

   - **Assure that the driver interface for information and telematics systems MINIMIZES distraction**
     - » Shared guidelines ⭐
     - » Test procedures
   - **Assure that new technologies for assisting drivers are properly integrated**
     - » To prevent/reduce distraction & assist in crash avoidance
     - » To support driver supervisory attention & situation awareness

   - **Engage all parties --including and beyond automobile manufacturers (portable device manufacturers, 'apps' developers, network providers)**

3. **Educate drivers to make *smart choices* in *choosing and using* technology – and to create a safety culture -- because even the best technologies can only be a partner with *responsible* drivers toward safe outcomes**

Thank You!