

Presentation for



Analyzing Cognitive Distraction with Video and Voice

Slaven Sljivar – VP, Hardware & Analytics

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Overview of the Study

- FMCSA-funded, with VTTI and SmartDrive jointly performing the data collection, reduction and analysis work.
- Titled: “Driver Distraction: Eye Glance Analysis and Cognitive Distraction”.
- Builds on two previous studies:
 - “Driver Distraction in Commercial Vehicle Operations” (*Olson 2009*)
 - “Distraction in Commercial Trucks and Buses: Assessing Prevalence and Risk in Conjunction with Crashes and Near-Crashes” (*Hickman 2010*)

About SmartDrive

FOUNDED

2004

EMPLOYEES

370+

EVENTS

44,000,000

The world's largest and fastest-growing database of risky driving events.

A "Top-Ranked
Venture Backed
Company"

WALL STREET JOURNAL



HEADQUARTERS
San Diego



Global Operations

United States, United Kingdom, China, India, Australia and New Zealand

SmartRecorder 3: Platform Capabilities

Primary Camera
Remote Camera
Controller
Optional Keypad



120 ° ROAD-VIEW VIDEO



160 ° IN-CAB VIDEO

- ✓ Video
- ✓ Audio
- ✓ Speed
- ✓ Acceleration
- ✓ Location
- ✓ Vehicle data (ECU)
- ✓ Driver feedback

SmartRecorder 3: Triggering

15
seconds before

Trigger Point



15
seconds after



Speeding



Shock & Erratic Driving



Manual Activation

SmartDrive Event Player

- A Play by play notes
- B Add annotations in timeline
- C Video options
 - Zoom
 - Enlarge view
 - Flip video feed
 - Save snapshot
 - Adjust video
- D Speed and acceleration gauges
- E Ability to update driver assignment
- F Advanced analysis when needed

The screenshot displays the SmartDrive Event Player interface. At the top, it shows event details: EVENT S6X4-2WGR, COMPANY ACME Corporation, VEHICLE 117, DRIVER Warfield, Paul, CAPTURE DATE Sep 27, 2009 11:49 AM, and SITE Coach. The interface is divided into several sections:

- Event List (Left):** A list of events with timestamps and descriptions. Annotations A, B, and C are placed over specific entries.
- Video Feeds (Top Right):** Two video windows showing the driver's perspective (left) and an interior view of the driver (right). Annotation E is placed over the driver's name in the top right.
- Gauges (Middle):** A speedometer showing 56.5 mph and a GPS gauge. A circular gauge on the right shows acceleration/deceleration values (FORWARD / BACKWARD 0.01, SIDE TO SIDE -0.04). Annotation D is placed over the acceleration gauge.
- Timeline (Bottom Middle):** A horizontal timeline with a play button and a timestamp of 11:49:48.00 AM. Annotation B is placed over the timeline.
- Map (Bottom):** A satellite map showing the vehicle's location on a road. Annotation F is placed over the map.
- Controls (Bottom Left):** A compass and navigation controls.

Research Objectives

- Analyze video/voice recordings to determine if there is an objective measure of cognitive distraction.
- Assess whether the risk associated with cognitive distraction depends on the type of conversation:
 - Serious vs. superficial conversation
 - Complex vs. simple conversation
- Characterize the link between eye glance behavior and safety critical events (crashes, near-crashes).
- Examine the effects of talking on hands-free or hand-held mobile phone on eye glance behavior.

Study Approach

- Analyze video recordings as SmartDrive captures them in the course of its regular business.
- Identify Safety Critical Events (SCE's) per existing data reduction protocols.
- For each SCE's, identify 4 Spurious and 4 Random baseline recordings.
 - Spurious: existing; triggered as shock false-positives.
 - Random: additional; triggered on random (speed > 0).
- Perform additional data reduction per protocols that were specifically defined for this study.

Data Reduction Protocols

- **Environmental** – Lighting/visibility, weather condition, relation to junction and traffic density
- **Driver Distraction** – Various interactions associated with mobile phones, CB's, passengers, etc.
- **Voice** – Length / duty cycle of conversation; emotional content and intensity of conversations
- **Eye Glance** – Frame-level indicators for whether driver's eyes are on or off the forward roadway.

Distracted Video Example



Handheld mobile phone_excessive speed.wmv

 **SMARTDRIVE[®]**



FMCSA
Federal Motor Carrier
Safety Administration

 VirginiaTech
**TRANSPORTATION
INSTITUTE**