The State of the Art, Practice and Knowledge about Digital Billboards and Traffic Safety

First International Conference on
Driver Distraction and Inattention
Gothenburg, Sweden

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Inattention vs Distraction:

- We don't need yet another definition at this conference
- Let's just say that:
  - Inattention is passive
    - Drivers can be inattentive any time and for any reason
  - Distraction is active (although maybe unconscious)
    - Drivers accept many distractions – most of which road authorities cannot control
- As an example, the state of California recently banned hand-held mobile phone use, but …


OH, SORRY, I THOUGHT YOU WERE USING A CELL PHONE...
TOM MEYER / The Chronicle

But roadside billboards are distracters that we can control.

Of all the distractions that face drivers, billboards are the *only* ones that are *designed and intended* to distract.

And billboards do their job…

- Terry Landsdown reported yesterday that:
  - Speirs, et al (2008) found 96% of drivers self-reported being distracted by a billboard.
- Agathe Backer-Grendahl reported yesterday that:
  - In a self-report of 4307 crash-involved drivers, billboards were the highest relative risk distracter.

Why are DBBs Different?

- The human eye is drawn to the brightest objects in the scene and to those that display motion, or apparent motion.
  - This is called phototaxis or phototropism.
  - Recent research (e.g. Theeuwes) shows that this response is both is automatic and unavoidable.
- DBBs use both brightness and movement to capture attention.
- In the U.S., DBBs typically change messages every 6-8 seconds.

A DBB from a Distance of 6 Miles (~ 9.6 Km)

How Else do DBBs Differ from Conventional Billboards?

- Size potential - technology is almost limitless
- Compelling photo-realistic/broadcast imagery
- Intermittency and image change at will
- Potential for message sequencing
- Potential for interactivity with driver

The Progression in BB Technology

- Billboards have gone from paintings on barns, to print on poster paper, to vinyl sheets, and now to digital displays.
- It's not the technology of the display that should concern us, but the manner in which that display is used
- We're not concerned because they are digital, but because of their operational characteristics coupled with their location.

In Other Words:

- *IF* a DBB was set to a luminance level appropriate to the ambient environment in which it is viewed, *and*
- *IF* the DBB message change interval was such that no driver saw more than one such change, *and*
- *IF* we ensured that location restrictions (e.g. interchange areas, horizontal curves, merges, lane drops, etc.) were truly enforced,
- *THEN* we should not be particularly concerned about safety impacts due to distraction.

Recent Research

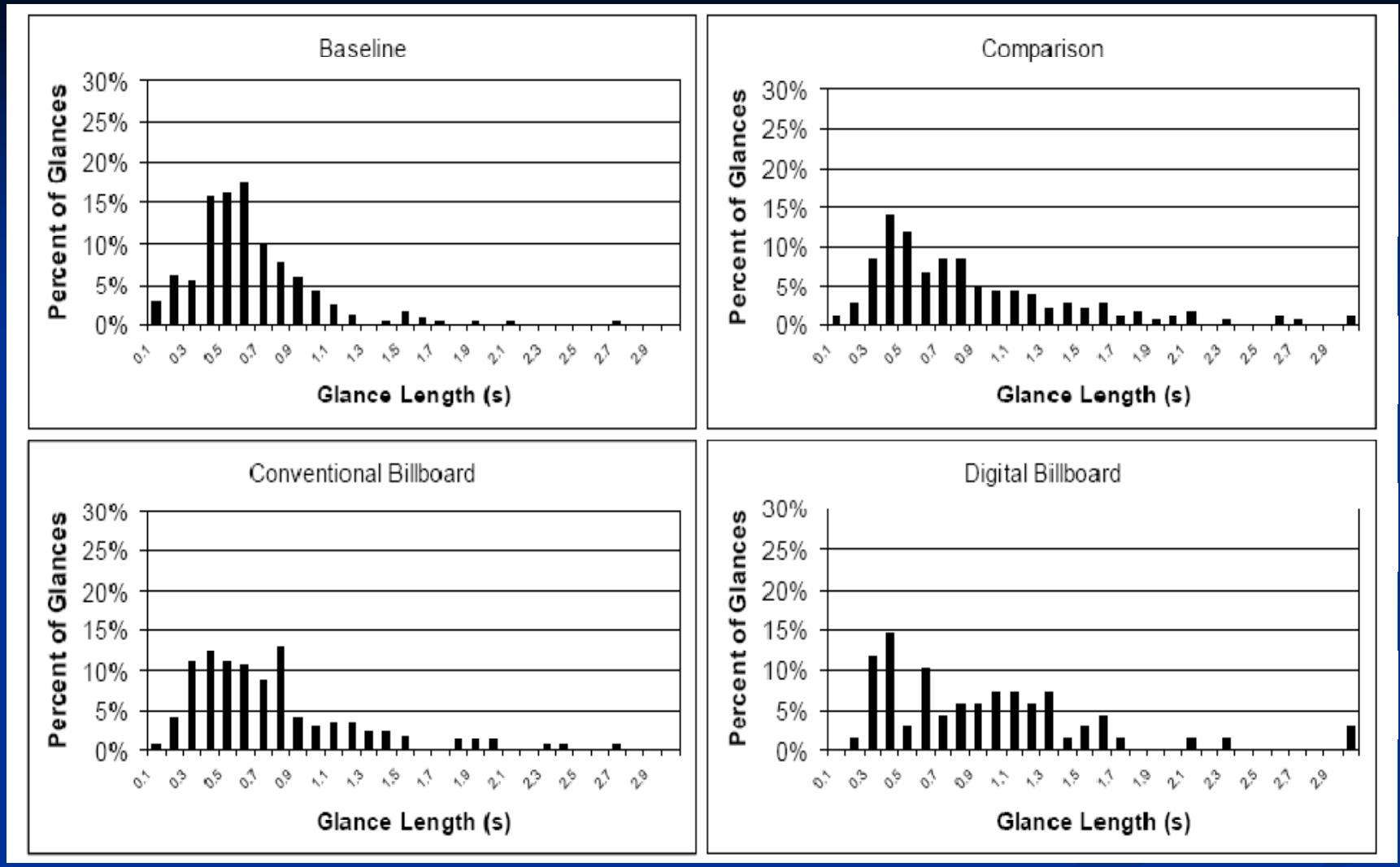
- In recent years, independent research studies have been conducted in several countries:
  - U.S.
  - Netherlands
  - England
  - Scotland
  - South Africa
  - Australia
  - Brazil
  - Finland
- Studies have included:
  - Laboratory
  - Simulation
  - On-road
  - Interviews , focus groups
  - Post-hoc crash analyses

The Research is Quite Clear

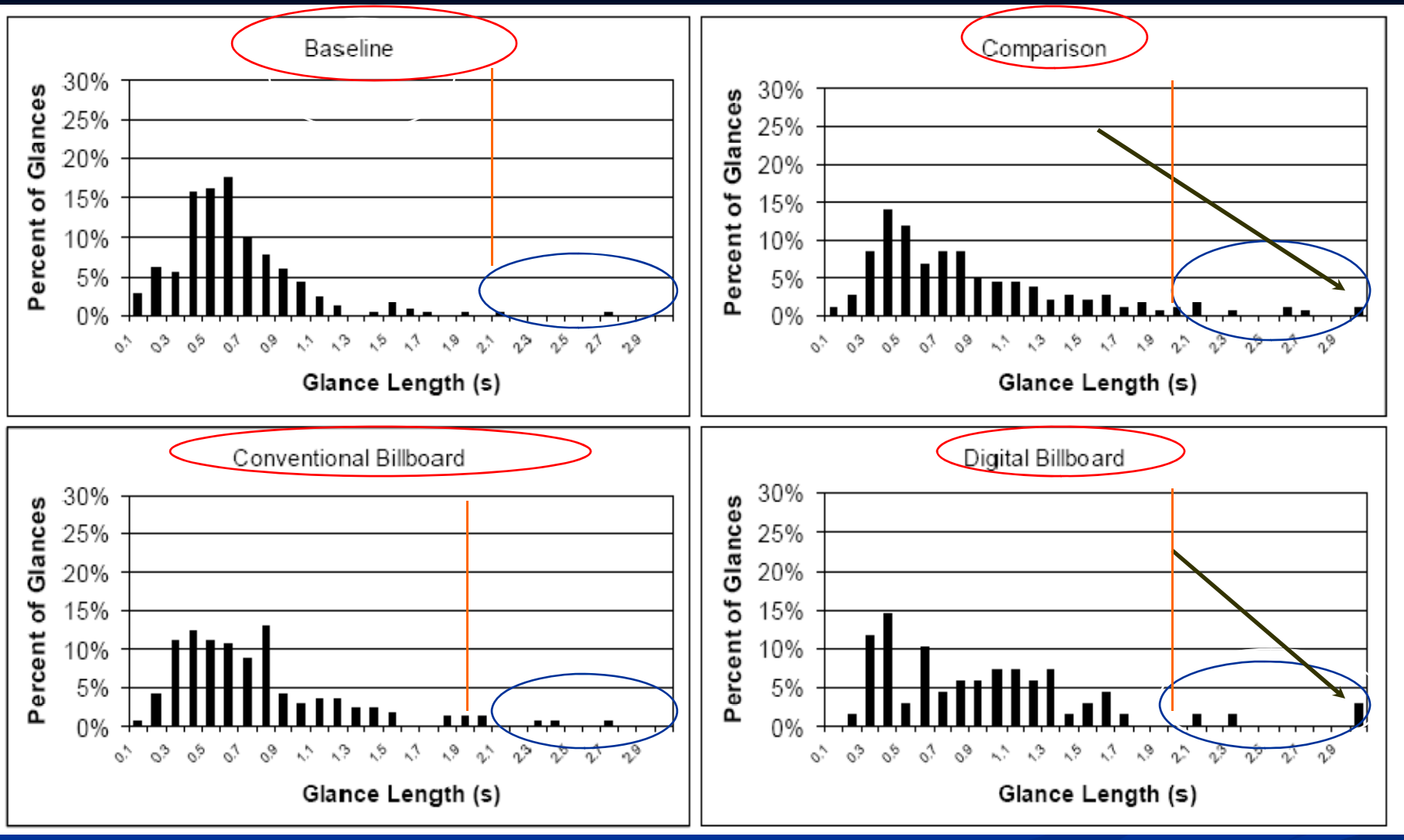
- More recent research = stronger findings, and
- Stronger theoretical basis for understanding the nature of the problem
  - Drivers' eyes off road for 2.0 seconds or longer leads to a substantially higher crash risk - 100 car study.
    - Wierwille found that 1.6 seconds was the cut point.
  - DBBs can attract drivers' eyes for longer than 2.0 seconds, and dramatically longer than for conventional billboards.

Only Two Recent Studies Show No Adverse Safety Impact

- Tantala and Tantala (epidemiological study)
- Lee, et al. (VTTI) (human factors/eye glance)
- Both sponsored by billboard industry
- Both severely criticized in peer review
  - Ironically, Virginia Tech study found substantial degradation in eye glance behavior but did not report it.
  - Authors recommended analyzing tails of distribution (per Horrey and Wickens) but failed to do so for this measure.



The Virginia Tech Data on Long Eye Glances. Reported no differences in long duration glances between conditions.



Maximum Glance Duration – From Report by VTTI

Summary of Unanalyzed VA-Tech Data

	Glances > 1.6s	Glances > 2.0s	Glances > 3.0s
Baseline (No billboard)	6%	2%	0%
Conventional (Traditional billboard)	9%	5%	0%
Comparison (Digital on premise)	21%	10%	2%
Digital billboard	13%	7%	3%

Conclusions – Unreported

- DBBs and on-premise DBBs together produced:
  - 2X as many glances > 1.6 seconds as baseline sites and conventional billboards (34% - 15%)
  - 2.5X as many glances > 2.0 seconds as baseline and conventional sites (17% - 7%)
  - 5% of glances > 3.0 seconds – no such glances were made to baseline or conventional sites.
- From a pilot study, the authors predicted significantly worse DBB performance at night.

On-Premise Signs

- Lee, et al found, that on-premise digital signs were as bad as, if not worse than, DBBs
- But in US we regulate billboards, not on-premise signs
- These are left to local governments through zoning, land use
- But, on premise signs may be:
  - Bigger
  - Brighter
  - Closer to the ROW
  - Contain full motion video
  - At or near interchanges, curves, etc.
- If our concern is driver distraction, isn't the potential just as high, or higher, for on-premise signs?

The World's Largest DBB 90' x 65' (~27x20m) on a 165' (~50m) Post – Visible more than 2 mi (~3.2 km) Along Major Road

A Few Words About Official CMS

An Official Changeable Message Sign
Showing a Non-Incident Message

Lessons Learned from Recent Study on Uses of Official CMS:

- Road authorities under pressure to display public service messages, safety campaigns, and advertisements, against the wishes of safety personnel
- There are excellent guidelines for design and operation of CMS – not always followed
- Long messages (e.g. telephone numbers, websites, license plate numbers) take too long to read and cause drivers to slow
- Messages "irrelevant" to traffic safety opposed by motorists
- Change blindness can occur if a message has changed from irrelevant to relevant
- Loss of credibility when CMS display untimely or irrelevant messages

But these are the very characteristics of advertising signs

Advertising Signs on the ROW: The US Government Manual Says:

- Traffic control devices …shall not bear any advertising messages or any other message that is not related to traffic control.
- TCDs shall "fulfill a need," "convey a clear, simple meaning," and "command respect from road users."
- "Changeable message signs shall display pertinent traffic operational and guidance information only, not advertising."


NORTH
24
35
Des Moines
EXIT 2V
14th St
Downtown
EXIT 2U
WEST
670
70
Topeka
EXIT 2U
70 EAST
St Louis
EXIT 2U
Broadway
EXIT ONLY
WB I-70
EXIT
CLOSED
2U
EXIT
WEST
670
70
Topeka
70 EAST
St Louis


EXIT 1A
NORTH
678
Van Wyck Expwy
Belt Pkwy WEST
Verrazano Br
EAST
878
Nassau Expwy
Belt Pkwy EAST
Eastern LI
EXIT ONLY
NYC LAW


Parking Lot 4
Parking Lot 8
Airport Exit
Parkway West
Manhattan
Rental Cars
SAMSU G
NEW YORK


GRIDLOCK ALERT TODAY
AVOID MIDTOWN 8AM - 10PM
iPod

New Challenges Facing Authorities

- DBBs on large trucks in moving traffic
- Personalized billboards
- Billboards that interact with the driver
- Billboards that capture information from passing vehicles so as to target their messages

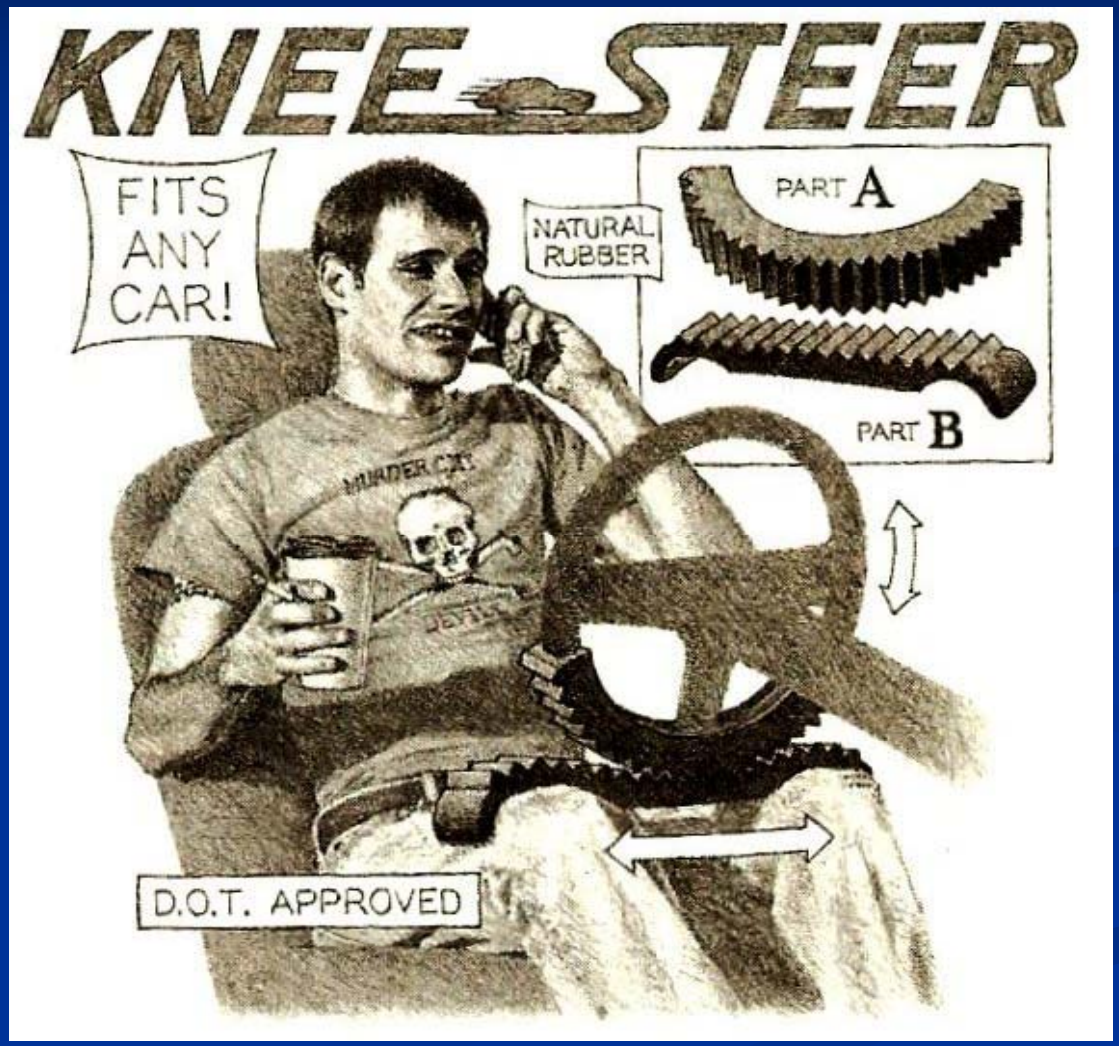

LG
Livin' LG
www.LifeWithLG.com

This sign sends a personalized message to the approaching driver

An Interactive Billboard in Belgium

1. The driver sends an SMS using a code from the sign
2. The billboard sends a return message with a question
3. The driver messages a response to the question
4. A correct answer causes the billboard to act like a pinball machine – the driver is entered into a drawing; a wrong answer causes the billboard to "tilt."

Driver distraction is an increasing concern – we can't control all of it…



But it is within our purview to control some of it…

Thanks for your attention.

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