Distraction: Friend or Foe?

Clifford Nass

Stanford University

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Acknowledgements

- John Lee
- Toyota Collaborative Safety Research Center
- Adrian Lund

Traditional Paradigm for Studying Distraction

1. Cars are *mechanical* devices

2. These mechanical devices are *consequential* and *demand attention*

3. Driving involves *control* of a mechanical system

Radical New Paradigm

Cars are a collection of a dozen *screens*

Cars as Screens

- ## The 12 screens of a car
  - Windshield
  - Rear window
  - Four side windows
  - Rear view mirror
  - Two side view mirrors
  - Dashboard
  - Center panel
  - (sometimes) Personal device

Radical New Paradigm

Psychology of driving=Psychology of screens

Welcome to Screen User Assessment 2013

The Psychology of Screens

Distraction vs. Attention

Distraction vs. Attention

- Understanding cars as *dangerous machines* leads to a focus on *distraction*

- Understanding cars as *screens* leads to focus on *attention*

- Attention is a broader concept than distraction

  – Not *a priori* normative

  – Controlled vs. automatic

Unpacking Attention

- ## Three levels of attention

  Level 1: Selective exposure

  - Not always "selected"

  Level 2: Selective processing

  - Not always "selected"

  Level 3: Selective influence

  - Not always "selected"

- ## The three levels of attention are not independent

This Parallels …

Situation Awareness!

Knowing
what is going on
in order to know
what to do

Three Levels of Situational Awareness (SA)

- Knowing what is *going on*

  Level 1: Perception: What information is *relevant*?

  Selective exposure

  Level 2: Comprehension: What does (1) *mean* to *me*?

  Selective processing

- Knowing *what to do*

  Level 3: Projection: What should I *do* given (2)?

  Selective influence

- The three levels of SA are not independent

  – Each influences the other

Can Drivers Have Situational Awareness?

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Screen Multitasking is Ubiquitous

- Average college student use 3 media simultaneously whenever they are using media

  - Top 25% (and growing): 4 or more media at one time

  - Bottom 25%: 1.8 or less media at one time

- In-the-moment use of multiple screens:

  - Always hurts perception

  - Can hurt cognition and perception

What About *Chronic* Multitasking?

- "When it really matters, I don't multitask"

- "Multitasking doesn't bother me because I do it so often"

- "Young brains are able to multitask"

Multitasking and Level 1

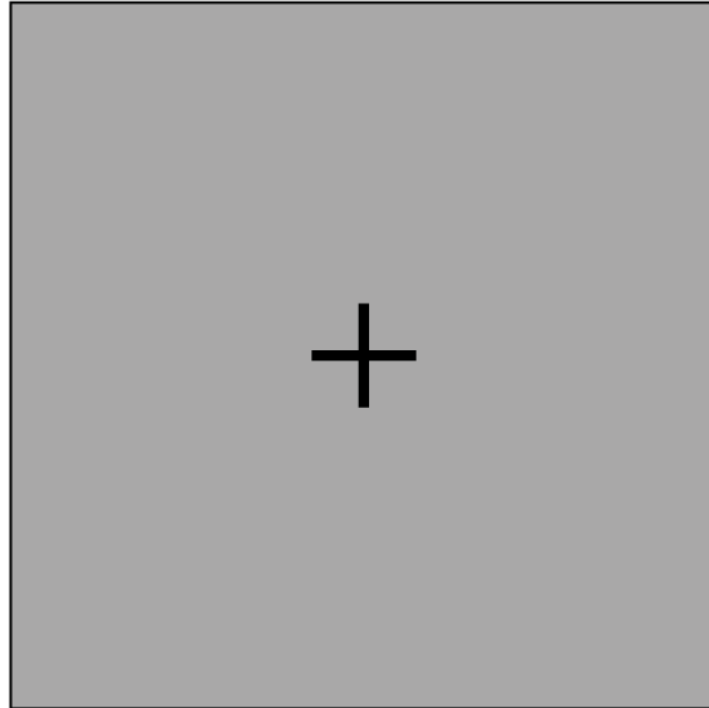- Count the passes

Results

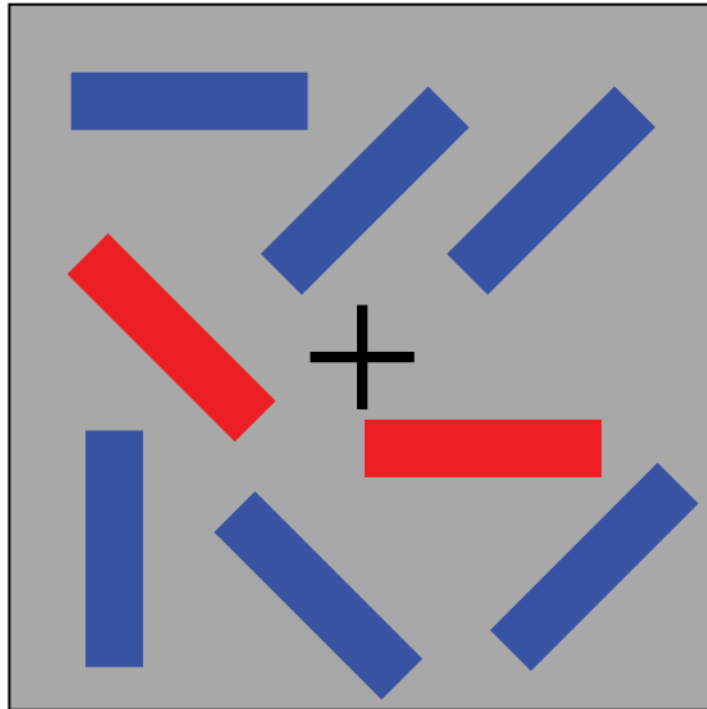- High SMs were more likely to see the gorilla

BUT .....

- Low SMs were more likely to get the number of passes correct

- Low SMs look where they are supposed to look

- High SMs look all over

  – Not an attention "deficit," but a misallocation

- High SMs have a Level 1 (perception) problem
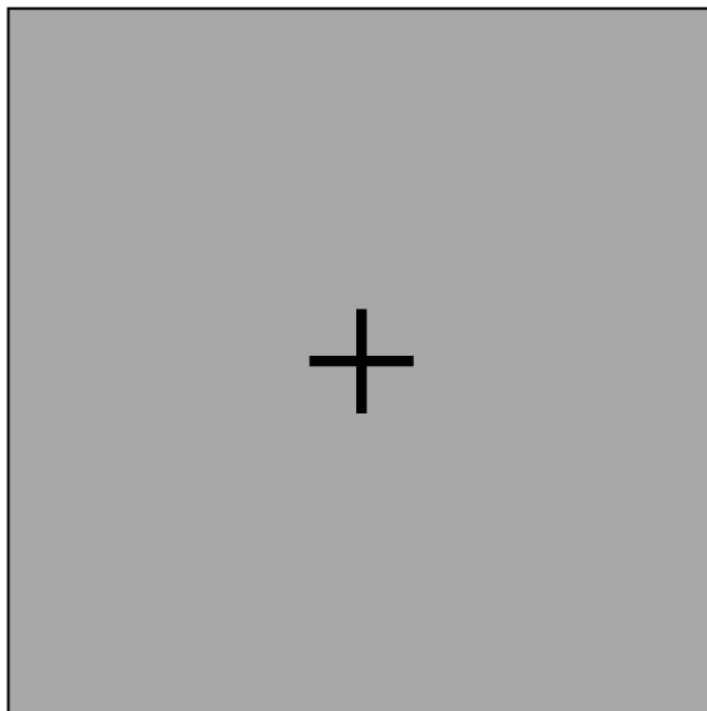
Multitasking and Level 2

- You will see a group of rectangles twice

- IGNORE the blue rectangles

- Remember the red rectangles

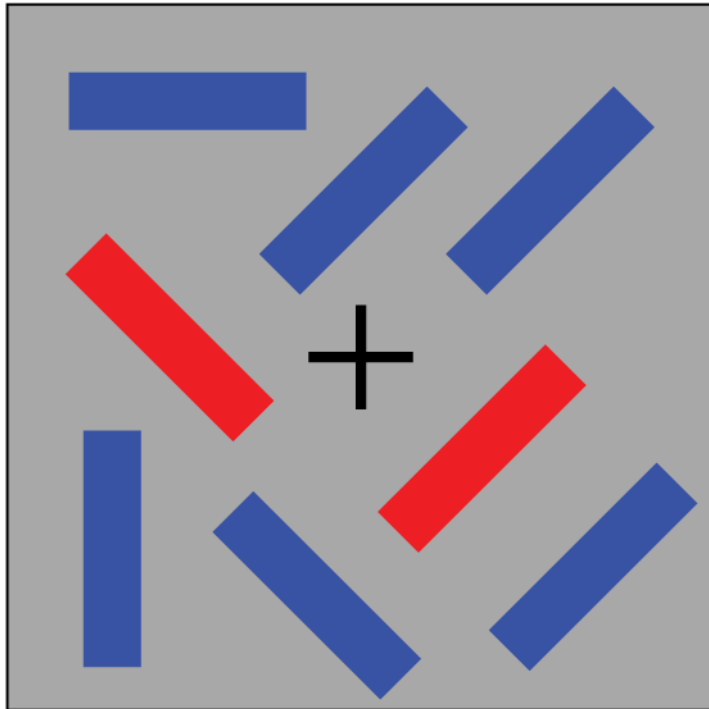- Say if one of the red rectangles changed orientation

200 ms

100 ms

900 ms

2,000 ms

Results

Results

- High SMs have Level 2 (comprehension) problem
  - Somewhat Level 1

A Related Study

- High and low SMs do a telephone job interview while in a car simulator

- High SMs drive better (still badly) BUT

- High SMs do worse on the job interview

WHY?

- Voice input/output is much more engaging than bland screen

  – Cell phone conversation is the *primary* task

- High SMs are more "distracted" by the road!

Multitasking and Level 3

- Participants given 30 minutes to answer the following GRE question:

  – "The luxuries and conveniences of contemporary life prevent people from developing into truly strong and independent individuals.

- Other people are (ostensibly) also writing an essay

- At pre-determined intervals, relevant/irrelevant items are displayed on the news feed

- Assessment of essay (Six point rubric)

  – Organization

  – Coherence

Prompt: "The luxuries and conveniences of contemporary life prevent people from developing into truly strong and independent individuals."

Write a response in which you discuss the extent to which you agree or disagree with the statement and explain your reasoning for the position you take. In developing and supporting your position, you should consider ways in which the statement might or might not hold true and explain how these considerations shape your position. Use facts and references to support your position.

This is my essay response....|

Time remaining: 18:42

User posted content

- [This is a cool topic. Any clues on where to start?](#)

- [I found this article on how modern society is "autistic"](#)

- [This guy Jacques Ellul wrote a book on the Technological Society](#)

- [What is the difference between society and culture?](#)

- [Not the best source, but they answer that here:](#)

- [Oh, here's another one about that...](#)

- [This one's about modern society ruining childhood](#)

Send content

Comment: _____

Link: http://_____

Send

Mozilla Firefox   jre-7u9-wi...

Windows 7
Build 7600
This copy of Windows is not genuine

3:29 PM
12/11/2012

CHIMe Lab communication between humans & interactive media

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Prompt: "The luxuries and conveniences of contemporary life prevent people from developing into truly strong and independent individuals."

Write a response in which you discuss the extent to which you agree or disagree with the statement and explain your reasoning for the position you take. In developing and supporting your position, you should consider ways in which the statement might or might not hold true and explain how these considerations shape your position. Use facts and references to support your position.

Time remaining: 19:09

User posted content

- [Top 10 Ways to Smash a Pumpkin (Slow-Motion)](#)

- [Sneezing Panda](#)

- [Shark vs. Kite Surfer](#)

- [These are jokes that are so bad they are good](#)

- [My friend sent this to me: Indie artists Organize yourselves and get what you deserve.](#)

- [Have you guys seen Maru the cat?](#)

- [I love this video. It will brighten up your day if you know who Bob Ross is --](#)

Send content

Comment:

Link: http://

Send

Mozilla Firefox   jre-7u9-wi...

3:42 PM
12/11/2012

CHIMe Lab communication between humans & interactive media

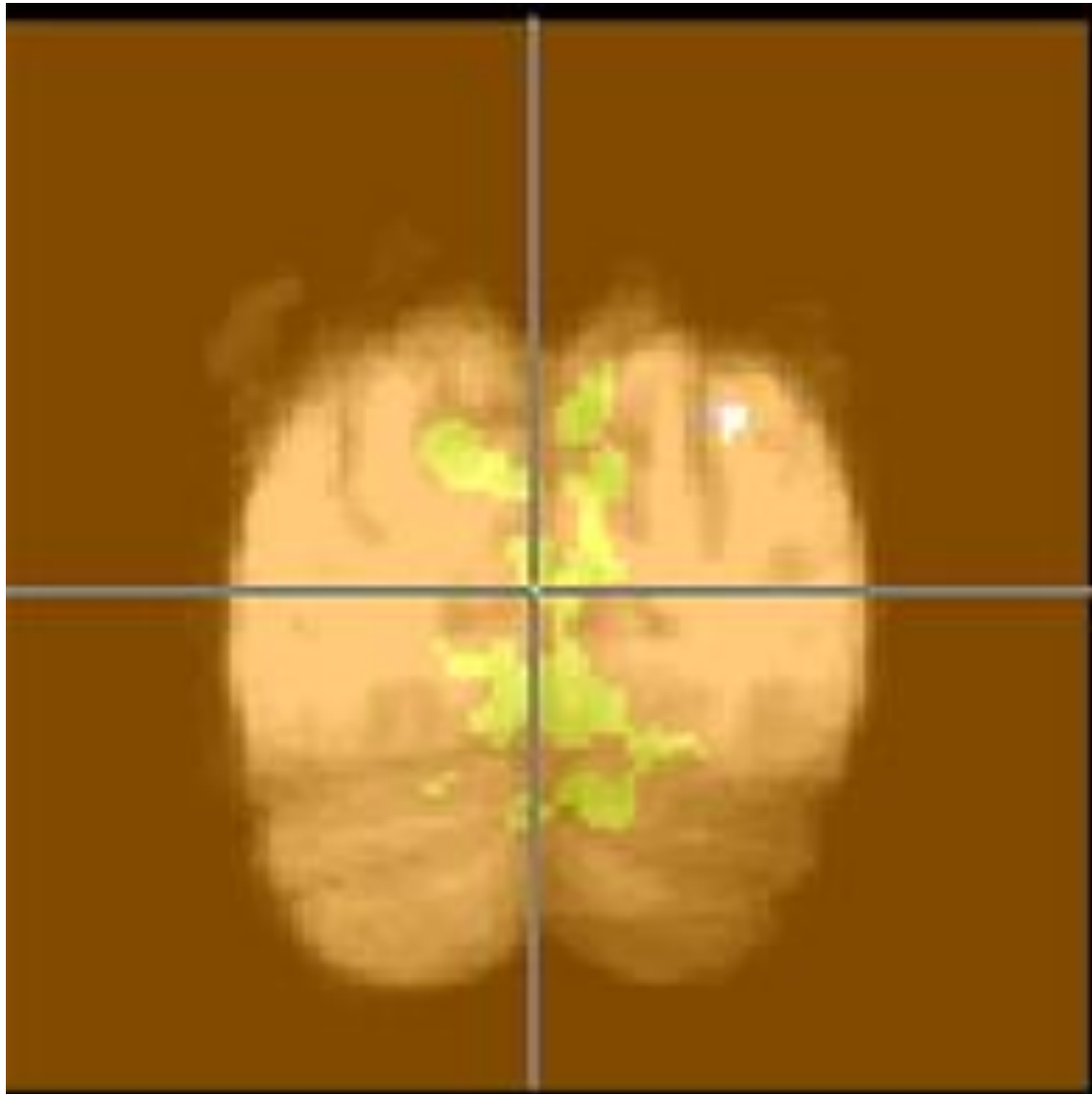**STANFORD UNIVERSITY**

Results

- Irrelevant side information hurts high SMs
    - Much worse essays when content is irrelevant
    - This is the norm for teens and increasingly all drivers!
- High SMs have Level 3 problems

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Summary of Situation Awareness

- High SMs are growing percentage of the population

- High SMs are deficient at ALL aspects of Situation Awareness

- High SMs don't have a primary task!

Why Do High SMs Have Sit. Aware. Problems?

Understanding Automobile Intelligence and

Situational Awareness (SA)

Intelligence, Situation Awareness, and Generations of Screens/Cars

Four Generations of Screen Intelligence

1. User does everything (line editor)

2. Intelligence is hidden (GUI; auto spell check)

3. Incomplete intelligence is overt (voice user interface)

4. Complete intelligence (filters and full-blown agents)

Automobiles: Generation 1

- No automation/intelligence
- Situation Awareness concern is *perception*
  - Immediate distractions (alerts)
  - Long-term distractions (infotainment)
  - Visibility of functions
  - Visibility of roads
- This concern persists in first three generations

Automobiles: Generation 2

- *Hidden* automation/intelligence

  - Anti-lock brakes

  - ESP

  - *Drivers don't need to know about this intelligence, especially not in real time*

- Situation Awareness concern is *risk homeostasis*

  - Implicates all three levels

    - Perception: Driver pays less attention

    - Comprehension: Driver doesn't think very hard

    - Prediction: Drivers reacts more slowly and casually

- Little risk homeostasis in hidden automation

Automobiles: Generation 3

- ## Partial and Present Automation/Intelligence

  - *Full* automation *part* of the time

    - Automated driving some of the time; manual at other times

  - *Partial* automation *all* of the time

    - There are certain intelligent functions that work all of the time

Situation Awareness and Generation 3
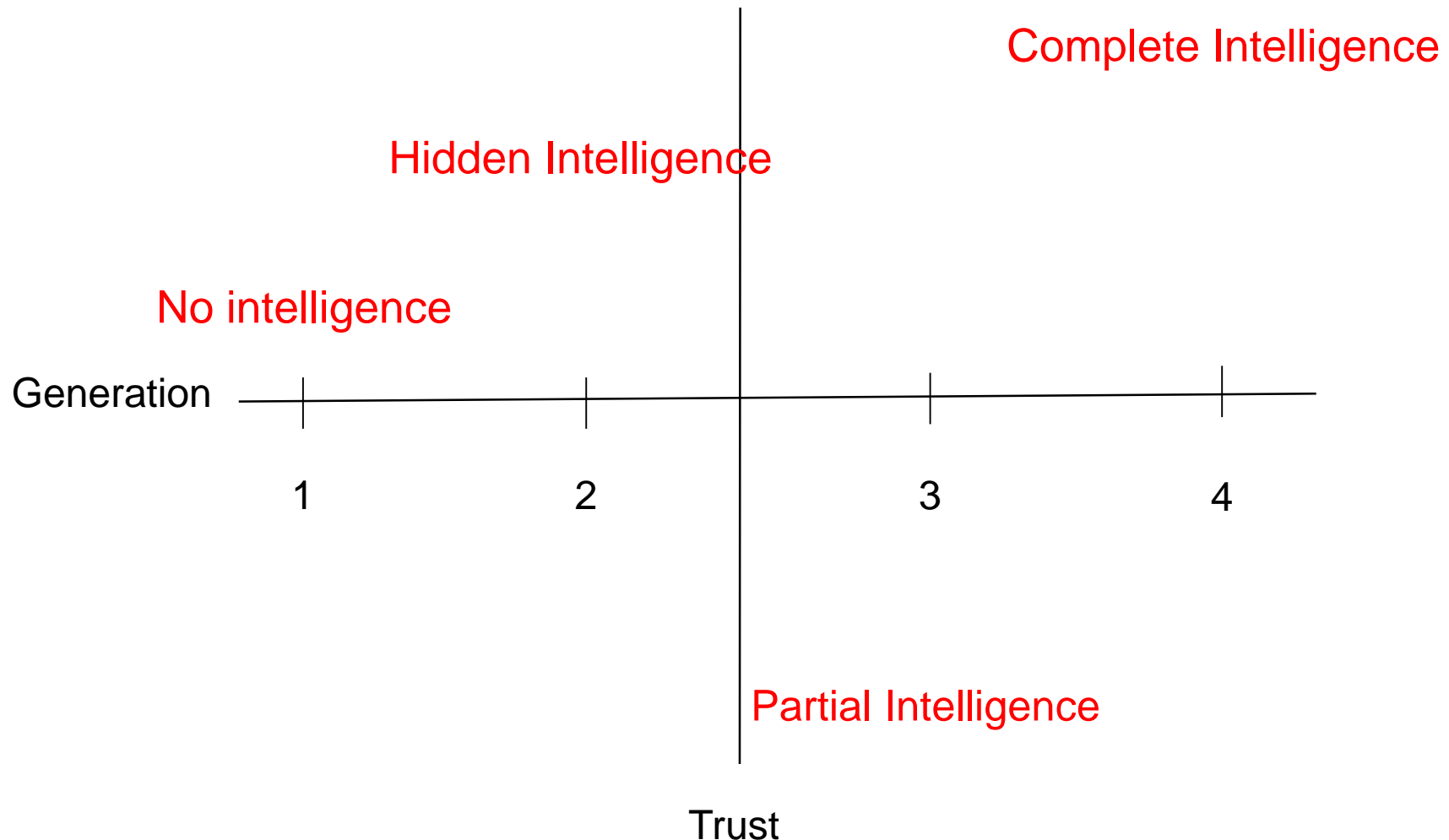
- Full autonomy part of the time
  - *Acquiring* Situational Awareness when none exists
  - Challenges at all three levels
    - Perception
      - Desire to look at terminated task
    - Comprehension
      - It's raining?!
    - Prediction
      - Framing is based on previous task
      - Affect influenced by previous task
- Partial autonomy all of the time
  - Risk homeostasis is at issue

Automobiles: Generation 4

- Complete Automation/Intelligence

- No situation awareness issues

- Media providers' dream

  - They sell attention

The Generations of Automotive Intelligence

Complete Intelligence

Hidden Intelligence

No intelligence

Generation

1   2   3   4

Partial Intelligence

Trust

Diversity of Screens and Situational Awareness

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Diversity of Screens

- Size
  - Larger screens draw more of all three levels
- 3D vs. 2D
  - Greater exposure for 3-D
    - Dashboard and center panel are 2D but can be 3D
  - Not clear for comprehension and prediction
- Resolution
  - Greater exposure and easier comprehension with higher resolution
    - Dashboard and center panel are very high-resolution
    - Other screens affected by dirt
  - Not clear for prediction
- Positioning
  - Greatest exposure to screens facing front; not clear for comprehension and prediction

Screen User Psychology vs. Driver

Elaborating Screen Psychology: 1

From: Drivers want to pay attention; interfaces should not distract

To: Drivers do *not* want to pay attention; cars have to fight for attention

Examples:

1. When eyes linger on center panel, show view from windshield

2. Show dangerous obstacles on side window

3. Put critical content where driver attention is

Elaborating Screen Psychology: 1

From: Focused attention is Job 1 for the driver

To: Situation Awareness is Job 1 for the *car*

- – Perception
- – Comprehension
- – Planning

Examples:

1. "Please check your mirrors"

2. "It's raining outside and the roads are slippery"

3. "There's much more traffic than usual"

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Change in Approach 3

From: Voice is replacement for visual

To: Drivers use screens continuously and simultaneously

Examples:

1. All screens are dynamic; "deserve" constant attention

2. Level 1 tracking is important but insufficient

Change in Approach 4

From: Drivers use interface for discrete acts

To: Drivers love speaking, listening, looking simultaneously

Examples:

1. All screens are dynamic; "deserve" constant attention

2. Level 1 tracking is important but insufficient

3. Audio I/O is not replacement

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Change in Approach 5

From: Mental models are hardware-oriented

To: Mental models are software-oriented

Examples:

1. Create mental models of how car software works

2. Support different mental models for different screens

Summary:
Psychology of Cars=Psychology of Screens

- ## Cars are screens

    – Not mechanical devices

- ## Driving is a casual experience

    – Not consequential

- ## Driving involves *consumption* of screens

    – Not control of machines

- ## Forget "distraction"

    – General attention and situation awareness are more important

Final Plea

- I *desperately* need outstanding Ph.D. students

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