

Distractions au volant

Enjeux et problématiques



Mobilité



RVI



Site Web



TV



Logiciels

World Usability Day: 13 Novembre 2008

Introducing...

Karine Grandé

Ergonome des interfaces



Agenda

- 1. Les distractions au volant**
Les types de distractions
- 2. Système attentionnel et concurrence cognitive**
Quel est l'impact d'une distraction sur le cerveau?
- 3. Études de cas**
Quel est l'impact d'une distraction en situation réelle?
4. The Problem
Why Focus on Driving Distractions?
5. Modeling The Psychological Situation
A Practical Understanding: The Cognitive Constraint Model
6. An Approach
Validating In-car Interfaces Without Killing Anyone in the Process
7. The Opposite Approach
Solving the Problem in the Other Direction: Improving Car Interfaces
8. Conclusions
...what were we talking about again?

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Distractions au volant

Distractions internes



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Distractions internes



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Distractions au volant

Distractions internes



Distractions au volant

Distractions internes

1. Ajuster des outils de contrôle dans le véhicule (température ambiante, etc.)
2. Manipuler la radio, le volume sonore, etc.
3. Discuter avec un ou plusieurs passagers
4. Boire, manger
5. Se maquiller, se peigner, se raser
6. Lire ou écrire
7. Discuter au téléphone, répondre ou composer un numéro
8. Discipliner des enfants, des nourrissons
9. Utiliser d'autres dispositifs technologiques
10. Fumer



Tâche de conduite

Variabilité environnementale



- Conducteur
- Véhicule
- Environnements rencontrés

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Systeme attentionnel

Tâche de conduite: traitement de l'information (TI)

PERCEPTION VISUELLE
Lobe occipital
Cortex Primaire



PROCESSUS ATTENTIONNELS
Cortex pré-frontal

- Attention sélective
- Attention partagée
- Attention soutenue

<http://www.downbeast.com/general/>

TI = processus automatiques + processus attentionnels contrôlés
(Schneider et Shiffrin (1977))

Concurrence cognitive

Multiplicité des tâches au volant

- Informations à prélever et informations à traiter
- Capacité limitée du traitement d'information: charge mentale
- Distractions : rupture temporelle et augmentation du temps de réaction



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Exemple 1: Boire, fumer



Source: Extrait du film The Big Lebowski, 1998

Exemple 1: Boire, fumer



Exemple 2: Dans ses pensées



Source: Extrait du film Mensonges et trahisons et plus si affinités, 2004

Exemple 2: Dans ses pensées



Exemple 3: Maquillage et discussion passager...



Sources: Extrait 1: La Cité de la Peur, 1994

Extrait 2: Le grand détournement, 1993

Exemple 3: Maquillage et discussion passager



Exemple 3: Maquillage et discussion passager



Exemple 4: Cellulaire



Source: Extrait du film De battre mon cœur s'est arrêté, 2005

Exemple 4: Cellulaire



Source: Extrait du film De battre mon cœur s'est arrêté, 2005

L'écart...

- Il y a un écart entre notre connaissance du système attentionnel, de l'impact des distractions sur le cerveau et les données réelles de personnes accidentées dûes à des distractions pendant la conduite.
- C'est la tâche actuelle de la science de combler cet écart et de développer des connaissances solides sur la façon dont surviennent ces accidents afin de les prévenir efficacement.



Introducing...

Jay Vidyarthi

User Interface Designer / Usability Specialist



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4. The Problem

Why focus on driving distractions?

- With new technologies, the human brain is multi-tasking more often.

+

- Motor vehicles are particularly dangerous: over 200 000 people injured or killed on the road in a single year.

=

- Implementing technologies in the car can lead to significant safety hazards.



4. The Problem

Why focus on driving distractions?

- Empirical research demonstrates that secondary-tasks (ipod, gps, cellphone, etc) have harmful effects on driving performance.

[Briem & Hedman (1995), Salvucci (2001), Salvucci & Macuga (2002), Salvucci et. al. (CHI 2007)]



4. The Problem

Why focus on driving distractions?

- A survey of 5000 american drivers
[GMAC Insurance NDT 2006]
 - 40% talk on the phone while driving
 - 20-25% of younger generation use an ipod or text message while driving.



4. The Problem

Why focus on driving distractions?

- In the context of usability, this raises two key questions:
 1. Can we tailor our user interfaces for use while driving to increase both their usability and overall safety?



4. The Problem

Why focus on driving distractions?

- In the context of usability, this raises two key questions:

2. How do we test our design ideas without hurting or killing anyone?



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5. Modeling the Psychological Situation

A Practical Understanding: The Cognitive Constraint Model

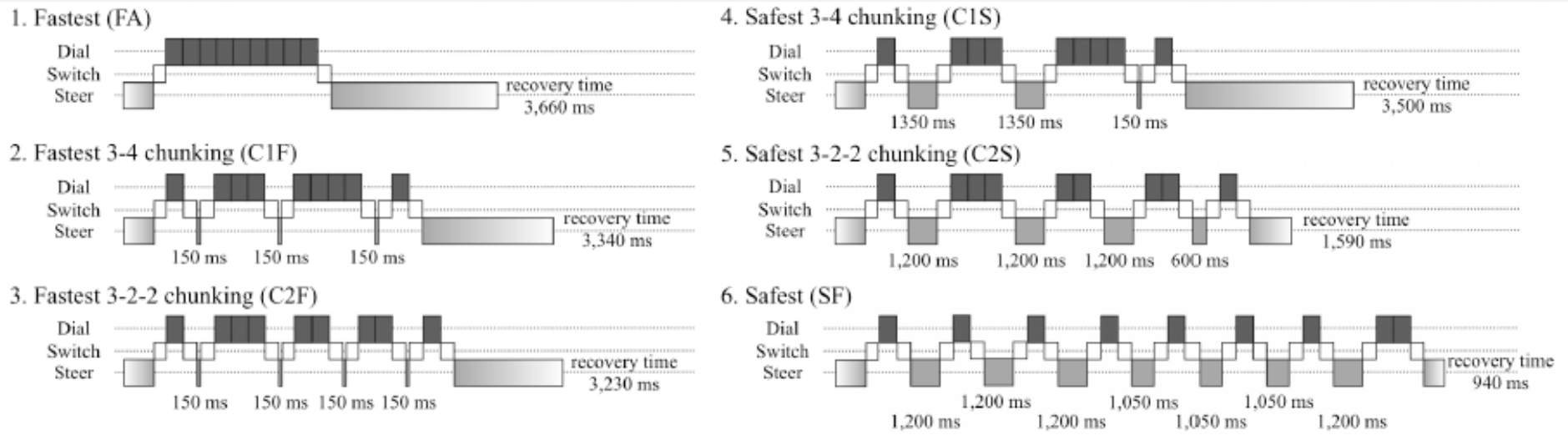
- We can't assume that we understand the psychological situation of driving a car.
- Researchers tried to develop cognitive models, but failed without accomodation for human-like strategies.
[Brumby et. Al. 2007]
- *Cognitive Constraint* models make calculations using numerous plausible strategies and constraints on behaviour to help predict behaviour.



5. Modeling the Psychological Situation

A Practical Understanding: The Cognitive Constraint Model

- This figure shows different strategies of phone dialing.



[Brumby et. Al. 2007]

- Model can analyze the different strategies and generate estimates on speed and safety that match real subjects.



5. Modeling the Psychological Situation

A Practical Understanding: The Cognitive Constraint Model

- So why do we care about cognitive models of the driving process?
 - It gives us the insight we need to design interfaces truly suited to a multi-tasking situation.
 - It gives us a framework to test in-car interfaces...



5. Modeling the Psychological Situation

A Practical Understanding: The Cognitive Constraint Model



- It gives us a framework to test in-car interfaces...
without sending anyone to the hospital.

(I know what you're thinking, but driving simulators are too expensive.)



5. Modeling the Psychological Situation

A Practical Understanding: The Cognitive Constraint Model

- In theory...
- Microscopic interactions involved with an interface can be meticulously modeled based on real human strategies and data.
- **Distraction coefficients** can be calculated without any real drivers or expensive simulators.



5. Modeling the Psychological Situation

A Practical Understanding: The Cognitive Constraint Model

- In practice...

this kind of analysis is simply not cost-effective for real-world interface design scenarios.

- We'd have to build a new cognitive model for every interface we want to test!!!!1111



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6. An Approach

Validating In-car Interfaces Without Killing Anyone in the Process

- Is there a cost-effective alternative?
- **Distract-R:** An integrated solution.
A rigorous cognitive model combined with a simplified prototyping system attempts to make predictions. Not fully generalizable yet, but...

(Salvucci, 2005)



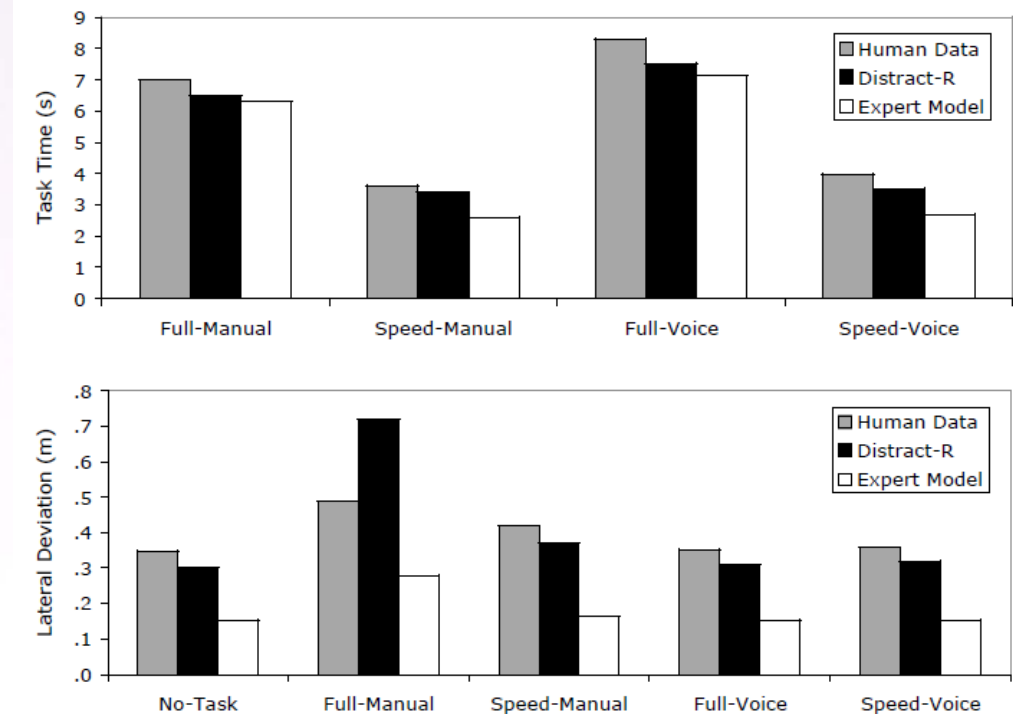
6. An Approach

Validating In-car Interfaces Without Killing Anyone in the Process

- ...early data looks good.

- Grey = humans
- Black = distract-r
- White = cognitive model

(Salvucci, 2005)



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7. An Opposite Approach

Solving the Problem in the Other Direction: Improving Car Interfaces

- Distraction-related accidents (i.e. accidents while using a cellphone) can be reduced in two ways...

- We can work on designing less distracting interfaces (as we've already discussed)

OR, the opposite approach...

- We can improve the car's interface



7. An Opposite Approach

Solving the Problem in the Other Direction: Improving Car Interfaces

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OR, the opposite approach...

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7. An Opposite Approach

Solving the Problem in the Other Direction: Improving Car Interfaces

- An example...
 - A test was performed to study a localized warning system which alerts drivers when the car ahead is braking.
(Lee et. Al., 2004)
 - Experiments were conducted showing a significant improvement: distraction effects were reduced.
 - Participants subjectively judged graded warnings and tactile stimulation as much less annoying.
- Less annoying!?
- USER EXPERIENCE!



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8. Conclusions

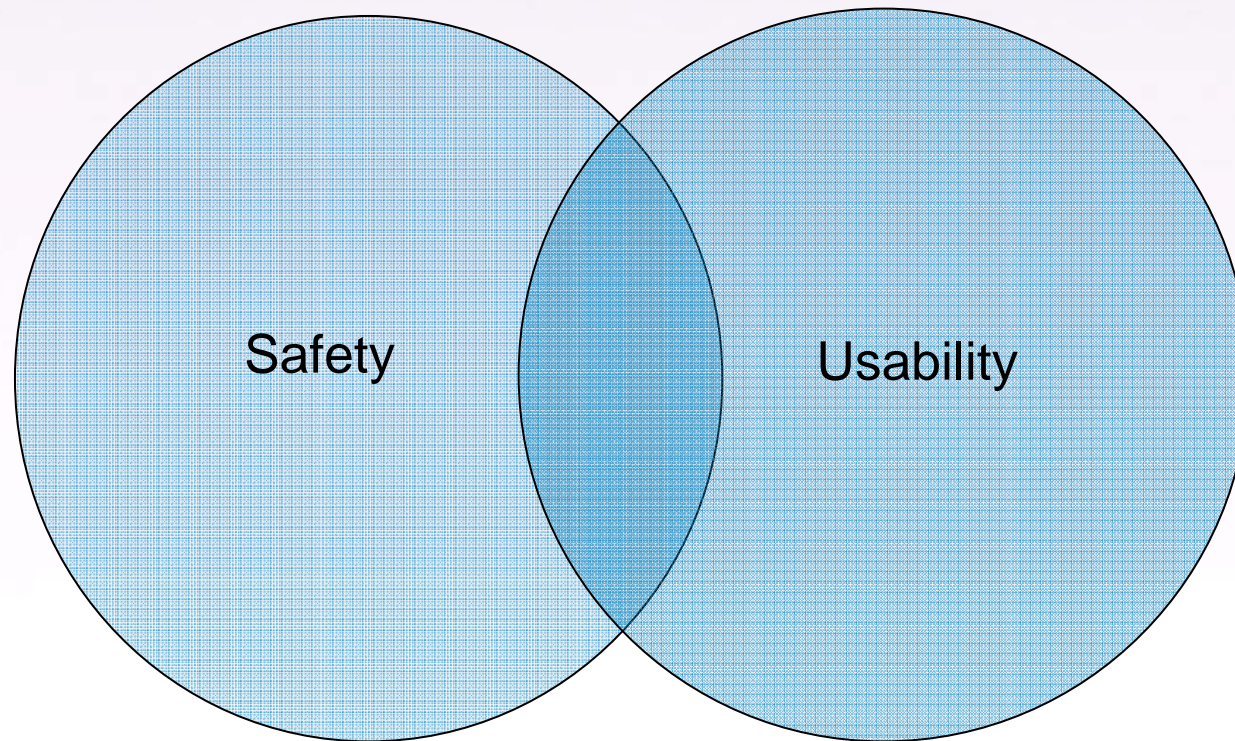
...what were we talking about again? I got distracted...

- Distractions steal attentional resources.
- In-car user interfaces create distractions which can be dangerous to drivers, passengers and pedestrians (theoretical and empirical evidence).
- Scientists are moving toward paradigms to test how distracting a particular interface would be.
- As **usability** specialists, we need to take distractions and other safety concerns into consideration along with our focus on **USER EXPERIENCE**.
- Safety is not mutually exclusive with usability.



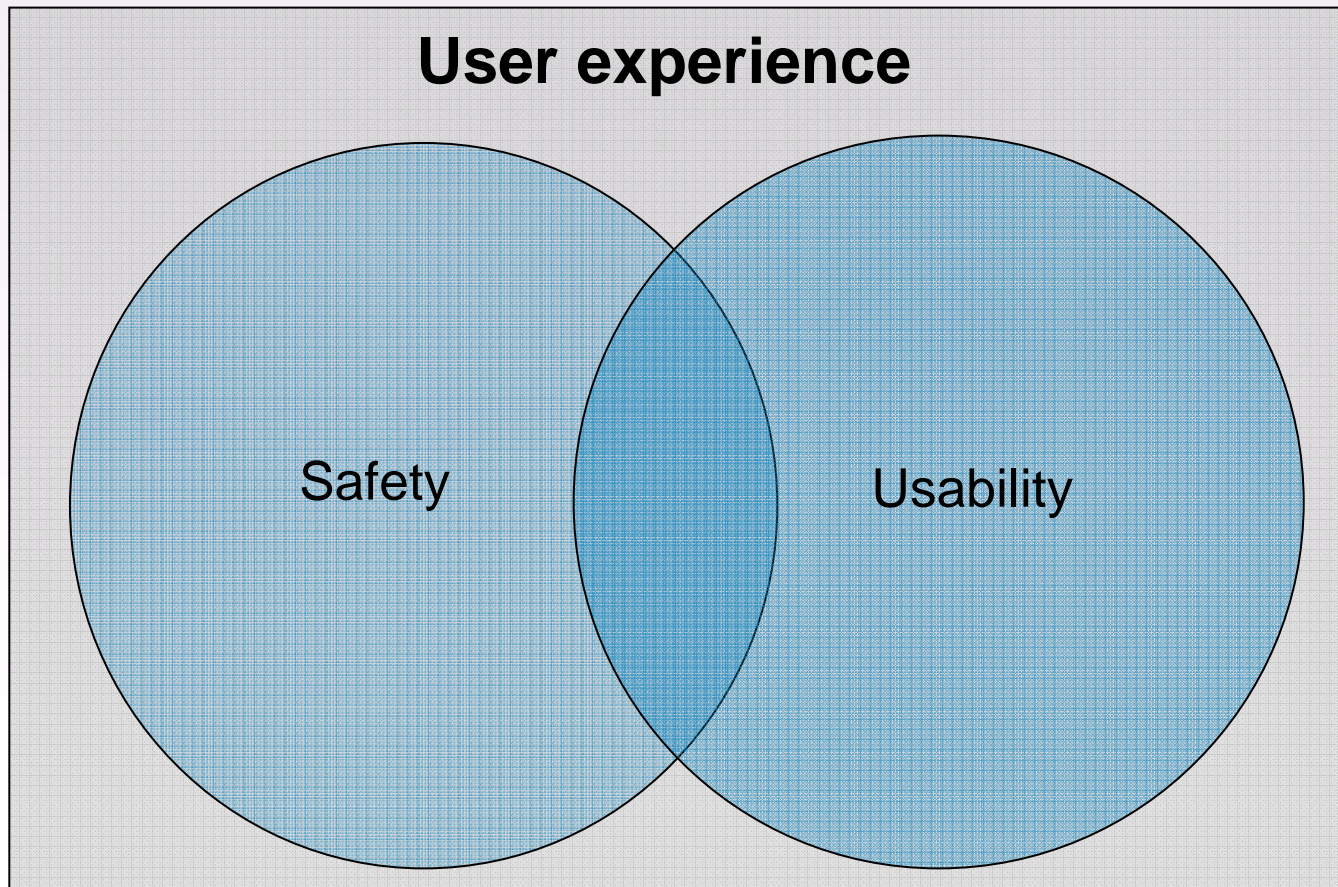
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...what were we talking about again? I got distracted...



8. Conclusions

...what were we talking about again? I got distracted...



Merci de votre attention!!!!



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Annexe 1

Distractions au volant: Définition

- La distraction suppose un **détournement de l'attention** accordée à la conduite parce que le conducteur s'intéresse **temporairement** à un objet, une personne, une tâche ou un événement qui **n'est pas lié à la conduite**, ce qui diminue sa **vigilance**, sa **capacité de décision** ou son **rendement** et augmente les risques de **gestes correctifs**, de **collisions** ou de **quasi-collisions**.

(Service de la Sécurité routière de CAA Québec, 2007)