Infotainment Interface Design for Automobiles

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April 25, 2015

Infotainment Interface

- Infotainment
  - Information for work and play are accessed through the same devices
- Interface
  - How we interact with a device
  - Crucial to a user's satisfaction when using a device

Why Cars?

- Multiple-goal environment
- Safety is a very real concern
- Laws are not enough to prevent people from using infotainment devices while driving

Outline

Touchscreens

- Found on many consumer electronics
  - Smartphones
  - Tablets
- Interactions
  - Tap
  - Swipe
  - Pinch-to-zoom
  - Long press

Voice Dictation

- Method of typing
- Speak your message aloud, and the computer transcribes it into text
- Allows user to look away from interface
- Often less accurate, harder to correct than physical typing

Screen Reading

- Augments visual interface to allow user to spend less time looking at the interface
- Often used to make interfaces accessible to the visually impaired
- Three types studied here:
  - Text-to-speech
  - Spindex
  - Spearcon

Air Gestures

- Sensors detect user's motions
- Some detect whole body (Microsoft Kinect)
- Some detect only hands (Leap Motion Controller)
- Very young interface category

Typical Setup

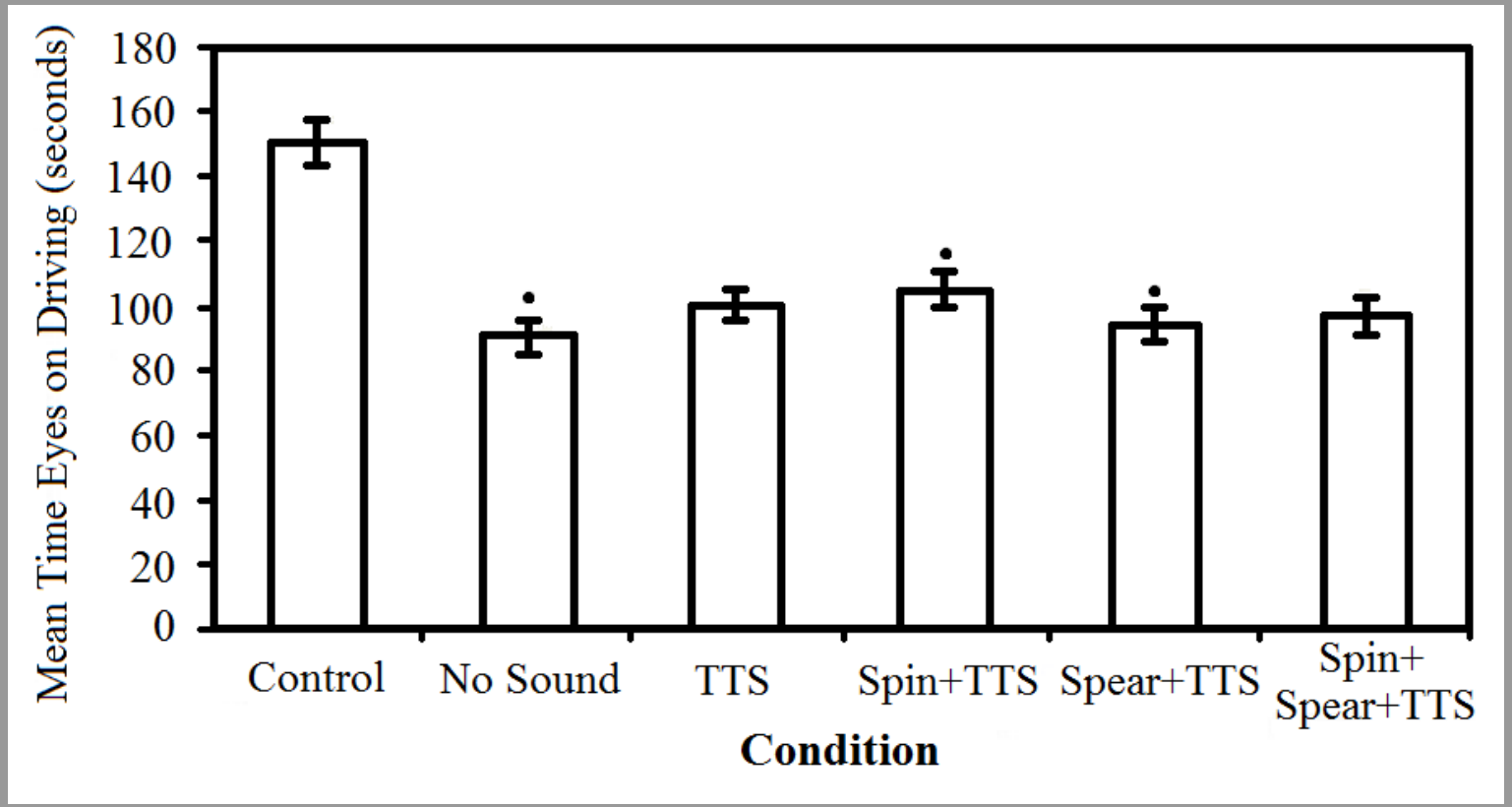
Eye Tracking

- Participant wears eye tracking glasses
- Gaze that falls on computer monitor counts as gaze time on primary task
- Gaze that falls anywhere else counts as gaze time on secondary task

Auditory Cues

- Gable et al.
- Goal: test affect of different auditory cues on gaze times
- Simulation: lane changing exercise
- Secondary task: find given song in list of 150
- 26 participants

Gaze Time Results



Other Results

- Deviation from ideal driving line: control was significantly less than all others
- Number of songs found and mistakes made similar for all search conditions
- Participants preferred Spindex+TTS over other search conditions

Text-to-Speech and Voice Dictation

- Truschin et al.
- Goal: improve upon existing speech interfaces
- Simulation: lane changing exercise
- Secondary task: listen and reply to email conversations
- 112 participants

Voice Condition

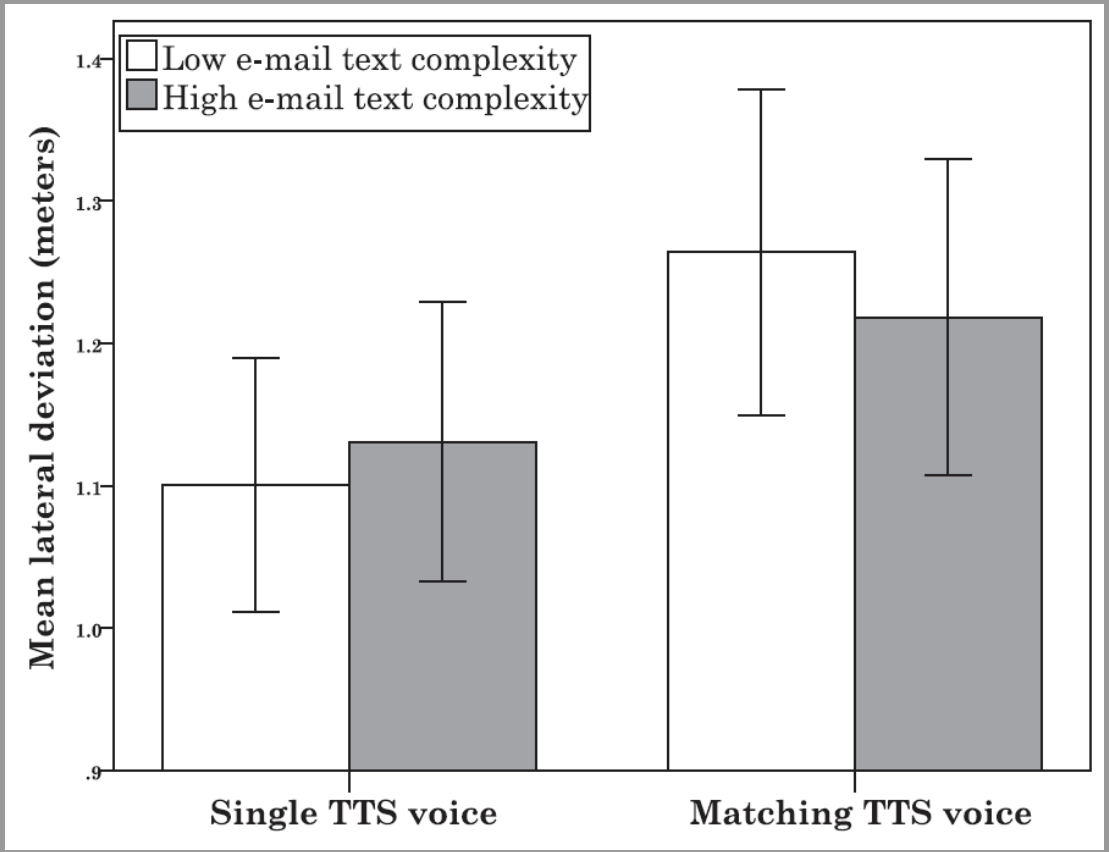
- Single voice for all participants in email thread OR
- Different voices for each participant in email thread
  - Voices matched by gender to sender
- Hypothesis: matched voices would improve driving performance and email comprehension

Emails

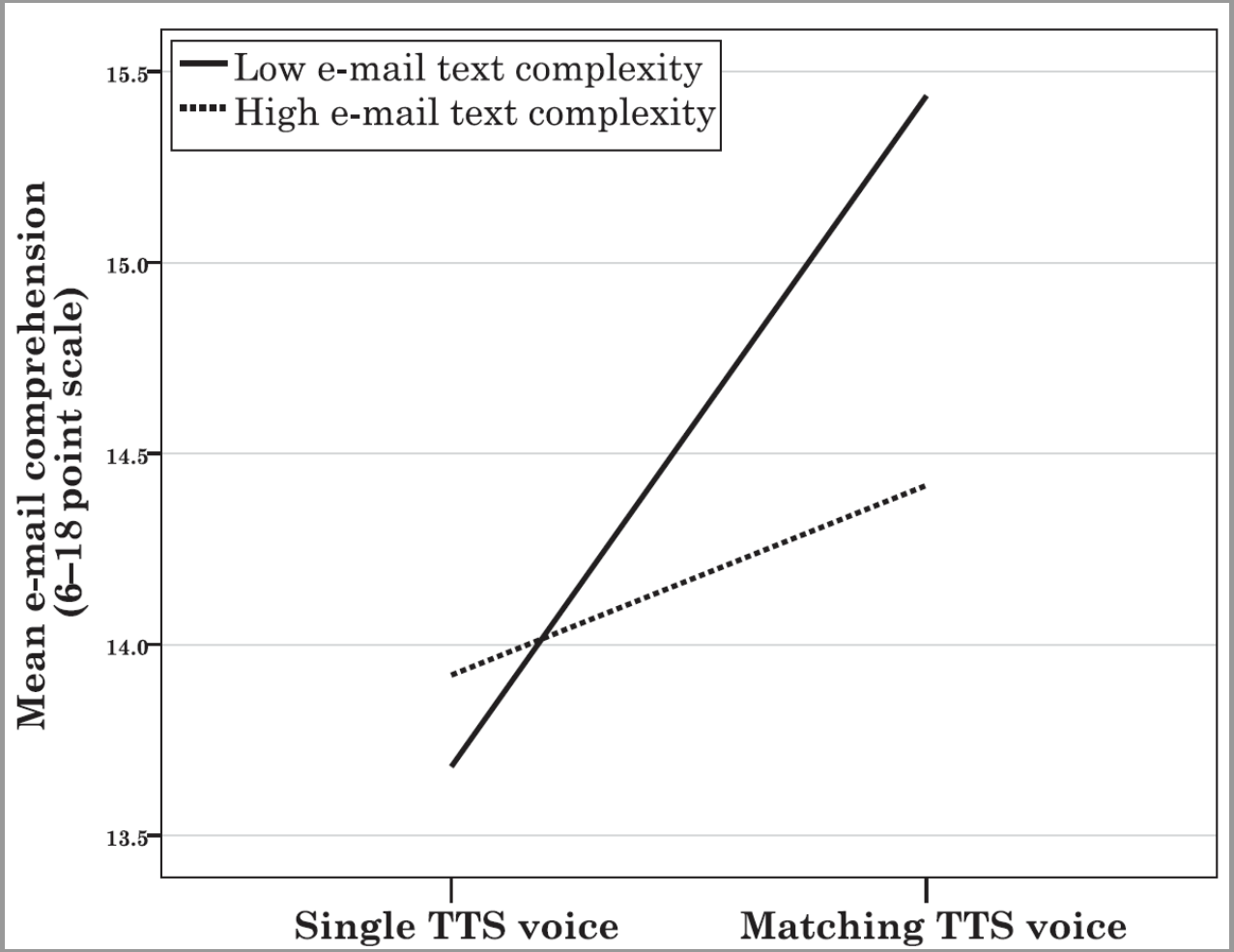
- Based on real-life conversations
- Low or high complexity
- Participants role-played when responding to messages
  - Given 6 facts about their character to memorize

Deviation from Ideal Driving Line Results

- No significant difference during listening phase
- Significant difference during responding phase:



Email Comprehension Results



Air Gestures

- May et al.
- Goal: compare performance of air gestures to that of touchscreens
- Simulation: car following exercise
- Secondary task: menu selections (1 to 4 sequential targets)
- 26 participants

The Interface

- Actions: scrolling, select current item, go back to previous menu
- Various audio cues
- Avoid unintended gestures

Results

- Deviation
  - Significantly higher for all search conditions than control
  - No significant difference between search conditions
- Efficiency: touchscreen was faster and fewer errors were made
- Participants preferred touchscreens

Discussion

- Auditory cues
  - Preferred by participants
  - Does allow user to look at road more
  - Few technological barriers
- Text-to-speech and voice dictation
  - Unclear if participants prefer it
  - Difficult to compare to touchscreen
  - Conceptually similar to telling passenger what to do with phone
  - Already available in many modern cars
- Air gestures
  - Not preferred by participants
  - Did not improve driving performance over touchscreens
  - Require more advanced technology
- None brought driving performance to control levels

Acknowledgements

- Kristin Lamberty
- Elena Machkasova
- Everyone who came to my practice talks

References

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