Perception

Change Blindness and Motion

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The Papers

- Level of detail: Varying rendering fidelity by exploiting human change blindness. Kirsten Cater, Alan Chalmers and Colin Dalton. Proc.
- Perceptual and Interpretative Properties of Motion for Information Visualization, Lyn Bartram
- Internal vs. External Information in Visual Perception, Ronald A. Rensink

Change Blindness

- Change blindness is the inability of the human eye to detect what should be obvious changes
- Requires a distracter

Distracters

- image flicker
- eye movements (saccades)
- eye blinks
- occlusions by passing objects
- real-world interruptions
- movie cuts
- brief "splats" that do not cover the change
- changes made gradually

It's not a Trick

- Even when the changes are large
- Even when the changes are repeatedly made
- Even when the observer knows they will occur.

Demos

- Research into change blindness as it applies to automobile accidents
- Hash marks on images correspond to mud splashes
- Marks don't occlude the actual change

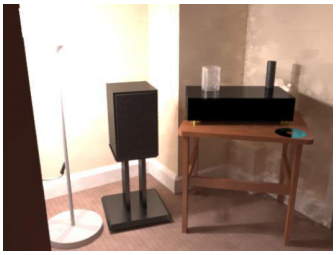
Coherence Theory

- Without focused attention, we just have proto-objects
- Focused selection chooses a small number of proto objects and stabilizes them
- After focused attention is released, the object loses its coherence and dissolves back into its constituent proto-objects.

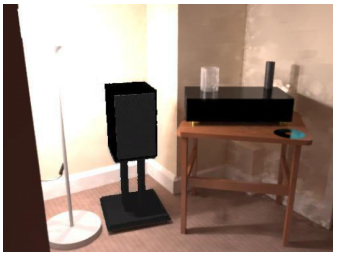
Real-Time rendering

- Can we use knowledge of change blindness to change rendering fidelity
- Simulation with flash display

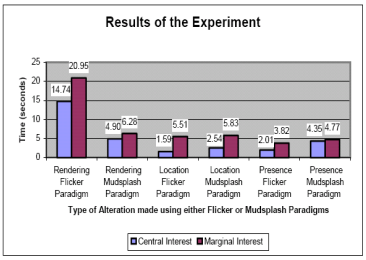
High Quality Image



Low Quality



The Results



Applications

- Retina monitors
- Peripheral changes are unlikely to be noticed

Perceptual and Interpretive Properties of Motion for Information Visualization

Summary

- Motion is very powerful. We should use it for information visualization
- Few concrete examples
- From 1997

Why Motion

- Pre-attentively sensitive across the entire visual field
- Eliminates change blindness
- Can track up to 5 paths
- Cheap and easy to compute

Some Applications

- Control user focus
- Velocity translates to urgency

Smooth motion

- Use oscillations to create groupings
- Discontinuous motion for anomalous data

Motion: The central tool?

- Can't tell if the user is looking at the screen
- Users read and think at different speeds
- Having information disappear is frustrating

Interface design

- Continuous updates can easily distract
- Group changes into one event
- Very slow motion can hide transitions

Conclusion

- Without motion, change blindness can easily occur
- It's worth thinking about how to use motion more effectively