Perception

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CPSC 533 fall ‘06

Papers Presented

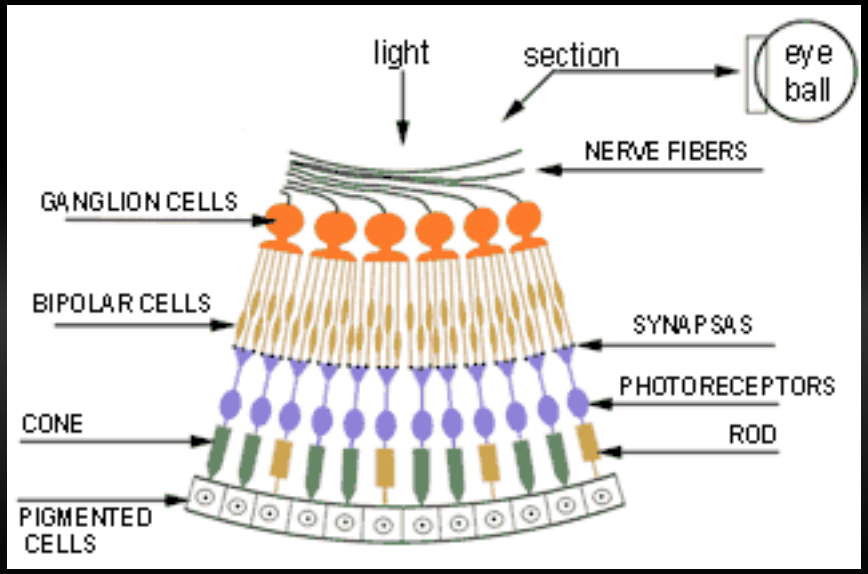
- *Level of detail: Varying rendering fidelity by exploiting human change blindness.* Kirsten Cater, Alan Chalmers and Colin Dalton. Proc. 1st International Conference on Computer Graphics and Interactive Techniques in Australia and South East Asia, 2003, pp 39-46.
- *Perceptual and Interpretative Properties of Motion for Information Visualization*, Lyn Bartram, Proc. 1997 Workshop on New Paradigms in Information Visualization and Manipulation, 1997, pp 3-7.
- *Internal vs. External Information in Visual Perception,* Ronald A. Rensink. Proc. 2nd Int. Symposium on Smart Graphics, pp 63-70, 2002.
- Scope: Providing Awareness of Multiple Notifications at a Glance, Maarten van Dantzich, Daniel Robbins, Eric Horvitz, Mary Czerwinski, Proc. of AVI, 2002.

Perception

- Process of acquiring, interpreting, selecting and organizing sensory information (wikipedia.org)
- Types:
  - Amodal perception
  - Color perception
  - Depth perception
  - Form perception
  - Hepatic perception
  - Speech perception
  - **Perception as Interpretation (Vision)**

Vision Basics (pre-attentive processes)

- Form:
  - Orientation, length, width, linear, Size, Curvature, grouping, Blur, extra marks, amount.
- Color:
  - Hue, intensity.
- Spatial Position:
  - 2D position, stereo depth, concave / convex.
- Motion:
  - Flicker, direction.
- Stuff and Things.



Perception of Motion for InfoVis (Bartram 1997)

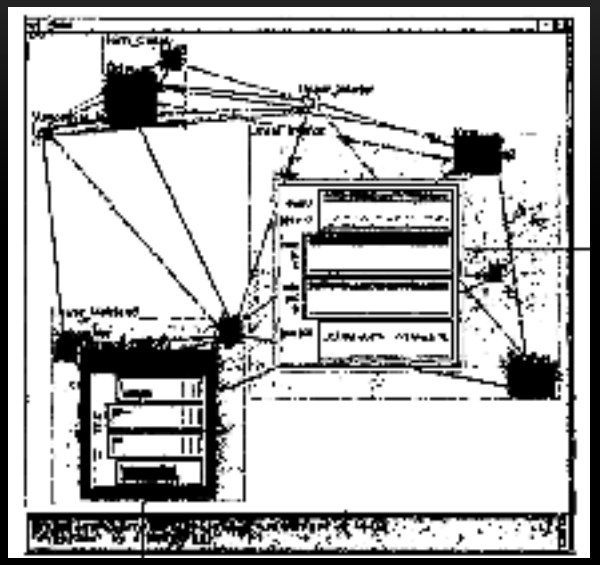
- Large Volume of data;
- Require screen real-estate;
- Goal to signal the user correctly:
  - By pre-attentive visual system.
- Old static graphical dimensions;
- Track up to 5 vectors.

Motion (Bartram 1997)

- Traditionally:
  - Motion for time and signaling;
  - Support transitions.
- Advantages:
  - Easy to compute;
  - Little screen space;
  - Layered.

Annunciation (Bartram 1997)

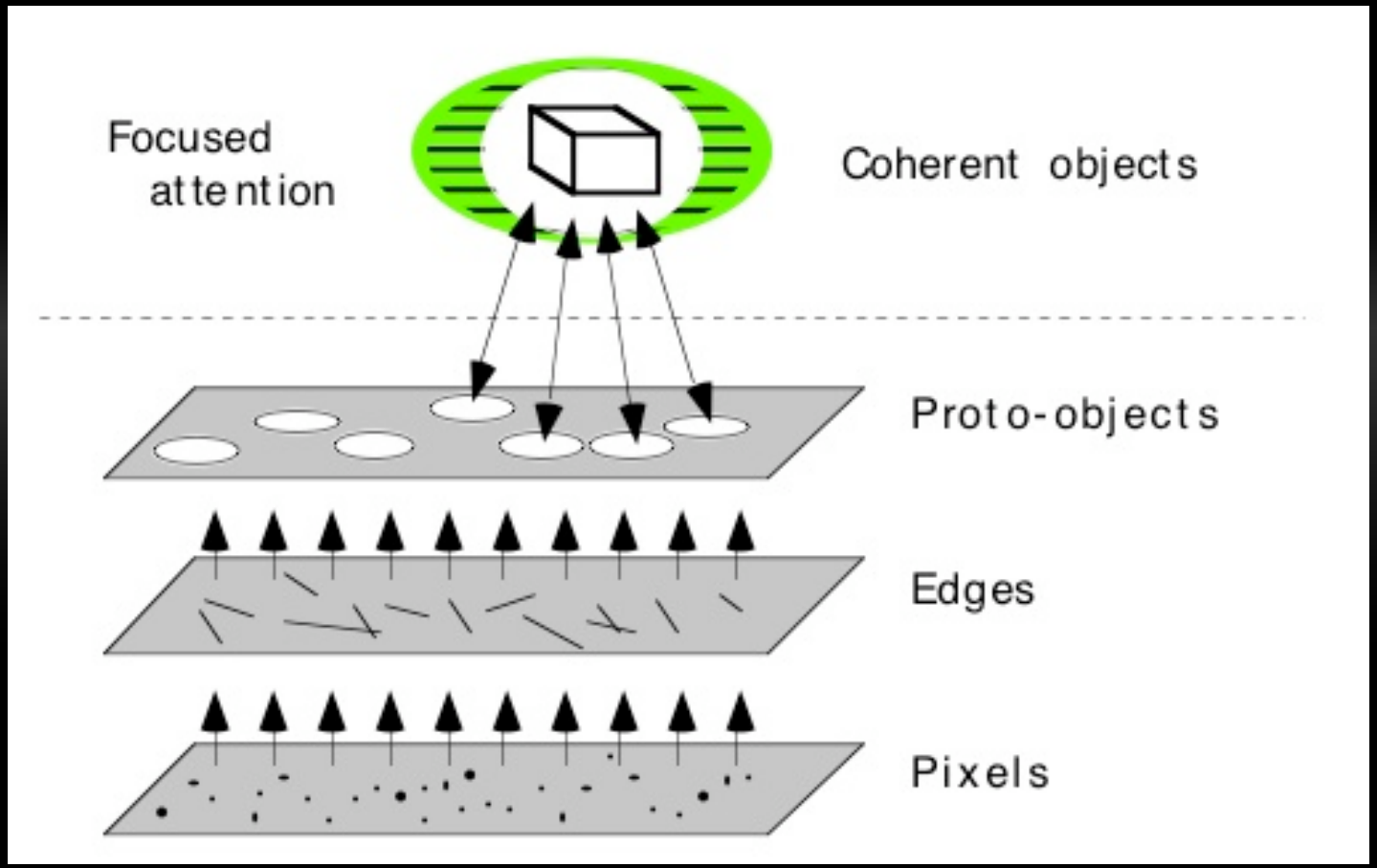
- Known facts:
  - Velocity and amplitude (more urgent)
  - Smoothness (less disruptive)
- Recommendations:
  - Represent power levels on software.



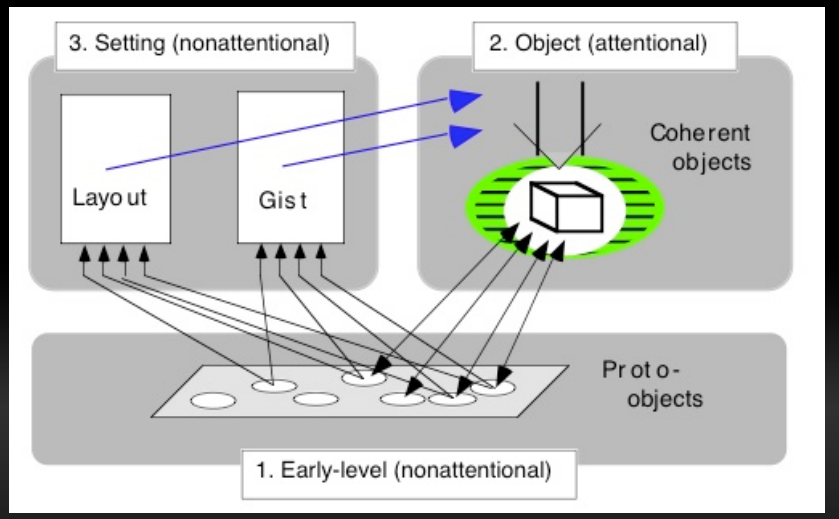
Future (Bartram 1997)

- Taxonomy:
  - Basic motion;
  - Patten recognition;
  - Interpretative and relative motion.
- Attribute motion:
  - Phase, amplitude, frequency and direction
    - Selection association.

Coherence Theory



Details about theory



- Triadic Architecture:
  - Quick;
  - Limited stable objects;
  - Context help scene;
  - Layout+gist intertwined;
  - 20-40 items/second;
  - Unexpected structure problem.
- Scene is never constructed
- One representation at a time
- Cannot be both stable and contain a lot of detail.

Varying Rendering by Change Blindness (Carter 2003)

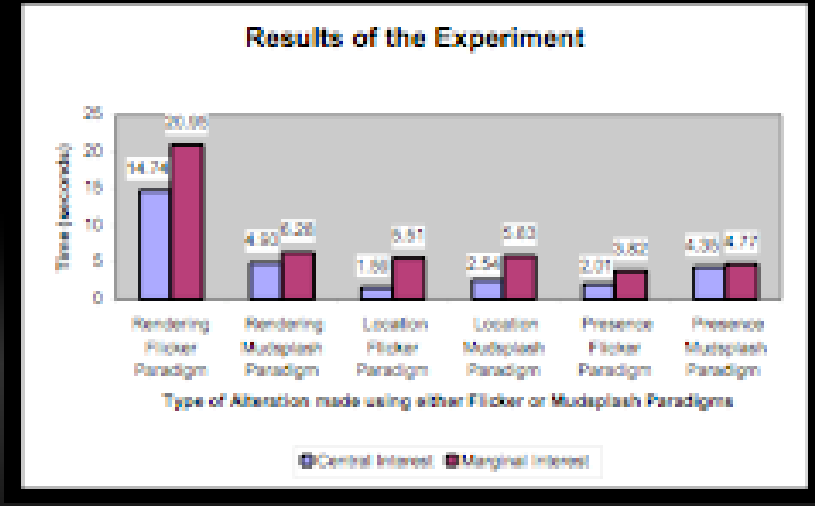
- Alter render quality without observers noticing;
- Does this hold for rendered images too?

The Experiment (Carter 2003)

- 24 rendered images
  - Judged for interest (marginal or central);
  - Degree of interest;
- 240 ms; 290 ms; 240 ms for 60 s

Results (Carter 2003)

- Results: Change blindness occurs in computer graphics images as it does in real life!
- 8 times central; 4.5 times marginal; 1.5 times central interest; .3 times marginal interest.
- t > 4.07



Internal vs. external Information in Visual Perception (Rensink 2003)

- Just in time perception;
- Perception without attention is perception without awareness;
- Can operate independent of attention;
- Grasping, reaching, and eye movement.

How should we display (Rensink 2003)

- Never both detailed and stable;
- Never constructed, just coordinated;
- Attention is extremely limited.

Helpful info (Rensink 2003)

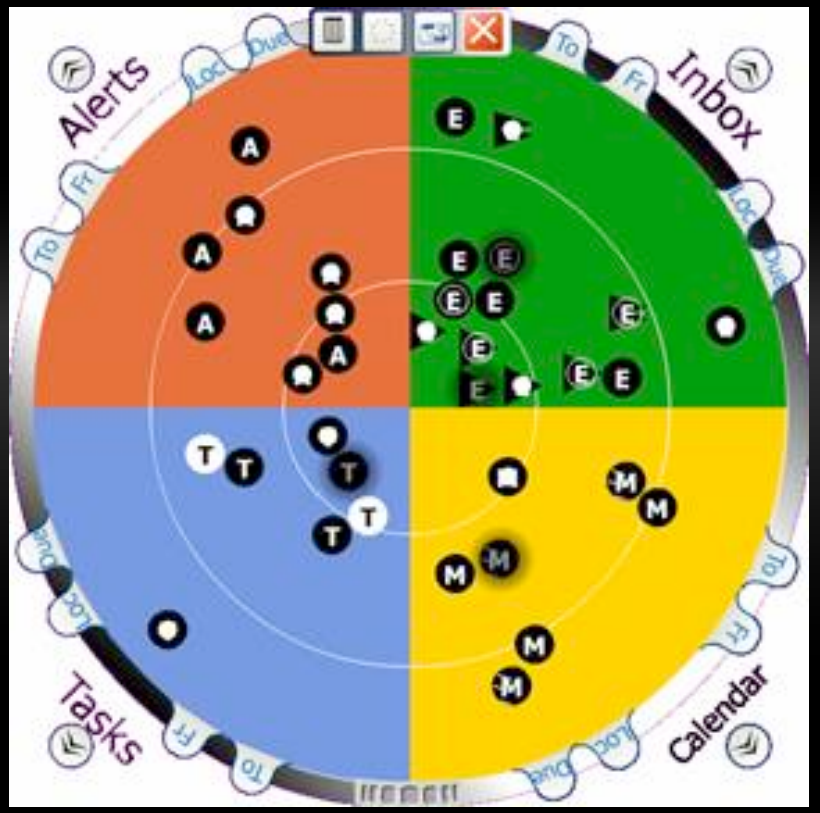
- Eye-tracking;
- Background change;
- Careful use of change;
- Proximity / saccades;
- Background events;
- Foreground events.

Helpful info (Rensink 2003) (cont.)

- Attention Coercion;
  - High, mid and low level interest.
  - Examples:
    - Draw attention elsewhere during transition;
    - Email will simply appear by magic.
- Non-attentional information
  - Works in parallel;
  - Example:
    - Change when users gaze elsewhere;
    - Alert the users.

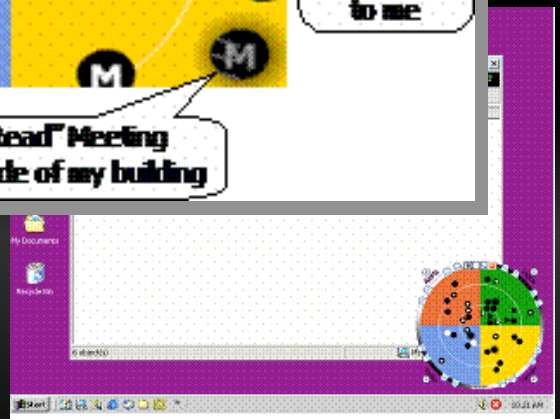
Scope (van Dantzich 2002)

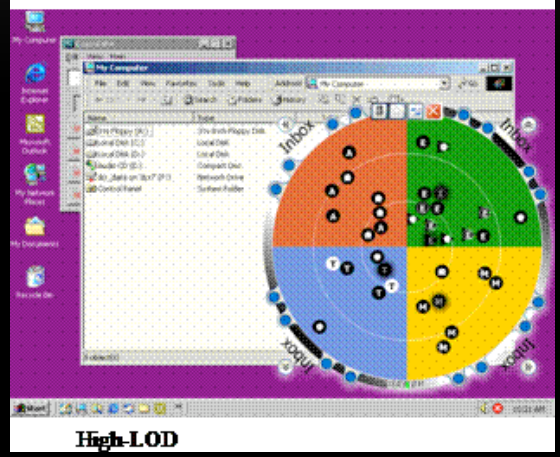
- notification overload management in one central location;
- Focus on primary task;
- Glance awareness.



Scope (vanDantzich 2002)

- Radar design;
- Wedges/Sectors:
  - Task related: work/home;
  - Item related: todo/email;
  - Configurable.
- Visual annotations (iconography);
- Level of Detail (LOD);
- Degree of newness;
- Urgency: “ToMeAlone” property;
- Interaction.


Low-LOD



High-LOD

Scope (vanDantzich 2002)

- Adds awareness without much attention;
- Needs more user studies;

- Stress level?

Papers presented:

- Bartram on motion;
- Carter on rendered image;
- Rensink model and advice;
- Van Dantzich on scope.

Direction and Future

- Helpful research:
  - Un-obtrusive;
  - Another dimension.
- Needs more work:
  - Association;
  - Attention and pre-attention.
- Direction towards:
  - Ubiquitous computing;
  - Intelligent computing.
- Comments?