Representing relations between 3D locations in immersive virtual reality



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Change blindness for changes in 3D scenes



Task 2: Sensitivity to configuration and/or scale



Figure 5: On 50% of trials, one, all but one or all of the spheres moved. Task: identify the 'signal' trials.

Figure 1: Sphere distances from starting location: 2.5-7.5m.

Experiment 1: Adding task-irrelevant dipoles (that change) can disrupt performance [1]. Due to image change or change in grouping?

Experiment 2: Is relative movement or global movement (overall expansion/contraction) more important?

Task 1: Grouping



S. d-prime pred. PC= 0.92184

pred. PC= 0.8561

Response of target detector

Figure 6: Top: SDT model, going from movement detection in a scene with a single sphere to one with multiple spheres. Right: Predicted performance in the 4 conditions above assuming the relative or global sensitivity is 0, respectively.







Figure 3: Performance of 3 participants for dipoles and colour conditions (2 colour groups; 100 trials per participant per condition).

Original dipole effect is replicated (Fig 3 left) but not when group-



Figure 7: There is more tolerance to the strength of the relative signal set in the model than the global signal.



Figure 8: Absolute difference between predictions of the combined model and actual d' for all 4 conditions for S1 (middle). On the left and right are the slices of the middle plot that represent the relative/global-only models.

ing is defined by colour using 2 colours (Fig 3 right) or 4 colours which defines pairings uniquely (Fig 4).

Figure 4: Variation of the colour grouping task using pairs of colours.

| Effect | DFn | DFd | F | η^2 | p-value |
|--------------------|-----|-----|------|----------|-------------|
| dipoles (Fig. 3) | 2 | 4 | 8.18 | .80 | .039* |
| colour v1 (Fig. 3) | 2 | 4 | 0.35 | .14 | .725 (n.s.) |
| colour v2 (Fig. 4) | 2 | 4 | 3.27 | .62 | .144 (n.s.) |

Table 1: Group level effects of conditions shown in Figs 3 and 4.

Conclusions

- **Grouping:** Dipoles, but not color or image change, disrupt change-detection performance.
- **Configuration and/or overall scale:** Participants are more sensitive to relative movement but have some sensitivity to overall expansion of the scene in this task[2].

References

- [1] Peter Scarfe and Andrew Glennerster. Sensory cues used to determine 3d world stability. *Journal of Vision*, 16(12):285–285, 2016.
- [2] Andrew Glennerster, Lili Tcheang, Stuart J Gilson, Andrew W Fitzgibbon, and Andrew J Parker. Humans ignore motion and stereo cues in favor of a fictional stable world. *Current Biology*, 16(4):428–432, 2006.