Representation of shape and space when objects undergo transformations

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Stimuli and Procedure
- We use the dot matching task (Phillips, Todd, Koenderink, & Kappers, 1997) that asks participants to identify corresponding dots between two objects.
- Example display:

Participants use the cursor to move the green dot to the position that they perceive as corresponding to the position of the red dot (no time constraints).

Experiment 1 – Results for Shape Contours

- Correlation between surprisal and response accuracy was significant but relatively low (0.2 to 0.3 depending on shape and transformation).
- Correlation was stronger for unsigned surprisal (Attneave, 1954) compared to signed surprisal (Singh & Feldman, 2000).

- The optimal integration window size was between 5% to 20% of the shape perimeter (examples on the left used a size of 10%).

Experiment 2 – Results for Shape and Space

- Responses close to true locations of transformed dots – no switches (object-centered frame of reference).
- Correlation of response accuracy with surprisal not feasible because dots were not on the contour.

Conclusions
- Shape representations are remarkably robust against rigid transformations. Still, they are modulated by the (1) type and level of transformation (Moran & Leiser, 2002), (2) contour saliency, (3) and the distance to the contour (Phillips et al., 1997).
- Space representation is transformed in line with the shape, so participants infer causal history and establish object-centered reference frames.
- The experiments are a starting point for investigations into more complex transformations resulting from changes of the physical objects themselves.