Why objects in images may appear closer—or farther—than they actually are

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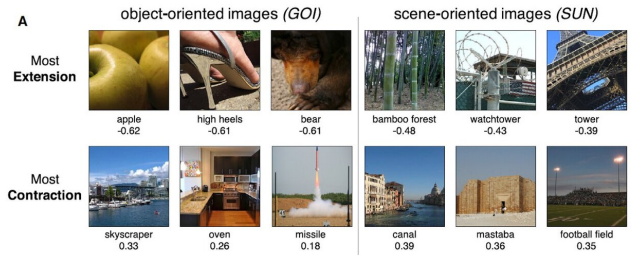

The study relied on two databases, Google Open Images (SOI) and the Scene Understanding Database (SUN), which categorized images using object- and scene-oriented words. Credit: Wilma Bainbridge

When people remember images, they fill in the edges with details they didn't actually see. That's the idea behind the boundary extension, a term which has become widely accepted in psychology classes, textbooks and test-prep flashcards.

But what if the concept isn't quite accurate?

A University of Chicago psychologist has discovered new evidence that challenges the decades-old understanding of the memory error as a universal phenomenon. Published in the journal *Current Biology*, the study proposes that boundary contraction may be just as common as boundary extension—and that whether something appears zoomed in or out depends on the properties of the image itself.

"In a way, we're debunking this very strong claim that has been made in psychology over the last 30 years," said Asst. Prof. Wilma Bainbridge, the study's lead author and an expert on the perception and memorability of images.

The finding is important, she added, because boundary extension has been used to make other claims about the nature of the brain, such as the function of the hippocampus.

Bainbridge co-authored the study with Chris Baker, a principal investigator at the National Institute of Mental Health. Testing 2,000 participants, they found that although images of objects caused boundary extension, images of full scenes were more likely to produce boundary contraction. That is, a person may see a close-up photo of an apple and fill in details that were not actually present. But if they see a football field, they may be more likely to remove details—zooming in, or contracting, the actual image.

In a previous study, Bainbridge and Baker showed participants various images and asked them to draw copies. They were "perplexed" when boundary extension did not occur as often as they had expected.

To further investigate those results, they conducted an online experiment using a broad set of 1,000 images and 2,000 participants. Participants would see an image, see a scrambled image and then see the original image again.

Even though the final image was identical to the first, the researchers found that people would indicate it being farther or closer according to its visual properties (object-based vs. scene-based).

Bainbridge said the results highlight the need for psychologists to revisit even long-held assumptions, as well as the potential pitfalls of drawing larger inferences from limited data sets.

Past replications of boundary extension, she suggested, could have been skewed in part by narrow data sets that repeated the use of certain image types.

"Anecdotally, I've spoken with many people who have thought about looking at boundary extension

—but then they aren't able to replicate the effects, so they give up and they set aside the data," she said.

More information: Wilma A. Bainbridge et al. Boundaries Extend and Contract in Scene Memory Depending on Image Properties, *Current Biology* (2020). DOI: 10.1016/j.cub.2019.12.004

Wilma A. Bainbridge et al. Drawings of real-world scenes during free recall reveal detailed object and spatial information in memory, *Nature Communications* (2018). DOI: 10.1038/s41467-018-07830-6

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