Review: Hybrid motion illusions as examples of perceptual conflict (#7084)

Edited by
Stuart Anstis, University of California, USA

Round 1, Review by:
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For author and editor
The status and nature of illusions has attracted a great deal of debate and disagreement in the scientific literature, more so recently following a provocative article by Oliver Braddick in 2018. The first page of the Introduction does not pick up on these recent contributions to the debate, and in any case may serve as a distraction in the context of this paper.

The main focus of the paper is the presentation of some illusions, so I would suggest abbreviating the first page so that it just acknowledges the existence of the debate, perhaps with some up-to-date references (e.g. Braddick, 2018; Todorovic, 2018; Arthur Shapiro, 2018; van Buren ad Scholl, 2018; Rogers, 2019), and then proceeds by stating (as at the top of page 2) that this paper will consider some phenomena that arise from conflicts across stimulus dimensions. (As an example of how the early content does not help but serves to distract, one could argue that conflict often does not result in an illusion, though the text implies that it does. For example, conflicts across depth cues may be resolved by averaging, Bayesian combination, winner-take-all resolution and so on).

The paper is a catalogue of the motion/contrast illusions presented by Arthur Shapiro and colleagues in recent years. As such it is a useful summary of this work but, given that the illusions have been presented previously,this paper could be an opportunity to appraise their significance as a set of effects. At present the paper focuses on descriptive aspects of the effects rather than functional aspects. If the phenomena all relate to the combination or selection of information in different spatial frequency ranges, as argued, then they could be conceptualised in terms of mid-level visual processing that must deal with information across spatial scales to generate intermediate representations (‘sketches’ etc.) that feed into higher level processes. Then the phenomena presented would ask questions about how and why information in different spatial frequency bands is used by the visual system to create mid-level representations.

So it would be good to add some consideration of relevant functional theories, or at least mention of them. For example:

- The Harmon & Julesz effect has inspired work on theories of mid-level vision.

- Certain theories of mid-level vision propose that information at different spatial frequencies is combined earlier in the stream of processing than other theories.

Do the effects reported in the paper have implications for theories mid-level vision that involve combination across frequency?

References

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Recommendation: Resubmit for Review
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Round 1, Review by:
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For author and editor
The author presents a new illusion which they call motion hybrid images. The illusion is inspired by static hybrid images (Oliva et al. 2006; Harmon & Julesz, 1973), where the high and low spatial frequency components of the image convey different information. Different percepts emerge depending on whether the high spatial frequency information is available to the visual system or not. The motion hybrid images presented by the author are created by removing the high spatial frequency components from certain moving displays through added optical blur. This makes the low spatial frequency motion in the videos visible, because it is no longer masked by the high spatial frequencies. Overall, the paper is well written and together with the supplied videos, it demonstrates the illusion compellingly. However, I have some points to address:

- Most of the videos that provide demonstrations of the effect come with blur added to the images, whereas videos 5 A – C do not. The effects in movie 5A and movie 5B work with squinting my eyes or moving away from the screen, however, I do not experience the motion capture mentioned in the paper that was supposedly demonstrated with movie 5C. This issue might be resolved by adding the 'correct' blur to the demo. In any case, the author needs to add a sentence about interindividual variability, like the one in the discussion, where the variability across observers with regards to apparent color changes is addressed ("Similar color

changes seem to occur for the motion hybrid images but might be hard to address with a small number of observers in a laboratory since there seems to be variance across observers.").

- The author claims that neurons that are sensitive to low spatial frequency motion but aren't correlates of consciousness should encode the movies the same regardless of blur, but that seems misleading to me. He states: "cortical neurons that respond to low spatial frequency motion and do not contribute directly to conscious perception should not be affected by blur, whereas neurons that respond to low spatial frequency content and are correlated with consciousness should turn on and off when the image is blurred." There might very well be neurons that respond to low spatial frequencies that are not correlates of consciousness that still turn on and off in the absence/presence of high spatial frequency content. They might for example receive input from neighboring neurons that are sensitive to high spatial frequencies (i.e., presence/absence of masking activity), or they might receive different top-down feedback depending on the presence of high spatial frequency motion. If there is a change in these other inputs, there should also be a change in the response of these low spatial frequency neurons (compare this paper for example: David, Vinje, & Gallant, 2004, Journal of Neuroscience.) This might be related to consciousness, but there is no guarantee that it is, because a change occurred not only in conscious perception but also in the stimulus. So, if one was to find a neuron sensitive to low spatial frequency motion that changed its response to the motion hybrid image depending on the presence or absence of blur, one should not conclude that this neuron is a correlate of consciousness.

- The author claims that "motion is a better signal for neuroimaging than static pictures" and I am unsure what he means by that.

Recommendation: Revisions Required
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