Material image morph and binocular integration

Hua-Chun Sun, Roland W. Fleming

Justus Liebig University Giessen, Germany

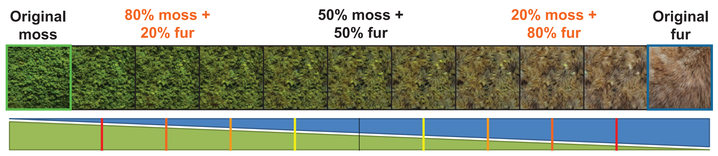
Center for Mind, Brain and Behavior (CMBB), University of Marburg, Justus Liebig University Giessen and TU Darmstadt, Germany

Introduction

- **How does the brain integrate conflicting material information presented to the two eyes?**
- **How does the visual system represent intermediate materials that lie between material categories in perceptual feature space?**

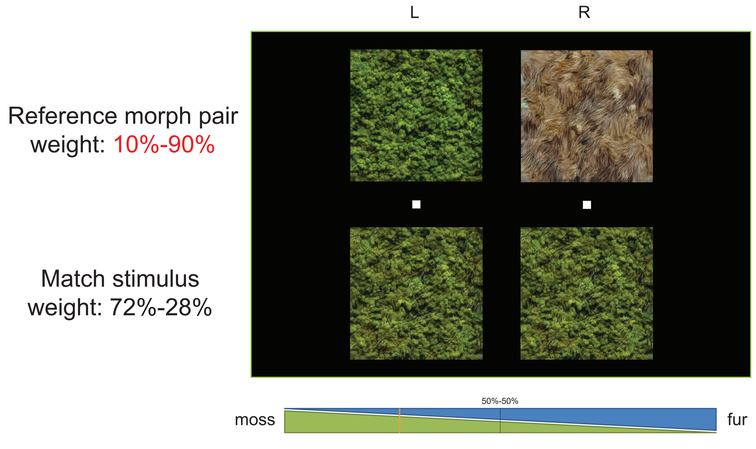
Methods

- **Stimuli**
  - 24 natural material images from the STUFF dataset (Schmidt et al., 2025)
  - 12 morph pairs from deep learning-based image interpolation (Vacher et al., 2020)



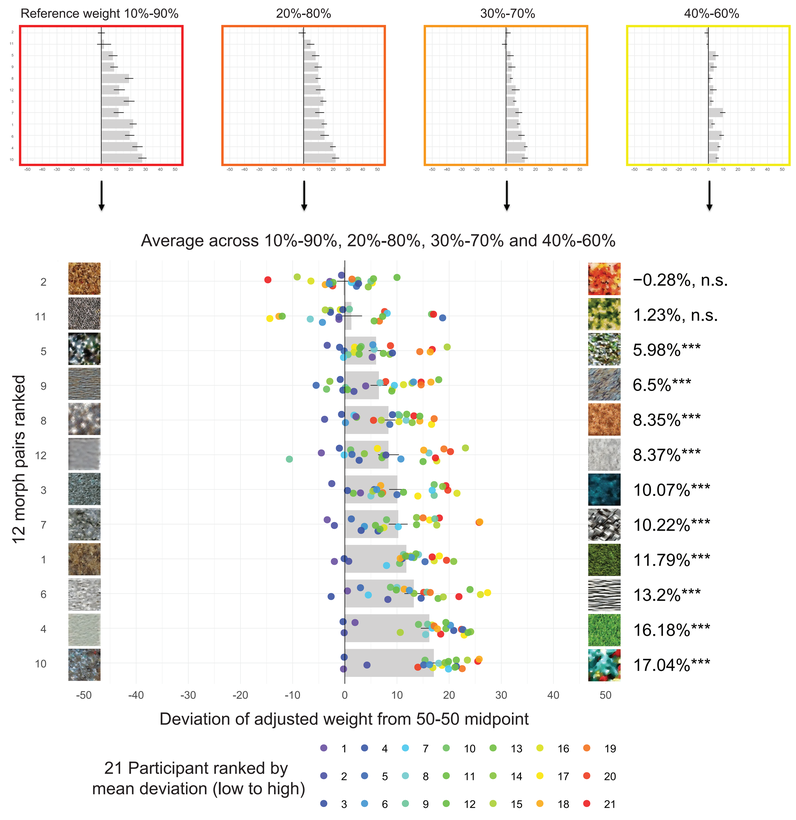
- **Procedure**

Task: adjust the bottom image to match the top image, using a stereoscope

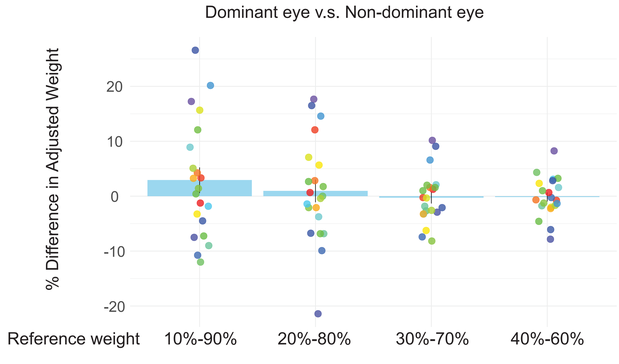


Results

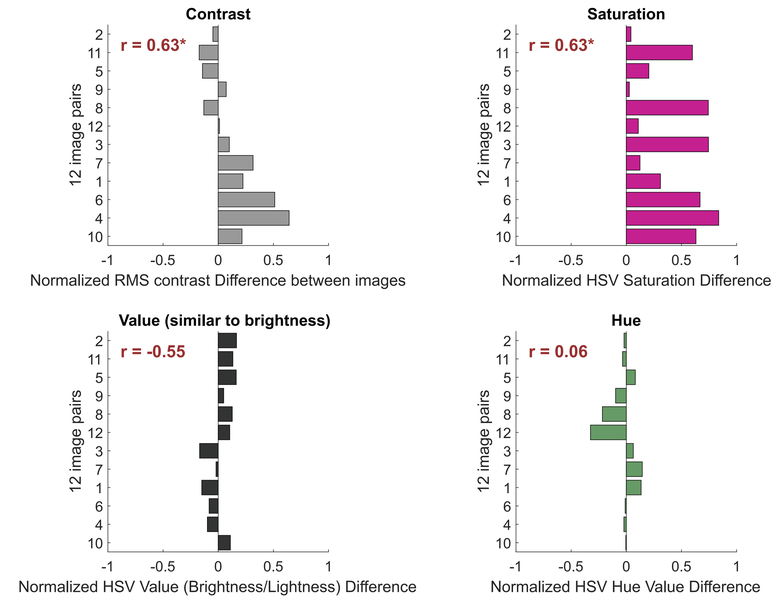
- The adjusted morph weight for the match stimuli



- Little effect of eye dominance



- Correlation with image statistics (Ref. weight 10%-90%)



- Stepwise regression analysis showing that Contrast and Saturation are the most important factors. 50% of the variance in the adjustment task results is explained by the two predictors (R^2 = 0.589; Adjusted R^2 = 0.498)

Summary

- Perceptually distinct materials presented separately to each eye can be integrated into a coherent material percept by the visual system.
- Our findings suggest that this interocular integration of material information is systematically biased by low-level image features.
- Materials with higher contrast and greater color saturation tend to be weighted more heavily in the resulting perceptual blend.

Reference

1. Schmidt, F., Hebart, M. N., Schmid, A. C., & Fleming, R. W. (2025). Core dimensions of human material perception. Proceedings of the National Academy of Sciences, 122(10), e2417202122.
2. Vacher, J., Davila, A., Kohn, A., & Coen-Cagli, R. (2020). Texture interpolation for probing visual perception Proceedings of the 34th International Conference on Neural Information Processing Systems, Vancouver, BC, Canada.

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