# Cue combination is sensitive to the reliability of cues but generally not in a statistically optimal way

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Cue combination is often modelled as parameter estimation from a normative statistical viewpoint. A number of studies argue, for example, that humans combine cues using the minimal variance unbiased estimator, i.e. Maximum Likelihood Estimation with the variances known exactly. In the present chapter we review evidence suggesting that cue combination is sensitive to the reliability of cues but only heuristically-optimality in the minimal-variance unbiased estimation sense does not hold generally.

Having observed that slant-from-texture discrimination depends on the texture type, we manipulated the reliability of the texture cue by changing the texture type. We tested whether the visual system is sensitive to the reliability within the same sensory modality, using texture and motion, and between sensory modalities using texture and haptic cues. In both cases we found little evidence for statistical optimality. What we did find, in particular for texture and haptic cues, is that cue combination is influenced as expected by the reliability of the cues. However, the much stronger claim of optimality is not met.

We argue that a quantitative, but more heuristic view of cue combination is needed that should lead us to study, for example, under what circumstances optimal behaviour may result from the heuristic cue combination rules.