An information-theoretic approach for fitting a psychometric function in a multi-dimensional transsaccadic feature space

Fabian Parth (fabian.parth@uni-marburg.de)[1], Alexander C. Schütz (alexander.schuetz@uni-marburg.de)[1] & Dominik Endres (dominik.endres@uni-marburg.de)[1]
[1]Department of Psychology, Philipps-University Marburg, Gutenbergstrasse 18,
35032 Marburg, Germany

Abstract

Due to the heterogeneous processing across the visual field, humans select potentially relevant objects in peripheral vision before they execute a saccadic eye movement to bring them to foveal vision for more fine-grained processing. Before a saccade, object features are stored to establish correspondence with the subsequent post-saccadic foveal input. This process is called transsaccadic object correspondence (TOC). To examine the relationship and weighting of different object features, a multidimensional adaptive sampling method is necessary. Based on the ideas of Paninski (2005) we introduce a novel approach combining adaptive gradient based optimization of mutual information for maximizing information gain across the parameters in every trial. We conducted an eye-tracking experiment where we use gaze selection as a response for fitting a multi-dimensional psychometric function to measure the weighting of two feature dimensions in a continuous stimulus space. Our results indicate that the relation of feature weights is not homogeneously distributed.

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