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# Real-Time 2nd-order Gaze Metrics

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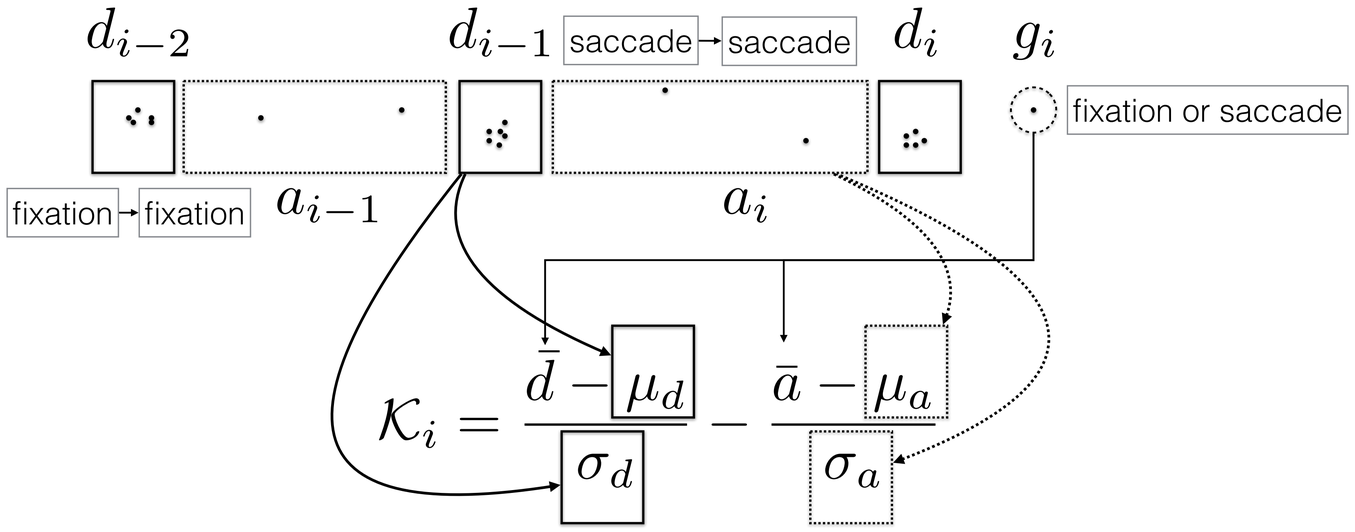
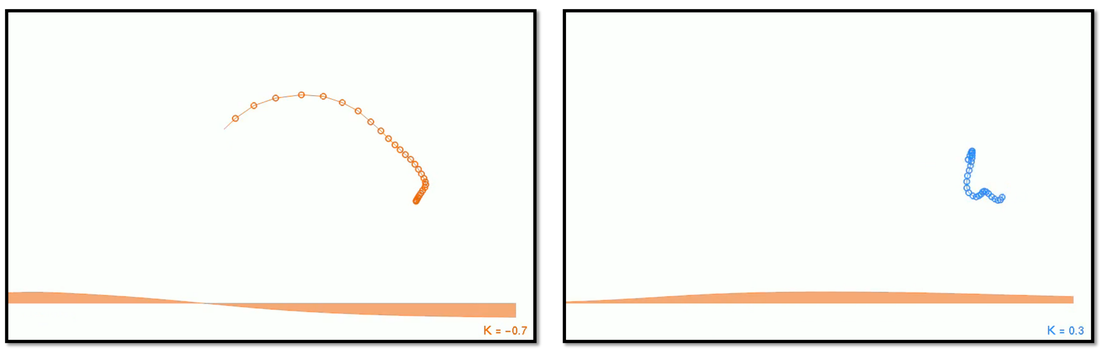
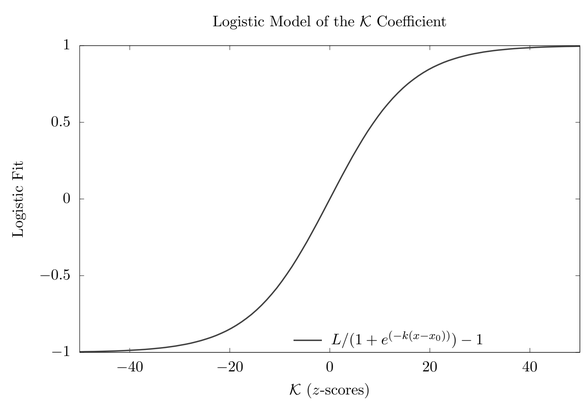
## Ambient/Focal Coefficient




Ambient movement. Focal movement

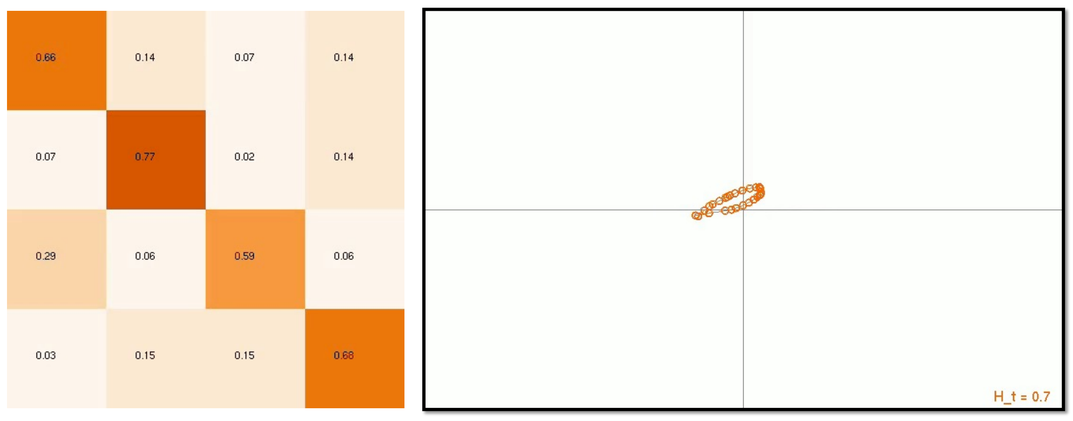
Real-time computation is similar to a windowed approach.[1] However, an instantaneous estimate relies on updating fixation duration and saccade amplitude depending on the classification of the current gaze point, as shown above.




Normalization is achieved with the use of the logistic function, similar to the squashing function using in neural networks.[2]

## Gaze Transition Entropy

$$H_t = -\frac{1}{\log_2 s} \sum_{i \in \mathcal{S}} p_i \sum_{j \in \mathcal{S}} p_{ij} \log_2 p_{ij}$$

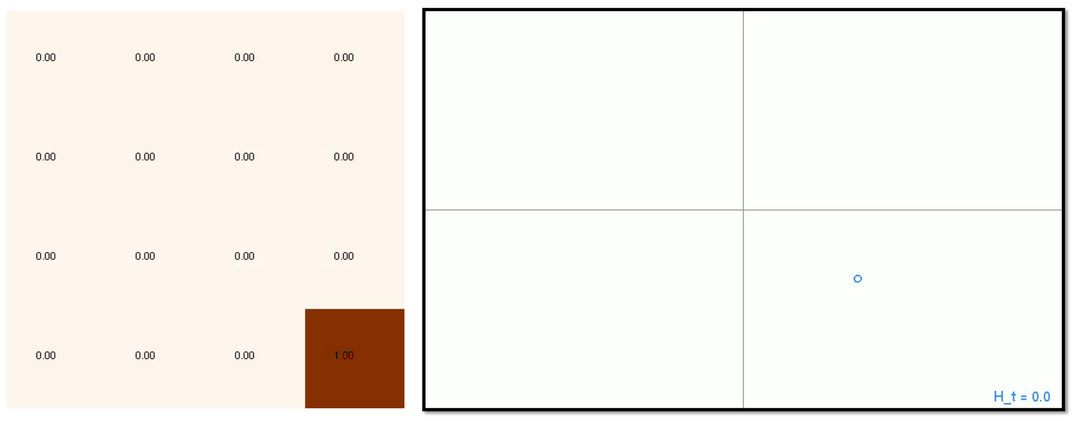



High entropy

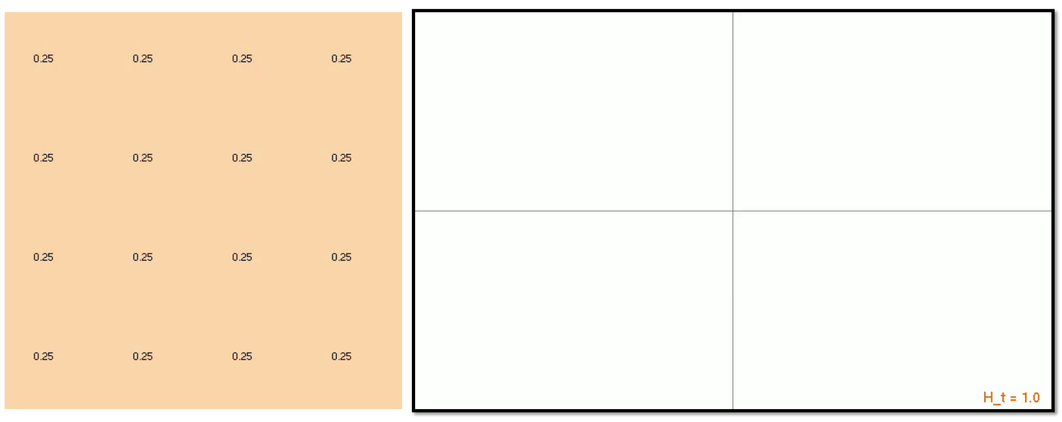
$\mathcal{S} = \{1, \ldots, s\}$ set of AOIs, with $s = |\mathcal{S}|$

$\mathbf{x} = \{x_0, \ldots, x_i, x_{i+1}, \ldots, x_n\}$ sequence of observed AOIs

$|\mathbf{x}|$ should be manageable as should $(m \times n)$ number of AOIs




Low entropy




No entropy

The present implementation corrects an earlier assumption when no particular transitions were observed,[3] however, it is preserved when no transitions are observed at all.

## Conclusion & Future Work

Both metrics require validation and tests of utility. Both metrics are suitable for context-free implementation by eye trackers lacking a scene camera. A possible improvement to entropy computation is consideration of a weight function.[4] Many applications are envisioned, falling under the auspices of human action recognition. [5,6]

[1] Abeysinghe et al. (2024) [2] Gerhsenfeld, N. A. (1998) [3] Krejtz et al. (2015) [4] Konrad et al. (2024) [5] Herath et al. (2017) [6] Masoud and Papanikolopoulos (2003)