

d_2 – a new metric for characterising retinotopic areas

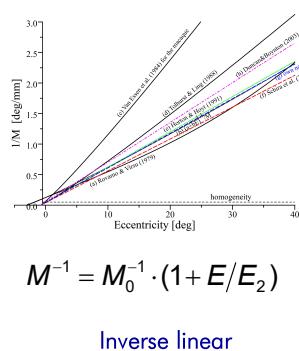
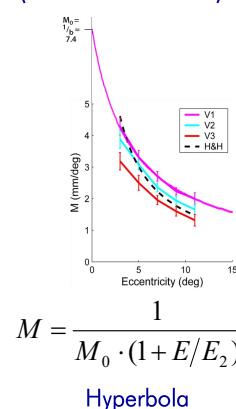
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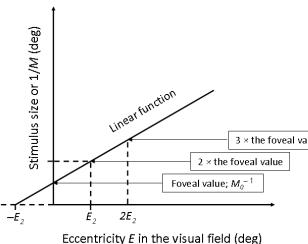
Summary

- The retino-cortical visual pathway is retinotopically organized.
- Locally, the cortical map is characterised by the cortical magnification factor (CMF) M . Its inverse increases linearly with eccentricity E .
- The latter, linear function is described by E_2 .
- Globally, locations are given by a logarithmic or exponential function (Fischer, 1973; Schwartz, 1980).
- An explicit equation for the location function was derived by Strasburger (2021).
- It can be characterised by d_2 , the cortical equivalent of E_2

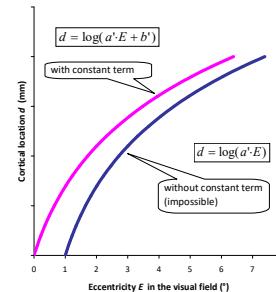
CMF function (local behaviour)



E_2 concept



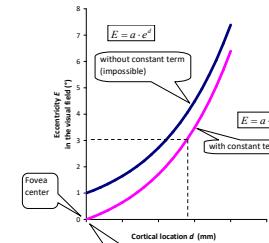
Cortical location function (global behaviour)



Log version

d_2 metric

E_2 – the visual-field location where the foveal value is doubled.
 \Rightarrow
 d_2 – the cortical-map location where the retinotopic centre's magnification factor is halved



Exponential version

Explicit new cortical loc. function

$$E = E_2 (e^{(\ln 2)d/d_2} - 1)$$

E = eccentricity in the visual field [°]
 d = distance from retinotopic centre [mm]
 M_0 = central cortical magnification factor [mm⁻¹]

$$d_2 = M_0 E_2 \ln 2$$

Link to paper

Results

... from literature re-analysis

Study	M_0 [mm ⁻¹]	E_2 [°]	d_2 [mm]
Larsson & Heeger (2006)	35.4	0.6	14.72
"	25.3	1.0	17.54
Duncan & Boynton (2003)	18.5	0.83	10.66
Schira, Tyler, Breakspear & Spehar (2009)	47.6	0.21	6.93
"	34.8	0.33	7.96
Dougherty et al. (2003, Fig. 5)	7.4	3.67	18.8

Conclusions

- Literature estimates of E_2 and M_0 vary widely
- d_2 is more stable
- d_2 characterises the map in a single number
- or a single contour (see 😊)
- and allows literature comparisons
- and species comparisons



References

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