

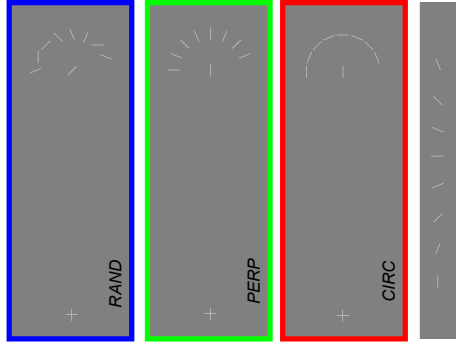
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MOTIVATION

We lack a general, comprehensive model of orientation discrimination in the periphery for targets that are arranged in a texture or along a continuous contour. Such a model is necessary for understanding the visual information available for planning eye movements in complex environments.

QUESTION
How do surrounding line elements interact with a target line element?

STIMULI



Experimental Details:

Targets were presented at 10° and were preceded by a small flashed probe to reduce spatial uncertainty

Surrounds contained lines at each of 8 possible orientations, arranged into 3 different configurations: random, perpendicular and co-circular.

The surround appeared 1, 1.5 or 2° inward (not shown) or outward of the target, with respect to fixation

Stimuli were presented for: 250ms

Observers judged the target as having one of the 8 possible orientations (chance performance is 12.5%)

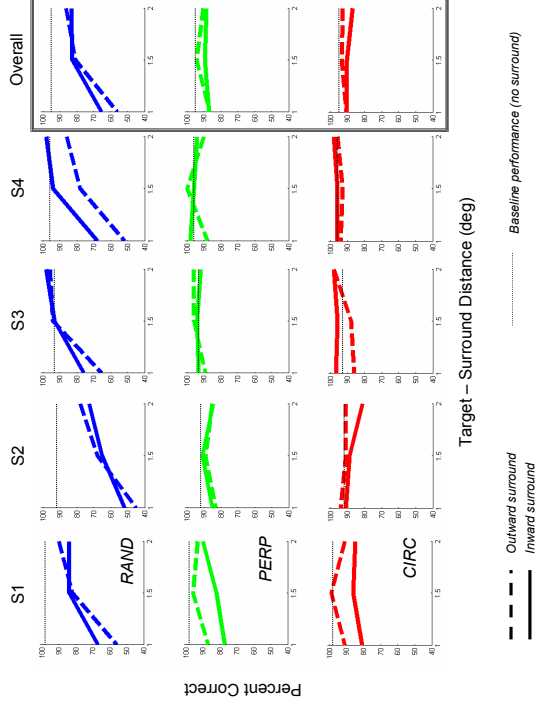
references

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funding

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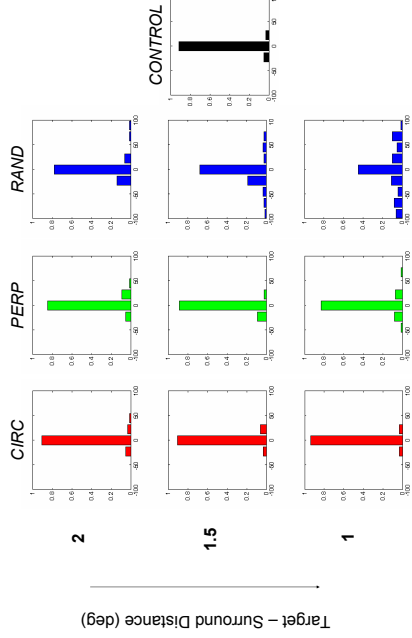
ORIENTATION DISCRIMINATION



Legend:
 - - - - - Outward surround
 - - - - - Inward surround
 Baseline performance (no surround)

DISTRIBUTION OF ERRORS

Example of distribution of identification errors. Data is from S2 for outward surrounds.

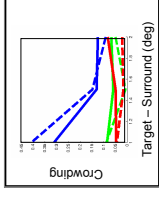


Orientation Judgment Error (deg)

SUMMARY

A random configuration of oriented lines in the surround causes crowding of the target

- Discrimination performance declined sharply at a critical distance of 1/10 the eccentricity
- More crowding occurred when surround was positioned outward (radial asymmetry)¹
- Errors were distributed to non-neighboring orientations

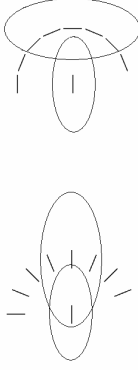


Organized surrounds (perpendicular & co-circular) reduce or eliminate crowding²

CROWDING AS GROUPING

A working hypothesis...

Crowding is a by-product of grouping by 'association fields', whose size must increase with eccentricity.



Some Supporting Observations

The observed configuration effects act early. Similar results were obtained when experiments were repeated with a brief presentation time of 40ms. Could lateral connections as early as V1 mediate contextual effects in these stimuli?

Reduction of crowding is slightly greater for co-circular than perpendicular surrounds, analogous to the stronger grouping seen for collinear versus parallel gabor targets in other studies^{3,4}.

One Challenge

Predict radial asymmetry effects of crowding in both directions, (towards and away from the fovea, e.g. S1).

CONCLUSION
Surrounds that "group" do not crowd.