**A CORF Computational Model of a Simple Cell**  
*with application to Contour Detection*

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**Contribution**
- CORF is a computational model of a simple cell.
- The proposed CORF model shares more properties with a simple cell than the Gabor Function (GF) model.

<table>
<thead>
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<tbody>
<tr>
<td>1. Orientation selectivity</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2. Cross orientation suppression</td>
<td>✓</td>
<td>✗</td>
</tr>
<tr>
<td>3. Contrast invariant orientation tuning</td>
<td>✓</td>
<td>✗</td>
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<tr>
<td>4. Response saturation</td>
<td>✓</td>
<td>✗</td>
</tr>
</tbody>
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- CORF is more effective than GF in contour detection, which is assumed to be the primary biological role of simple cells.

**Motivation**

CORF = Combination Of Receptive Fields

The local LGN activity determines which LGN receptive fields are used in the CORF model.

**CORF model**

Prototype edge  
DoG responses  
Determine local arrangement

**CORF properties**

- **Receptive field determined by simulated reverse correlation**
- **Contrast invariant orientation tuning**
- **Cross orientation suppression**

**Results of contour detection**

Examples of images from the RuG data set  

Input image  
Ground truth  
CORF output  
GF output

Matlab script of the CORF operator: http://matlabserver.cs.rug.nl/

Paired t-test statistic  
**RuG data set**: $t(39) = 4.39, p < 10^{-4}$

**GF outperforms CORF**

**References**

