Joint estimation of surface gloss and 3D shape
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Visual estimation of material properties is an ill-posed problem.

Fitting physical and rendered gloss
To match physical gloss to rendered gloss we fit the Ward BRDF parameters that matched the reflectance of our physical gloss stimuli.

Rendered stimuli

<table>
<thead>
<tr>
<th>Matched Gloss</th>
<th>Rendered 5 x 5 cm ellipsoid grids</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth</td>
<td>9 depth levels: [0.8, 1.2, ..., 4.0] cm</td>
</tr>
<tr>
<td></td>
<td>9 gloss levels: [10, 20, ..., 90] %</td>
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<tr>
<td></td>
<td>2 illumination conditions from SYNS Dataset</td>
</tr>
</tbody>
</table>

Results

Perceived depth

Perceived glossiness

Equi-gloss contours

Objects with more depth are perceived to be glossier.

Low depth values are overestimated, high depth values are underestimated.

Conclusion

Are shape and reflectance jointly estimated?

Overestimation of gloss is coupled with underestimation of depth. This is consistent with the joint estimation of shape and gloss.

References

3. SYNS Dataset: https://syns.soton.ac.uk/

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