RECOGNITION AND PERCEPTUAL USE OF SPECULAR REFLECTIONS

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Specular reflections are special image features, characterized by a combination of luminance, color, form, and relative depth and motion cues. These attributes are also rich sources of information about surface and light source geometry and composition. For example, the relative motion of specular reflections can constrain the recovery of surface curvature. A specularity on a rotating sphere viewed by a stationary observer remains stationary in the image; on a rotating elongated (flattened) ellipsoid, a specularity moves in the same (opposite) direction as the surface markings. Recent experiments have yielded conflicting results on whether the human visual system uses information from specularity attributes [Hurlbert et. al., **Inv. Ophth. Vis. Sci. Suppl,. 30:3**, 221, 1989; Blake and Bulthoff **Nature 343**, **165-168**, **1990.**) We are investigating how combinations of specularity attributes influence (a) categorical judgments of glossiness and (b) the use of specularities in higher-level shape perception tasks.

Although specularities are local, they endow surfaces with glossiness, a global property. Observers are asked to extract a measure of "mean" glossiness from images of objects with varying strengths of specular reflection and to classify each object as more or less glossy than the mean. Observers robustly perform this task. Objects are perspective projections of textured ellipsoids generated by volumetric ray-tracing with Phong shading, displayed on a high resolution CRT monitor. In experimental trials, the following parameters of the specularity are independently varied: (a) peak brightness (b) spatial profile (c) binocular horizontal and vertical relative disparities and (d) relative motion. In this way we have determined the specularity brightness contrast and spatial profile for maximal glossiness perception. By using different combinations of attributes, we have found for some observers that binocular disparity overrides brightness in determining glossiness, whereas relative motion does not. In ambiguous motion sequences of opaque objects with ambiguous surface curvature, specularities with physically correct relative motion do not disambiguate the stimulus.

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