Human shape perception

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One aspect in which human shape estimation is better than state-of-the-art computer vision algorithms, is that it is extremely stable across a wide range of complex lighting and reflectance conditions. For example, while most stereo and shape-from-shading algorithms require minimal specular reflections, the human brain, by contrast, appears to be well aware of the physics of specular reflections, to the extent that highlights actually improve human shape perception. Similarly, it is common for shape-from-shading algorithms to assume known illumination, and often collimated light (which is rarely encountered during the daytime). By contrast, human shape perception works best under complex illumination patterns.

I will present a review of some of the findings from our research group in which human shape perception is evaluated under conditions that are particularly challenging for many computer systems, including complex lighting conditions and spatially varying or non-Lambertian BRDFs. In general we find that the more complex and naturalistic the viewing conditions, the better human perception is, suggesting that there are many sources of information within shading still to be discovered. I will present the community with a few key findings from human vision that I believe any biologically motivated machine vision system should emulate.