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**Brian G Stafford\*** ([stafford@lanl.gov](mailto:stafford@lanl.gov)), Brian G. Stafford, 3015 Siringo Rd., Santa Fe, NM 87507-5038. *Category Theory for Inferring the Shape of a Light Source From an Optimized Model of its Shadow*. Preliminary report.

The unknown shape of a light source is determined by optimizing a rotated polynomial reciprocal whose origin symmetry is disrupted by four shaping parameters. These shaping parameters adjust a blurring convolution matrix representing the light source distribution. Shadow edges are determined by the blurring convolution. A 'U' shaped category theory diagram provides the context for the inverse problem of finding light source shaping parameters from the blurred shadow edges in image data. The first side of the 'U' registers the position and scale of image data to the model of a known target object in the image. The second side of the 'U' transforms a geometric model of the target to account for known effects of optical elements, adsorption, and detector blur along with the unknown shape of the light source distribution. The bottom of the 'U' compares data and model paths, providing a fitness function for optimizing all variables in the diagram. (Received August 31, 2011)