Photometric stereo under unknown lights position

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The *shape from shading* problem in Computer Vision consists of reconstructing the 3D shape of an object, starting from a set of images. This kind of procedures have important applications in many fields, among which rock art documentation in Archaeology [2]. The photometric stereo technique extracts shape and color information from pictures of an object, taken from the same point of view, but under different lighting conditions. While the classical shape restoration approach assumes the knowledge of the lights position, we will explore the situation where the position of the light sources is unknown. We will show that when at least 6 pictures of the observed object are available, the lights position can be estimated directly from the data [1]. Numerical experiments will illustrate the perfomance of the algorithm developed, on both computer generated and real-world data sets.

References

[1] A. Concas, R. Dessì, C. Fenu, G. Rodriguez, and M. Vanzi, *Identifying the lights position in photometric stereo under unknown lighting*, arXiv:1809.06933 [math.NA], 2018.

[2] R. Dessì, C. Mannu, G. Rodriguez, G. Tanda, and M. Vanzi, *Recent improvements in photometric stereo for rock art 3D imaging*. Digital Applications in Archaeology and Cultural Heritage (DAACH), 2 (2015) pp. 132–139.