Contribution ID: **24** Type: **Talk**

On the ideality of real-world datasets for photometric stereo under unknown lights position

Tuesday, 21 January 2025 15:00 (20 minutes)

Photometric stereo is a computer vision technique for reconstructing the shape of a three-dimensional object starting from digital images. Several assumptions are required but they are rarely verified in experimental datasets. Specifically, the object under observation should behave as a Lambertian reflector, with light sources positioned at an infinite distance, along known directions. In real-world scenarios these assumptions can not be satisfied, indeed is impossible to accurately measure the relative position between the light sources and the target. This situation is common in archaeological applications. Although the Hayakawa method determines an estimation of the light source position starting from the data images, in some cases it breaks down when some images deviate from ideality. To identify which images from a given dataset should be selected to produce a better reconstruction, we introduce and discuss two measures of data ideality. Then, we investigate the effectiveness of these indicators using synthetic and experimental datasets.

1. E. Crabu, F. Pes, G. Rodriguez, and G. Tanda. Ascertaining the Ideality of Photometric Stereo Datasets under Unknown Lighting. Algorithms, **16(8)**, 375 (2023).
2. E. Crabu, F. Pes, G. Rodriguez, and G. Tanda. Color reconstruction by photometric stereo with unknown lighting of rock art carvings found in two Sardinian Domus de Janas. Submitted (2024).

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Session Classification: Afternoon Session II