PHOTOGRAPHIC 3D-SCANNING IN THE WILD

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Numerous multi-view 3D reconstruction solutions are available to the general public. However, these methods cannot reconstruct high frequencies as accurately as the so-called photometric stereo (PS) method, which involves estimating the shape and reflectance of a surface from several photographs obtained from the same viewpoint, under different illumination conditions.

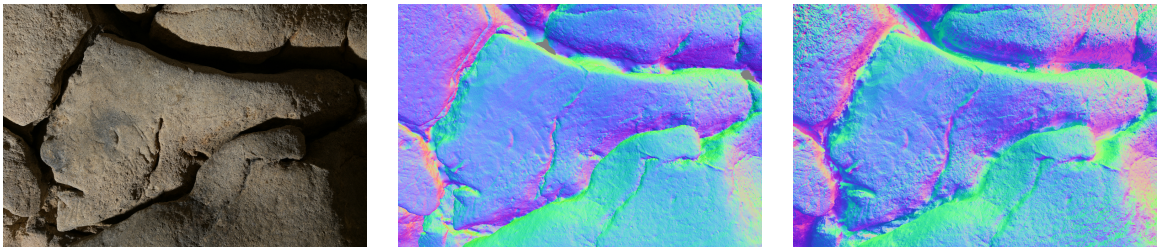

Figure 1: From left to righ: One of the 38 images used to reconstruct the archeological artefact "Le masque" (Mas d'Azil, Ariège, France); Normal map estimated by photogrammetry; Normal map estimated by PS using our approach. Fine surface details are more accurately recovered, without losing the overall structure (low frequencies) of the scene.

In order to estimate the illumination conditions at the time of shooting, it is customary to use a sphere. This approach has a number of disadvantages. First, it can be tedious to install a sphere in the scene without obscuring it. Moreover, this method estimates illumination at a single point in the scene. The latter, in the absence of any more reliable information, is then wrongly generalized to the entire scene. Poor illumination estimation degrades the low frequencies of the PS reconstruction. We therefore propose to locally estimate the illumination of the scene from a coarse reconstruction obtained by photogrammetry, in order to improve PS results.

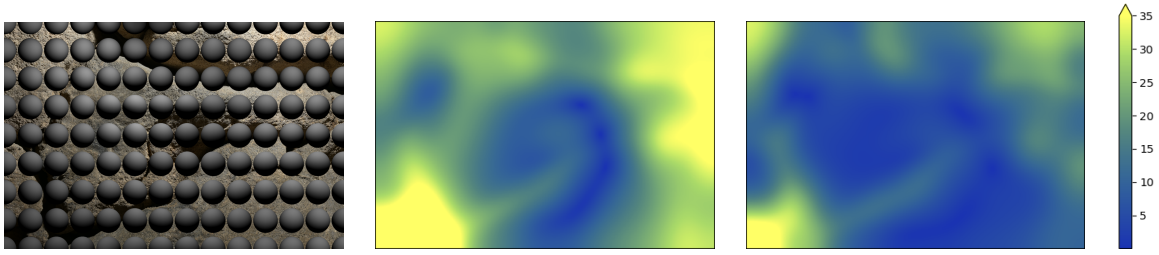

Figure 2: Left: Estimated illuminations at different points of the scene; Center and right: Angular error between PS and photogrammetric reconstructions at low frequencies, respectively using global and local estimations of the illumination.