LOW RANK AND SPARSE SPLITTING FOR GLYPH EXTRACTION

A. Azzarelli, *A.Buccini*, *A.ElHachimi*, L. Reichel
Department of Mathematics and Computer Science, University of Cagliari
09124 Cagliari, Italy
andrea.azzarelli@unica.it

This work is concerned about the extraction of archaeological glyphs from a surface by extending the approach introduced in a previous work [1]. As in that work, the input surface is decomposed into the sum of two components: a smooth surface representing the underlying general shape, and a sparse one capturing the fine details, including the glyphs. However, instead of relying on the Fractional Laplacian differential operator to extract the smooth component, we propose a novel variational framework that promotes low-rank matrices via nuclear norm minimization. This formulation leads to a convex optimization problem that is less sensitive to boundary conditions and effectively isolates the localized features associated with the glyphs. In addition, we explore non-convex sparsity models by incorporating quasi-norms ℓ_q with $q < 1$, which further enhance the separation of fine structures. We evaluate the effectiveness of the method on both synthetic and real archaeological datasets and propose strategies for reducing the computational cost of the algorithm.

References

[1] Azzarelli, A and Buccini, A.. Fractional Laplacian for petroglyphs extraction, 2025 (submitted).