An application of Shepard operator in image reconstruction

Andra Malina

Faculty of Mathematics and Computer Science, Babeș-Bolyai University &
Tiberiu Popoviciu Institute of Numerical Analysis, Romanian Academy

`andra.malina@ubbcluj.ro`

Shepard's method, introduced in [5], is one of the best ways to solve scattered data approximation problems, i.e., to reconstruct an unknown functions' values from some given scattered data. Multiple improvements were made during the time to obtain better results than the ones provided by the original method (e.g., [1], [3]). One example of improvement is the combination of the bivariate Shepard operator with inverse quadratic and inverse multiquadric radial basis functions which was introduced in [2].

Besides function approximation, another topic that uses Shepard method is the one of image reconstruction. With some ideas from [4] and [6], we will focus on reconstructing damaged black and white or color images, using the combined Shepard operator of inverse quadratic and inverse multiquadric type and evaluate the results by studying the approximation errors.

References

[1] T. Cătinaş, The bivariate Shepard operator of Bernoulli type, *Calcolo* **44**, 4 (2007), 189—202.

[2] T. Cătinaș, A. Malina, The combined Shepard operator of inverse quadratic and inverse multiquadric type, *Stud. Univ. Babeș-Bolyai Math.* **67** (2022), 579—589.

[3] R. Franke, G. Nielson, Smooth interpolation of large sets of scattered data, *Int. J. Numer. Meths. Engrg.* **15** (1980), 1691—1704.

[4] P. Paewpolsong et al., Image reconstruction by shapefree radial basis function neural networks (RBFNs), *Journal of Physics: Conference Series 2312.1* (2022).

[5] D. Shepard, A two dimensional interpolation function for irregularly spaced data, *Proc. 23rd Nat. Conf. ACM* (1968), 517—523.

[6] K. Uhlir, V. Skala, Reconstruction of damaged images using Radial Basis Functions, *13th European Signal Processing Conference* (2005), 1—4.