A PUM interpolation algorithm using a cell-based searching procedure

R. Cavoretto, and **A. De Rossi**
Department of Mathematics, University of Turin
Via Carlo Alberto 10, I–10123 Turin, Italy
alessandra.derossi@unito.it

In this paper we propose a fast algorithm for the bivariate interpolation of large scattered data sets. It is based on the *Partition of Unity Method* (PUM) [3] and involves radial basis functions as local approximants. The PUM algorithm is efficiently implemented and optimized by connecting the method itself with an effective *cell-based searching procedure*. More precisely, we construct a cell structure, which partitions the domain and strictly depends on the dimension of its subdomains, thus providing a meaningful improvement in the searching process compared to the nearest neighbour searching techniques presented in [1, 2]. In fact, this powerful algorithm and, in particular, the new searching procedure enable us a fast computation also in several applications, where the amount of data to be interpolated is often very large, up to many thousands or even millions of data. Analysis of computational complexity shows the hi! gh efficiency of the proposed interpolation algorithm. This is also supported by numerical experiments.

References

[1] G. Allasia, R. Besenghi, R. Cavoretto, A. De Rossi, *Scattered and track data interpolation using an efficient strip searching procedure*, Appl. Math. Comput. 217 (2011), pp. 5949–5966.

[2] R. Cavoretto, A. De Rossi, *Fast and accurate interpolation of large scattered data sets on the sphere*, J. Comput. Appl. Math. 234 (2010), pp. 1505–1521.

[3] G. E. Fasshauer, *Meshfree Approximation Methods with MATLAB*, World Scientific Publishers, Singapore, 2007.