Multiresolution analysis for surfaces

M. A. Fortes and M. L. Rodríguez
Department of Applied Mathematics
University of Granada
Facultad de Ciencias, C/ Severo Ochoa, s/n, Spain
miguelrg@ugr.es

Beam and Warming proved in [1] that the supercompact wavelets can exactly represent any piecewise polynomial function in one variable, generalizing the fact that Haar wavelet can exactly represent any piecewise constant function. Higher level of accuracy is attained by higher order polynomials of supercompact wavelets. Later, in [2], the authors developed an extension of the work [1] to the case of surfaces defined over uniform meshes of the domain of the surface. Such construction keeps the same advantages attained by [1] in relation with orthogonality, short support, approximation of surfaces with no border effects, detection of discontinuities, higher degree of accuracy and compressibility. The approach in [2] allows transfer information of a function between different resolution levels by means of reconstruction and decomposition algorithms stated in a multiresolution context.

Actually, we are working in generalizations of [2] in two different ways: First of all, we extend the multiresolution scheme for surfaces to the case of non-uniform meshes. On the other hand, we handle the problem of generalizing the multiresolution analysis with the aim of transfering other kinds of information, like derivative or integral values, curvatures,...between different resolution levels.

References

[1] R. M. Beam and R. F. Warming, *Multiresolution analysis and supercompact multiwavelets*, SIAM J. Sci. Comput., 22(4) (2000), pp. 1238–1268.

[2] M. A. Fortes and M. Moncayo, *Multiresolution analysis and supercompact multiwavelets for surfaces*, Journal of Computational and Applied Mathematics. Accepted for publication (2010), DOI: 10.1016/j.matcom.2010.12.02.