

25th Umbrella Symposium

for the Development of Joint Cooperation Ideas „Modeling and Simulation with emphasis on High Performance Computing And Grid Computing"

Irad Yavneh:

Title: Multiscale Methods for Image Processing

Multi-level techniques of various forms have become more and more prevalent over recent years in the framework of computational image processing. Typically, a hierarchy of representations of the problem under consideration is defined, consisting of the target problem and a collection of less detailed versions of this problem. Usually, the "coarser" versions are employed in order to obtain a good initial approximation of the sought detailed solution, in an effort to reduce computation time and/or to avoid locally optimal solutions that are significantly inferior to the global optimum. Sometimes this works well. And yet, it is often recognized that the coarse versions may be of limited utility, and might even lead us astray, due to the fact that they lack some vital information that is encoded in the fine scales.

To make good use of the coarse versions we must therefore somehow embed in them the influence of the fine-scale information on the coarse scales. This approach has been formalized and brought to efficient use in the framework of multigrid methods for partial differential equations since the 1970's, but it has not been found easy to incorporate in many other settings. In this talk we will describe some algorithms that contain such two-way flow of information across scales, and their implementation in image processing problems.