Numerical analysis for meshless methods: A survey

J.M. Melenk
Institut für Analysis und Scientific Computing, TU Wien,
Wiedner Hauptstrasse 8-10, A-1040 Wien, melenk@tuwien.as.at

ABSTRACT

Meshless methods such as the the PUM/gFEM, XFEM, RKPM, Particle PUM are generalizations of the classical FEM. Particular features include their ability to design approximation spaces that are tailored to a specific problem under consideration. Additionally, many meshless methods do not use explicitly use a mesh, thus circumventing the difficulties and costs associated with meshing. Many realizations of such meshless methods and their application to a variety of problem classes have demonstrated that these ideas can be successfully used in practice.

The numerical analysis for these nonstandard methods has made significant progress in recent years, include quadrature error analysis and the incorporation of essential boundary conditions. We will survey some of these results. Additionally, we will discuss the approximation properties of spaces that emmanate from moving least squares method and those generated by radial basis functions.