8th. World Congress on Computational Mechanics (WCCM8)
5th. European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2008)
June 30 – July 5, 2008
Venice, Italy

ADVANCES IN KRIGING-BASED FINITE ELEMENT METHOD

W. Kanok-Nukulchai

School of Engineering and Technology, Asian Institute of Technology, Pathumthani 12120, Thailand

ABSTRACT

During the last two decades, a large variety of mesh-free methods have been introduced as superior alternatives to the traditional FEM. However, the acceptance in professional practices seems to be slow due to their implementation complexities. Recently, the author and his coworkers proposed a very convenient implementation of Element-free Galerkin Method (EFGM) using the node-based Kriging interpolation (KI). Two key properties of KI are *Kronecker delta* and *consistency* properties. Due to the former, KI passes through all the nodes thus requiring no special treatment for boundary conditions. The consequence of the latter ensures reproduction of a linear interpolation if the basis function includes the constants and linear terms. In our previous studies, layers of finite elements around any node are adopted as its domain of influence. This method is referred to as Kriging-based FEM (K-FEM), which can be viewed as a generalized form of FEM. Precisely, if we limit the nodal domain of influence to only one finite element layer around the node, K-FEM specializes to the traditional FEM.

In this paper, the K-FEM was applied to solve 2D elastostatic, Reissner-Mindlin's plate and shell problems. The convergence and locking issues were discussed. In all cases, accurate displacement and stress fields can be achieved in relatively coarse meshes. In addition, the same set of Kringing functions can be used to interpolate the mesh geometry. This property is particularly useful to model curved shells. The distinctive advantage of the K-FEM is its inheritance of the computational procedure of FEM. Any existing FE code can be easily extended to K-FEM; thus, it has a higher chance to be accepted in practice.