Editorial

Advances in Finite Element Method

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The finite element method (FEM) forms an important branch of computational mechanics and applied mathematics, and it has been broadly adopted in scientific research and engineering applications. Despite the significant development in FEM over the past few decades, some key technical challenges remain outstanding, while new challenging problems are continuously emerging with the growth of new explorations in science and technology. These issues attract many researchers to make great efforts in developing novel principles, techniques, algorithms, and schemes to improve precision, efficiency, robustness, and applicability of the conventional FEM. The main focus of this special issue is on the latest ideas, developments, and applications in the field of FEM, with a special emphasis on how to solve various mathematical problems encountered in the related areas.

Thirty-five papers are accepted for publication in this special issue, which have provided a fairly complete review of the current research in developments and applications of FEM and other related numerical methods. The topics covered by this special issue include:

(i) new types of FEM and related numerical methods, including the analytical trial function (ATF) method (works of S. Cen et al. or X.-R. Fu et al. or G. Tian et al.), the quadrilateral area coordinate method (work of X.-M. Chen et al.), the X-FEM and its applications (works of Y. Liu et al. or G. Liu et al. or X. Xia et al.), the base force element method (works of Y. Liu et al. or Y. Peng et al.), and the NURBS-based isogeometric method (work of X. Li et al.);

(ii) applications of FEM in nonlinear and coupled problems, including the discontinuous Galerkin FEM in thermo-mechanical problems (work of D. Liu and Y. Liu), the contact

FEM for crack propagation (work of L. Zhao et al.), the coupled FEM-BEM method for acoustic-structure analysis (work of J. Feng et al.), the nonlinear FEM for magnetoelectric composite (work of H.-L. Wang et al.), the adaptive FEM for buckling analysis of nonuniform Bernoulli-Euler members (work of S. Yuan et al.), and the coupled ISEM-FEM method (work of Q. Zhang et al.);

(iii) stochastic FEM (work of X. Wang et al.);

(iv) structural optimization problem (work of J. Tie and Y.-K. Sui);

(v) mesh generation (work of S. Sun et al.);

(vi) high performance computing (works of Q. Song et al. or L. Zhang et al. or L. Wang et al. or L. Zhang et al. or J. Zhang and L. Zhang);

(vii) engineering applications, including analyses of soil surrounding pile in layered foundations (work of W.-J. Yao and H.-C. Zhou), asphalt pavement dynamic response (work of P. Cao et al.), a large-scale double-suction centrifugal pump (work of F.-J. Wang et al.), dynamic responses of bridges under moving vehicles (work of H. Li et al.), mechanical characteristics of rock mass (work of J. Zhang et al.), plastic and elastic responses of a jacket platform subjected to ship impacts (work of L. Li et al.), damage and failure process of concrete structure (work of F. Shen et al.), stiffness of air spring (work of H. Li et al.), dynamic response of buried fiber reinforced plastic matrix pipe under seismic load (work of L. Xu et al.), arresting gear system with multibody dynamic approach (work of W. Shen et al.), and external heat transfer of dams during construction (work of Y. Hu et al.).

We hope that the great diversity of presented topics that cover the state-of-the-art FEM research will give this special

issue a much more lasting value and make it appealing to a broad audience of researchers, practitioners, and students who are interested in FEM. We hope that each reader can find in this special issue something useful or inspiring.

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