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*Editorial*

# Advances in Finite Element Method 2016

**Song Cen,[1] Chenfeng Li,[2] Sellakkutti Rajendran,[3] and Zhiqiang Hu[4]**

[1]*AML, Department of Engineering Mechanics, School of Aerospace Engineering, Tsinghua University, Beijing 100084, China*
[2]*Zienkiewicz Centre for Computational Engineering & Energy Safety Research Institute, College of Engineering, Swansea University Bay Campus, Swansea SA1 8EN, UK*
[3]*School of Mechanical and Aerospace Engineering, Nanyang Technological University, Nanyang Avenue, Singapore 639798*
[4]*State Key Laboratory of Ocean Engineering, Shanghai Jiao Tong University, Shanghai 200240, China*

Correspondence should be addressed to Song Cen; censong@tsinghua.edu.cn

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This is the third annual special issue of "Advances in Finite Element Method" we have been editing for this journal. The first and the second special issues were published in 2014 and 2015, respectively.

The Finite Element Method (FEM) has been around for over 50 years and is now recognized as the industry standard for engineering analysis virtually for all industry sectors where numerical solutions for partial differential equations are required. Instead of briefly recapping the history, research activity, and achievement of FEM, which would be a standard practice and appropriate for an editorial note, we thought it could be more informative and more beneficial to the general readership to show the research field from a different angle, that is, its associated commercial market.

The global market for engineering software is worth about US$ 20 Bn in 2014, and it mainly includes Computer-Aided Design (CAD) software (valued at US$ 8-9 Bn), Computer-Aided Engineering (CAE) software (valued at US$ 4-5 Bn), and others (e.g., architecture, manufacturing, and electronic design, with a combined valuation of US$ 6–8 Bn). The CAE software family covers mainly FEM and CFD (Computational Fluid Dynamics) applications, which are of similar market sizes. These figures are approximate, but they do reveal a clear trend: the CAD and the CAE software families occupy about two-thirds of the global market for engineering software, where the market of CAD software is currently just under two times of the CAE and is about four times of the FEM. However, when looking at the figures of market growth, the trend is different: the CAGR (Compound Annual Growth Rate) of the CAD software market is about 8-9% currently, while the CAGR for CAE software is about 15%. Similar trend can also been observed by comparing the finance reports of Autodesk Inc. (the world's largest CAD software provider) and ANSYS Inc. (the world's largest CAE software provider): the revenue of Autodesk is about US$ 2.5 Bn in 2014 compared to US$ 0.9 Bn for ANSYS, while the annual growth rate of Autodesk is about 9% compared to 15% for ANSYS.

It was believed by some researchers in the community of computational mechanics that the global market for CAD software is at least ten times larger than that for the CAE software, and similar statements have been repeated/exaggerated in research papers and conference presentations. This argument might have been true, but the current market trend is very different. The global market of CAD software is about two times of the CAE software market, but due to the latter's much higher growth rate the gap between the two is reducing quickly. The strong and rapidly growing industrial demand for CAE software provides a major drive and continues to open up new opportunities for research work in FEM and computational mechanics in general.

This special issue only serves as a snapshot for some of the latest research work conducted by the FEM community. The following research topics are covered:

(1) Soil slope stability analysis

(2) Fracture and cracks

(3) Modelling of hydraulic fracturing

(4) Composite structures

(5) Multiphysics modelling

(6) Fluid simulation

(7) Element technology

The guest editors are very pleased to observe the increasing impact of the special issue series and hope it will remain interesting, inspiring, and beneficial to the broad readership, either as a researcher, a practitioner, or a student.

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*Song Cen*
*Chenfeng Li*
*Sellakkutti Rajendran*
*Zhiqiang Hu*