Mathematics for Industry

Volume 26

Aims & Scope

The meaning of "Mathematics for Industry" (sometimes abbreviated as MI or MfI) is different from that of "Mathematics in Industry" (or of "Industrial Mathematics"). The latter is restrictive: it tends to be identified with the actual mathematics that specifically arises in the daily management and operation of manufacturing. The former, however, denotes a new research field in mathematics that may serve as a foundation for creating future technologies. This concept was born from the integration and reorganization of pure and applied mathematics in the present day into a fluid and versatile form capable of stimulating awareness of the importance of mathematics in industry, as well as responding to the needs of industrial technologies. The history of this integration and reorganization indicates that this basic idea will someday find increasing utility. Mathematics can be a key technology in modern society.

The series aims to promote this trend by (1) providing comprehensive content on applications of mathematics, especially to industry technologies via various types of scientific research, (2) introducing basic, useful, necessary and crucial knowledge for several applications through concrete subjects, and (3) introducing new research results and developments for applications of mathematics in the real world. These points may provide the basis for opening a new mathematics oriented technological world and even new research fields of mathematics.

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Mathematical Analysis of Continuum Mechanics and Industrial Applications

Proceedings of the International Conference CoMFoS15

Springer

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Preface

The international conference CoMFoS15 was held in Fukuoka, Japan, at the Nishijin Plaza of Kyushu University, November 16–18, 2015. The name "CoMFoS" is derived from the research topics called "Continuum Mechanics Focusing on Singularities." The founding members held the first meeting, "Workshop on Fracture Criterion Viewed from Mathematics", in Ishikawa, Japan, January 27–29, 1995, to foster research cooperation among the mathematics, computer simulation, and continuum mechanics communities. The research group subsequently organized a series of CoMFoS conferences. In 2004 those activities blossomed into the foundation of a new division under the Japan Society for Industrial and Applied Mathematics (JSIAM). Finally, in 2010, the name of the division was renamed "Mathematical Sciences on Continuum Mechanics", aimed at broader exchanges among scientists and engineers, and subsequently the division has been steadily hosting a series of CoMFoS conferences.

The CoMFoS15 conference succeeded in bringing together a number of leading scientists in the field of mathematical and computational research on continuum mechanics as well as its peripheral domains such as physics, engineering, information, and experimentation. In consequence, academic scientists provided cutting-edge mathematical descriptions of phenomena in continuum mechanics for those working in industry and, in contrast, industrial researchers offered crucial aspects of core manufacturing technology to academics. In addition, the conference covered various technological aspects: fracture mechanics, shape optimization for product design, phenomena of earthquakes and tsunamis, viscoelasticity, materials science, interface mechanics, and industrial applications.

It is a particular pleasure to shed light on the important future prospects of the fields dealt with in the conference. First, several mathematical techniques developed in one field are applicable in another field. The theory and techniques either on shape optimization or on eigenvalue will be applied in a wider range of industrial problems. Second, cutting-edge mathematical theory and techniques will contribute to solving complex industrial problems in the near future. Several examples of complex industrial problems were discussed at the conference: (1) crack growth, propagation, or dislocation; (2) brittle, fragile, or viscoelastic behaviors of

materials; and (3) phase transition or phase separation. Multiscale and multiphysics techniques, in particular, are becoming increasingly useful in industry. Third, it is important to nurture scientists and engineers who can translate from industrial problems to mathematical requirements and vice versa.

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Tokyo, Japan, May 2016

Akira Takada
On behalf of the Organizing Committee of CoMFoS15

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