

Preface

Fluid Informatics is a newly created word by combining “Fluid” and “Informatics” and means a new discipline studying the fluid phenomenon using research methods in informatics. Applying the information processing using the computer, various fields have been born recently. In the bioinformatics, the genome information and protein function have been identified by means of informatics. The medical informatics has supported the management and diagnosis of the medical information. In the hydroinformatics, the information technology has been applied to the field of civil and environmental engineering with the leadership of International Association for Hydraulic Research. Fluid Informatics has also been receiving an increasing attention recently.

Fluid Informatics is required to be born because of the following three reasons: 1. Exteriorization of the fluid-related problems in various fields, 2. Complexity of the fluid-related problems, and 3. Appearance of new fluid-related problems. The world we now live demands the solution to various problems such as environment, energy, and health. Such problems often require state variables we cannot measure directly in real time. To address those problems, we need a new discipline that integrates fluid research with informatics, including numerical simulation, optimization, visualization, data mining, data assimilation, and so on.

The Institute of Fluid Science (IFS), Tohoku University, has established Transdisciplinary Fluid Integration Research Center in April 2003 with 10-year time limit. The center is responsible for research and application of Fluid Informatics to solve transdisciplinary fluid problems in various science and engineering fields, such as aerospace, energy, environment, life science, information technology, and micro and nano-technologies.

This book summarizes the ten-year research activities at seven laboratories in the center. The center consists of Integrated Fluid Informatics Laboratory, Integrated Visual Informatics Laboratory, Shock Wave Research Laboratory, Super-Real-Time Medical Engineering Laboratory, Intelligent Nano-Process Laboratory, Energy Dynamics Laboratory and Reality-Coupled Computation Laboratory. As those names of the laboratories indicate, the seven chapters cover a wide range of fluid researches. We hope the contents of the book emphasize the importance of further development of Fluid Informatics.

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Shigeru Obayashi

Director of Transdisciplinary Fluid Integration Research Center
Institute of Fluid Science, Tohoku University