

**INFORMATION  
TECHNOLOGIES  
IN MEDICINE**



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# INFORMATION TECHNOLOGIES IN MEDICINE

VOLUME I: MEDICAL SIMULATION  
AND EDUCATION

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Edited by

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## **PREFACE**

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The information technologies have made a significant impact in the areas of teaching and training surgeons by improving the physicians training and performance to better understand the human anatomy.

Surgical simulators and artificial environment have been developed to simulate the procedures and model the environments involved in surgery. Through development of optical technologies, rapid development and use of minimally invasive surgery has become widespread and placed new demands on surgical training. Traditionally physicians learn new techniques in surgery by observing procedures performed by experienced surgeons, practicing on cadaverous animal and human, and finally performing the surgery under supervision of the experienced surgeons. Note that, this is an expensive and lengthy training procedure. However, surgical simulators provide an environment for the physician to practice many times before operating on a patient. In addition, virtual reality technologies allow the surgeon in training to learn the details of surgery by providing both visual and tactile feedback to the surgeon working on a computer-generated model of the related organs.

A most important use of virtual environments is the use of the sensory ability to replicate the experience of people with altered body or brain function. This will allow practitioners to better understand their patients and the general public to better understand some medical and psychiatric problems.

In this volume, we will focus on the applications of information technologies in medical simulation and education.

The first chapter by R. Robb discuss the interactive visualization, manipulation, and measurement of multimodality 3-D medical images on computer workstations to evaluate them in several biomedical applications. It gives an extensive overview of virtual reality infrastructure, related methods and algorithms and their medical applications.

The second chapter by A. C. M. Dumay presents the extensive overview of the virtual environments in medicine and the recent medical applications of virtual environments.

The third chapter by A. N. Marsh covers the virtual reality and its integration into a 21st century telemedical information society. It outlines a possible framework for how the information technologies can be incorporated into a general telemedical information society.

The fourth chapter by J. M. Rosen discusses the virtual reality and medicine challenges with the specific emphases on how to improve the human body

models for medical training and education. It also discuss the grand challenge in virtual reality and medicine for the pathologic state of tissues and the tissue's response to interventions.

The fifth chapter by G. Faulkner presents the details of a virtual reality laboratory for medical applications including the technical components of a virtual system, input and output devices.

The sixth chapter by M. Yoshizawa et al. discusses the medical applications of virtual reality in Japan, including the computer aided surgery, applications of virtual reality for medical education, training and rehabilitation.

The seventh chapter by E. Jovanov et al. presents the multimodal interactive environment for perceptualization of biomedical data based on the virtual reality modelling language head model with sonification to emphasize temporal dimension of selected visualization scores.

The eight chapter by H. Hoffman discusses a new virtual environment, Anatomic VisualizeR designed to support the teaching and learning of 3-D structures and complex spatial relationships.

The last chapter by R. M. Satava presents extensive reviews of current and emerging medical devices and technologies and major challenges in medicine and surgery in the 21st century.

We thank the authors for their valuable contributions to this volume and George Telecki, the Executive Editor and Shirley Thomas, Senior Associate Managing Editor of John Wiley & Sons, Inc. for their valuable support and encouragement throughout the preparation of this volume.

METIN AKAY

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