Preface

Motor capabilities of a person include dexterity, reaching, and stretching, as well as locomotion. A significant number of individuals of all ages confront permanent, occasionally or transiently functional motor limitations. The number of persons with motor disabilities is not inconsiderable. For example, studies in Europe show that 0.4% of the general population are wheelchair users, 5% cannot walk without an aid, 0.3% cannot use fingers, 0.1% cannot use the arm, 2.8% have reduced strength and 1.4% have reduced coordination. Moreover, 0.3% of the general population are speech impaired due mainly to a motor limitation of their articulators. The range of these disabilities expands from mild or moderate to severe loss of capability. The variation by age indicates that 50% of those over 75 years old experience some loss of motor capability. Some of them have multiple disabilities.

Computer-based Assistive Technology offers devices, tools, equipment, and services that can be used to maintain, increase, or improve the functional capabilities of people with motor limitations. The last few decades there is an increasing strong interest in the domain of Assistive Technology for the disabled. This interest comes from the industry, academia, and a number of various professional disciplines, such as rehabilitation sciences, occupational therapists, computer engineers (mainly developers of human-computer interfaces, Web designers, and Web content providers), ergonomists, and teachers in inclusive and special education. The main forces that boost this interest come from:

1. The relative, universal, and national legislation and policy framework for the benefit of the disabled and their societal inclusion and participation.
2. The problem of increasing the demographic figures of the aging population, given that the number of the disabled rises drastically for those above 65 years old.

In recent years, the field of Assistive Technologies and computer access for motor disabilities has made significant progress in consolidating theoretical approaches, scientific methods, and technologies, as well as in exploring new application domains.

Information and Communication Technologies (ICT) face two challenges concerning those with motor disabilities:

1. To provide smart Assistive Technologies for improving their day-life at home, leisure, work, and school.
2. To not exclude or divide them from the Information Society (i.e. to provide accessibility means to the Web content and the Internet services).

Two important pillars that assist ICT to achieve Web accessibility are the relative accessibility international standards and in the methodological perspective, the Design for All or Universal Design approach. The last one plays a significant role towards the reduction of the cost of the Assistive Technologies. We have also to take into account that the recent and emerging ICT technological approaches are

dealing with all kinds of motor limitations including the situation-based (occasionally or transient loss of motor functionality) along with the entire diverse spectrum of the user devices (personal computers, notebooks, mobile phones, etc.).

In the framework of the above, this book covers the principles, methods, and technological solutions of informatics for all those with motor impairments or limitations. These Assistive Technologies comprise a twofold scope: firstly, to enable a more independent daily life (either at home or at school and work place) and secondly, they offer an inclusive participation to the benefits of the information society covering web content accessibility and accessible internet services (email, chatting, e-government, e-learning, etc.). It presents recent and emerging personal Assistive Technologies, smart accessible environmental adaptations and developments based on the design-for-all (or universal design) approach. The breadth of the book contents includes software and hardware solutions for desktop, laptop, notebooks, and tablet computers as well as for mobile telephones and embedded microprocessors/controllers.

In a collection of eleven chapters, this book discusses how to systematically apply design principles, methodologies, and tools in the domain. It explains the various dimensions of diversity in the technological platforms and contexts of use, including trends in mobile interaction and ambient intelligence environments. Novel interaction methods and techniques for computer access for individuals with motor limitations are analyzed, and a variety of applications in diverse domains are discussed.

The chapters of this book covers: haptic and gesture-based Assistive Technologies, scanning-based interaction techniques, technologies for brain-injured gamers, gaze-based Assistive Technologies, sensor Assistive Technologies, head and face tracking interfaces, pointing in graphical user interfaces, facial expression natural user interfaces, environmental control, and the impact of Assistive Technology on independence and employment.

This publication is integrated with its pair book *Disability Informatics and Web Accessibility for Motor Limitations* which covers: the formal representation of Assistive Technology, functional assessment approaches for the motor disabled, solutions for ambient assisted living, techniques for affective computer-mediated learning, Augmentative and Alternative Communication systems, indoor navigation and location based services, motion-tracking and performing arts for the motor impaired, robotic systems, technologies for the Autism Spectrum Disorders, and Web accessibility.

This book targets audiences from the industry, academia, and a variety of professionals such as advanced students, researchers, system designers and developers, professionals and practitioners in the rehabilitation engineering, computer science and engineering (mainly developers of human-computer interfaces, Web designers and Web content providers), occupational therapists ergonomists, teachers in inclusive and special education, clinical engineers, and health care providers.

The contents of this book reflect recent developments, consolidate present knowledge, and point towards new perspectives for the future in the domain of assistive technology and computer access for motor limitations. As an indispensable source of information for interdisciplinary and cross-thematic study, this book provides a baseline for further in-depth studies, as well as an important educational tool in an increasingly globalized research and development environment.

Georgios Kouroupetroglou
University of Athens, Greece