

Zero-Effort Technologies

*Considerations, Challenges, and Use in Health,
Wellness, and Rehabilitation*, Second Edition

Synthesis Lectures on Assistive, Rehabilitative, and Health-Preserving Technologies

Editor

Ron Baecker, *University of Toronto*

Advances in medicine allow us to live longer, despite the assaults on our bodies from war, environmental damage, and natural disasters. The result is that many of us survive for years or decades with increasing difficulties in tasks such as seeing, hearing, moving, planning, remembering, and communicating.

This series provides current state-of-the-art overviews of key topics in the burgeoning field of assistive technologies. We take a broad view of this field, giving attention not only to prosthetics that compensate for impaired capabilities, but to methods for rehabilitating or restoring function, as well as protective interventions that enable individuals to be healthy for longer periods of time throughout the lifespan. Our emphasis is in the role of information and communications technologies in prosthetics, rehabilitation, and disease prevention.

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ABSTRACT

This book introduces zero-effort technologies (ZETs), an emerging class of technologies that require little or no effort from the people who use them. ZETs use advanced computing techniques, such as computer vision, sensor fusion, decision-making and planning, machine learning, and the Internet of Things to autonomously perform the collection, analysis, and application of data about the user and/or his/her context. This book begins with an overview of ZETs, then presents concepts related to their development, including pervasive intelligent technologies and environments, design principles, and considerations regarding use. The book discusses select examples of the latest in ZET development before concluding with thoughts regarding future directions of the field.

KEYWORDS

zero-effort technologies (ZETs), pervasive computing, artificial intelligence, disability, health, rehabilitation, wellness

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Preface

In the 1980s, a new field of research in the area of technology and health emerged, with the aims of mitigating the effects of disease and improving rehabilitation outcomes. In the 1990s, assistive technologies (ATs) were defined as a specific class of artefacts intended to improve function for people with disabilities. More recently, the terminology has expanded beyond ATs to include quality of life and ambient assistive living (AAL) technologies, signaling the rise of a new wave of sensor-based and intelligent systems. Accordingly, over the years, technologies have ranged from simple reminding devices to help with scheduling and medication management to advanced robotic systems to support motor, sensory, and cognitive function. Regardless of the terminology, the objective has remained the same: to help people achieve their goals.

Effective, appropriate, and accepted technology solutions should offer support without increasing the workload for people living with disabilities, caregivers, and clinicians. However, using these technologies has often increased the effort required by users or transferred the effort to someone else, such as a caregiver. As a result, many devices that are intended to help are not adopted or soon abandoned by their users. In response, researchers from various fields have recognized the need for usable devices, developed with direct input from users throughout the design process; and for advanced techniques, reducing explicit user interactions.

Fields such as computer science and biomedical engineering are expanding rapidly and with them the bounds of what can be achieved with new technologies for healthcare and rehabilitation continues to grow. Incorporating advances such as artificial intelligence is greatly reducing—and in some instances eliminating—the amount of effort required to operate the technology. This book explores the exciting emerging field of zero-effort technologies (ZETs); technologies that leverage advances across multiple disciplines and sectors to provide seamless and effortless support to the people who are using them. It is through technologies such as ZETs that we gain a glimpse the future of pervasive, personalised, and holistic support for health and wellbeing.

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