

By George A. Bekey

Springer Handbook of Robotics

Bruno Siciliano and Oussama Khatib, Editors, Springer-Verlag 2008. ISBN: 978-3-540-23957-4.

Robotics has come of age. It is now clear that it is not a passing fancy but rather that robots in one form or another are finding their way into more and more aspects of society. Robots are in the factory, in the home, on the battlefield, and many more venues, performing an incredible array of tasks, many of which were inconceivable even 20 years ago. What is perhaps even more remarkable than the enormous range of applications is that the field has grown up with a solid foundation in physics and mathematics. This may be because most robots were born in university laboratories around the world, where thousands of students enabled them to perceive, process information, learn, move, manipulate, and perform a wide range of tasks before they became sufficiently robust and reliable to become commercial products. Now, theory and applications, fundamental work in universities, and technology developed in the industry are mature enough to attempt a consolidated view of the entire field. This handbook accomplishes this task beautifully, both in style and substance.

The handbook is a very large and truly encyclopedic work, covering all aspects of robotics, from fundamental principles to applications. The book's 1,600 pages are subdivided into seven parts: Part A: Robotics Foundations, Part B: Robot Structures, Part C: Sensing and Perception, Part D: Manipulation and Interfaces, Part E: Mobile and Distributed Robotics, Part F: Field and Service Robotics, and Part G: Human-Centered and Life-Like Robotics. Each of the seven parts is subdivided into multiple chapters, all written by experts in their fields

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throughout the world. This reviewer tried to find aspects of robotics not treated in the book, and he failed: it is indeed a remarkably complete view of the field. The book also has four forewords by leading contributors to robotics, including Hirochika Inoue from Japan, Georges Giralt from France, and Bernard Roth and Rodney Brooks from the United States. They provide a most valuable introduction to the handbook from their perspective and experience, as all of them are among the founders of the field.

One may view the contents in another way. The first two parts provide the mathematical and physical fundamentals of robotics, including not only kinematics and dynamics and an introduction to motion planning and system architectures but also treatments of the physical elements of robots, such as mechanisms, hands, legs, and wheels. The third part deals extensively with sensors. The next two parts concern basic and applied issues in manipulation, grasping, motion planning and control, and distributed systems. Part F deals with what we might call contemporary applications, in space, under water, in agriculture, medicine, rehabilitation, and others. These are the applications that many people view as representing the significant impact of robotics on society. In Part G, these areas are supplemented by problems that still present major research challenges, including humanoid robots, human-robot interaction, neurorobotics, and a discussion of robot ethics.

This amazing book does an incredible job of balancing theory and practice throughout. It should be an immensely valuable reference for students and practitioners of robotics for many years to come.

TC SPOTLIGHT

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The new event promoted by the IEEE Robotics and Automation Society (RAS) jointly with the EMBS, the International Conference on Biomedical Robotics and Biomechanics (BioRob conference), which took place in Pisa, Italy, 20–22 February 2006, explicitly included a dedicated track on rehabilitation and assistive robotics, which was very successful.

Both the rehabilitation and the assistive robotics fields have already produced several commercial spin-offs, which brought to the market advanced systems that are currently being validated in extensive clinical trials worldwide.

The Rehabilitation and Assistive Robotics Technical Committee (TC) was the recipient of the RAS 2008 Most Active

TC award. The committee was established in 2001 as the Rehabilitation Robotics TC. The name was changed this year to reflect the scientific progress and maturity reached by this broad research area. The TC currently has about 450 registered members worldwide and welcomes new members. See the Web site at http://www-arts.sssup.it/IEEE_TC_RehaRob/.

Recent activities of the TC include workshops at ICRA 2007 in Rome, technical sponsorship of the First EURON Summer School on Rehabilitation Robotics, and special issue on Socially Assistive Robotics (*Autonomous Robots*, January 2007), *Rehabilitation Robotics (Journal of Neuroengineering and Rehabilitation)*, and *IEEE Transactions on Neural Systems and Rehabilitation Engineering* (September 2006).