Preface

Since one of the goals of robotics research is to realize the robot that can automatically work like a human, the research on the motion planning for a humanoid robot is considered to be essential and important. However, the motion planning for a humanoid robot can be quite difficult due to their complex kinematics, dynamics and environment. It is consequently one of the key research topics in humanoid robotics research and the last few years have witnessed considerable progress in the field. This book surveys the remarkable recent advancement in both the theoretical and the practical aspects of humanoid motion planning. Various motion planning frameworks are presented in this book, including one for skill coordination and learning, and one for manipulating and grasping tasks.

This book is composed of 10 chapters written by different robotics researchers. The editors organized workshop on motion planning for humanoid robots in conjunction with the IEEE-RAS International Conference on Humanoid Robots (Humanoids) on 29 November 2007 in Pittsburg, USA. The goal of this workshop was to provide an opportunity to discuss the recent advances in humanoid motion planning from both theoretical and experimental points of view. We were pleased to have 10 presentations by qualified researchers of humanoid motion planning. After the workshop, we asked Springer-Verlag to publish a book related to this workshop. The research workers, including the speaker of the workshop, agreed to each write a chapter for this book.

Several new advances are included in each chapter. Chestnutt looks at gait planning and locomotion for navigating humanoid robots through complicated and rough terrain. Sentis describes torque-level control realizing multi-contact behaviors. Gienger *et al*. reviews some elements for a movement control and planning architecture. Yoshida *et al*. describe the research results on planning whole-body locomotion, reaching, and manipulation. Vahrenkamp *et al*. present a motion planning framework for manipulating and grasping tasks. Escande *et al*. investigate the problem of planning sequences of contacts that support acyclic motion in a highly constrained environment. Harada presents motion planning based on a biped walking pattern generator. Stilman describes the autonomous manipulation of moving obstacles. Hauser *et al*. present a motion planner that enables a humanoid robot to

push an object to a desired location on a cluttered table. Kallmann *et al*. present a motion planning framework for skill coordination and learning. The editors would like to express the sincere thanks to all the authors of this book for their excellent contributions.

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