Contents

Robot Motion Planning and Control: Is It More than a Technological Problem? ........................................ 1
Mehdi Benallegue, Jean-Paul Laumond and Nicolas Mansard

Part I Geometry, Action and Movement

Several Geometries for Movements Generations. ....................... 13
Daniel Bennequin and Alain Berthoz

On the Duration of Human Movement: From Self-paced to Slow/Fast Reaches up to Fitts’s Law. .................. 43
Frédéric Jean and Bastien Berret

Geometric and Numerical Aspects of Redundancy ...................... 67
Pierre-Brice Wieber, Adrien Escande, Dimitar Dimitrov and Alexander Sherikov

Part II Numerical Analyzis and Optimization

Some Recent Directions in Algebraic Methods for Optimization and Lyapunov Analysis ......................... 89
Amir Ali Ahmadi and Pablo A. Parrilo

Positivity Certificates in Optimal Control ................................. 113
Edouard Pauwels, Didier Henrion and Jean-Bernard Lasserre

The Interplay Between Big Data and Sparsity in Systems Identification ................................................. 133
O. Camps and M. Sznaier
Part III  Foundation of Human Movement

Inverse Optimal Control as a Tool to Understand Human Movement ............................................ 163
Katja Mombaur and Debora Clever

Versatile Interaction Control and Haptic Identification in Humans and Robots ........................................ 187
Yanan Li, Nathanael Jarrassé and Etienne Burdet

The Variational Principles of Action ........................................ 207
Karl Friston

Modeling of Coordinated Human Body Motion by Learning of Structured Dynamic Representations ........ 237
Albert Mukovskiy, Nick Taubert, Dominik Endres, Christian Vassallo, Maximilien Naveau, Olivier Stasse, Philippe Souères and Martin A. Giese

Physical Interaction via Dynamic Primitives ........................................ 269
Neville Hogan

Human Control of Interactions with Objects – Variability, Stability and Predictability ..................................... 301
Dagmar Sternad

Part IV  Robot Motion Generation

Momentum-Centered Control of Contact Interactions ................. 339
Ludovic Righetti and Alexander Herzog

A Tutorial on Newton Methods for Constrained Trajectory Optimization and Relations to SLAM, Gaussian Process Smoothing, Optimal Control, and Probabilistic Inference ................. 361
Marc Toussaint

Optimal Control of Variable Stiffness Policies: Dealing with Switching Dynamics and Model Mismatch ................. 393
Andreea Radulescu, Jun Nakanishi, David J. Braun and Sethu Vijayakumar