

Contents

Robot and Cognitive Approaches to Spatial Mapping	
<i>Margaret E. Jefferies, Wai K. Yeap</i>	1

Part I: Robot Mapping

Robot Mapping: An Introduction	
<i>Raja Chatila</i>	9
1 Simultaneous Localization and Mapping	
<i>Sebastian Thrun</i>	13
2 Hybrid, Metric-Topological Representation for Localization and Mapping	
<i>Nicola Tomatis</i>	43
3 Machine Perception in Unstructured and Unknown Environments	
<i>Steven Scheding, Richard Grover, Hugh Durrant-Whyte</i>	65
4 Emergent Cognitive Mappings in Mobile Robots Through Self-organisation	
<i>Ulrich Nehmzow</i>	83
5 Towards a Generalization of Self-localization	
<i>Diedrich Wolter, Christian Freksa, Longin Jan Latecki</i>	105

Part II: Cognitive Mapping

Dead Reckoning, Cognitive Maps, Animal Navigation and the Representation of Space: An Introduction	
<i>Charles R. Gallistel</i>	137

6	Geometry and Navigation	
	<i>Ken Cheng</i>	145
7	Cue and Goal Encoding in Rodents: A Source of Inspiration for Robotics?	
	<i>Etienne Save, Vincent Hok, Sophie Renaudineau, Carole Parron, Bruno Poucet</i>	163
8	These Maps Are Made for Walking – Task Hierarchy of Spatial Cognition	
	<i>Sabine Gillner, Hanspeter A. Mallot</i>	181
9	Landmarks for Navigation in Human and Robots	
	<i>Stephen C. Hirtle</i>	203
10	Learning Cognitive Maps: Finding Useful Structure in an Uncertain World	
	<i>Eric Chown, Byron Boots</i>	215

Part III: Cognitive Robot Mapping

Cognitive Robot Mapping: An Introduction		
	<i>Benjamin Kuipers</i>	239
11	An Intellectual History of the Spatial Semantic Hierarchy	
	<i>Benjamin Kuipers</i>	243
12	Robot Cognitive Mapping – A Role for a Global Metric Map in a Cognitive Mapping Process	
	<i>Margaret E. Jefferies, Jesse Baker, Wengrong Weng</i>	265
13	Using a Mobile Robot to Test a Theory of Cognitive Mapping	
	<i>Wai K. Yeap, Chee K. Wong, Jochen Schmidt</i>	281
14	A Robot System for Biomimetic Navigation – From Snapshots to Metric Embeddings of View Graphs	
	<i>Mathias O. Franz, Wolfgang Stürzl, Wolfgang Hübner, Hanspeter A. Mallot</i>	297
15	Robots as Tools for Modelling Navigation Skills – A Neural Cognitive Map Approach	
	<i>Verena V. Hafner</i>	315
Author Index		325