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Srikanta Patnaik

Robot Cognition and Navigation

An Experiment with Mobile Robots

With 95 Figures, and 7 Tables

 Springer

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To my wife

Priti

and my sons

Sritam and Priyam

Preface

This book is meant for graduate and undergraduate students. It contains eighteen chapters, covering robot simulation, experiments and modelling of mobile robots. It starts with the cybernetic view of robot cognition and perception. Chapter 2 discusses map building, which is necessary for the robot to sense and represent its surrounding. Chapter 3 describes path planning in a static environment and a path planning technique using quad-trees. Chapter 4 discusses robot navigation using genetic algorithm techniques.

Chapter 5 briefly covers the robot programming package along with hardware details for the robot experiments. Socket programming and the multithreading concept are also briefly explained for robot programming. Chapter 6 covers a client–server program for robot parameter display. Chapter 7 covers the BotSpeak program and Chap. 8 covers gripper programs. Chapter 9 covers the program for Sonar reading display. Chapter 10 covers the robot program for wandering within the environment and Chap. 11 describes the program for tele-operation. A complete navigation program has been explained in Chap. 12 utilizing all the functions of the earlier chapters.

Chapter 13 describes the techniques for imaging geometry. Image formation and the camera perspective matrix in 3D is covered in the chapter. Chapter 14 describes the program for image capture through the robot's stereo camera. Chapter 15 describes the minimal representation of a 2D line, a 3D line and a 3D plane. The chapter also describes the techniques for reconstruction of 3D points, 3D lines and 3D planes using the Kalman filter. A correspondence problem has also been highlighted in the chapter. The program for 3D perception using the Kalman filter is given in Chap. 16. Chapter 17 describes robot perception for non-planar surfaces. In Chap. 18, a real-time application of the mobile robot is given.

The detailed source codes of various programs mentioned in the book are available in the website (<http://www.springer.com/3-540-23446-2>).

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India, February 2007

Srikanta Patnaik

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