CONTENTS OF VOLUME I

1. The Dynamic Programming Algorithm

- 1.1. Introduction
- 1.2. The Basic Problem
- 1.3. The Dynamic Programming Algorithm
- 1.4. State Augmentation
- 1.5. Some Mathematical Issues
- 1.6. Notes, Sources, and Exercises

2. Deterministic Systems and the Shortest Path Problem

- 2.1. Finite-State Systems and Shortest Paths
- 2.2. Some Shortest Path Applications
 - 2.2.1. Critical Path Analysis
 - 2.2.2. Hidden Markov Models and the Viterbi Algorithm
- 2.3. Shortest Path Algorithms
 - 2.3.1. Label Correcting Methods
 - 2.3.2. Auction Algorithms
- 2.4. Notes, Sources, and Exercises

3. Deterministic Continuous-Time Optimal Control

- 3.1. Continuous-Time Optimal Control
- 3.2. The Hamilton Jacobi Bellman Equation
- 3.3. The Pontryagin Minimum Principle
 - 3.3.1. An Informal Derivation Using the HJB Equation
 - 3.3.2. A Derivation Based on Variational Ideas
 - 3.3.3. The Minimum Principle for Discrete-Time Problems
- 3.4. Extensions of the Minimum Principle
 - 3.4.1. Fixed Terminal State
 - 3.4.2. Free Initial State
 - 3.4.3. Free Terminal Time
 - 3.4.4. Time-Varying System and Cost
 - 3.4.5. Singular Problems
- 3.5. Notes, Sources, and Exercises

4. Problems with Perfect State Information

- 4.1. Linear Systems and Quadratic Cost
- 4.2. Inventory Control
- 4.3. Dynamic Portfolio Analysis
- 4.4. Optimal Stopping Problems
- 4.5. Scheduling and the Interchange Argument
- 4.6. Notes, Sources, and Exercises

.. .1

5. Problems with Imperfect State Information

- 5.1. Reduction to the Perfect Information Case
- 5.2. Linear Systems and Quadratic Cost
- 5.3. Minimum Variance Control of Linear Systems
- 5.4. Sufficient Statistics and Finite-State Markov Chains
- 5.5. Sequential Hypothesis Testing
- 5.6. Notes, Sources, and Exercises

6. Suboptimal and Adaptive Control

- 6.1. Certainty Equivalent and Adaptive Control
 - 6.1.1. Caution, Probing, and Dual Control
 - 6.1.2. Two-Phase Control and Identifiability
 - 6.1.3. Certainty Equivalent Control and Identifiability
 - 6.1.4. Self-Tuning Regulators
- 6.2. Open-Loop Feedback Control
- 6.3. Limited Lookahead Policies and Applications
 - 6.3.1. Flexible Manufacturing
 - 6.3.2. Computer Chess
- 6.4. Approximations in Dynamic Programming
 - 6.1.1. Discretization of Optimal Control Problems
 - 6.4.2. Cost-to-Go Approximation
 - 6.4.3. Other Approximations
- 6.5. Notes, Sources, and Exercises

7. Introduction to Infinite Horizon Problems

- 7.1. An Overview
- 7.2. Stochastic Shortest Path Problems
- 7.3. Discounted Problems
- 7.4. Average Cost Problems
- 7.5. Notes, Sources, and Exercises

Appendix A: Mathematical Review

Appendix B: On Optimization Theory

Appendix C: On Probability Theory

Appendix D: On Finite-State Markov Chains

Appendix E: Least-Squares Estimation and Kalman Filtering

Appendix F: Modeling of Stochastic Linear Systems