

Contents

PREFACE	xi
ACKNOWLEDGMENTS	xiii

Introduction

Objectives	1
The Problem of Optimal Search	2
Example	3
Outline of Chapters	8

Chapter I Search Model

1.1. The Target Distribution	17
1.2. Detection	22
1.3. Basic Search Problem	32
Notes	34

Chapter II Uniformly Optimal Search Plans

2.1. Optimization by the Use of Lagrange Multipliers	35
2.2. Uniformly Optimal Search Plans for Regular Detection Functions	41
2.3. Optimal Search with Uncertain Sweep Width	59
2.4. Uniformly Optimal Search Plans for the General Case	70
Notes	81

Chapter III Properties of Optimal Search Plans

3.1. An Interpretation of Lagrange Multipliers	84
3.2. Maximum Probability Search	87

3.3. Incremental Optimization	91
3.4. Multiple Constraints	96
Notes	100

Chapter IV Search with Discrete Effort

4.1. Model for Search with Discrete Effort	102
4.2. Uniformly Optimal Search Plans	104
4.3. Minimizing Expected Cost to Find the Target	110
4.4. Optimal Whereabouts Search	114
Notes	116

Chapter V Optimal Search and Stop

5.1. Optimal Search and Stop with Discrete Effort	119
5.2. Optimal Search and Stop with Continuous Effort	130
Notes	135

Chapter VI Search in the Presence of False Targets

6.1. False-Target Models	137
6.2. Criterion for Optimality	145
6.3. Optimal Nonadaptive Plans	146
6.4. Optimization Theorems	155
6.5. Examples	162
6.6. Semiadaptive Plans	165
Notes	177

Chapter VII Approximation of Optimal Plans

7.1. Approximations That Are Optimal in a Restricted Class	179
7.2. Incremental Approximations	189
Notes	196

Chapter VIII Conditionally Deterministic Target Motion

8.1. Description of Search Problem	198
8.2. Uniformly Optimal Plans When the Target Motion Is Factorable	202
8.3. Optimal Plans within $\psi(m_1, \infty, K)$	213
8.4. Necessary and Sufficient Conditions for t -Optimal Search Plans	217
Notes	219

Chapter IX Markovian Target Motion

9.1. Two-Cell Discrete-Time Markovian Motion	222
9.2. Two-Cell Continuous-Time Markovian Motion	229
9.3. Continuous-Time Markovian Motion in Euclidean N -Space	231
Notes	233

<i>Contents</i>	ix
Appendix A Reference Theorems	235
Appendix B Necessary Conditions for Constrained Optimization of Separable Functionals	
B.1. Necessary Conditions for the Discrete Space J	238
B.2. Necessary Conditions for the Continuous Space X	241
Notes	244
References	245
AUTHOR INDEX	251
SUBJECT INDEX	255
NOTATION INDEX	259