# Table of Contents


**Preface** ..... **ix**

**1. Introduction to Game AI** ..... **1**
Deterministic Versus Nondeterministic AI 2
Established Game AI 3
The Future of Game AI 4

**2. Chasing and Evading** ..... **6**
Basic Chasing and Evading 7
Line-of-Sight Chasing 9
Line-of-Sight Chasing in Tiled Environments 10
Intercepting 20

**3. Pattern Movement** ..... **27**
Standard Algorithm 28
Pattern Movement in Tiled Environments 30
Pattern Movement in Physically Simulated Environments 38

**4. Flocking** ..... **52**
Classic Flocking 53
Flocking Example 55
Obstacle Avoidance 73
Follow the Leader 76

**5. Potential Function-Based Movement** ..... **80**
How Can You Use Potential Functions for Game AI? 80
Chasing/Evading 82

Obstacle Avoidance 87
Swarming 89
Optimization Suggestions 94

**6. Basic Pathfinding and Waypoints** **96**
Basic Pathfinding 96
Breadcrumb Pathfinding 101
Path Following 109
Wall Tracing 115
Waypoint Navigation 120

**7. A* Pathfinding** **126**
Defining the Search Area 126
Starting the Search 128
Scoring 132
Finding a Dead End 141
Terrain Cost 141
Influence Mapping 146
Further Information 148

**8. Scripted AI and Scripting Engines** **149**
Scripting Techniques 149
Scripting Opponent Attributes 150
Basic Script Parsing 151
Scripting Opponent Behavior 154
Scripting Verbal Interaction 157
Scripting Events 162
Further Information 164

**9. Finite State Machines** **165**
Basic State Machine Model 165
Finite State Machine Design 168
Ant Example 170
Further Information 187

**10. Fuzzy Logic** **188**
How Can You Use Fuzzy Logic in Games? 190
Fuzzy Logic Basics 192
Control Example 205
Threat Assessment Example 207

**11. Rule-Based AI ..... 212**
Rule-Based System Basics 214
Fighting Game Strike Prediction 218
Further Information 226

**12. Basic Probability ..... 228**
How Do You Use Probability in Games? 228
What is Probability? 232
Probability Rules 238
Conditional Probability 242

**13. Decisions Under Uncertainty—Bayesian Techniques ..... 244**
What is a Bayesian Network? 245
Trapped? 249
Treasure? 254
By Air or Land 258
Kung Fu Fighting 262
Further Information 267

**14. Neural Networks ..... 269**
Dissecting Neural Networks 274
Training 285
Neural Network Source Code 289
Chasing and Evading with Brains 305
Further Information 315

**15. Genetic Algorithms ..... 316**
Evolutionary Process 317
Evolving Plant Life 321
Genetics in Game Development 327
Further Information 347

**Appendix: Vector Operations ..... 349**

**Index ..... 359**