

- Acknowledgments p. XI
- Introduction p. XIII
- 1 Welcome to Competition Robots p. 1
  - What Is a Robot? p. 5
  - Combat Robot Competitions p. 5
  - The Scope of This Book p. 17
- 2 Getting Started p. 21
  - The Robot Design Approach p. 23
  - Top Ten Reasons Why a Robot Fails p. 34
  - Sources of Robot Parts p. 35
  - Cost Factors in Large Robot Construction p. 35
  - Safety p. 36
- 3 Robot Locomotion p. 41
  - Robots with Legs p. 42
  - Tank Treads: The Power of a Caterpillar Bulldozer in a Robot p. 45
  - Wheels: A Tried and True Method of Locomotion p. 47
- 4 Motor Selection and Performance p. 61
  - Electric Motor Basics p. 62
  - Internal Combustion Engines p. 76
  - Conclusion p. 77
- 5 It's All About Power p. 79
  - Battery Power Requirements p. 80
  - Battery Capacity Basics p. 83
  - Electrical Wiring Requirements p. 91
  - Battery Types p. 92
  - Installing the Batteries: Accessible vs. Nonaccessible p. 100
- 6 Power Transmission: Getting Power to Your Wheels p. 103
  - Power Transmission Basics p. 106
  - Chain Drive Systems p. 115
  - Belt Drive Systems p. 118
  - Gearboxes p. 122
- 7 Controlling Your Motors p. 127
  - Relay Control p. 128
  - Variable Speed Control Basics p. 139
- 8 Remotely Controlling Your Robot p. 157
  - Traditional R/C Controls p. 158
  - Control Channels p. 160
  - AM, FM, PCM, and Radio Interference p. 167
  - Radio Interference and Reliable Control p. 170
  - Antennas and Shielding p. 173
  - Innovation First Isaac Robot Controller and Other Radio Modems p. 175
  - Failsafe Compliance p. 179
- 9 Robot Material and Construction Techniques p. 183
  - Metals and Materials p. 184
  - General Machining Operations p. 193
  - When in Doubt, Build It Stout p. 201

- 10 Weapons Systems for Your Robot p. 203
- Weapon Strategy and Effectiveness p. 204
- Closing Remarks on Weapons p. 236
- 11 Autonomous Robots p. 239
- Using Sensors to Allow Your Robot to See, Hear, and Feel p. 241
- Implementing Sensors in Combat Robots p. 248
- Semiautonomous Target and Weapon Tracking p. 250
- Autonomous Target Tracking p. 253
- More Information p. 257
- 12 Robot Brains p. 259
- Microcontroller Basics p. 260
- Microcontroller Applications p. 268
- Summary p. 273
- 13 Robot Sumo p. 275
- Modifying an R/C Servo for Continuous Rotation p. 281
- Building a Mini Sumo p. 284
- Mini Sumo Body Assembly p. 284
- Remote-Control Mini Sumo p. 285
- Autonomous Mini Sumo p. 286
- Edge Detector p. 286
- Object Detector p. 290
- Sensor Integration p. 293
- Performance Improvements p. 297
- Various Mini Sumo Robots p. 297
- Motors p. 299
- Motor Controllers p. 299
- Ultrasonic Range Detectors p. 300
- Infrared Range Detectors p. 301
- Laser Range Finding and Vision Systems p. 301
- Advanced Software Algorithms p. 301
- Traction Improvements p. 302
- Robot Part Suppliers p. 302
- 14 Real-Life Robots: Lessons from Veteran Builders p. 305
- Ronni Katz--Building Chew Toy p. 306
- Pete Miles--Building Live Wires p. 316
- 15 Afterword p. 329
- The Future of Robot Combat p. 330
- A Prototyping Electronics p. 335
- Breadboarding and Using Prototyping Boards for Electronic Circuits p. 336
- Wire-Wrapping Prototyping p. 337
- Soldering for Robots p. 337
- Crimp-Style Connectors p. 339
- Static Sensitivity p. 340
- B Resources and References p. 343
- Robot Competition Web Sites p. 344
- Electric Motor Sources p. 344

- Battery Suppliers p. 346
- Electronic Speed Controller Vendors p. 346
- Remote Control System Vendors p. 347
- Mechanical Systems Suppliers p. 347
- Electronics Suppliers p. 348
- Microcontroller Suppliers p. 350
- Reference Books p. 350
- Robotics Organizations p. 351
- Other Robotics Resources p. 352
- C Helpful Formulas p. 355
- Chain Drive Centerline Distances p. 356
- Timing Belt Centerline Distances p. 357
- V-Belts p. 357
- Index p. 358