

## Contents

Preface	v
Who is this book for?	v
What do you need?	v
What is in this book?	v
How should you use this book?	vi
Trademark Attributions	vi
Contents	vii
Chapter 1: Foundational Concepts	1
1.1 ROBOTIS Hardware Design Approach	2
1.2 ROBOTIS Software Design Approach	5
1.2.1 STEAMCUP Overview	5
1.2.2 Brief Tour of R-BLOCK	7
1.3 Sense-Think-Act Paradigm	14
Chapter 2: Fishes in the Sea	16
2.1 Assembly Notes	16
2.2 Mechanism Usage	17
2.3 Ideas For Further Explorations	18
2.3.1 Motion Phases	18
2.3.2 Varying Linkage Lengths	18
2.3.3 Challenge for the Reader	19
2.4 Standards Alignment	19
2.5 Reference Materials	19
Chapter 3: Fishing Rod	20
3.1 Assembly Notes	20
3.2 Mechanism Usage	21
3.3 Motion Platform Features	22
3.4 Ideas For Further Explorations	23
3.4.1 Varying Linkage Lengths	23
3.4.2 Challenges for the Reader	23
3.4.3 Looking Forward	24
3.5 Standards Alignment	24
3.6 Reference Materials	24
Chapter 4: Dinosaur	25
4.1 Assembly Notes	25
4.2 Mechanism Usage	27
4.3 Motion Platform Features	28

4.4 Ideas For Further Explorations	28	
4.4.1 Varying Linkage Lengths	28	
4.4.2 Looking Forward	29	
4.5 Standards Alignment	30	
4.6 Reference Materials	30	
Chapter 5: Knight	31	
5.1 Assembly Notes	31	
5.2 Mechanism Usage	33	
5.3 Motion Platform Features	34	
5.4 Ideas for Further Explorations	34	
5.4.1 Coordinating Shield and Sword Motions	34	
5.4.2 Varying Linkage Lengths	35	
5.4.3 Combining 4-Bar Linkages >> Boxer	36	
5.4.4 Looking Forward	39	
5.5 Standards Alignment	40	
5.6 References	40	
Chapter 6: Forklift	42	
6.1 Assembly Notes	42	
6.2 Mechanism Usage	43	
6.3 Motion Platform Features	43	
6.4 Ideas for Further Explorations	44	
6.4.1 Looking Forward	44	
6.5 Standards Alignment	45	
6.6 References	45	
Chapter 7: Bulldozer	46	
7.1 Assembly Notes	46	
7.2 Mechanism Usage	47	
7.3 Motion Platform Features	47	
7.4 Ideas for Further Explorations	48	
7.4.1 Varying Linkage Lengths	48	
7.4.2 Looking Forward	48	
7.5 Standards Alignment	49	
7.6 References	49	
Chapter 8: Excavator	50	
8.1 Assembly Notes	50	
8.2 Mechanism Usage	51	
8.3 Motion Platform Features	53	
8.4 Ideas for Further Explorations	54	
8.4.1 Varying Linkage Lengths	54	

8.4.2 Looking Forward	54
8.5 Standards Alignment	55
8.6 References	55
Chapter 9: Helicopter	56
9.1 Assembly Notes	56
9.2 Looking Forward	57
9.3 Standards Alignment	58
9.4 References	58
Chapter 10: Catapult	60
10.1 Mechanism Usage	60
10.2 Looking Forward	61
10.3 Standards Alignment	62
10.4 References	62
Chapter 11: Bow	64
11.1 Assembly Notes	64
11.2 Looking Forward	64
11.3 Standards Alignment	65
11.4 References	65
Chapter 12: Cannon	66
12.1 Assembly Notes	66
12.2 Mechanism Usage	66
12.3 Motion Platform Features	67
12.4 Looking Forward	68
12.5 Standards Alignment	69
12.6 References	69
Chapter 13: Double-Decker Bus	70
13.1 Assembly Notes	70
13.2 Motion Platform Features	72
13.3 Looking Forward	72
13.4 Standards Alignment	73
13.5 References	73
Chapter 14: Dancing Brave	74
14.1 Mechanism Usage	74
14.2 Looking Forward	75
14.3 Standards Alignment	76
14.4 References	76
Chapter 15: Crocodile	78
15.1 Assembly Notes	78
15.2 Mechanism Usage	78

15.3 Ideas For Further Explorations	79
15.3.1 Varying Linkage Lengths	79
15.3.2 Looking Forward	79
15.4 Standards Alignment	80
15.5 Reference Materials	80
Chapter 16: Guitar	82
16.1 Assembly Notes	82
16.2 Motion Platform Features	83
16.3 Mechanism Usage	83
16.4 Ideas For Further Explorations	84
16.4.1 Varying Linkage Lengths	84
16.4.2 Looking Forward	85
16.5 Standards Alignment	85
16.6 Reference Materials	85
Chapter 17: Train	88
17.1 Assembly Notes	88
17.2 Motion Platform Features	89
17.3 Looking Forward	89
17.4 Standards Alignment	90
17.5 References	90
Chapter 18: Using R-BLOCK	92
18.1 Construction of Basic Knight Robot	92
18.2 R-BLOCK Menu System (RB-86)	93
18.2.1 CONTROL Blocks	95
18.2.2 CALCULATION and VARIABLE Blocks	96
18.2.3 FUNCTION Blocks	97
18.2.4 SENSING Blocks	98
18.2.5 MOTION Blocks	99
18.2.6 SCREEN, SOUND and LINE Blocks	101
18.3 Learning R-BLOCK Programming Basics	102
18.3.1 Sequence Control	103
18.3.2 Motion Control Level 2, Function & Time Delay	106
18.3.3 Using Variables & Conditional Structure IF	108
18.3.4 Using Main Endless Loop	110
18.4 Beginner's Approach for R-BLOCK Projects	115
18.4.1 Sense-Think-Act Paradigm (RB-86)	115
18.4.2 Reactive Control	116
18.4.3 Event-Action Pairs	116
18.4.4 Sensor-Actuator Pairs	117

18.4.5 Event-Programming Approach	118
18.4.6 Application to Escaping Spinning Top	119
18.5 Remote Control Options	124
18.5.1 Clap based Remote Control	124
18.5.2 RC-300 based Remote Control	129
18.6 Object Detection & Line Tracking	138
18.6.1 Avoider	138
18.6.2 Smart Avoider	146
18.6.3 Line Trackers	152
18.7 Position Control of Servo Motors	160
18.8 Standards Alignment	163
18.9 References	163