

Contents

	Foreword	xiii
	Preface	xvii
	About the Author	xx
	Acknowledgements	xx
	Contributor Biography	xxii
Chapter 1	Software Patterns	1
	The Concept of a Software Pattern	2
	Pattern Description, Organization and Categorization	8
	Summary	10
Chapter 2	A Brief Introduction to Parallel Programming	11
	Parallel Programming	12
	Factors that Influence the Performance of a Parallel Program	12
	Advantages and Disadvantages of Parallel Programming	23
	Summary	25
Chapter 3	Architectural Patterns for Parallel Programming	27
	Parallel Pipes and Filters	28
	Parallel Layers	41
	Communicating Sequential Elements	54
	Manager–Workers	67
	Shared Resource	79
	Summary	93

Chapter 4	Design Patterns for Communication Components	95
	Shared Variable Pipe	96
	Multiple Local Call	103
	Message Passing Pipe	114
	Multiple Remote Call	124
	Shared Variable Channel	136
	Message Passing Channel	145
	Local Rendezvous	156
	Remote Rendezvous	165
	Summary	173
Chapter 5	Some Idioms for Synchronization Mechanisms	175
	Semaphore	177
	Critical Region	185
	Monitor	192
	Message Passing	199
	Remote Procedure Call	208
	Summary	217
Chapter 6	Two Case Studies	219
	Blood Vessel Segmentation	220
	Adaptive 3D Grid-Based Eulerian (Gasdynamic) Program	249
	Summary	297
Chapter 7	Parallel Software Design	299
	A General Parallel Software Design Process	300
	A Pattern-Based Parallel Software Design Method	302
	Problem Analysis	305
	Coordination Design – Architectural Patterns	315
	Communication Design – Design Patterns	327
	Detailed Design – Idioms	340
	Implementation and Evaluation	349
	Summary	357
Chapter 8	Parallel Software Architecture	359
	A Definition of Parallel Software Architecture	359
	Parallel Software Design	361
	Summary	366

Chapter 9	Directions in Patterns for Parallel Programming	367
	The Situation in Software Design	368
	Design Experience and Techniques	369
	A Tangible Description for Parallel Software Systems	371
	The Need for Measurement in Parallel Software Design	372
	Final Remarks	374
	Glossary	377
	Notations	393
	References	397
	Index of Patterns	409
	Index	411