

---

# Contents

<b>1</b>	<b>Basic Concepts of Computer Science</b>	1
<b>2</b>	<b>Designing Algorithms</b>	7
2.1	Case Study: Currency Conversion	7
2.2	The First Smalltalk Program	8
2.2.1	Entering Program Text	10
2.2.2	Executing Programs	11
2.2.3	Adding Flexibility to the Currency Conversion	14
2.3	Case Study: Solving a Quadratic Equation	16
2.3.1	The Algorithm	17
2.3.2	The Program	18
2.3.3	Generalising the Solving of Quadratic Equations	20
2.4	Summary	27
<b>3</b>	<b>Basics of Object-Oriented Programming Using Smalltalk</b>	31
3.1	Objects, Messages, Methods	32
3.1.1	Messages	36
3.1.2	Case-by-Case Distinctions	39
3.1.3	Blocks	40
3.1.4	Creating Objects—Classes	40
3.2	Literals	45
3.3	Variables and Assignments	49
3.4	Assignment Semantics	53
3.4.1	Using Object Explorer	56
<b>4</b>	<b>Repetitions</b>	59
4.1	Searching for a Maximum Value	60
4.2	Additional Smalltalk Messages for Loops	73
4.2.1	Count Loops	73

4.2.2	Interval Run . . . . .	74
4.2.3	Collection Run . . . . .	75
<b>5</b>	<b>The VisualWorks Development Environment . . . . .</b>	<b>77</b>
5.1	Overview . . . . .	77
5.2	Starting the Development Environment . . . . .	79
5.3	Launcher with Transcript . . . . .	80
5.3.1	Creating One's Own Image . . . . .	80
5.3.2	Setting System Parameters . . . . .	81
5.3.3	Using Transcript . . . . .	83
5.4	Workspace . . . . .	85
5.5	Inspector . . . . .	86
5.6	The Debugger . . . . .	88
5.7	System Browser . . . . .	88
<b>6</b>	<b>Examining a Sample Class: Circle . . . . .</b>	<b>97</b>
6.1	Class Hierarchies and Inheritance . . . . .	97
6.2	Implementing Methods . . . . .	101
6.3	Alternative Implementation of the Class Circle . . . . .	108
<b>7</b>	<b>Defining New Classes . . . . .</b>	<b>113</b>
7.1	Case Study: Currency Conversion . . . . .	114
7.1.1	Creating a New Class . . . . .	115
7.1.2	Individualised Class Methods for Creating Instances . . . . .	121
7.1.3	Defining Instance Methods . . . . .	124
7.1.4	Expanding the Converter . . . . .	128
7.2	Case Study: Cinemas . . . . .	130
7.2.1	Analysis of the Problem Description . . . . .	130
7.2.2	Implementation . . . . .	133
7.3	Defining Class Variables . . . . .	139
<b>8</b>	<b>Class Hierarchies—Inheritance—Polymorphism . . . . .</b>	<b>143</b>
8.1	The Smalltalk Class Hierarchy . . . . .	144
8.1.1	Structure . . . . .	144
8.1.2	Smalltalk's Number Concept . . . . .	145
8.1.3	The Integer Classes . . . . .	150
8.1.4	The Classes Float, Double and Fraction . . . . .	156
8.1.5	Methods Common to All Number Classes . . . . .	157
8.1.6	Mixed Expressions . . . . .	161
8.1.7	Truth Values . . . . .	163
8.1.8	Characters and Character Strings . . . . .	166
8.1.9	Date and Time . . . . .	171
8.2	Abstract and Concrete Classes . . . . .	174
8.3	Generic Methods . . . . .	177

---

8.4	Polymorphism . . . . .	179
8.5	Case Study: Quadratic Equations . . . . .	180
8.5.1	The Class <code>QuadrEquat</code> . . . . .	182
8.5.2	Classes for Solution Objects . . . . .	185
8.5.3	The Solution Methods . . . . .	189
8.5.4	Examples of Applications . . . . .	191
8.5.5	Use of Inheritance and Polymorphism . . . . .	193
8.5.6	Test Programs as Class Methods . . . . .	193
8.5.7	Error Management . . . . .	195
<b>9</b>	<b>Debugging Smalltalk Programs . . . . .</b>	<b>199</b>
9.1	Syntax Errors . . . . .	199
9.2	Unknown Variables . . . . .	200
9.3	Unknown Message Selectors . . . . .	201
9.4	Exceptions . . . . .	202
9.5	Debugging Methods . . . . .	203
<b>10</b>	<b>Containers . . . . .</b>	<b>211</b>
10.1	Unordered Collections . . . . .	213
10.1.1	The Class <code>Set</code> . . . . .	213
10.1.2	The Class <code>Bag</code> . . . . .	216
10.1.3	The Class <code>Dictionary</code> . . . . .	217
10.2	Ordered Collections . . . . .	223
10.2.1	The Class <code>Array</code> . . . . .	226
10.2.2	The Class <code>OrderedCollection</code> . . . . .	227
10.2.3	The Class <code>SortedCollection</code> . . . . .	230
10.2.4	The Class <code>Interval</code> . . . . .	232
10.2.5	The Class <code>String</code> . . . . .	234
10.2.6	The Class <code>Symbol</code> . . . . .	234
10.3	Transforming Collections . . . . .	234
10.4	Case Study: Cinemas . . . . .	235
10.4.1	Assignment: Display all Cinemas in Transcript . . . . .	236
10.4.2	Assignment: Display the Profits of a Specific Cinema . . . . .	243
10.4.3	Assignment: Display all Cinemas Arranged by Size . . . . .	246
<b>11</b>	<b>Additional Smalltalk Basics . . . . .</b>	<b>249</b>
11.1	Blocks . . . . .	249
11.1.1	Blocks as Objects . . . . .	249
11.1.2	Blocks with Parameters . . . . .	251
11.1.3	Applications . . . . .	253
11.1.4	Case Study of a Finite-State Automaton . . . . .	255
11.2	Inheritance—Method Search . . . . .	264
11.2.1	Rules for the Method Search . . . . .	267
11.2.2	The Meaning of the Pseudo-variables <code>self</code> and <code>super</code> . . . . .	267

11.3	Metaclasses . . . . .	269
11.4	Object Identity . . . . .	272
11.4.1	Equality Versus Identity . . . . .	273
11.4.2	Equality of Objects of Self-Defined Classes . . . . .	277
11.4.3	Object Copies . . . . .	279
<b>12</b>	<b>Algorithmic Excursus: Recursion . . . . .</b>	<b>285</b>
12.1	Recursive Algorithms . . . . .	286
12.2	Correctness of Recursive Algorithms . . . . .	293
12.3	Recursive Thinking . . . . .	295
12.4	Infinite Structures . . . . .	296
<b>13</b>	<b>Streams and Files . . . . .</b>	<b>299</b>
13.1	Sequential Access to Ordered Collections . . . . .	300
13.2	Sequential Access to Files . . . . .	303
<b>14</b>	<b>Structure of Smalltalk Programs . . . . .</b>	<b>307</b>
14.1	Standard Method Protocols . . . . .	308
14.2	The <code>printOn:</code> Framework . . . . .	311
14.3	Transferring Partial Algorithms to Independent Methods . . . . .	315
14.4	User Interfaces—The Model-View-Controller Paradigm . . . . .	321
14.5	Relationships Among Classes . . . . .	324
14.5.1	Inheritance . . . . .	324
14.5.2	Association . . . . .	328
14.5.3	Aggregation . . . . .	329
<b>15</b>	<b>Systematic Testing . . . . .</b>	<b>333</b>
15.1	Component Tests . . . . .	334
15.2	Test Automation Using the SUnit . . . . .	335
15.2.1	Test Case: Cinemas . . . . .	335
15.2.2	Additional <code>TestCase</code> Messages . . . . .	339
15.2.3	An Additional Test for the Class <code>Expenses</code> . . . . .	340
15.3	Test-Driven Development . . . . .	341
<b>16</b>	<b>Developing Web Applications . . . . .</b>	<b>343</b>
16.1	Case Study: Currency Converter . . . . .	344
16.1.1	Objective . . . . .	345
16.1.2	The Model for the Currency Converter . . . . .	346
16.1.3	A First Glance at Seaside . . . . .	349
16.1.4	Realising the Web Interface . . . . .	350
16.1.5	Implementing the Functionality . . . . .	363
16.1.6	Shortcomings in the First Version . . . . .	366
16.1.7	Refactoring the Method <code>renderFormOn:</code> . . . . .	366
16.2	Improving the Usability of the Currency Converter . . . . .	368
16.2.1	Selection Lists in Seaside . . . . .	370

---

16.2.2	Checking the Amount Input . . . . .	371
16.3	Introducing an Administrative Dialogue . . . . .	375
16.3.1	Creating the Component <i>CcAdministration</i> . . . . .	375
16.3.2	Calling the Component <i>CcAdministration</i> . . . . .	377
16.3.3	Seaside's Call/Answer Mechanism . . . . .	378
16.3.4	Implementing the Administration Dialogue . . . . .	381
16.4	Incorporating CSS . . . . .	386
16.4.1	Combining HTML with CSS . . . . .	389
16.4.2	Defining a <i>style</i> Method . . . . .	391
16.4.3	Making a CSS File Available in a Seaside File Library . . . . .	392
16.5	Generalising the Converter . . . . .	394
16.6	Further Seaside Concepts . . . . .	399
<b>17</b>	<b>What's Next?</b> . . . . .	<b>401</b>
<b>18</b>	<b>Smalltalk Applications in Industry</b> . . . . .	<b>407</b>
18.1	AG5—Safety Compliance . . . . .	408
18.2	Cognitone— <i>Music</i> . . . . .	409
18.3	Georg Heeg eK— <i>Software Projects and Services</i> . . . . .	409
18.4	JPMC— <i>Financial Services</i> . . . . .	411
18.5	Key Technology— <i>Manufacturing</i> . . . . .	412
18.6	MetaCase— <i>Software Development Tools</i> . . . . .	413
18.7	MMA— <i>Insurance</i> . . . . .	414
18.8	OOCL— <i>Logistics</i> . . . . .	415
18.9	Rudolph Technologies— <i>Semiconductor Industry</i> . . . . .	416
18.10	SOOPS— <i>Energy Markets</i> . . . . .	417
<b>Appendix</b>	<b>Expanding the VisualWorks Image</b> . . . . .	<b>419</b>
A.1	Adding SunitToo . . . . .	420
A.2	Adding the Object Explorer . . . . .	421
A.3	Adding Seaside . . . . .	421
A.4	The Cincom Public Repository . . . . .	421
<b>References</b>	. . . . .	<b>423</b>
<b>Index</b>	. . . . .	<b>425</b>



<http://www.springer.com/978-3-658-06822-6>

Programming Smalltalk - Object-Orientation from the  
Beginning

An introduction to the principles of programming

Brauer, J.

2015, XXI, 429 p. 277 illus., 1 illus. in color., Softcover

ISBN: 978-3-658-06822-6