

1	Introduction	
	1.1 Intellectual Precursors	4
	1.2 Acknowledgments	4
	1.3 References	5
2	Overview	
	2.1 Structure of Classes and Instances	7
	2.2 Inheriting Variables and Methods	8
	2.3 Data Oriented Programming Using Active Values	9
	2.4 Knowledge Bases	10
3	Creating and Using Objects	
	3.1 Sending a Message to an Object	13
	3.2 Creating a New Instance	14
	3.3 Naming and Pointing to Objects	14
	3.4 Defining a New Class	15
	3.5 Defining a Method	16
4	Object Variables and Properties	
	4.1 Access Expressions	18
	4.2 Getting Variable and Property Values	19
	4.3 Putting Variable Values and Property Values	20
	4.4 Non-triggering Get and Put	21
	4.5 Local Get Functions	21
	4.6 Accessing Class and Method Properties	22
	4.7 General Get and Put Functions	23
	4.8 Summary of Get and Put Functions	24
5	Active Values	
	5.1 Active Values Notation	25
	5.2 Nested Active Values	25
	5.3 Active Values as Default Values	26
	5.4 Standard Access Functions	26
	5.5 User-Defined Access Functions	27
6	Combining Inherited Methods	
	6.1 Augmenting an Inherited Method	31
	6.2 Combining Multiple Inherited Methods	32
	6.3 General Method Invocation	32
7	Instance Creation	
	7.1 Specifying Values at Instance Creation	34
	7.2 Sending a Message at Instance Creation	34
	7.3 Computing a Value at First Fetch	35
	7.4 Computing a Value at Instance Creation	35
	7.5 Special Actions at Instance Creation	36

8	Composite Objects	
	8.1 Basic Concepts for Composite Objects	38
	8.2 Specializing Composite Objects	39
	8.3 Conditional and Iterative Templates	40
9	Loops Knowledge Bases	
	9.1 Review of Knowledge Base Concepts	41
	9.2 Environmental Objects and Boot Layers	42
	9.3 Starting With No Preexisting Knowledge Bases	44
	9.4 Continuing from a Previous Session	45
	9.5 Starting from a Community Knowledge Base	46
	9.6 Freezing and Thawing References to Knowledge Bases	47
	9.7 Using Several Knowledge Bases in an Environment	48
	9.8 Changing the Associations of Objects	49
	9.9 Switching Among Environments	49
	9.10 Saving Parts of a Session	51
	9.11 Copying Layers from one Knowledge Base to Another	51
	9.12 Summarizing and Combining Knowledge Bases	52
	9.13 Subdividing a Knowledge Base	53
	9.14 Going Back to a Previous Boot Layer of a Knowledge Base	54
	9.15 A ecting what is Saved	54
	9.15.1 Temporary Objects	55
	9.15.2 Not Saving some IV values	55
	9.15.3 Ignoring changes on an IV	55
	9.15.4 Getting rid of objects explicitly	56
	9.16 Examining Environmental Objects	56
	9.17 The Class KBState	57
	9.18 The Class KB	58
	9.19 The Class Environment	59
	9.20 The Class Layer	61
	9.21 The Class KBMeta	61
	9.22 The Class EnvironmentMeta	62
10	Introduction to Rule-Oriented Programming in LOOPS	
	10.1 Introduction	63
	10.2 Basic Concepts	64
	10.3 Organizing a Rule-Oriented Program	65
	10.4 Control Structures for Selecting Rules	66
	10.5 One-Shot Rules	68
	10.6 Task-Based Control for RuleSets	69
	10.7 Control Structures for Generators	71
	10.8 Saving an Audit Trail of Rule Invocation	72
	10.8.1 Motivations and Applications	72
	10.8.2 Overview of Audit Trail Implementation	73
	10.8.3 An Example of Using Audit Trails	73
	10.9 Comparison with other Rule Languages	75
	10.9.1 The Rationale for Factoring Meta-Level Syntax	75
	10.9.2 The Rationale for RuleSet Hierarchy	76
	10.9.3 The Rationale for RuleSet Control Structures	76

11	The Rule Language	
	11.1 Rule Forms	80
	11.2 Kinds of Variables	81
	11.3 Rule Forms	83
	11.4 In x Operators and Brackets	83
	11.5 Interlisp Functions and Message Sending	85
	11.6 Variables and Properties	86
	11.7 Perspectives	87
	11.8 Computing Selectors and Variable Names	87
	11.9 Recursive Compound Literals	88
	11.10 Assignment Statements	88
	11.11 Meta-Assignment Statements	89
	11.12 Push and Pop Statements	90
	11.13 Invoking RuleSets	90
	11.14 Transfer Calls	91
	11.15 Task Operations	91
	11.16 Stop Statements	92
12	Using Rules in LOOPS	
	12.1 Creating RuleSets	94
	12.2 Editing RuleSets	94
	12.3 Copying RuleSets	95
	12.4 Saving RuleSets on LISP Files	95
	12.5 Printing RuleSets	96
	12.6 Running RuleSets from Loops	96
	12.7 Installing RuleSets as Methods	96
	12.8 Installing RuleSets in ActiveValues	97
	12.9 Tracing and Breaking RuleSets	98
	12.10 The Rule Exec	99
	12.11 Auditing RuleSets	99
13	Using the Loops System	
	13.1 Starting up the System	101
	13.2 The Loops Screen Setup	101
	13.3 Using the Browser	102
	13.3.1 Using the Class Browser	102
	13.3.2 Building Your Own Browser	105
	13.4 Editing in Loops	108
	13.4.1 Editing a Class	108
	13.4.2 Editing an Instance	109
	13.4.3 Editing a Method	110
	13.5 Inspecting in Loops	110
	13.5.1 Inspecting Classes	110
	13.5.2 Inspecting Instances	110
	13.6 Errors in Loops	111
	13.6.1 When the Object is Not Recognized	111
	13.6.2 When the Selector is Not Recognized	111

	13.7	Breaking and Tracing Methods	112
	13.8	Monitoring Variable Access	112
14		The LOOPS Kernel	
	14.1	The Golden Braid (Object, Class, MetaClass)	113
	14.2	Perspectives and Nodes	113
	14.3	Useful Mixins	114
	14.4	The MetaClass Named "Class"	115
	14.5	The Class Named "Object"	118
	14.6	Functions for changing Loops Structure	120
		14.6.1 Moving and Renaming Methods	120
		14.6.2 Moving and Renaming Variables	121
15		Loops and the Interlisp System	
	15.1	Saving Class and Instance Definitions on Files	122
	15.2	Classes for Lisp Datatypes	122
	15.3	Some Details of the Loops implementation	122