PREFACE xv

### 1. INTRODUCTION

1.1	Introduction to Objects	1-1
	1.1.1 Object	1-2
	1.1.2 Message	1-3
	1.1.3 Method	1-3
	1.1.4 Selector	1-3
	1.1.5 Class	1-3
	1.1.6 Instance	1-4
1.2	Storage of Data in Objects	1-4
	1.2.1 Class Variables and Instance Variables	1-4
	1.2.2 Properties	1-5
1.3	Metaclasses	1-6
1.4	Introduction to Inheritance	1-6
	1.4.1 Single Superclasses	1-7
	1.4.2 Multiple Superclasses	1-8
1.5	Introduction to Access-Oriented Programming: Using Active Values	1-9
1.6	Introduction to the LOOPS User Interface	1-10
	1.6.1 SEdit	1-10
	1.6.2 Inspector	1-10
	1.6.3 Masterscope	1-10
	1.6.4 File Manager	1-11
	1.6.5 Grapher Module	1-11

# 2. INSTANCES

	2.1 Instance Naming Conventions	2-1
	2.2 Creating Instances	2-4
	2.3 Data Storage in Instances at Creation Time	2-8
	2.4 Changing the Number of Instance Variables in an Instance	2-10
	2.5 Moving Variables	2-13
	2.6 Destroying Instances	2-15
	2.7 Methods Concerning the Class of an Object	2-16
	2.8 Copying Instances	2-19
	2.9 Querying Structure of Instances	2-21
	2.10 Other Instance Items	2-24
3. (	CLASSES	
	3.1 Creating Classes	3-1
	3.1.1 Function Calling and Message Sending	3-2
	3.1.2 Dynamic Mixins	3-4
	3.2 Destroying Classes	3-5
	3.3 Inheritance	3-7
	3.4 Editing Classes	3-10
	3.5 Modifying Classes	3-11
	3.6 Methods for Manipulating Class Names	3-16
	3.7 Querying the Structure of a Class	3-17
	3.8 Copying Classes and Their Contents	3-23
	3.9 Enumerating Instances of Classes	3-24
	3.10 Dealing with Inheritance	3-27
4. ľ	METACLASSES	
	4.1 Specific Metaclasses	4-1
	4.1.1 Metaclass Class	

	4.1.2 Metaclass Metaclass	4-2
	4.1.3 Metaclass AbstractClass	4-2
	4.1.4 Metaclass DestroyedClass	4-2
	4.2 Pseudoclasses	4-2
	4.3 Defining New Metaclasses	4-5
	4.4 Tofu	4-6
- 40		
5. AC	CCESSING DATA	
	5.1 Generalized Get and Put Functions	5-1
	5.2 Accessing Data in Instances	5-4
	5.2.1 Compact Accessing Forms	5-10
	5.2.2 Support for Changetran	5-13
	5.3 Accessing Data in Classes	5-13
	5.3.1 Metaclasses and Property Access	5-13
	5.3.2 Class Variable Access	5-16
	5.3.3 Instance Variable Access	5-19
6. ME	ETHODS	
J		
	6.1 Categories	6-1
	6.2 Structure of Method Functions	6-3
	6.3 Creating, Editing, and Destroying Methods	6-4
	6.4 Escaping from Message Syntax	6-6
	6.5 Movement between Classes	6-8
	6.5.1 Movement of Methods	6-8
	6.5.2 Stack Method Macros	6-10

# 7. MESSAGE SENDING FORMS

### 8. ACTIVE VALUES

8.1	Using Active Values	8-2
8.2	Specializations of the Class ActiveValue	8-2
	8.2.1 IndirectVariable	8-3
	8.2.2 LocalStateActiveValue	8-6
	8.2.2.1 ExplicitFnActiveValue	8-8
	8.2.2.2 NoUpdatePermittedAV	8-9
	8.2.2.3 LispWindowAV	8-10
	8.2.2.4 Breaking and Tracing Active Values	8-10
	8.2.2.5 AppendSuperValue	8-11
	8.2.2.6 FirstFetchAV	8-12
	8.2.3 InheritingAV	8-14
	8.2.4 ReplaceMeAV	8-15
	8.2.5 NotSetValue	8-15
	8.2.5.1 NestedNotSetValue	8-16
	8.2.6 User Specializations of Active Values	8-16
8.3	Active Value Methods	8-16
	8.3.1 Adding and Deleting Active Values	8-17
	8.3.2 Fetching and Replacing Wrapped Values	8-19
	8.3.3 Get and Put Functions Bypassing the ActiveValue Mechanism	8-22
	8.3.4 Shared Active Values in Variable Inheritance	8-22
	8.3.5 Creating Your Own Active Values	8-23
8.4	Annotated Values	8-24
	8.4.1 Explicit Control over Annotated Values	8-25
	8.4.2 Saving and Restoring Annotated Values	8-26
8.5	Active Values in Class Structures	8-27

### 9. DATA TYPE PREDICATES AND ITERATIVE OPERATORS

	9.1 Data Type Predicates	9-1
	9.2 Iterative Operators	9-3
10	BROWSERS	
10.	BROWSERS	
	10.1 Types of Built-in Browsers	10-1
	10.1.1 Lattice Browsers	10-2
	10.1.2 Class Browsers	10-2
	10.1.3 File Browsers	10-2
	10.1.4 Supers Browsers	10-2
	10.1.5 Metaclass Browsers	10-2
	10.1.6 Instance Browsers	10-3
	10.2 Opening Browsers	10-3
	10.2.1 Using Menu Options to Open Browsers	10-3
	10.2.1.1 Overview of Background Menu and LOOPS Icon	10-3
	10.2.1.2 Command Summary	10-4
	10.2.2 Using Commands to Open Browsers	10-5
	10.3 Using Class Browsers, Meta Browsers, and Supers Browsers	10-7
	10.3.1 Selecting Options in the Title Bar Menu	10-8
	10.3.1.1 Recompute and its Suboptions	10-8
	10.3.1.2 AddRoot and its Suboptions	10-10
	10.3.1.3 Add Category Menu	10-10
	10.3.2 Selecting Options in the Left Menu	10-11
	10.3.2.1 PrintSummary and its Suboptions	10-12
	10.3.2.2 Doc (ClassDoc) and its Suboptions	10-13
	10.3.2.3 WhereIs and its Suboptions	10-14
	10.3.2.4 DeleteFromBrowser and its Suboptions	10-16
	10.3.2.5 SubBrowser	10-16
	10.3.2.6 TypeInName	10-16
	10.3.2.7 Extending Functionality with the Left Mouse Button	10-16
	10.3.3 Selecting Options in the Middle Menu	10-17

10.3.3.1	Box/UnBoxNode	.10-17
10.3.3.2	Methods (EditMethod) and its Suboptions	.10-18
10.3.3.3	Add (AddMethod) and its Suboptions	.10-20
10.3.3.4	Delete (DeleteMethod) and its Suboptions	.10-21
10.3.3.5	Move (MoveMethodTo) and its Suboptions	.10-22
10.3.3.6	Copy (CopyMethodTo) and its Suboptions	.10-23
10.3.3.7	Rename (RenameMethod) and its Suboptions	.10-23
10.3.3.8	Edit (EditClass) and its Suboptions	.10-24
10.4 Using File Browsers.		.10-24
10.4.1 Selecting	Options in the Title Bar Menu	.10-25
10.4.1.1	Recompute and its Suboptions	.10-25
10.4.1.2	AddRoot and its Suboptions	.10-25
10.4.1.3	Add Category Menu	.10-25
10.4.1.4	Change display mode and its Suboptions	.10-25
10.4.1.5	Uses IV? and its Suboptions	.10-26
10.4.1.6	Edit FileComs and its Suboptions	.10-28
10.4.1.7	CLEANUP file and its Suboptions	.10-30
10.4.2 Selecting	Options in the Left Menu	.10-30
10.4.2.1	PrintSummary and its Suboptions	.10-30
10.4.2.2	Doc (ClassDoc) and its Suboptions	.10-30
10.4.2.3	WhereIs (WhereIsMethod) and its Suboptions	.10-30
10.4.2.4	DeleteFromBrowser and its Suboptions	.10-31
10.4.2.5	SubBrowser	.10-31
10.4.2.6	TypeInName	.10-31
10.4.2.7	AddSubs and its Suboptions	.10-31
10.4.3 Selecting	Options in the Middle Menu	.10-31
10.4.3.1	BoxNode	.10-32
10.4.3.2	Methods (EditMethod) and its Suboptions	.10-32
10.4.3.3	Add (AddMethod) and its Suboptions	.10-32
10.4.3.4	Delete (DeleteMethod) and its Suboptions	.10-32
10.4.3.5	Move (MoveMethodTo) and its Suboptions	.10-32
10.4.3.6	Copy (CopyMethodTo) and its Suboptions	.10-32
10.4.3.7	Rename (RenameMethod) and its Suboptions	.10-32
10.4.3.8	Edit (EditClass) and its Suboptions	.10-32

10.4.3.9 UsesIV and its Suboptions	10-33
10.5 Programmer's Interface to Lattice Browsers	10-33
10.5.1 Instance Variables for the Class LatticeBrowser	10-33
10.5.2 Class Variables for the Class LatticeBrowser	10-34
10.5.3 Methods for the Class LatticeBrowser	10-35
10.6 Instance Browsers	10-50
10.6.1 Instance Variables for the Class InstanceBrowser	10-50
10.6.2 Methods for the Class InstanceBrowser	10-50
10.6.3 Selecting Options in the Title Bar Menu	10-51
10.6.4 Selecting Options in the Left Menu	10-51
10.6.5 Selecting Options in the Middle Menu	10-52
10.7 Automatic Updates of Class Browsers	10-52
11. ERRORS AND BREAKS	
11.1 Error Handling Functions and Methods	11-1
11.2 Error Messages	11-5
11.1.1 Classes and Instances	11-6
11.1.2 Methods and Messages	11-7
11.1.3 Naming Objects	11-8
11.1.4 Annotated and Active Values	11-9
11.1.5 Miscellaneous	11-9
12. BREAKING AND TRACING	
12.1 Breaking and Tracing Methods	12-1
12.2 Breaking and Tracing Data	12-3
13. EDITING	
13.1 Editing Classes	13-1

	13.2	Editing Instances	13-5
14.	FILE MA	NAGER	
	14.1	Manipulating Files	14-1
	14.2	Loading Files	14-2
	14.3	LOOPS File Manager Commands	14-3
	14.4	Saving LOOPS Objects on Files	14-6
	14.5	Storing Files	14-10
	14.6	Compiling Files	14-12
15.	PERFO	RMANCE ISSUES	
	15.1	Garbage Collection	15-1
	15.2	Instance Variable Access	15-1
	15.3	Method Lookup	15-3
	15.4	Cache Clearing	15-3
16.	PROCES	SSES	
17.	READIN	IG AND PRINTING	
	17.1	Reading Objects	17-1
	17.2	Print Flags	17-2
	17.3	Printing Classes	17-4
	17.4	Printing Objects	17-8
	17.5	Printing Active Values	17-11
	17.6	Printing Methods	17-12
	17.7	Unique Identifiers (UIDs)	17-14

### 18. USER INPUT/OUTPUT MODULES

18.1 Inspector	18-1
18.1.1 Overview of the User Interface	18-1
18.1.2 Using Instance Inspectors	18-2
18.1.2.1 Titles of Instance Inspector Windows	18-2
18.1.2.2 Menu for the Title Bar	18-3
18.1.2.3 Menu for the Left Column	18-4
18.1.2.4 Menu for the Right Column	18-6
18.1.3 Using Class Inspectors	18-7
18.1.3.1 Titles of Class Inspector Windows	18-7
18.1.3.2 Menu for the Title Bar	18-8
18.1.3.3 Menu for the Left Column	18-8
18.1.3.4 Menu for the Right Column	18-8
18.1.4 Using Class IVs Inspectors	18-9
18.1.4.1 Titles of Class IVs Inspector Windows	18-9
18.1.4.2 Menu for the Title Bar	18-9
18.1.4.3 Menu for the Left Column	18-10
18.1.4.4 Menu for the Right Column	18-10
18.1.5 Functional Interface for Instance Inspectors	18-11
18.1.6 Customizing the Inspector	18-15
18.2 Extensions to ?=	18-16
18.2.1 Message Sending	18-16
18.2.2 Record Creation	18-17
19. WINDOWS	
19.1 The Class Window	19-1
19.2 Basic Window Methods	19-2
19.3 Prompt Windows	19-9
19.4 Mouse and Menu Functionality	19-14

# TABLE OF CONTENTS

19.4.1	Menu Item Structure	19-17
19.4.2	Caching Menus	19-18
19.5 Subclasses	of a Window	19-18
19.6 Lisp Window	ws	19-22
20. SYSTEM VARIABLES	S AND FUNCTIONS	
INDEX		INDEX-1
GLOSSARY		GLOSSARY-1