

# HMSL

## Table of Contents

---

### Chapter 1: Introduction to HMSL

Getting Started.....	1
About HMSL.....	1
An Outline of the HMSL Environment.....	2
About Forth.....	2
What is Object Oriented Programming?.....	3
Morphologies - HMSL Classes for Composition.....	3
Macintosh and Amiga Implementations.....	4
History of HMSL.....	4
A Quick Tour of HMSL.....	5
Simple MIDI Commands.....	5
A Simple Example: Playing Random Notes.....	6
MIDI Input.....	7
Shapes and the Shape Editor.....	8
Looking at Morphs.....	8
Run Some Example Pieces.....	9
XFORMS.....	9
Music for Bookstores.....	9
SUBDIV.....	9
Score Entry and Sequencing.....	10

### Chapter 2: How to Learn HMSL

Introduction: Paths to learn the system.....	1
Path 1 - MIDI.....	1
Path 2 - HMSL Hierarchies.....	2
Path 3 - User Interfaces.....	2
Path 4 - Tools.....	2
Path 5 - Advanced HMSL Hierarchies, do Path 2 first.....	2
Path 6 - Amiga Local Sound and Tuning.....	2
Other Tips on Learning HMSL.....	2
Disk-Based Examples.....	2
HMSL Source Code.....	3
Before You Start, A Forth Quiz!.....	3
Syntax Used in Code and Manual.....	3
Answers for Forth Quiz.....	5

### Chapter 3: HMSL Operation

HMSL Operating Modes.....	1
Forth Mode.....	1
HMSL Mode.....	1
Forth+HMSL Mode.....	2
HMSL Menus.....	2
HMSL Menu.....	2
Screens Menu.....	3
HMSL Control Reference.....	3
Controlling HMSL using ASCII Keystrokes.....	4

### Chapter 4: Object-Oriented Development Environment

Overview.....	1
Object-Oriented Programming.....	1

Philosophy.....	1
Definitions.....	2
Advantages and Disadvantages.....	2
Creating and Using Objects.....	3
Instancing.....	3
Sending Messages.....	3
Using Arrays.....	3
Early versus Late Binding.....	3
Freeing Memory in Array Classes.....	4
Predefined Classes.....	4
OBJECT.....	5
OB.INT.....	5
OB.BARRAY.....	5
Example of Using Arrays.....	6
OB.ARRAY.....	7
OB.ELMNTS.....	7
OB.LIST.....	10
OB.OBJLIST.....	11
Defining New Classes and Methods.....	11
Defining Words.....	11
Accessing Instance Variables.....	12
Using SELF in Method Definitions.....	12
Using SUPER and SUPERDOOPER in Method Definitions.....	13
Special Methods: INIT.....	14
Example Class Definition.....	14
Example of Creating a Class with Instance Objects.....	15
Advanced Topics.....	16
ODE Functions.....	16
Getting Information About Classes.....	16
Dynamically Allocated Objects.....	16
Examining Instance Variables.....	18
Error Reporting.....	18
Inheritance.....	18
Memory Placement for Amiga.....	19
Explanation of ODE Structures Diagram.....	19

## Chapter 5: Shapes

Introduction to Shapes.....	1
Tutorial 1: Using Shapes.....	1
Tutorial 2: Building Shapes.....	3
Shape - subclass of OB.MORPH , OB.ELMNTS.....	4
Shape Methods.....	5
Different ways of representing data in shapes.....	10
Type 0: Raw. abstract data. "Pure" Shapes.....	10
Type 1: Compact Notes. Monophonic.....	10
Type 2: Expanded Notes. Separate ON and OFF elements.....	11
Type 3: Compressed Notes. Notes with ON dimension.....	11
Type 4: MIDI Data Stream.....	11
Type 5: Control Shapes.....	11
Shape Conversion Utilities - SE.COMPRESS.NOTES.....	11
The Shape Editor Screen.....	12
Introduction.....	12
Description of the Screen.....	13
The Options Grid.....	15
Tutorial 3: Customizing a Shape for the Shape Editor.....	15
Advanced Use of the Shape Editor.....	15
Cross Reference.....	16

## Chapter 6: Players

Most Important Information.....	1
Tutorial 1: Shapes, Players and Instruments.....	1
Tutorial 2: Controlling Players.....	3
Advanced Technique: Use of Local Variables in Functions.....	5
Tutorial 3: Algorithmic Composition.....	6
Players - subclass of OB.JOB, OB.MORPH.....	9
Specifying Time in different ways.....	9
Duty Cycle of Players.....	10
Stock Players.....	11
OB.PLAYER Methods.....	12
OB.PLAYER Methods.....	12
Advanced Topics.....	14
Player Methods That Are Internal to HMSL.....	14

## Chapter 7: Instruments and Interpreters

Introduction.....	1
Tutorial 1 - Using Instruments Directly.....	2
Tutorial 2 - Using Instruments with Players.....	4
Tutorial 3 - Experimenting with Interpreters.....	6
OB.INSTRUMENT subclass of OB.LIST.....	10
OB.MIDI.INSTRUMENT subclass of OB.INSTRUMENT.....	14
MIDI INSTRUMENT Methods.....	14
OB.ALLOCATOR subclass of OB.BARRAY.....	16
Allocator Methods.....	17
Interpreters.....	18
What Happens When an Element is Played.....	18
Writing Interpreters.....	18
Specifying Interpreters.....	19
Predefined Interpreters.....	19
Interpreter Example.....	20

## Chapter 8: Collections

COLLECTIONS: Brief Introduction.....	2
Collection Execution.....	2
Collection Customization.....	3
Tutorial 1: A Simple Hierarchy.....	3
Tutorial 2: Nested Collections.....	4
Collections: Technical Description, Behaviors, Methods.....	5
Technical Description.....	5
Behaviors.....	5
An Example Behavior.....	6
Collection Methods.....	7
Philosophy behind Collections.....	10

## Chapter 9: Structures

Structures.....	1
Markov Chains.....	1
Structure Methods.....	3
OB.STRUCTURE subclass of OB.COLLECTION.....	3
Structure Internals.....	4

## Chapter 10: Jobs & Productions

Most Important Information.....	1
Tutorial 1: Periodic Function.....	1
Tutorial 2: Notes from Jobs.....	2
Tutorial 3: MIDI Modulation Changer.....	3
Jobs.....	4
The JOB Function.....	4
Job Methods.....	5
Productions.....	6

## Chapter 11: Translators

Introduction.....	1
Table-Driven and Function-Driven Translators.....	1
Translator Methods.....	2
Some Translator Examples.....	3
Using a Simple Translator.....	3
Creating a Custom Function.....	3
Stock Translator.....	4
Examples using Stock Translator.....	5
Tunings.....	5
Introduction.....	5
Tuning Ratios.....	6
Example of Tuning Ratios.....	7
Stock Tuning Ratios.....	7
Some Ratio Approximations for Equal Temperaments.....	7

## Chapter 12: Perform and Actions

Tutorial 1: Using Actions Simply: Init, Term, Stimulus, Response.....	1
Tutorial 2: Executing a Hierarchy from an Action.....	3
Introduction to Actions and Perform.....	5
Perform.....	5
Historical note.....	5
Action Features.....	5
Priorities, Counters, and other capabilities.....	6
Action Instance Variables.....	6
Summary of Action Execution.....	6

Action Utilities.....	10
The Action Table.....	11
Action Table Methods and Utilities.....	12
Miscellaneous User Notes Regarding Actions.....	13
Perform Examples.....	13
The Action Screen.....	14
The Action Grid and Action Chooser.....	15
The Perform Chooser.....	15
The Behavior Chooser.....	15
The Priority Probabilities Grid.....	16
The MIDI.PARSER.....	16

## Chapter 13: MIDI Toolbox

Overview.....	1
Tutorial 1: Simple MIDI Output.....	1
Tutorial 2: Pitch Bend.....	3
Alternative Tuning using Pitch Bend.....	3
Tutorial 3: Control Changes, Modulation, Sustain.....	5
Reference.....	6
Standard MIDI Messages.....	6
MIDI Utilities.....	8
MIDI Tests.....	11
Low-Level MIDI Words.....	11
Host-Dependent MIDI Words.....	12
Macine Specific Routines (MIDI Manager, etc.).....	13
MIDI Input Parsing.....	13
Introduction.....	13
MIDI Parser User Vectors.....	14
MIDI Parser Utilities.....	14
MIDI Parser Examples.....	15
MIDI Parsing Advice.....	16
System Exclusive.....	16
SYSEX Example.....	17
Standard MIDI Files.....	17
Loading MIDIFile support.....	18
MIDI File Glossary.....	18
Reading MIDI Files.....	18
Example of Reading a MIDI File.....	20
Writing MIDI Files.....	20
Transferring MIDI files between other programs and HMSL.....	23
Example of Writing a MIDI File.....	23
Example of writing random quarter and eighth notes in MIDI File.....	24

## Chapter 14: Time and Scheduling

Time Glossary.....	1
Example of Using Virtual Time to Play An Arpeggio.....	3
Event Buffering.....	4
A simple illustration of Event Buffering.....	4
Three Times in HMSL.....	4
Summary of Event Buffering and Virtual Time.....	5
Warning about Macintosh Virtual Time.....	5

## Chapter 15: Interactive Controls

Control Classes Overview.....	1
Control Mouse Functions.....	2
Control Size and Placement.....	3

Tutorial 1 - Check Grid.....	4
Tutorial 2 - Numeric Grid.....	6
More Example on Disk.....	7
Control Grids Reference.....	8
OB.CONTROL subclass of OBJECT.....	8
Internal Methods for OB.CONTROL.....	10
OB.CONTROL.GRID subclass of OB.CONTROL.....	11
OB.CHECK.GRID subclass of OB.CONTROL.GRID.....	11
OB.MENU.GRID subclass of OB.CHECK.GRID.....	12
OB.RADIO.GRID subclass of OB.CHECK.GRID.....	12
OB.COUNTER subclass of OB.CONTROL.....	12
OB.NUMERIC.GRID subclass of OB.CONTROL.GRID.....	13
OB.FADER subclass of OB.CONTROL.....	13
OB.XY.CONTROLLER subclass of OB.NUMERIC.GRID.....	14
OB.TEXT.GRID subclass of OB.CONTROL.GRID.....	15
OB.SCREEN subclass of OB.ELMNTS.....	16
Special Topics.....	17
Screen Editor.....	17
Using Precompiled Screens.....	18
Debugging Controls.....	18

## Chapter 16: Score Entry System

Abstract.....	1
Tutorial.....	1
SES to Shapes.....	3
Example Piece using SES.....	4
SES Glossary.....	5
Advanced SES Topics.....	9
Sending SES Output to Other Devices.....	9
Sending SES to MIDI Files.....	9
Mixing MIDI Messages with SES.....	10

## Chapter 17: Recording & Sequencing

Recording using HMSL.....	1
Tutorial 1: A Step Entry System.....	1
Tutorial 2: Recording Notes with Accurate Timing.....	3
Tutorial 3: Using the Predefined Recording Tools.....	5
Recording Tools Reference.....	5
Recording Tips.....	7
Multi-Track Sequencer.....	7
Tutorial 4: Record and Playback with the Sequencer.....	7
Tutorial 5: Using the Score Entry System to load tracks.....	8
Sequencer Reference.....	8
Track Controls.....	8
Sequencer Glossary.....	9

## Chapter 18: Forth Extensions

Introduction.....	1
Words Added to Forth for HMSL.....	1

## Chapter 19: HMSL Utilities

Most Important Information.....	1
Distribution Functions (CHOOSE, 1/F).....	1
Linear Interpolator.....	1

## Appendix A: Morphs

Introduction to Morphs.....	1
Executing a Morph Hierarchy.....	2
Executing versus Posting.....	2
Some Basic Morph Methods.....	3
Morph Lists.....	5
Morph List Methods.....	5
OB.OBJLIST-Related Forth Words.....	6
Stock Morphs.....	7
Appendix B: Programming Tips.....	1
Morph Memory Allocation.....	1
Local Variables in a Morph's Functions.....	1
ANEW and INCLUDE?.....	1
Cleaning Up Afterwards.....	2
Incremental Testing.....	3
Recursive Morph Posting.....	3
Action Screen Text.....	3
Speed.....	3
Mac Object Addresses.....	4
Who's Bug Is This?.....	4

## Appendix C: Class Summary

### Bibliography