Abstract

In 1976, Apple Computer, Inc. released the Apple I and created the personal computing industry. In 1984, Apple released the first Macintosh computer, revolutionizing the personal computing industry. In 1987, Apple released HyperCard and HyperTalk, and tried to revolutionize the personal computing industry again.

1 Introduction

There is, perhaps, no piece of software written by Apple Computer, Inc. more prone to generating extreme emotions in its users than its operating system. Next below that, however, is HyperCard. Designed and released in 1987 by Bill Atkinson [7], HyperCard was an instant success. Leveraging the power and simplicity of its scripting language, HyperTalk, designed by Bill Atkinson and by Dan Winkler [1], HyperCard demystified the art of creating software. The language has a grammar and syntax similar to English, and as such appealed to computer hobbyists, teachers, and the uninitiated alike. The commands HyperTalk uses are similar to those used by the Macintosh Toolbox, the base-level API of Apple’s Macintosh operating system, and the logical structure is similar to Pascal and organized in an event-driven manner [8].

2 History

2.1 The Birth

HyperTalk was born as the core scripting language of the HyperCard application, developed by Bill Atkinson1 for Apple Computer, Inc. in 1987 under the condition that it must be available for free on all Macs. Originally, the application was named “WildCard” (and the language “WildTalk”, respectively), however, the name was changed because of legal issues. Atkinson was inspired to explore new interface technologies by Xerox’s Palo Alto Research Center and their SmallTalk language.

Quickly, the application and the language became very popular. The language was easy to learn and drew many people into programming computers for all sorts of purposes, from basic animation, to automation, to creating large databases.

1Key developer of QuickDraw and MacPaint, an Apple Fellow, and founder of GeneralMagic. Currently a high-resolution nature photographer.
2.2 The Life

Because Apple was under obligation to Bill Atkinson to provide HyperCard for free, the company found it difficult to justify devoting employees to developing HyperCard further. Regardless, HyperCard and HyperTalk became very popular, spawning a bimonthly magazine (HyperLink), and more than a few books. HyperCard “stacks” began to be sold alongside more traditional Macintosh programs in mail-order catalogs.

Eventually, in 1989, the internal political environment of Apple Computer changed under pressure from Kevin Calhoun—a programmer at Apple—and HyperCard and HyperTalk underwent a massive improvement that resulted in HyperCard 2.0 (and a revised and more consistent version of HyperTalk) which was released in 1990. Further improvements, like support for a color interface, were announced as being under development. Third-party vendors developed thousands of applications based on HyperCard, and in addition, thousands of XCMDs (external commands to extend HyperTalk to control additional things or to provide certain functionality) “for everything from HyperTalk compilers, to graphing systems, database access, internet connectivity and practically everything else” [7]. HyperCard was even used, before the introduction of PowerPoint, as a general-purpose presentation generator.

Shortly thereafter, however, Apple Computer reorganized, and spun its software division off to create Claris company—outsourcing even the Macintosh Operating System. This was a disaster for the company. The OS was returned to Apple, and HyperCard, after some minor updates to fulfill promises of color support, was apparently forgotten.

2.3 The Death

HyperCard was finally rolled into Apple’s QuickTime group (as it seemed to be multimedia-related), and began to be developed into a QuickTime development platform under the direction of Kevin Calhoun. The result of this development, HyperCard 3.0, was presented and distributed in 1996 at the annual Apple Word-Wide Developer’s Conference as a beta and sneak-preview of things to come. This version of HyperCard/HyperTalk had an impressive array of new features, including internet connectivity, and the ability to be displayed in a web browser or QuickTime viewer (somewhat similar to Flash, by Macromedia). The new version was never released, and the lead-developer, Kevin Calhoun, left Apple in 2001 [7]. Without a champion in Apple, or apparent support from Apple’s management, HyperCard and HyperTalk languished and became less popular. HyperCard is still available for sale on Apple’s website, but has not received an update since the mid-nineties.

2.4 The Legend

HyperCard clones, which also used the HyperTalk scripting language, were developed in the absence of Apple’s commanding lead. These clones and descendants included SuperCard (for the Macintosh), Toolbox (for Microsoft Windows), MetaCard (for Windows, Mac, and Unix/X11), WinPlus (for Microsoft Windows), HyperSense (originally for NeXT), FreeCard (an open-source clone), PLUS (for Mac, Windows, and OS/2), HyperStudio (for Mac and Windows), LinkWay (for DOS), and a cross-platform OracleCard from Oracle. The ideas embodied in HyperTalk, and even much of the syntax, was also used by Macromedia in their Director and Authorware products as the Lingo scripting language.

While HyperCard was dead, HyperTalk maintained popularity within the ranks of Apple’s engineering core. In 1993, Apple engineers developed a mechanism standard called Apple’s Open Scripting Architecture, which standardized a generic way for programs to respond to script calls (“Apple Events”). This allowed the development of a slightly modified HyperTalk language, called AppleScript, that was generic enough to be a cross-application OS-level scripting language (allowing programs from many vendors to be controlled by and accept high-level user commands from the operating system) [10]. The language and basic grammar was even translated into other languages, including English, French, Japanese, and Italian—although the feature was dropped with the introduction of Mac OS 8.5 on October 17, 1998 [11]. AppleScript itself lived on as a popular way to manage work-flow and automate operating system tasks.

3 Goals

“HyperCard is a descendant of two ideas. One was the give-away Rolodex program that I wrote just to keep track of my own journal articles. The other was a research project I did on what the new generation computer should be...”

—Bill Atkinson [3]

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2Calhoun left Apple in 2001 to form his own company, 4R Software [20].
Algorithms aside, what probably first inspired both HyperCard and HyperTalk is the so-called Macintosh dream. As Atkinson says, “The Macintosh dream has really been putting the power of the personal computer into an individual person’s hands.” While the general applications of the time were getting much easier to use and didn’t require memorization of control-characters and command sequences, Atkinson felt that the power of program creation still lay outside the individual person’s ken—that building useful and helpful programs still required arcane knowledge of the computer’s internals or of some obtuse mathematical constructs. To that end, HyperCard with HyperTalk was an attempt to make programming accessible to anyone. As Atkinson said, “The most exciting thing for me is when I see people amazed and pleased at the newfound power they got from a program—when they say, ‘Wow, I can do this!’… It’s the original Macintosh dream of making the power of personal computer accessible to individuals. HyperCard is just unfolding another layer of Macintosh.” [3]

HyperCard and HyperTalk were particularly important to people invested in “hypertext”, a concept that was developed in Stanford in the 1960’s as a format for creative information grouping [19]. HyperCard was hailed as a convenient demonstration of the power and utility of linked and grouped information (and more accessible to the common user than older hypertext projects like the Xanadu project), and many of the first HyperCard “stacks” were used for precisely that purpose.

4 Syntax Semantics

The basic design of HyperTalk is as a message-passing language, generating and handling messages (or events) between objects. How an object responds to messages that are sent to it depends on the script attached to it. With the advent of AppleScript and the Open Scripting Architecture, messages (Apple Events) can even be passed to other applications (which are treated as remote objects).

Scripting in HyperTalk, unlike most programming languages, is extremely easy for non-programmers to understand because its syntax is so similar to English. The common example of how readable HyperTalk is is the phrase:

```
put the first word of the third line of field 'hello' into field 'goodbye'
```

…which does exactly what it seems to. In order to achieve this kind of readability and apparent simplicity requires a lot of what is frequently termed “syntactic sugar.” For example, numbers have many synonyms: 1 and 2 can be replaced with one and two or even first

4.1 Implementation Notes

In many ways, HyperTalk—particularly in the beginning—depended heavily on the programming structure of HyperCard. HyperCard is frequently referred to as presenting itself like a stack of index cards. HyperCard projects are called “stacks” of “cards” to encourage that perception. Cards are containers for other objects like buttons, pictures, and text fields. The most basic HyperTalk scripts were used for defining transitions from card to card, and were associated with particular objects, such as a button or a card or a text field. A HyperTalk script or function would be triggered by an event sent to that object, such as a mouseUp. As more and more events are added to each object, much more active programming can be accomplished. Actions are mostly accomplished by sending events to other objects, all of which could be named and numbered for easy reference. The commands HyperTalk uses in addition to message passing are similar to those used by the Macintosh Toolbox, the base-level API of Apple’s Macintosh operating system, however most common tasks (such as displaying dialog boxes)¹⁰ have been simplified.

The HyperTalk script is normally saved in plain text form in the stack, although HyperCard 2.4 capable of compiling it to a binary executable.

4.2 Objects

Officially, HyperCard supports five kinds of objects: buttons, fields, backgrounds, and stacks—although applications can behave as a sixth kind of object. The distinction between buttons, fields, and backgrounds is only in how they present themselves in the graphic user interface—buttons as uneditable and clickable-looking things, fields as text blocks or graphics, and backgrounds as inert pictures; the HyperTalk capabilities of each and which messages they can receive are roughly identical. [10]

¹⁰For example: answer "This is displayed." with "Aha." or ask "What is your name?"
4.3 Messages

Messages come in two flavors: system messages and commands. System messages are defined by the environment, and are generated in response to user actions such as mouse clicks and key presses or environmental changes such as the time. Commands are arbitrarily named messages that are defined by the HyperTalk script-writer [10]. Messages are generally sent in the following manner:

send ⟨message⟩ to ⟨object⟩

4.4 Handlers

There are two kinds of execution blocks, or handlers. The first is a message handler, which is executed whenever the object the script is attached to receives a message of the corresponding name. In the script, The other kind of handler is the function handler [10]. Message handlers are defined like so:

on ⟨messageName⟩
  script statements
end ⟨messageName⟩

Function handlers are similar:

function ⟨functionName⟩
  script statements
end ⟨functionName⟩

5 Bibliography

References


A  BNF

The BNF description of the HyperTalk language was published in HyperTalk 2.2: The Book [23], and describes the language thusly\(^ {11} \), as cited by [13].

A.1  Scripts

\[
\begin{align*}
\langle \text{script} \rangle &= \langle \text{script} \rangle \langle \text{handler} \rangle \mid \langle \text{handler} \rangle \\
\langle \text{handler} \rangle &= \langle \text{return} \rangle \langle \text{handler} \rangle \mid \text{on} \langle \text{messageKey} \rangle \langle \text{return} \rangle \langle \text{stmtList} \rangle \text{eol} \langle \text{messageKey} \rangle \langle \text{return} \rangle \\
\langle \text{ifBlock} \rangle &= \text{if} \langle \text{logical} \rangle \{ \langle \text{return} \rangle \} \text{then} \{ \langle \text{singleThen} \rangle \mid \langle \text{return} \rangle \langle \text{multiThen} \rangle \} \\
\langle \text{singleThen} \rangle &= \langle \text{stmt} \rangle [ \langle \text{return} \rangle \langle \text{elseBlock} \rangle ] \\
\langle \text{multiThen} \rangle &= \langle \text{stmtList} \rangle \{ \text{end if} \mid \langle \text{elseBlock} \rangle \} \\
\langle \text{elseBlock} \rangle &= \text{else} \{ \langle \text{stmt} \rangle \langle \text{return} \rangle \langle \text{stmtList} \rangle \text{end if} \} \\
\langle \text{repeatBlock} \rangle &= \text{repeat} [ \text{forever} \mid \langle \text{duration} \rangle \mid \langle \text{count} \rangle \mid \text{with} \langle \text{identifier} \rangle = \langle \text{range} \rangle ] \langle \text{return} \rangle \langle \text{stmtList} \rangle \text{end repeat} \\
\langle \text{duration} \rangle &= \text{until} \langle \text{logical} \rangle \mid \text{while} \langle \text{logical} \rangle \\
\langle \text{count} \rangle &= \{ \langle \text{for} \rangle \langle \text{unsigned} \rangle \langle \text{times} \rangle \} \\
\langle \text{range} \rangle &= \langle \text{integer} \rangle \[ \text{down} \] \langle \text{to} \rangle \langle \text{integer} \rangle
\end{align*}
\]

A.2  Expressions

\[
\begin{align*}
\langle \text{expr} \rangle &= \langle \text{source} \rangle \mid - \langle \text{expr} \rangle \mid \text{not} \langle \text{expr} \rangle \mid \langle \text{expr} \rangle \langle \text{op} \rangle \langle \text{expr} \rangle \mid (\langle \text{expr} \rangle) \mid \langle \text{chunk} \rangle \langle \text{expr} \rangle \mid \text{there is} \{ \text{a} \mid \text{an} \mid \text{no} \} \langle \text{expr} \rangle \\
\langle \text{op} \rangle &= + \mid - \mid * \mid / \mid \& \mid \&\& \mid ^{\ast} \mid = \mid < \mid > \mid <> \mid \neq \mid <= \mid >= \mid \leq \mid \geq \mid \text{and} \mid \text{or} \mid \text{contains} \mid \text{div} \mid \text{mod} \mid \text{is} \mid \text{is not} \mid \text{is in} \mid \text{is not in} \mid \text{is within} \mid \text{is not within} \mid \text{is a[n]} \mid \text{is not a[n]} \\
\langle \text{source} \rangle &= \langle \text{literal} \rangle \mid \langle \text{constant} \rangle \mid \langle \text{simpleContainer} \rangle \mid \{\langle \text{adjective} \rangle \} \langle \text{function} \rangle \mid \{\langle \text{adjective} \rangle \} \langle \text{property} \rangle \text{of} \{\langle \text{object} \rangle \mid \langle \text{window} \rangle \mid \langle \text{menuItem} \rangle \langle \text{of} \rangle \langle \text{menu} \rangle \mid \langle \text{chunk} \rangle \langle \text{field} \rangle \} \\
\langle \text{literal} \rangle &= \text{“quoted string”} \mid \text{unquotedToken} \\
\langle \text{constant} \rangle &= \text{down} \mid \text{empty} \mid \text{false} \mid \text{formFeed} \mid \text{lineFeed} \mid \pi \mid \text{quote} \mid \text{space} \mid \text{tab} \mid \text{true} \mid \text{up} \mid \text{zero} \mid \text{one} \mid \text{two} \mid \text{three} \mid \text{four} \mid \text{five} \mid \text{six} \mid \text{seven} \mid \text{eight} \mid \text{nine} \mid \text{ten} \\
\langle \text{adjective} \rangle &= \text{long} \mid \text{short} \mid \text{abbrev} \mid \text{abbr} \mid \text{abbreviated} \\
\langle \text{window} \rangle &= \{ \text{the} \} \{ \text{card} \mid \text{pattern} \mid \text{tool} \mid \text{scroll} \} \langle \text{window} \rangle \mid \langle \text{messageBox} \rangle \\
\langle \text{menuItem} \rangle &= \langle \text{ordinal} \rangle \langle \text{menuItem} \rangle \mid \langle \text{menuItem} \rangle \langle \text{expr} \rangle \\
\langle \text{menu} \rangle &= \langle \text{ordinal} \rangle \langle \text{menu} \rangle \mid \langle \text{menu} \rangle \langle \text{expr} \rangle \\
\langle \text{function} \rangle &= \langle \text{theFunc} \rangle \mid \{ \langle \text{theFunc} \rangle \langle \text{of} \rangle \langle \text{oneFuncArg} \rangle \mid \langle \text{identifier} \rangle \langle \text{funcArgs} \rangle \}
\end{align*}
\]

\(^{11}\)There may be some omissions due to the breadth of the language.
\langle the\ Func \rangle = \ abs \ | \ annuity \ | \ atan \ | \ average \ | \ charToNum \ | \ clickChunk \ | \ clickH \ | \ clickLine \ | \ clickLoc \ | \ clickText \ | \ clickV \ | \ cmdKey \ | \ commandKey \ | \ compound \ | \ cos \ | \ date \ | \ diskSpace \ | \ exp \ | \ exp1 \ | \ exp2 \ | \ foundChunk \ | \ foundField \ | \ foundLine \ | \ foundText \ | \ heapSpace \ | \ length \ | \ ln \ | \ ln1 \ | \ log2 \ | \ max \ | \ menus \ | \ min \ | \ mouse \ | \ mouseClick \ | \ mouseH \ | \ mouseLoc \ | \ mouseV \ | \ number \ | \ numToChar \ | \ offset \ | \ optionKey \ | \ param \ | \ paramCount \ | \ params \ | \ programs \ | \ random \ | \ result \ | \ round \ | \ screenRect \ | \ seconds \ | \ selectedButton \ | \ selectedChunk \ | \ selectedField \ | \ selectedLine \ | \ selectedLoc \ | \ selectedText \ | \ shiftKey \ | \ sin \ | \ sound \ | \ sqrt \ | \ stacks \ | \ stackSpace \ | \ sum \ | \ systemVersion \ | \ tan \ | \ target \ | \ ticks \ | \ time \ | \ tool \ | \ trunc \ | \ value \ | \ windows

\langle property \rangle = \ address \ | \ autoHilite \ | \ autoSelectAutoTab \ | \ blindTyping \ | \ botRight \ | \ bottom \ | \ bottomRight \ | \ brush \ | \ cantAbort \ | \ cantDelete \ | \ cantModify \ | \ cantPeek \ | \ centered \ | \ checkMark \ | \ cmdChar \ | \ commandChar \ | \ cursor \ | \ debugger \ | \ dialingTime \ | \ dialingVolume \ | \ dontSearch \ | \ dontWrap \ | \ dragSpeed \ | \ editBkgnd \ | \ enabled \ | \ environment \ | \ family \ | \ filled \ | \ fixedLineHeight \ | \ freeSize \ | \ grid \ | \ height \ | \ highlight \ | \ highlit \ | \ hilite \ | \ icon \ | \ id \ | \ itemDelimiter \ | \ language \ | \ left \ | \ lineSize \ | \ loc \ | \ location \ | \ lockErrorDialogs \ | \ lockMessages \ | \ lockRecent \ | \ lockScreen \ | \ lockText \ | \ longWindowTitles \ | \ markChar \ | \ marked \ | \ menuMessage \ | \ menuMsg \ | \ messageWatcher \ | \ multiple \ | \ multipleLines \ | \ multiSpace \ | \ name \ | \ numberFormat \ | \ owner \ | \ partNumber \ | \ pattern \ | \ polySides \ | \ powerKeys \ | \ printMargins \ | \ printTextAlign \ | \ printUIFont \ | \ printTextHeight \ | \ printFontSize \ | \ printTextStyle \ | \ rect \ | \ rectangle \ | \ reportTemplates \ | \ right \ | \ script \ | \ scriptEditor \ | \ scriptingLanguage \ | \ scriptUIFont \ | \ scriptTextSize \ | \ scroll \ | \ sharedHilite \ | \ sharedText \ | \ showLines \ | \ showName \ | \ showPict \ | \ size \ | \ stacksInUse \ | \ style \ | \ suspended \ | \ textAlign \ | \ textArrows \ | \ uFont \ | \ uHeight \ | \ uSize \ | \ uText \ | \ uWidth \ | \ top \ | \ topLeft \ | \ traceDelay \ | \ userLevel \ | \ userModify \ | \ variableWatcher \ | \ version \ | \ visible \ | \ wideMargins \ | \ width \ | \ zoomed

A.3 Ordinals and Positions
\langle ordinal \rangle = \ [ \ the \ ] \ { \ last \ | \ mid \ | \ middle \ | \ any \ | \ first \ | \ second \ | \ third \ | \ fourth \ | \ fifth \ | \ sixth \ | \ seventh \ | \ eighth \ | \ ninth \ | \ tenth \ }

\langle position \rangle = \ this \ | \ [ \ the \ ] \ prev \ | \ [ \ the \ ] \ next

A.4 Chunks and Containers
\langle simpleContainer \rangle = \ \langle variable \rangle \ | \ \langle part \rangle \ | \ \langle menu \rangle \ | \ \langle messageBox \rangle \ | \ [ \ the \ ] \ selection
\langle container \rangle = \ \langle chunk \rangle \ \langle simpleContainer \rangle \ | \ \langle simpleContainer \rangle

\langle messageBox \rangle = \ [ \ the \ ] \ msg \ [ \ box \ | \ window \ ]

\langle chunk \rangle = \ \{ \{ \langle ordinal \rangle \ string \ char \ \langle expr \rangle \ [ \ to \ \langle expr \rangle \ ] \ \} \ of \ \langle word \rangle \ | \ \langle word \rangle \ \langle expr \rangle \ [ \ to \ \langle expr \rangle \ ] \ \} \ of \ \{ \{ \langle ordinal \rangle \ \langle item \rangle \ | \ \langle item \rangle \ \langle expr \rangle \ [ \ to \ \langle expr \rangle \ ] \ \} \ of \ \{ \{ \langle ordinal \rangle \ \langle line \rangle \ | \ \langle line \rangle \ \langle expr \rangle \ [ \ to \ \langle expr \rangle \ ] \ \} \ of \ \}

A.5 Objects
\langle object \rangle = \ 12 \ HyperCard \ | \ me \ | \ [ \ the \ ] \ target \ | \ \langle button \rangle \ | \ \langle field \rangle \ | \ \langle card \rangle \ | \ \langle bknd \rangle \ | \ \langle stack \rangle
\langle button \rangle = \ \{ \ buttonId \ \langle unsignedFactor \rangle \ | \ button \ \langle factor \rangle \ | \ \langle ordinal \rangle \ \langle button \rangle \ \} \ [ \ of \ \langle card \rangle \ ]
\langle field \rangle = \ \{ \ fieldId \ \langle unsignedFactor \rangle \ | \ field \ \langle factor \rangle \ | \ \langle ordinal \rangle \ \langle field \rangle \ \} \ [ \ of \ \langle card \rangle \ ]
\langle part \rangle = \ \langle button \rangle \ | \ \langle field \rangle \ | \ \{ \ partId \ \langle unsignedFactor \rangle \ | \ part \ \langle factor \rangle \ | \ \langle ordinal \rangle \ \langle part \rangle \ \} \ [ \ of \ \langle card \rangle \ ]
\langle card \rangle = \ recent \ card \ | \ back \ | \ forth \ | \ cardId \ \langle unsigned \rangle \ | \ \langle card \rangle \ | \ card \ \langle endLine \rangle \ | \ \langle ordinal \rangle \ \langle card \rangle \ | \ \langle position \rangle \ \langle card \rangle \ [ \ of \ \langle bknd \rangle \ ] \ | \ \langle ordinal \rangle \ \langle marked \ card \rangle \ | \ \langle position \rangle \ \langle marked \ card \rangle \ | \ \langle marked \ card \rangle \ \langle expr \rangle
\langle bknd \rangle = \ \langle bkndId \rangle \ \langle unsigned \rangle \ | \ \langle bknd \rangle \ \langle expr \rangle \ | \ \langle bknd \rangle \ \langle endLine \rangle \ | \ \langle ordinal \rangle \ \langle bknd \rangle \ | \ \langle position \rangle \ \langle bknd \rangle
\langle stack \rangle = \ \langle this \ stack \rangle \ | \ \langle stack \rangle \ \langle expr \rangle \ | \ \langle stack \rangle \ \langle endLine \rangle

12Note: “card field 1” is a field and “card (field 1)” is a card.
A.6 Commands

A.6.1 Command Nonterminals

\[ \text{dateItems} = \langle \text{unsigned}, \text{unsigned}, \text{unsigned}, \text{unsigned}, \text{unsigned}, \text{unsigned} \rangle \]

\[ \langle \text{date} \rangle = \langle \text{unsigned} \rangle \ | \ \langle \text{dateItems} \rangle \ \langle \text{humanDate} \rangle \ [ \langle \text{humanTime} \rangle ] \ | \ \langle \text{humanTime} \rangle \ [ \langle \text{humanDate} \rangle ] \]

\[ \langle \text{dateFormat} \rangle = [ \langle \text{adjective} \rangle ] \ \{ \text{seconds} \ | \ \langle \text{dateItems} \rangle \ | \ \text{date} \ | \ \text{time} \} \]

\[ \langle \text{dayOfWeek} \rangle = \text{Sunday} \ | \ \text{Sun} \ | \ \text{Monday} \ | \ \text{Mon} \ | \ \text{Tuesday} \ | \ \text{Tue} \ | \ \text{Wednesday} \ | \ \text{Wed} \ | \ \text{Thursday} \ | \ \text{Thu} \ | \ \text{Friday} \ | \ \text{Fri} \ | \ \text{Saturday} \ | \ \text{Sat} \]

\[ \langle \text{dest} \rangle = \{ \langle \text{card} \rangle \ | \ \langle \text{bkgrd} \rangle \ \} \ \text{of} \ \langle \text{stack} \rangle \ | \ \langle \text{stack} \rangle \ | \ \{ \langle \text{card} \rangle \ | \ \langle \text{bkgrd} \rangle \ \} \ \text{of} \ \{ \langle \text{stack} \rangle \} \ \langle \text{exprOrLine} \rangle \]

\[ \langle \text{duration} \rangle = \text{until} \ \langle \text{logical} \rangle \ | \ \text{while} \ \langle \text{logical} \rangle \]

\[ \langle \text{humanDate} \rangle = \{ \langle \text{dayOfWeek} \rangle, \} \ \langle \text{month} \rangle \ \langle \text{unsigned} \rangle \ | \ \langle \text{unsigned} \rangle \ | \ \langle \text{unsignedFactor} \rangle \ \{ / \ | - \} \ \langle \text{unsignedFactor} \rangle \]

\[ \langle \text{humanTime} \rangle = \langle \text{unsigned} \rangle \ : \ \langle \text{unsigned} \rangle \ [ \langle \text{am} \ | \ \text{pm} \ \rangle \]

\[ \langle \text{month} \rangle = \text{January} \ | \ \text{Jan} \ | \ \text{February} \ | \ \text{Feb} \ | \ \text{March} \ | \ \text{Mar} \ | \ \text{April} \ | \ \text{Apr} \ | \ \text{May} \ | \ \text{May} \ | \ \text{June} \ | \ \text{Jun} \ | \ \text{July} \ | \ \text{Jul} \ | \ \text{August} \ | \ \text{Aug} \ | \ \text{September} \ | \ \text{Sep} \ | \ \text{October} \ | \ \text{Oct} \ | \ \text{November} \ | \ \text{Nov} \ | \ \text{December} \ | \ \text{Dec} \]

\[ \langle \text{point} \rangle = \{ \langle \text{integer} \rangle, \ \langle \text{integer} \rangle \} \]

\[ \langle \text{preposition} \rangle = \text{before} \ | \ \text{after} \ | \ \text{into} \]

\[ \langle \text{rect} \rangle = \{ \langle \text{integer} \rangle, \ \langle \text{integer} \rangle, \ \langle \text{integer} \rangle, \ \langle \text{integer} \rangle \} \]

\[ \langle \text{springKeys} \rangle = \langle \text{springKeys} \rangle \ | \ \langle \text{springKey} \rangle \ | \ \langle \text{springKey} \rangle \]

\[ \langle \text{springKey} \rangle = \langle \text{shiftKey} \rangle \ | \ \langle \text{optionKey} \rangle \ | \ \langle \text{commandKey} \rangle \]

\[ \langle \text{style} \rangle = \text{transparent} \ | \ \text{opaque} \ | \ \text{rectangle} \ | \ \text{roundrect} \ | \ \text{shadow} \ | \ \text{checkBox} \ | \ \text{radioButton} \ | \ \text{scrolling} \ | \ \text{oval} \ | \ \text{popup} \]

\[ \langle \text{textAlign} \rangle = \text{right} \ | \ \text{left} \ | \ \text{center} \]

\[ \langle \text{textStyleList} \rangle = \langle \text{textStyleList} \rangle \ \langle \text{textStyle} \rangle \ | \ \langle \text{textStyle} \rangle \]

\[ \langle \text{textStyle} \rangle = \text{plain} \ | \ \text{bold} \ | \ \text{italic} \ | \ \text{underline} \ | \ \text{outline} \ | \ \text{shadow} \ | \ \text{condense} \ | \ \text{extend} \ | \ \text{group} \]

\[ \langle \text{visEffect} \rangle = \langle \text{visKind} \rangle \ [ \ {\text{very} \ | \ \text{slow} \ | \ \text{slowly} \ | \ \text{fast} \} \ [ \ \text{to} \ \langle \text{visSrc} \rangle \]

\[ \langle \text{visKind} \rangle = \text{barn door} \ \{ \langle \text{open} \ | \ \text{close} \ \} \ \langle \text{cut} \ | \ \text{plain} \ | \ \text{dissolve} \ | \ \text{venetian blinds} \ | \ \text{checkerboard} \ | \ \text{iris} \]

\[ \{ \langle \text{open} \ | \ \text{close} \ \} \ \langle \text{scroll} \rangle \ | \ \text{left} \ \langle \text{right} \ | \ \text{up} \ | \ \text{down} \ \} \ \langle \text{wipe} \rangle \ | \ \text{left} \ \langle \text{right} \ | \ \text{up} \ | \ \text{down} \ \} \ \langle \text{zoom} \rangle \]

\[ \langle \text{visSrc} \rangle = \langle \text{card} \rangle \ | \ \langle \text{black} \rangle \ | \ \langle \text{white} \rangle \ | \ \langle \text{gray} \rangle \ | \ \langle \text{inverse} \rangle \]

\[ \langle \text{window} \rangle = \{ \langle \text{card} \rangle \ | \ \langle \text{pattern} \rangle \ | \ \langle \text{tool} \rangle \ | \ \langle \text{scroll} \rangle \ | \ \langle \text{fatBits} \rangle \ \text{window} \ | \ \langle \text{messageBox} \rangle \]
A.6.2 Commands

add (arith) to (container)

answer (expr) [ with (factor) [ or (factor) [ or (factor) ] ] ] [ file (expr) [ of type (factor) [ or (factor) [ or (factor) ] ] ] ] [ program (expr) of type (factor) ]

arrowkey left | right | up | down

ask { password | file } (expr) [ with (expr) | line ]

beep [(unsigned)]

choose tool (unsigned) | { browse | button | field | select | lasso | pencil | brush | eraser | line | spray [ can ] | rect | round rect | bucket | oval | curve | text | reg poly | poly } tool

click at (point) [ with (springKeys) ]

close file (exprOrLine) | printing | application (exprOrLine) | <window>

commandKeyDown (expr)

colorkey (unsigned)

convert { (container) | <date> } [ from <dateFormat> [ and <dateFormat> ] ] to <dateFormat> [ and <dateFormat> ]

copy template (expr) to <stack>

create stack (expr) [ with { bkgnd } ] [ in [a] new window ] | menu (expr)

diff key hintBits | pureQuickDraw { true | false } | checkpoint | maxmem | sound { on | off }

delete <chunk> (simpleContainer) | [ <menuItemExpr> { of | from } ] (menuExpr) (part)

dial (expr) [ with modem | with [ modem ] (expr) ]

disable [ <menuItem> of ] (menu) | (button)

divide (container) by <float>

domain (exprOrLine) | (expr) [ , (expr) ] [ without dialog ]

drag from (point) to (point) [ with (springKeys) ]

edit [ the ] script of (object)

enable [ <menuItem> of ] (menu) | (button)

enterInField

enterKey

export paint to file (expr)

find [ whole | string | words | word | chars | normal ] [ international ] (expr) [ in (field) ] [ (ofOnly) marked cards ] functionkey (unsigned)

get (expr) | [ the ] (property) [ of ] [ (window) | (object) | (menuItem) of ] (menu) | (chunk) (field) ]

go [ to ] {{ (ordinal) | (position) } (endLine) | (dest) } [ in [ a ] new window ] [ without dialog ]

help

hide menuBar | picture of (object) | { card | bkgnd } picture | (window) | (part)
import paint from file (expr)

keyDown (expr)

lock screen | messages | error dialogs | recent

mark all cards | ⟨card⟩ | cards where (expr) | cards by finding [ whole | string | words | word | chars | normal ] [ international ] ⟨expr⟩ [ in ⟨field⟩ ]

multiply (container) by (arith)

open [report] printing [ with dialog ] | file ⟨exprOrLine⟩ | ⟨expr⟩ [ with ⟨exprOrLine⟩ ] | ⟨exprOrLine⟩

play stop | ⟨expr⟩ [ [ tempo (unsigned) ] ⟨exprOrLine⟩ ]

pop card [ ⟨preposition⟩ ⟨container⟩ ]

print (expr) with ⟨exprOrLine⟩ | (unsigned) cards | all cards | marked cards | ⟨card⟩ | ⟨field⟩ | ⟨expr⟩

push ⟨dest⟩

put ⟨expr⟩ [ (preposition) ] ⟨container⟩ | [ ⟨menuItem⟩ of ] ⟨menu⟩ [ with menuMessage[s] ⟨expr⟩ ]

read from file ⟨expr⟩ { until ⟨expr⟩ } | for ⟨unsigned⟩

reply ⟨expr⟩ [ with keyword ⟨expr⟩ ] error ⟨expr⟩

request ⟨expr⟩ { of | from } ⟨expr⟩ { ae | appleEvent } { class | ID | sender | returnID | data [ { of | with } keyword ⟨expr⟩ ] }

reset paint | menubar | printing

returnInField

returnKey

save { { this } stack | stack ⟨expr⟩ } as { stack } ⟨expr⟩

select [ before | after ] text of | ⟨chunk⟩ ⟨field⟩ | ⟨message⟩ | ⟨part⟩ | ⟨emptyExpr⟩

set [ the ] ⟨property⟩ [ { ofOnly } { ⟨window⟩ | ⟨object⟩ | ⟨menuItem⟩ of ⟨menu⟩ | ⟨chunk⟩ ⟨field⟩ } ] to ⟨propVal⟩

show menubar | picture of ⟨object⟩ | { card | bkgnd } picture | { ⟨window⟩ | ⟨part⟩ } [ at ⟨point⟩ ] | [ all | marked | ⟨unsigned⟩ ] cards

sort { { cards of } { this stack | ⟨bkgnd⟩ } | marked cards } [ ascending | descending ] [ text | numeric | international | dateTime ] by ⟨expr⟩ { { lines | items } of ] ⟨container⟩ by ⟨expr⟩

start using ⟨stack⟩

stop using ⟨stack⟩

subtract (arith) from ⟨container⟩

tabKey

type ⟨expr⟩ [ with ⟨springKeys⟩ ]

unlock screen [ with [ visual [ effect ] ] ⟨visEffect⟩ ] | error dialogs | recent | messages

unmark all cards | ⟨card⟩ | cards where ⟨expr⟩ | cards by finding [ whole | string | words | word | chars | normal ] [ international ] ⟨expr⟩ [ in ⟨field⟩ ]

13See notes on set.
visual [ effect ] ⟨visEffect⟩

wait ⟨duration⟩ | ⟨count⟩ [ ticks | tick | seconds | second | sec ]

write ⟨expr⟩ to file ⟨exprOrLine⟩

A.6.3 set Command Syntax

⟨style⟩ = transparent | opaque | rectangle | roundrect | shadow | checkBox | radioButton | scrolling | oval | popup

⟨textAlign⟩ = right | left | center

⟨textStyleList⟩ = ⟨textStyleList⟩ ⟨textStyle⟩ | ⟨textStyle⟩

⟨textStyle⟩ = plain | bold | italic | underline | outline | shadow | condense | extend | group

⟨propVal⟩ = ⟨exprOrLine⟩ | ⟨integer⟩ | ⟨unsigned⟩ | ⟨logical⟩ | ⟨point⟩ | ⟨rect⟩ | ⟨style⟩ | ⟨textAlign⟩ | ⟨textStyleList⟩

exprOrLine commandChar, cursor, debugger, environment, itemDelimiter, language, markChar, menuMessage, messageWatcher, name, numberFormat, owner, printTextStyle, reportTemplates, script, scriptEditor, scriptingLanguage, scriptTextFont, stacksInUse, textFont, variableWatcher, version

integer top, bottom, left, right, width, height

unsigned brush, dialingTime, dialingVolume, dragSpeed, family, freeSize, icon, ID, lineSize, multiSpace, partNumber, pattern, polySides, printTextStyle, printTextSize, scroll, size, textHeight, textSize, titleWidth, traceDelay, userLevel

logical autoHilite, autoSelect, autoTab, blindTyping, cantAbort, cantDelete, cantModify, cantPeek, centered, checkMark, dontSearch, dontWrap, editBkgnd, enabled, filled, fixedLineHeight, grid, hilite, lockErrorDialogs, lockMessages, lockRecent, lockScreen, lockText, longWindowTitle, marked, multiple, multipleLines, powerKeys, sharedHilite, sharedText, showLines, showName, showPict, suspended, textArrows, userModify, visible, wideMargins, zoomed

point loc, topLeft, botRight, bottomRight, scroll (of window)

rect rect, printMargins

style ⟨style⟩

textAlign ⟨textAlign⟩, printTextAlign

textStyleList printTextStyle, textStyle

A.7 Functions

Note: ⟨funcArith⟩, ⟨funcFloat⟩, ⟨funcExpr⟩, and ⟨funcUnsigned⟩ all take expressions where they're called with parentheses, but factors otherwise.

abs ⟨funcArith⟩

annuity ⟨float⟩, ⟨float⟩

atan ⟨funcFloat⟩

average ⟨arithList⟩

charToNum ⟨funcExpr⟩

clickChunk
numToChar  ⟨funcUnsigned⟩
offset  ⟨string⟩, ⟨string⟩
optionKey
param  ⟨funcUnsigned⟩
paramCount
params
random  ⟨funcUnsigned⟩
result
round  ⟨funcFloat⟩
screenRect
seconds
selectedButton  [ card | bkgnd ] family ⟨funcUnsigned⟩
selectedChunk
selectedField
selectedLine
selectedLoc
selectedText
shiftKey
sin  ⟨funcFloat⟩
sound
sqrt  ⟨funcFloat⟩
stacks
stackSpace
sum  ⟨arithList⟩
systemVersion
tan  ⟨funcFloat⟩
target
ticks
time
tool
trunc  ⟨funcFloat⟩
value  ⟨funcExpr⟩
windows