

To: Distribution
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Subject: The Video Typewriter

Date: March 13, 1974
Location: Palo Alto
Organization: SSL

MINI-MOUSE: A MINIMAL VIDEO TYPEWRITER

INTRODUCTION

The primary purpose of Mini-Mouse is to demonstrate a user interface for display text editing that is rapidly learned and comfortably used. Effort has been concentrated on what the novice needs to learn the first day of use. Therefore, the video typewriter is not fully general, and in fact has omissions which make it completely impractical as a production text editor.

CONCEPTUAL MODEL

The program tries to simulate an ordinary typewriter wherever possible. All keys which have a meaning on a typewriter have the same meaning in normal use of Mini-Mouse. The screen displays one "page" of text at a time -- exactly what would print in the typing area of a sheet of hard copy. When the video typewriter is idle, there is a black rectangular cursor (inverted character) indicating the location that the next-typed character will appear.

The new concepts to be learned by the novice are the ability to insert and delete characters, and the automatic starting of new lines and new pages with carry-over of the last word. These features are obvious and pleasant to use, and help to stimulate a favorable attitude on the part of the student towards the system.

CURSOR

The character marked by the black cursor is called the "target", and is the focus of all typing and editing operations. This cursor is of course moved after each character is typed, and can also be moved explicitly in various simple ways. For example, the space bar moves the cursor one character position to the right; the BS key moves it one left; the RETURN key moves it to the left margin on the next line; the TAB key moves it to the next tab stop.

If the top mouse button is pressed, the black cursor changes to a crosshair symbol which follows the motion of the mouse. When the button is

released, the crosshairs change back to a black cursor at the nearest character position.

None of these cursor-moving operations has any effect on the text.

KEYSTROKES

The blank keys on the right of the keyboard are labelled INS, UP, and DOWN. The LF key is re-labelled DO IT. The keyboard is encoded in software so that it is easy for the program to distinguish strokes like CTRL-TAB from SHIFT-TAB and TAB. This provides a variety of functions without a large set of function keys, and makes up for Mini-Mouse's sore lack of structural entities and insert mode.

UP and DOWN move the cursor up or down one line.

INS inserts a single space before the indicated character, breaking the line in two if it overflows. DEL deletes the indicated character. Because of the two-dimensional model of a page, many students have best understood the function of these keys as sliding text right and left. Consideration could be given to this interpretation as the basis of a set of editing functions.

DO IT packs (refills) an edited paragraph. Packing is not done after every correction, so that when working from hard copy, the lines on screen and copy would correspond to each other more closely and be easier to locate. Adherence to pagination would also be desirable in a production system.

CTRL DO IT terminates the edit. Other keystrokes less frequently used are tabulated in the appendix.

COMMANDS

Commands are used to start up an edit and to sign off. All the words of a command are typed in full, followed by a DO IT to cause execution. Commands are typed into a transcript file which scrolls through a three-line command window beneath the typing area. The principal commands are:

My name is <one word> ... creates a new transcript or reopens an old transcript belonging to the person named. The transcript is useful as a personal record of work performed.

Work on <document name> ... creates a new file or reopens an old file and sets it up for editing in the typing area.

Goodbye ... saves the session transcript, resumable at a later time using the "My name" command.

Any command can be edited before it is executed, and a previous command can be re-executed by moving the cursor into it and typing CTRL DO IT.

COMMAND ESCAPES

During an edit, ESC escapes to a command processor. The cursor appears in the command window and a "COMMAND:" message is printed there. The operator may cause one command to be executed. Some of the available commands at this level are:

page n ... turns to page n

page ... prints the number of the page now in view

find 'string' ... moves the cursor to the next occurrence in the document of the string

IN-PLACE EDITING

The video typewriter has no concept of a literal. The text being typed in is not distinguished from the text already in the document. This characteristic places Mini-Mouse in the category of "in-place editors" along with most other display editors other than NLS. Examples of other in-place editors are the Stanford TVEDITs, RAND's GRAIL, the wire-service systems, LEXITRON, intelligent terminals, the Yale editor, Peter Deutsch's LISP-based VTS editor, and Dan Swinehart's SAIL-based VTS editor.

In-place editing makes operations more direct. Feedback is provided inherently by the fact that each stroke causes an obvious change to the screen; thus artificial feedback is not needed as it is in NLS. Because of the typewriter analogy, users claim to find in-place editing more intuitive than the command-based editing of systems such as POET and NLS.

Unfortunately, in-place editors have been mainly line-oriented. A combination of their user interface with the functional capability of NLS could provide a system that is both easy to use and powerful.

UNUSUAL CHARACTERISTICS OF MINI-MOUSE

The video typewriter has no modes. This is not always an advantage, but the attempt is to see how far an editor can go without modes. In most in-place editors, there is an insert mode. In NLS, there are numerous modes (append character, replace word, etc.) and submodes (specify the target, specify the operand or literal). As a result, each manual operation has a variety of meanings depending on what mode the video typewriter is in. Mini-Mouse demonstrates that it is not necessary to understand modes for basic text entry and minor edits.

There are no invisible characters in the file except the space, as far as the user is concerned. Mousing and typing can occur anywhere in the page.

All screen changes except typein and single character edits are performed slowly enough so that the student can observe them in progress. This eliminates most surprises that baffle new users. Furthermore, it is not possible by a single keystroke to do any drastic damage to the document. Thus, the student becomes comfortable and confident very quickly.

TEACHING MINI-MOUSE

The "display typewriter" has been taught to several PARC secretaries and to a temporary typist who was a novice to computers. Each lesson lasted one or two hours; only one student (the temporary typist) had two sessions, both in one day. Several of the sessions were observed by Tom Moran and Beverly McHugh. They and the students suggested numerous improvements, most of which have been incorporated into the program. A typical session proceeded as follows.

First, the student was asked to type a two-page memo or a couple of one-page letters. Little or no instruction was required for this, since the video typewriter's normal "mode" is otype.

With some students, correcting was taught immediately; others waited five to fifteen minutes so that they could type a substantial amount and become accustomed to the keyboard. First the cursor movement keys were taught, then DEL, INS, and DO IT. When these were mastered, the mouse was taught as a rapid cursor-positioning device.

After fifteen to forty-five minutes, an experimentation period was suggested in which the student tried out the various keys and practiced with the mouse. Usually, the margin and tab setting facilities were explained and tried.

To learn commands such as "Work on" involves an understanding not only of text-editing but also of the concepts Command and File. To avoid overwhelming the student with too many concepts at once, the teaching of commands was usually deferred until after the first document was completed. The ESC key was seldom taught at all.

Discussion was held among student, teacher, and observer to share feelings about the system, other text editors, and typing in general. So far, reactions to the video typewriter have been consistently favorable.

RECOMMENDED EXTENSIONS

Four important facilities were omitted from Mini-Mouse for implementation convenience: hard copy, entity specification, insert mode, and cut-and-paste. It was found that novices could be introduced to display editing without them, so the effort of implementation was avoided. Of course, they are essential in any production editor.

The following is a proposal for extensions to Mini-Mouse which would enable it to encompass some of the capabilities described in Jeff Rulifson's Functional Specification document while retaining its in-place editing style.

PROPOSAL FOR USE OF THE MOUSE

The mouse would be used to select both the position and the size of the target entity; these are natural functions of "pointing", and should be done with a pointing device. To provide visual feedback, the crosshairs displayed when each button is pressed should be different.

Three mouse buttons are adequate for distinguishing the most common entities. When pointing at a character, the buttons would mean (1) select character, (2) select word, and (3) extend entity to here. When pointing in the left margin, they would mean (1) select line, (2) select paragraph, and (3) extend entity to here.

For scrolling, the mouse would be pointed in the right margin and the buttons would mean (1) jump line to top, (2) jump line to bottom, and (3) split screen (divide one pane into two for independent scrolling). Split screen would allow the specification of an extended entity longer than one pane in height.

The top edge of each pane would be marked to indicate the relative document position of the current page. Bugging along that edge would cause a long-distance jump.

No command-delete would be necessary, because a bug error could be corrected by simply re-bugging, and because there is no mode tree to unwind from.

PROPOSAL FOR USE OF THE KEYSSET

The keyset keys would be labelled with the names of the five most frequently used commands. This would enable the novice to use them before the binary alphabet was learned. They are:

P	H	D	B	A
PACK	HAVE&HOLD	DELETE	BEFORE	AFTER

PACK would refill the target paragraph, the same as DO IT in Mini-Mouse.

HOLD would cut the target entity out of the page and hold it in a three-line window above the typing area. For an entity longer than three lines, only the first and last lines would be displayed, with an ellipsis symbol in between.

DELETE would delete the target entity, the same as the DEL key.

BEFORE or AFTER would open up on one side of the target entity a space in which a carat symbol was displayed. To insert the contents of the hold-window there, HAVE would be pressed. In conjunction with a prior HOLD, this provides a move. New text could be inserted before the carat by typing on either the keyboard or the keyset; the new text would appear in place as it is typed. Striking either DEL or all five keyset keys would delete the carat and reinstate the former target.

BEFORE and AFTER pressed simultaneously would mean COPY, which would duplicate the target entity in place. The duplicate could then be edited, or moved to another place using HAVE and HOLD.

Other keyset commands would be disabled until learned.

Most editing operations would require fewer strokes than in NLS, primarily because of the absence of a command-accept.

CONCLUSION

The video typewriter concept could become the basis of a command language for a general text-editing system such as that being created by Jeff Rulifson. If the POLOS effort hopes to experiment with a variety of command languages for office typing, it will be necessary to assure now that the functional implementation can handle not only a command-based user interface, but also an in-place interface.

ACKNOWLEDGMENTS

Few if any design ideas in Mini-Mouse were original. Among the many contributors have been Sylvia Adams, Peter Deutsch, Beverly McHugh, Diana Merry, Tom Moran, Jeff Rulifson, Dan Swinehart, and the trial users in these studies.

Implementation support was provided by the makers of the ALTO and Smalltalk. In exchange, a mode was provided in Mini-Mouse to edit Smalltalk programs. In the latter stages of development, this capability has been sufficient for all edits of the video typewriter itself.

APPENDIX -- MINI-MOUSE KEYSTROKE MEANINGS

The more frequently used keystrokes are easiest to type. Those listed parenthetically were implemented to compensate for the lack of entity specification and insert mode.

	REGULAR	SHIFT	CTRL	BOTH
SPACE	Move right 1*	Erase & space	Move far right	---
BS	Move left 1*	BS and erase	Move far left	---
UP	Move up 1	Back a page	To top line	To page 1
DOWN	Move down 1	Forth a page	To bottom line	To last page
RETURN	Next line, left margin	Next paragraph	RETURN and restore margins	---
TAB	to next tabstop	to prev tabstop	save on disk	---
INS	insert 1 space	(insert many spaces)	(break line for insert)	insert a blank line
DEL	delete one character	(delete run of spaces)	erase rest of of line (or if all blank, rejoin with next line)	delete line
ESC	command escape	---	---	PANIC
DO IT	pack paragraph	---	exit the editor	---

(*) When overtyping rapidly, the space and BS keys erase so that SHIFTing is unnecessary.

CTRL-L (left) sets the Left margin. Control-R (Right) sets the right margin. Control-RETURN restores the margins to the edges of the page. The margins are visually displayed as vertical lines.

CTRL-T (Tab) sets a tab stop and CTRL-C (Clear) clears one. The tab stops should be visibly displayed as ticks on the bottom edge but they are not.

CTRL-F (Find) repeats the last "Find" command without ESCaping to the command window.

CTRL-S (Skipto) moves the cursor to the next occurrence in the current line of the character next typed.

CTRL-D (Deleteto) deletes from the cursor to the next occurrence in the current line of the next character typed.

DISTRIBUTION

Office Communications Group; L. Conway, P. Deutsch, J. Elkind, E. Fiala, R. Flegal, W. Gunning, W. C. Jeffers, S. Jerome, D. Jones, B. Lampson, N. Lindgren, J. Lustig, P. Marton, D. Merry, J. Mitchell, V. Parrish, A. Payne, E. Satterthwaite, J. Shoch, R. Shoup, C. Simonyi, R. Sproull, R. Sweet, R. Taylor, G. Tofani; J. Rifkind (ADL), R. Kincaid (Dallas).