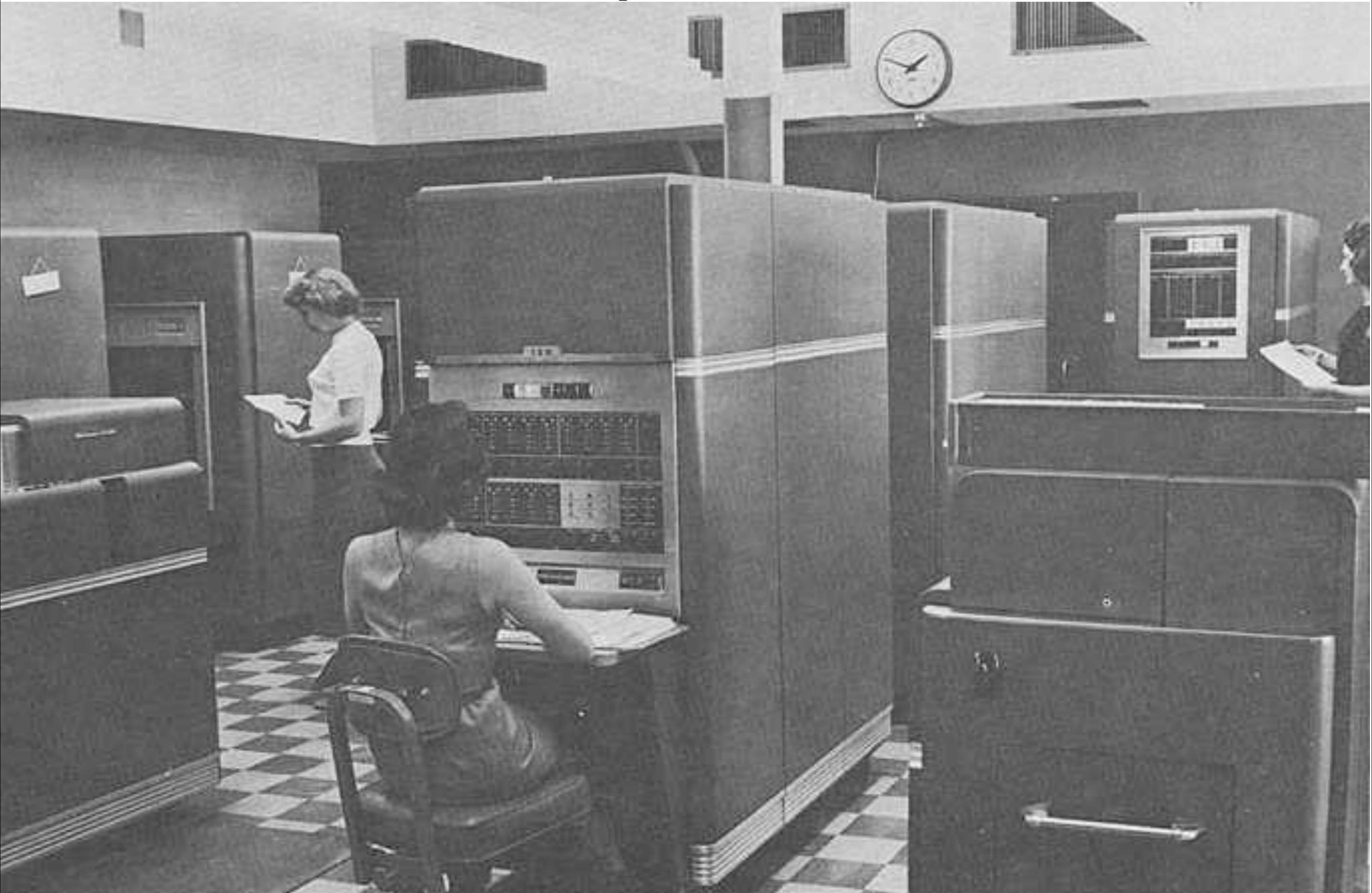


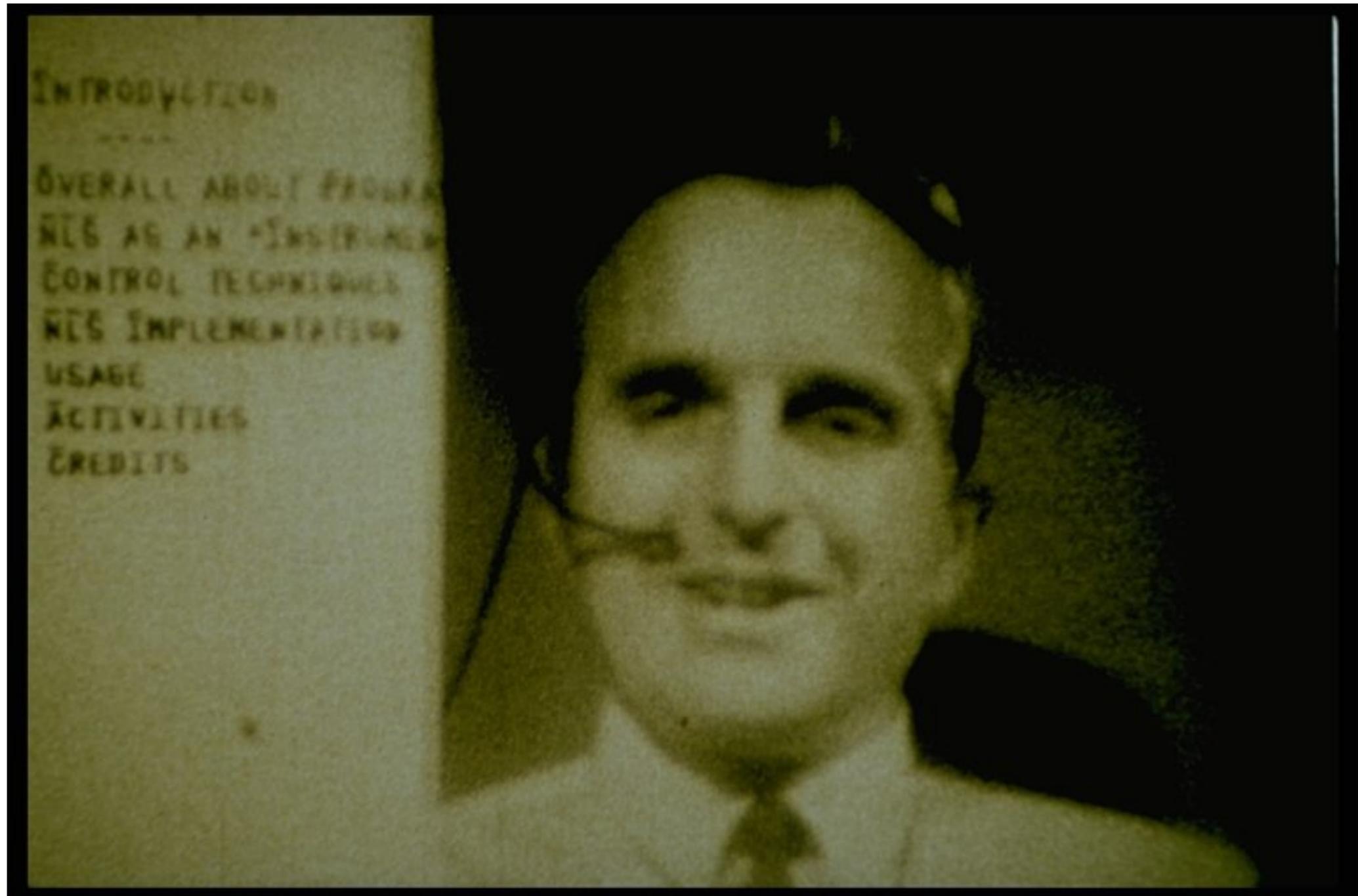
# Modeless Interaction Techniques for Text Editing

Larry Tesler  
for  
*Interaction Techniques*  
CMU HCII  
5 Feb 2014

# The User Experience in 1960



# Doug Engelbart's 1968 NLS Demo



# An NLS Workstation circa 1969

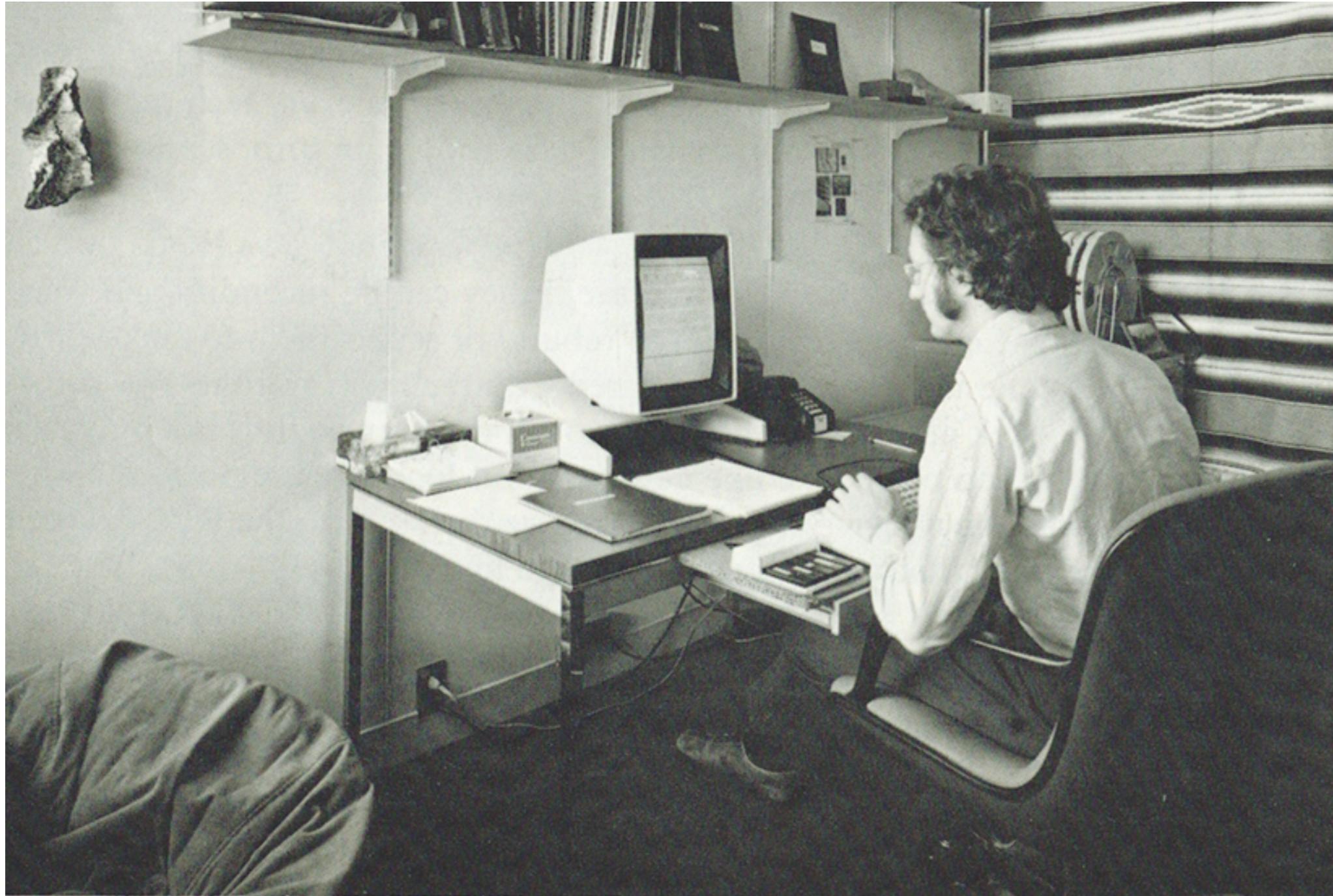


# [Xerox] PARC — Founded 1970



Source: Wikimedia Commons. Photo by Coolcaesar.

# Me and my Alto at PARC in 1975



**Offices and labs are linked to a computer network by plugging into a wall outlet.**

# Early Mice

SRI

1963



1968



Telefunken

1968



1972



Xerox PARC

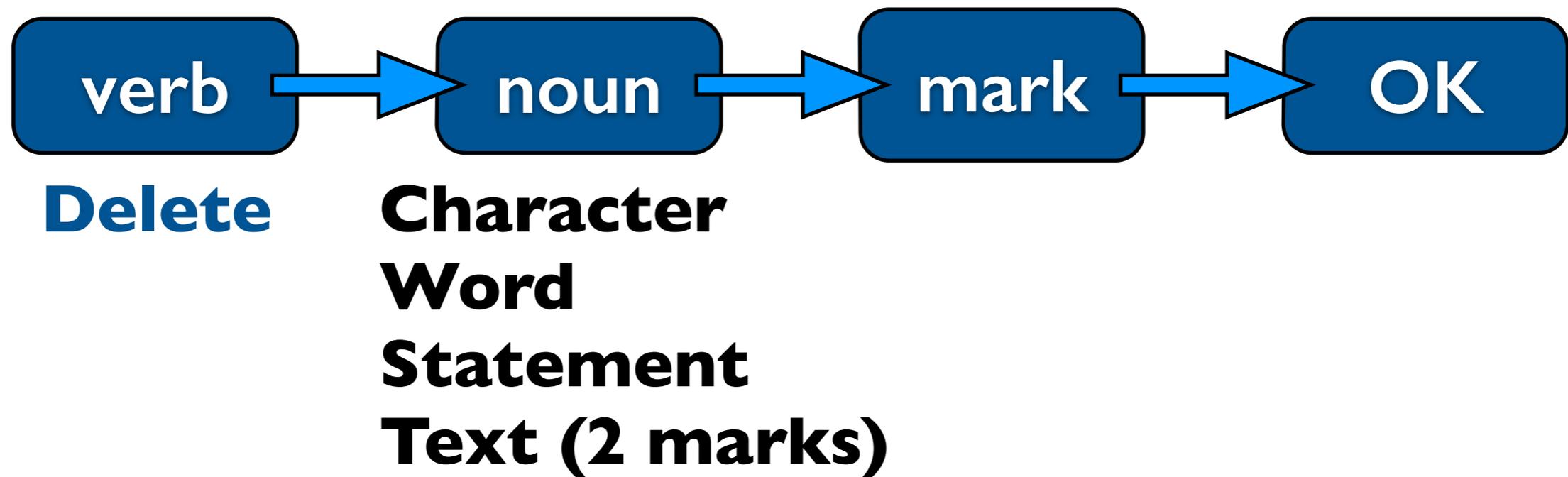
1973



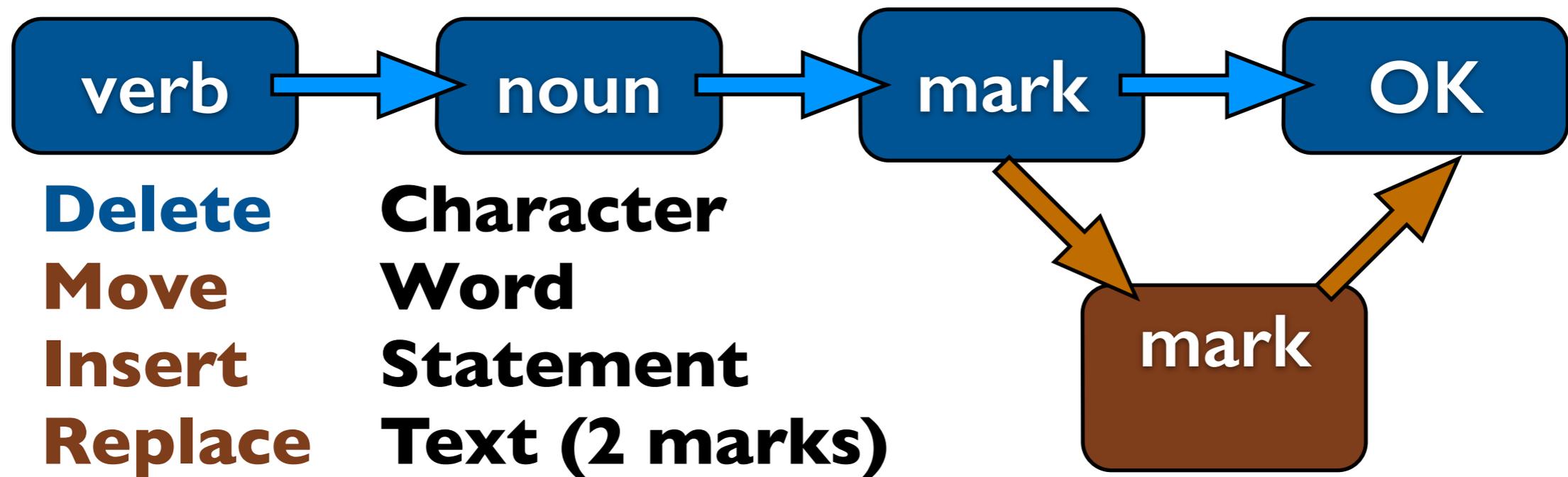
# User Studies I ran in 1973

- The main subject was our secretary
- Blank screen study findings included:
  - She wanted and expected WYSIWYG
  - To delete [imaginary] text she would run her finger across it on the screen and press a Delete key (verb *after* object)
- Studies of RCG (an NLS subset)
  - Syntax was verb *before* object

# NLS and RCG delete syntax



# NLS and RCG editing syntax



# RCG user study Aug 1973

often forgot  
how many CA's  
the letters for WF  
the point  
the click

12:40

2:00

Handset gradually introduced. A, C, D, P. Very easy!

Delighted by speed + non-complexity of ATS.

often forgot to point and/or click

difference between append/insert forgotten

~~would~~ like string to be less frequent & easier to do

always asking things like "what do I do to put a period in there"

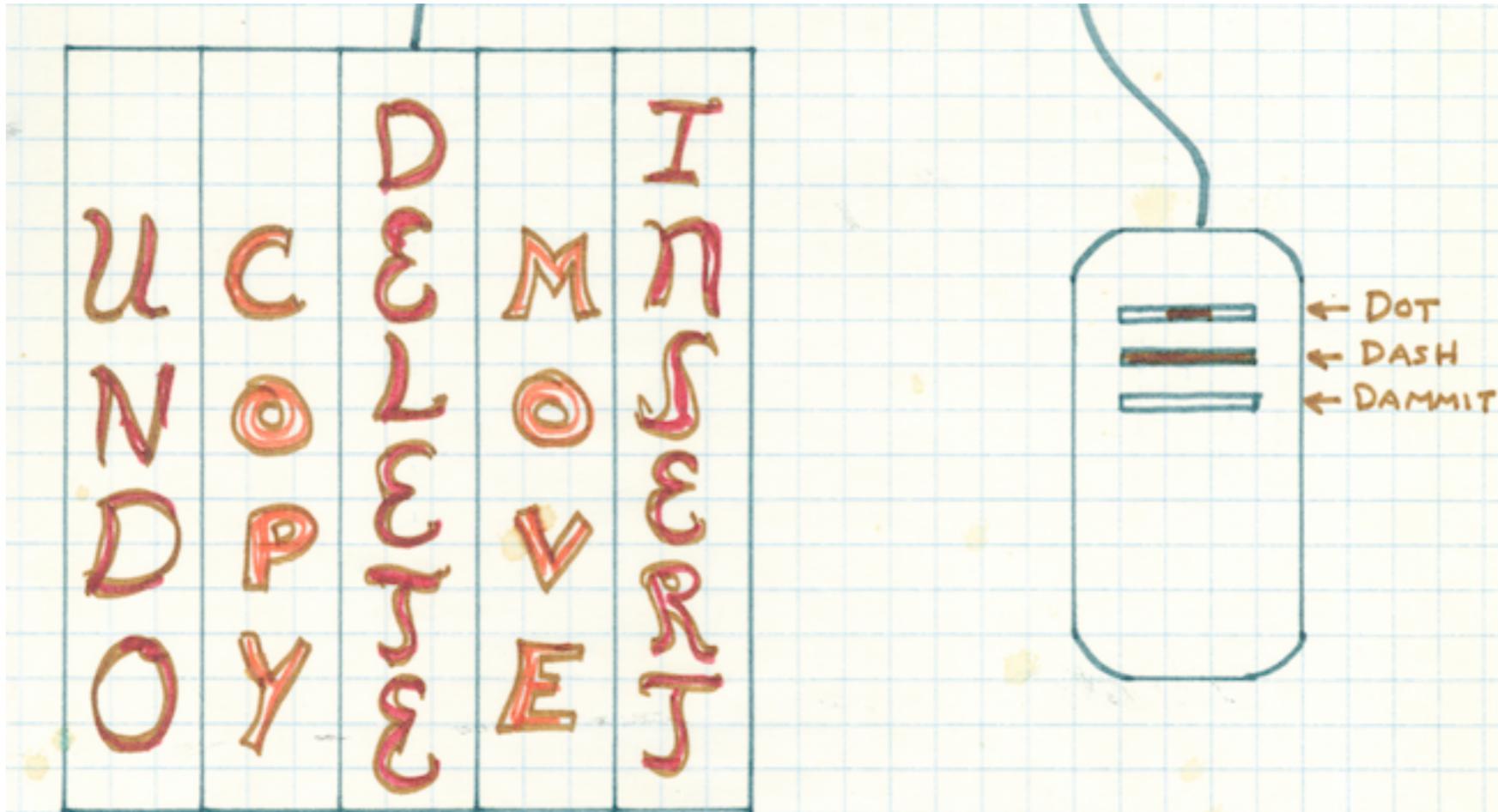
# Conclusions that endured

- Character keys type characters, not commands
- The intuitive use of a mouse is to point at things, not to accept and delete commands
- There is a “cursor” displayed showing where the next character typed will appear
- There are two ways to move the cursor: keystrokes and mouse pointing

# Conclusions we abandoned

- There are no invisible characters; carriage return is a command, not a character
- Space bar and carriage return should do what they do on typewriters
- Keys that don't exist on typewriters do nothing until the user has learned them
- The mouse is taught late; its best aspects are emphasized to make a positive impression

# Design explorations



keyset

mouse

## THE INTUITIVE TYPEWRITER

LARRY TESLER  
JUNE 25, 1973

(◆) CUT. RAISES A PIECE OF TEXT OUT OF A PAGE. IT LEAVES BLANK SPACE WHERE IT WAS.

(◆) PASTE. PASTES THE CUT TEXT INTO A BLANK SPACE THAT HAS BEEN MADE FOR IT BY A CUT OR AN INSERT.

KEY ---	REGULAR -----	SHIFT -----	CONTROL -----
SPACE BAR	RIGHT 1 EM	RIGHT 1 EN	---
BS	LEFT 1 EM	LEFT 1 EN	---
TOP BLANK	UP 1 LINE	UP 1/2 LINE	---
MIDDLE BLANK	DOWN 1 LINE	DOWN 1/2 LINE	---
DEL	DELETE	CUT	UNDO
BOTTOM BLANK	INSERT	PASTE	REDO

*Design done with Jeff Rulifson*

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*Design done with Jeff Rulifson*

# Objections to cut & paste

1. Unfamiliar metaphor (in the '60s and '70s)
2. User mistakes (e.g., forgot to paste)
3. Speed compared to NLS
4. Extensibility to other applications

# Advantages of cut & paste

- 1. Fewer errors because there can't be any mode errors.

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1. Fewer errors because there can't be any mode errors.
2. Speed. Roberts and Moran (1983) showed that experienced Gypsy users, on average, performed tasks in two-thirds the time of NLS. Fewer key presses were required.

# Roberts & Moran Results

**FIGURE 6. Overall Evaluation Scores for Nine Text Editors.**

Editor <sup>a</sup>	Evaluation Dimensions			
	Time <sup>b</sup> <i>M</i> ± <i>CV</i> <sup>f</sup> (sec/task)	Error <sup>c</sup> <i>M</i> ± <i>CV</i> (% Time)	Learning <sup>d</sup> <i>M</i> ± <i>CV</i> (min/task)	Functionality <sup>e</sup> (% tasks)
TECO	49 ± .17	15% ± .70	19.5 ± .29	39%
WYLBUR	42 ± .15	18% ± .85	8.2 ± .24	42%
EMACS	37 ± .15	6% ± 1.16	6.6 ± .22	49%
NLS	29 ± .15	22% ± .71	7.7 ± .26	77%
BRAVOX	29 ± .29	8% ± 1.03	5.4 ± .08	70%
BRAVO	26 ± .32	8% ± .75	7.3 ± .14	59%
WANG	26 ± .21	11% ± 1.11	6.2 ± .45	50%
STAR	21 ± .18	19% ± .51	6.2 ± .42	62%
GYPSY	19 ± .11	4% ± 2.00	4.3 ± .26	37%

# Advantages of cut & paste

**1.** Fewer errors because there can't be any mode errors.

**2.** Speed. Roberts and Moran (1983) showed that experienced Gypsy users, on average, performed tasks in two-thirds the time of NLS. Fewer key presses were required.

**3.** Modeless. The ability to do other things between cut and paste entails more benefits than risks.

# What is a *mode*?

A *mode* is a state of the user interface that lasts for a period of time, is not associated with any particular object, and has no role other than to place an interpretation on operator input.

# Prefix vs. suffix syntax in editors

- Prefix Syntax

- `<verb> <object>`

- After the verb, the editor must enter a mode to wait for the user to specify the object.

- Suffix Syntax

- `<object> <verb>`

- After the verb, the editor can perform the command immediately. No mode is needed.

# How modes degrade usability

- Keeping track of mode changes can distract a user from the task at hand.
- If the current mode is misjudged, unintended and sometimes disastrous results ensue.
- Users often get “stuck” in a mode and ask, “How do I get out of this mode?”

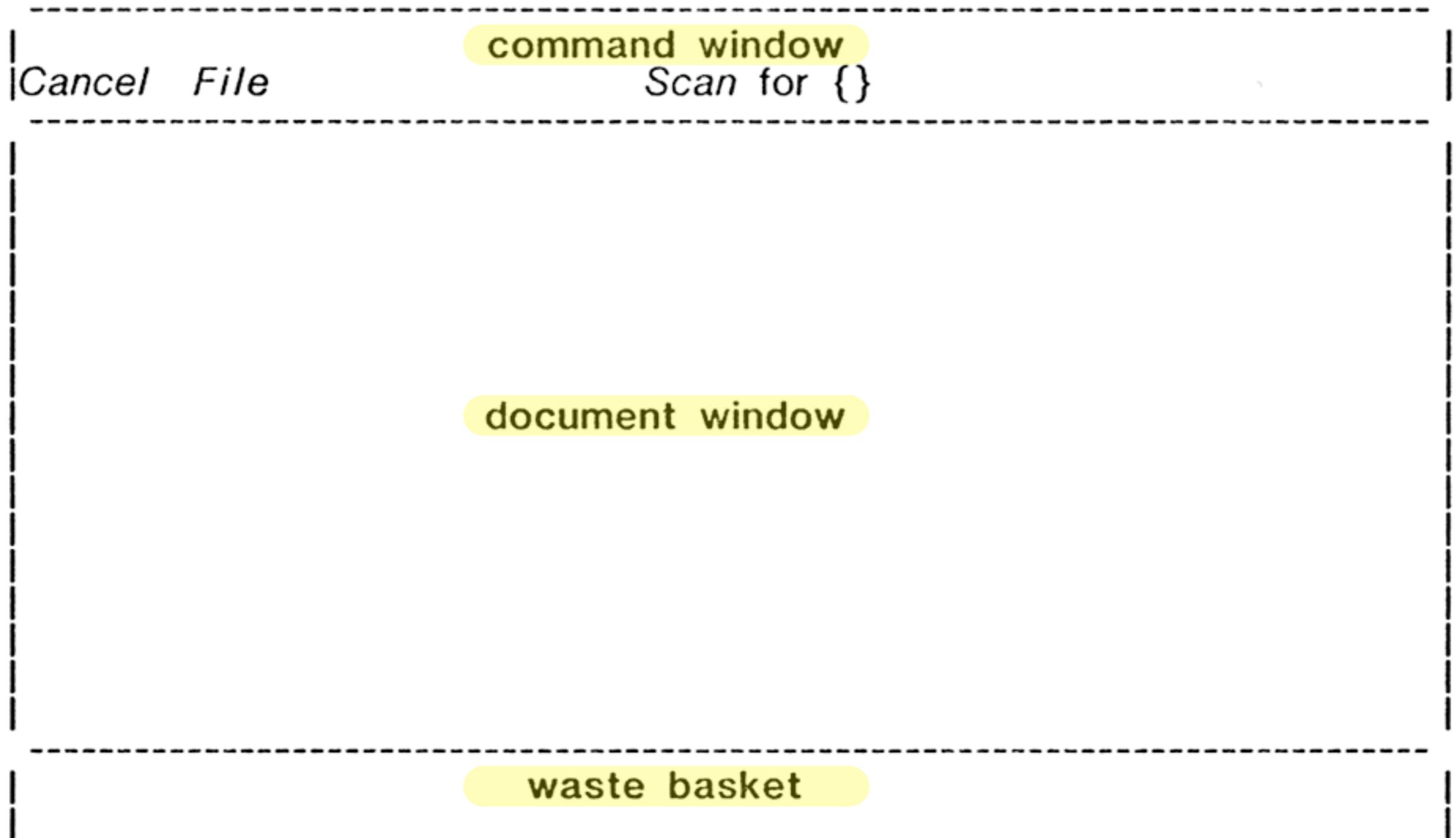
# **GYPSY: THE GINN TYPESCRIPT SYSTEM**

**April 20, 1975**

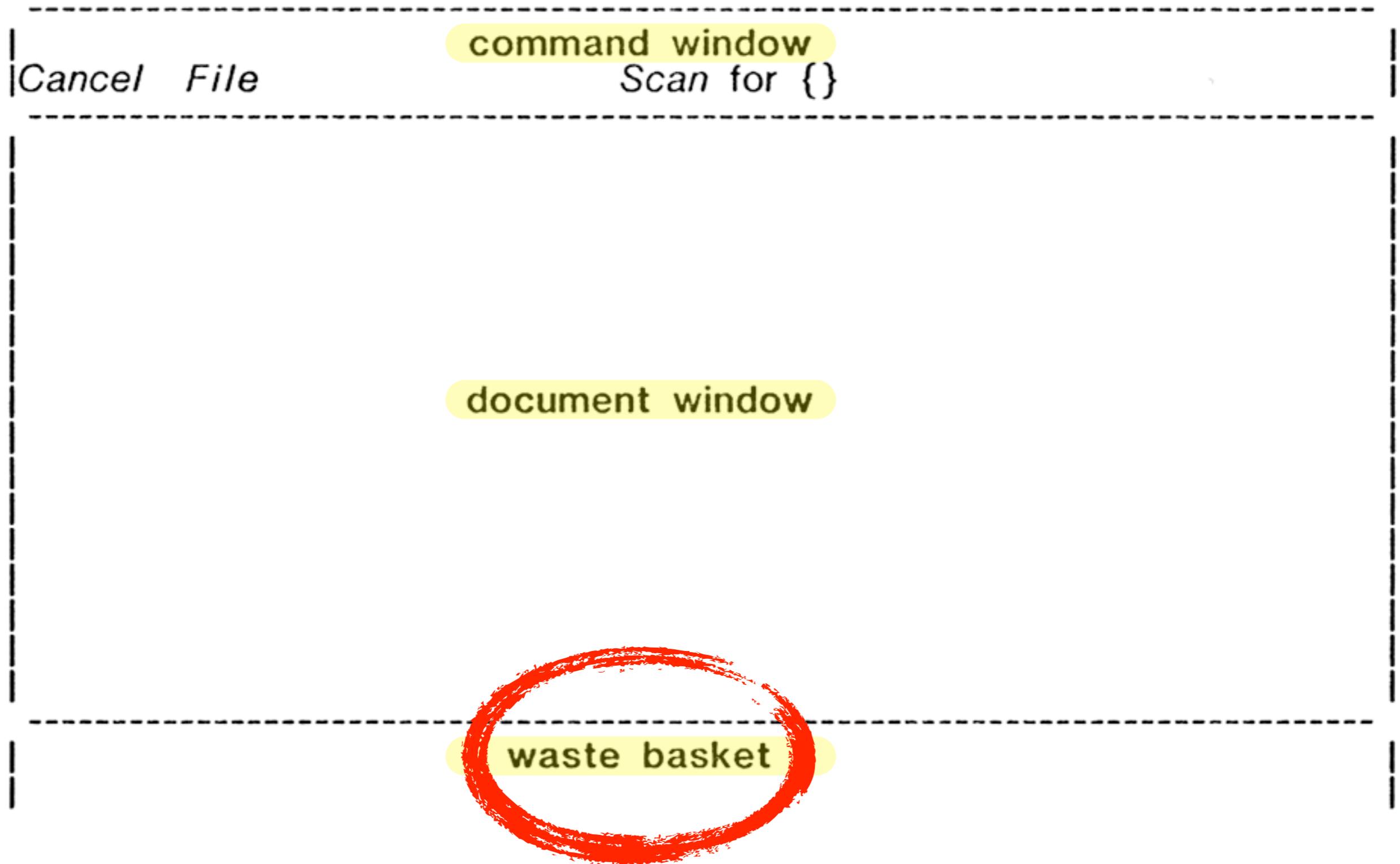
**Larry Tesler  
Palo Alto Research Center**

**Timothy Mott  
Ginn and Company**

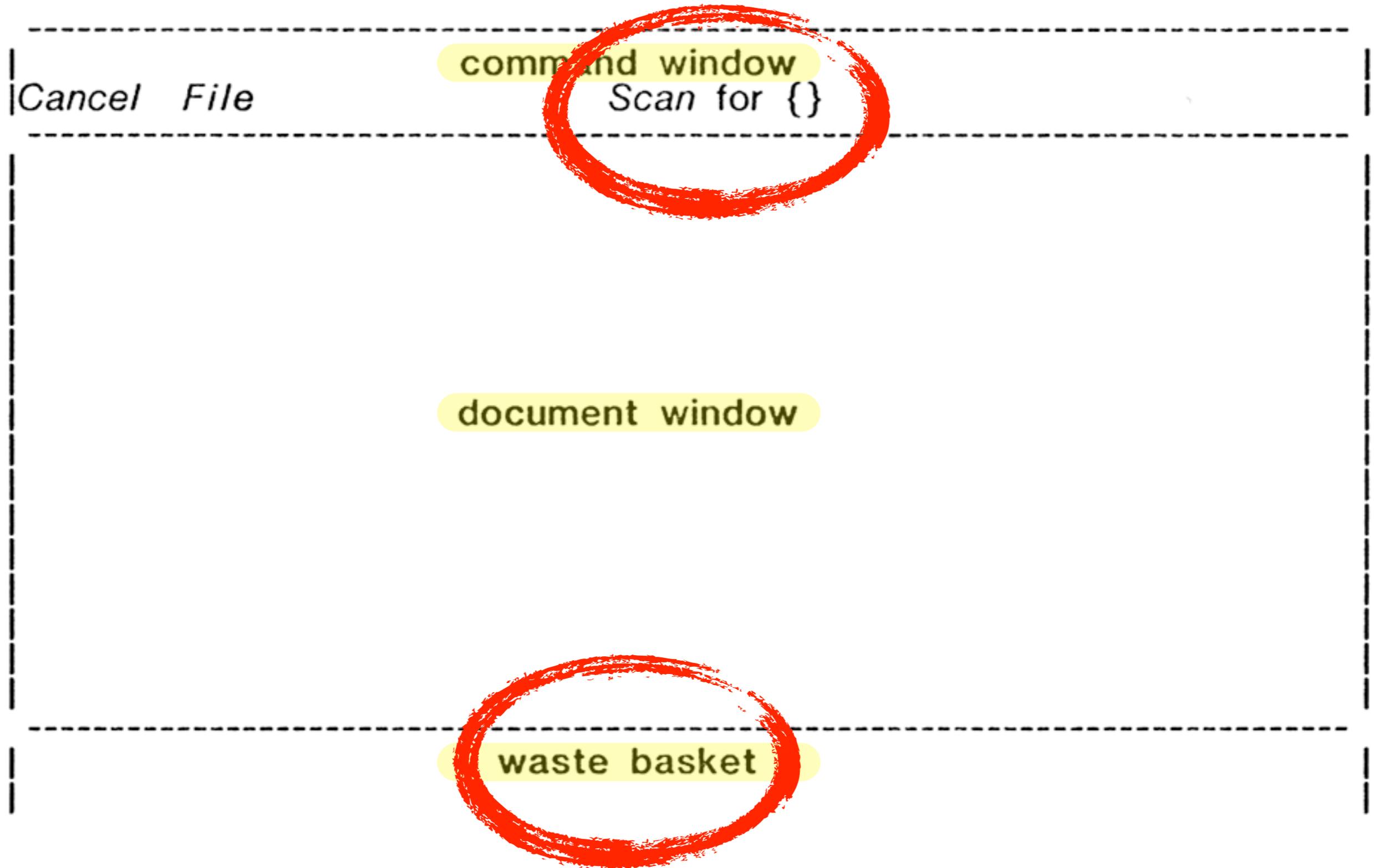
# Modeless Search, Move and Copy



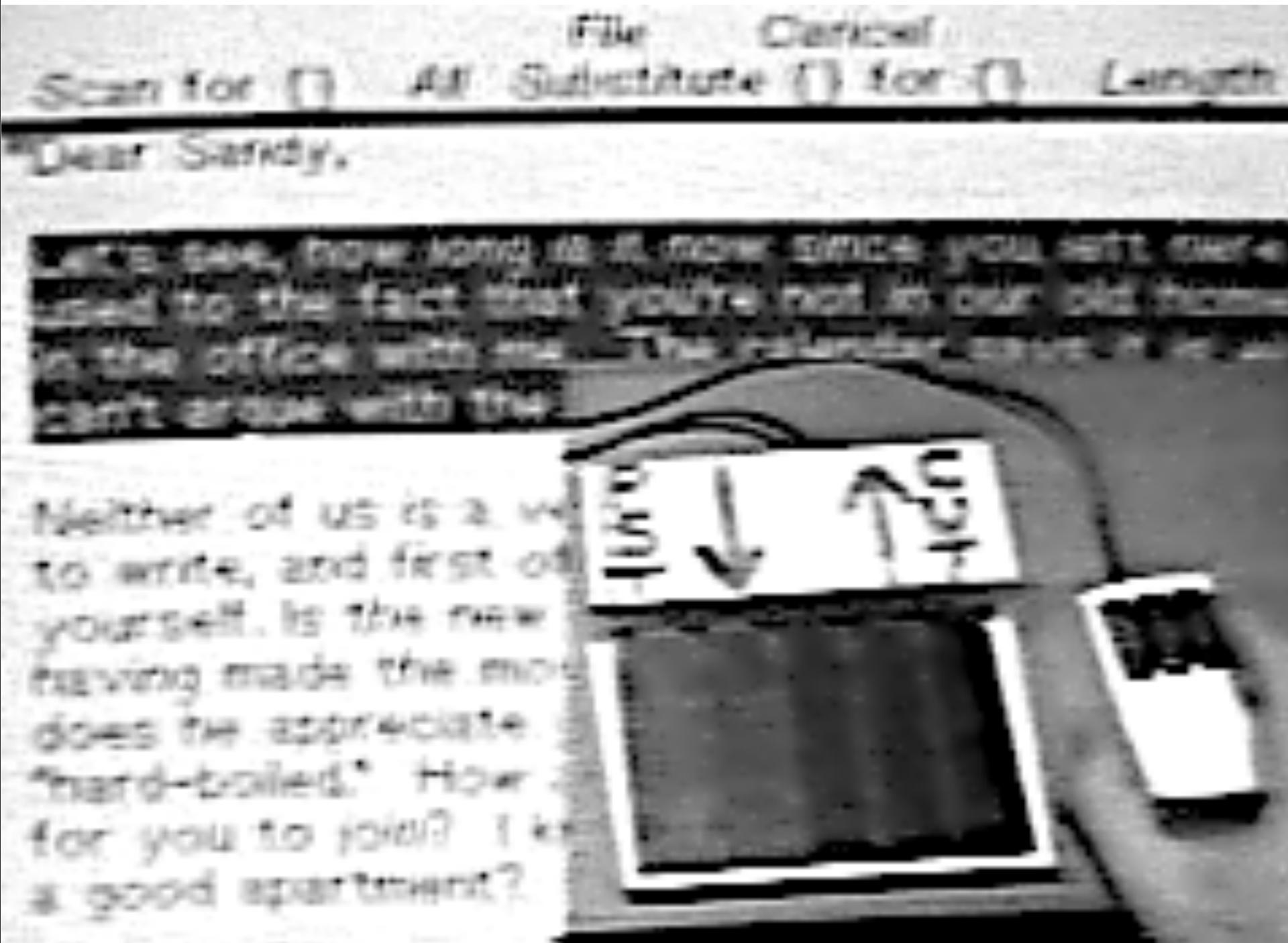
# Modeless Search, Move and Copy

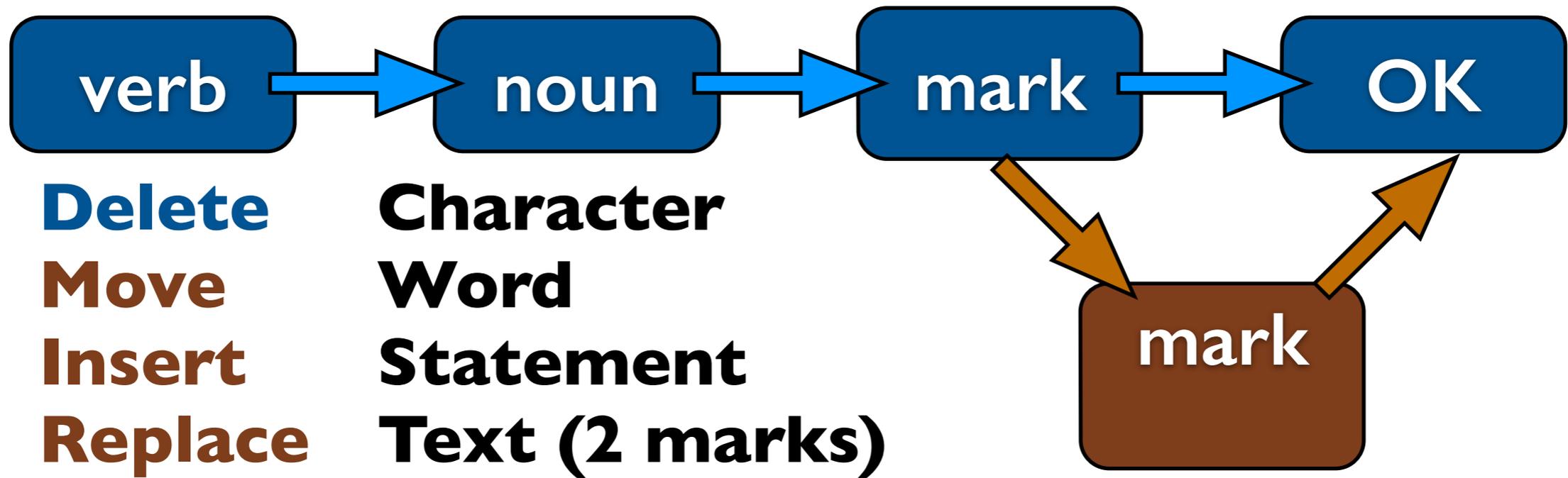
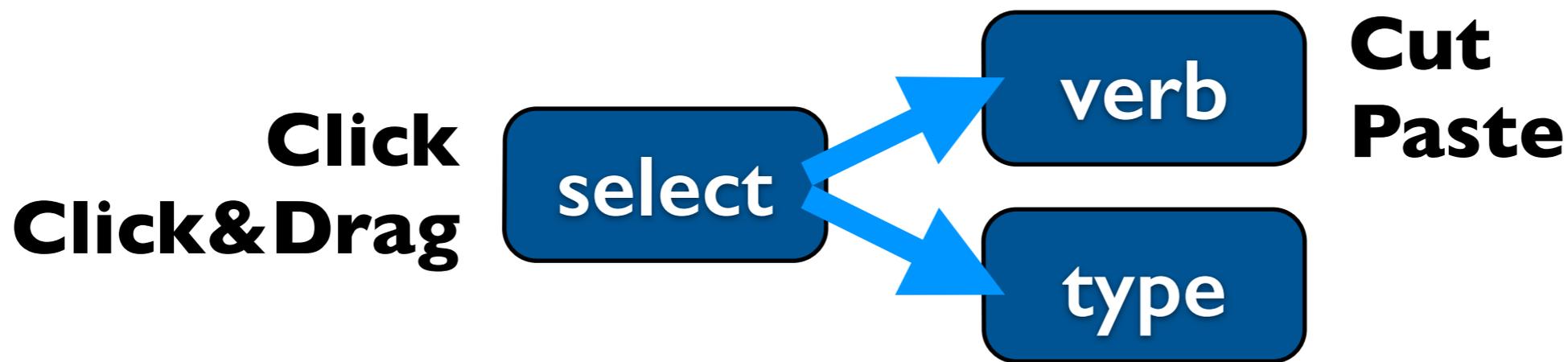


# Modeless Search, Move and Copy

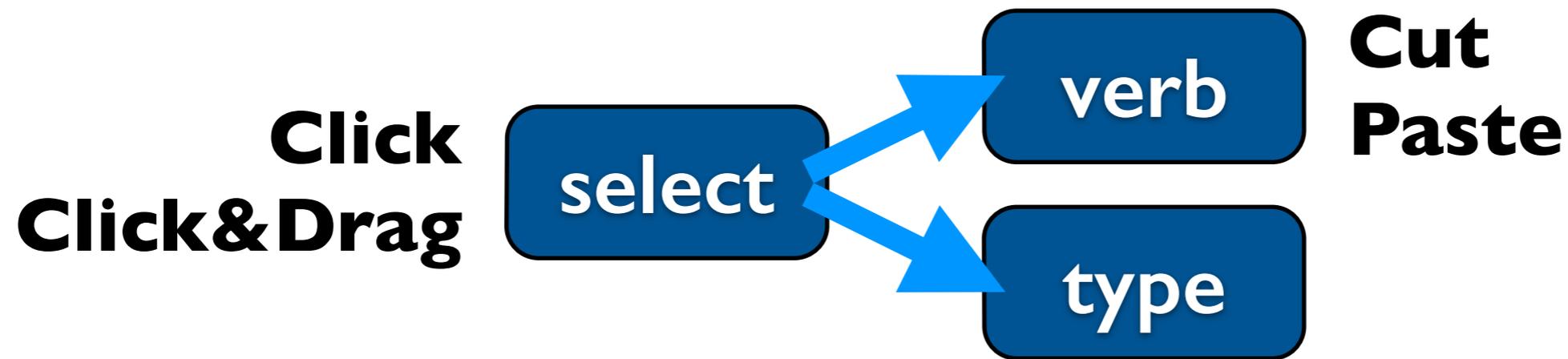


# Gypsy photographed

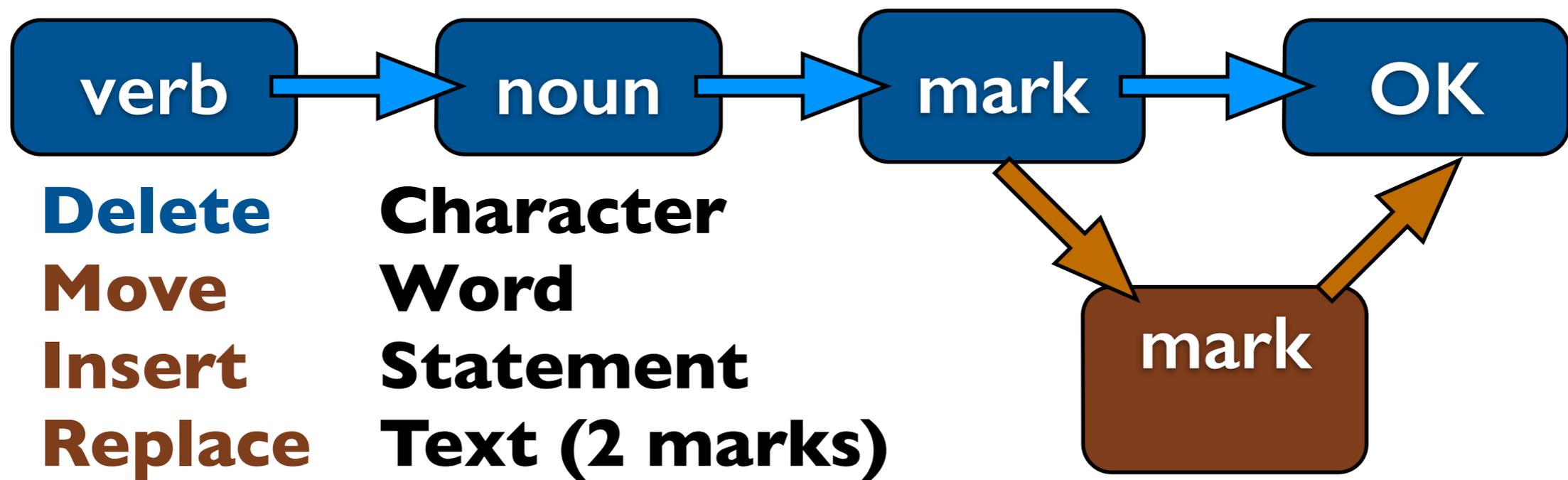




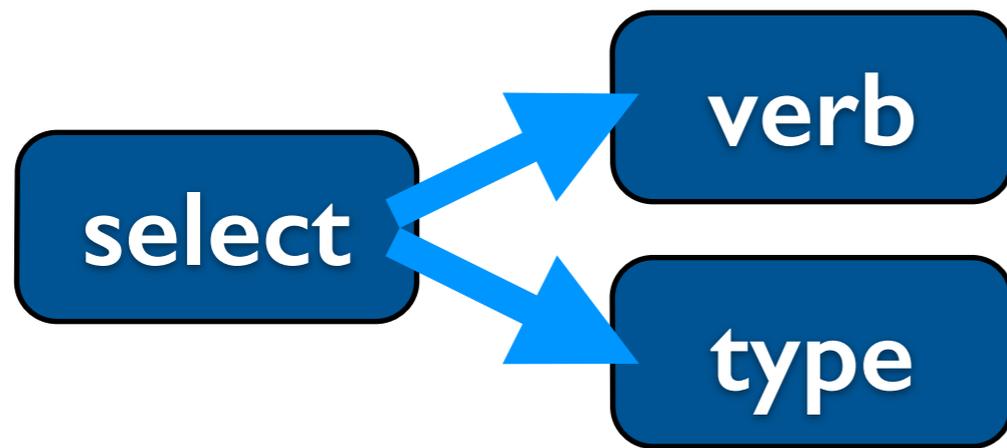
# Modeless



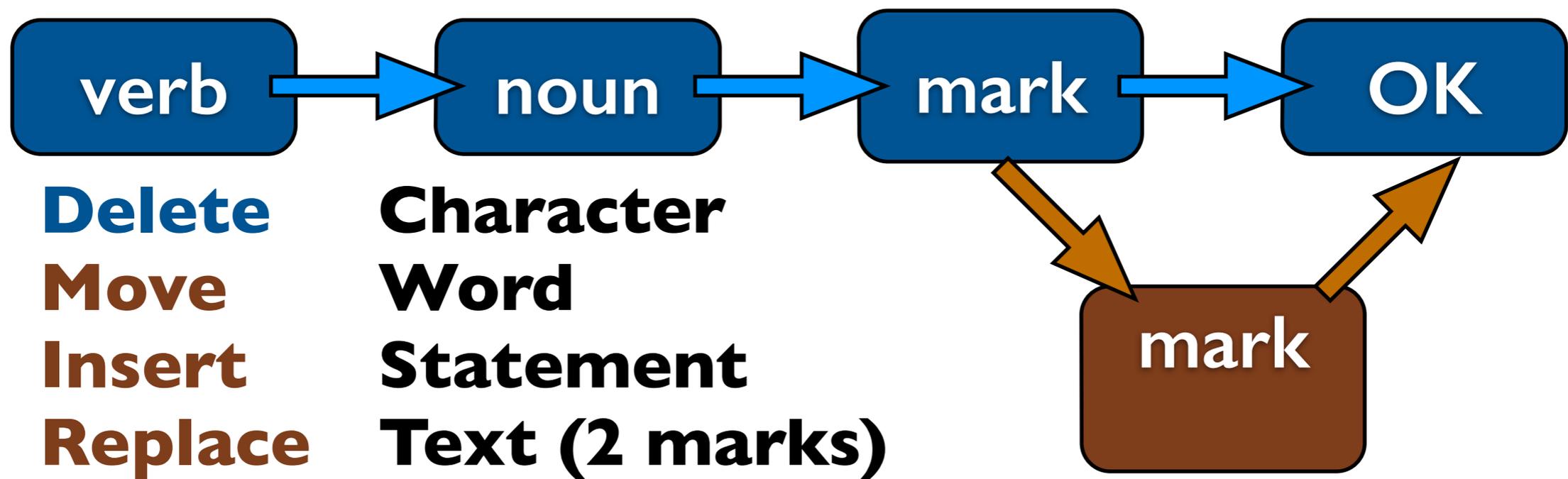
# NLS



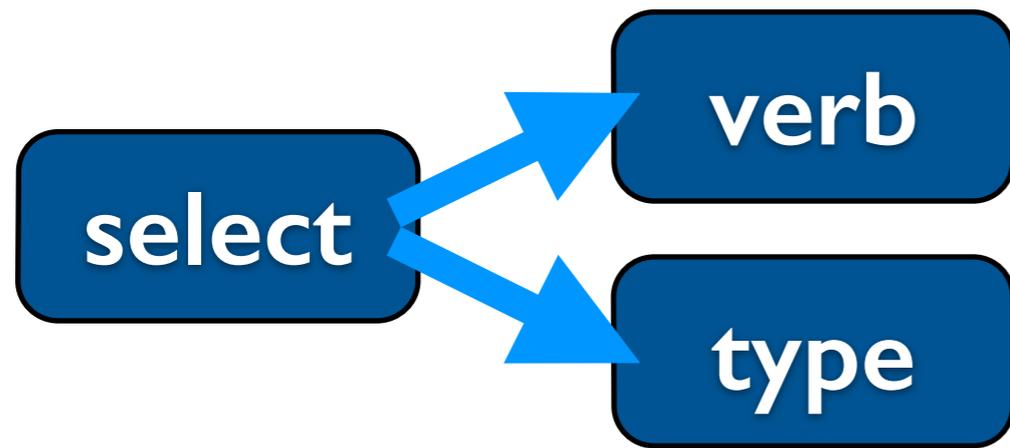
# Modeless



# NLS

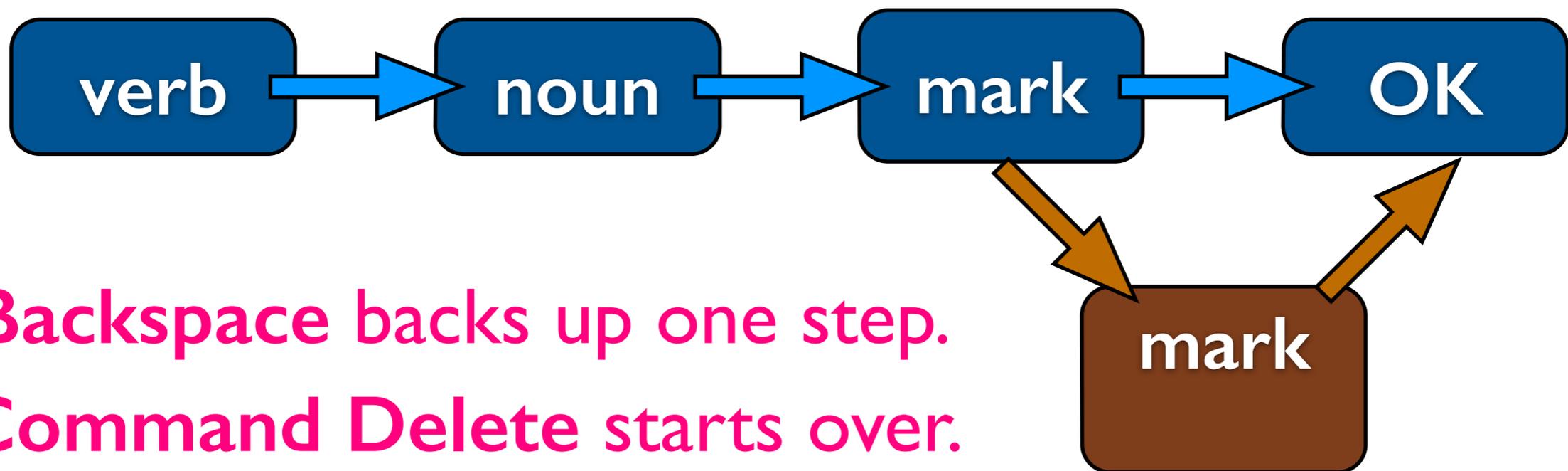


# Modeless error recovery



Selection error? Reselect.  
Command error? Undo.

# NLS error recovery



Backspace backs up one step.  
Command Delete starts over.

# ✓ One button subset

- Novices used only the top button
  - Single click selected between characters
  - Click & drag selected a **character range**
  - Marginal click & drag selected paragraphs
- Typing, cut and paste were about like today
- Look-b/i/u did bold/italic/underline

# ✘ Middle & bottom buttons

- For power users
  - Single click selected *one character*
  - Marginal click selected *one paragraph*
  - *Double* click [and drag] selected *word[s]*
  - Otherwise, same as the top button
  - But they differed from each other..

# ✘ Source and Target

- For power users
  - Top or middle button selected the **target**
  - Bottom button selected the source
  - Anything cut also became the source
  - Paste copied the source to the target
  - Cut+Paste transposed source and target

## Command Summary

-  *To select a caret target:*  
Point with the mouse, push the top button, release.
-   *To select a blacked out target:*  
Point with the mouse, push the top or middle button, draw to the right, release.
-  *To select a source:*  
Point with the mouse, push the bottom button, draw to the right, release.
-   *To select words:*  
Double click the middle or bottom button before drawing.
-   *To select paragraphs:*  
Draw downward in the left margin.
-  *To insert new text:*  
Select a caret target, type the new material on the keyboard.
-  *To delete text:*  
Select a blacked out target, press CUT.
-  *To undo the delete:*  
Press PASTE.
-  *To replace text by new typing:*  
Select a blacked out target, press CUT, type in the new material;  
Or:  
Select a blacked out target, overwrite new material, press CUT (last step may be omitted if nothing left blacked out).
-   *To move text:*  
Select a blacked out target, press CUT, select a caret target, press PASTE;  
Or:  
Select a source and a caret target in either order, press CUT+PASTE.
-  *To copy text:*  
Select a source and a caret target in either order, press PASTE.
-  *To transpose two passages:*  
Select a source and a blacked-out target in either order, press CUT+PASTE.
-  *To make a target and typein look bold, italic, underlined, or remark font:*  
Press LOOK-B, LOOK-I, LOOK-U, or LOOK-X. Their opposites are SHIFT-LOOK-B, etc.

# Gypsy scorecard

# Smalltalk-76 (Dan Ingalls)

## **Mouse buttons:**

**(1) Select**

**(2) Edit Menu**

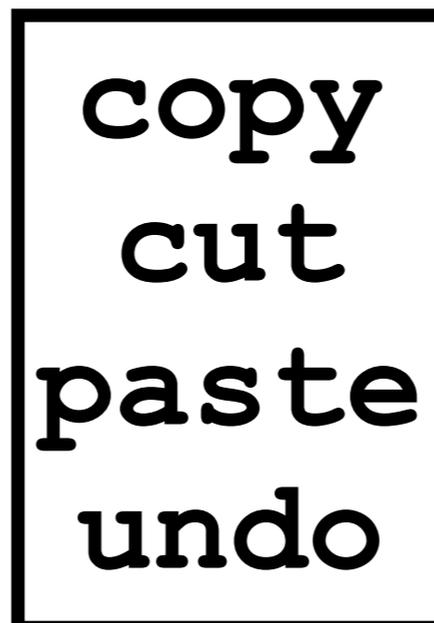
**(3) Window Menu**

# Smalltalk-76 (Dan Ingalls)

## Mouse buttons:

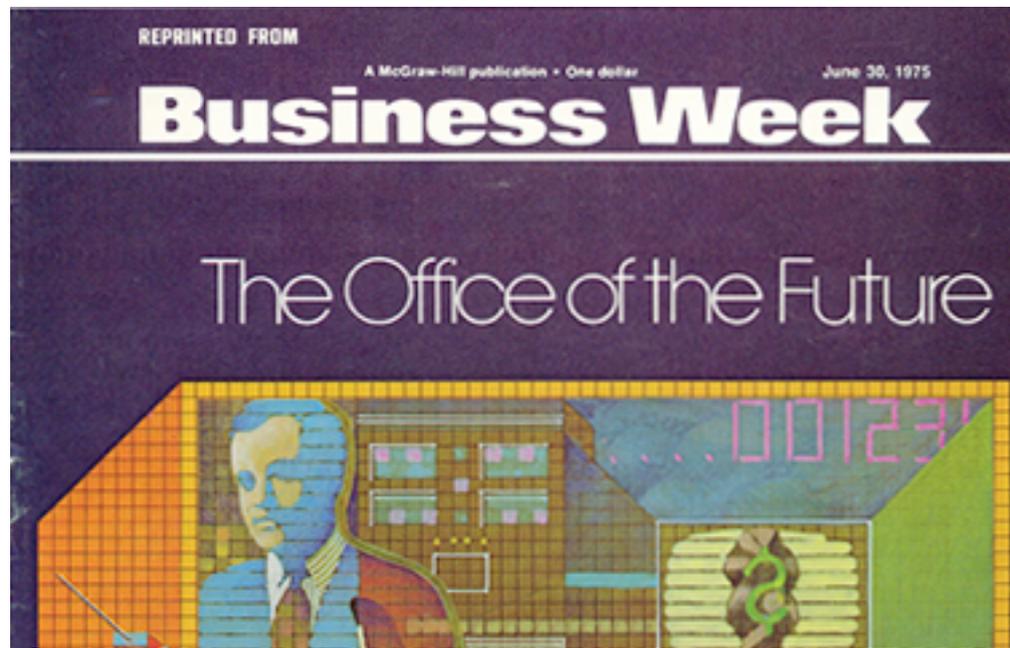
- (1) Select
- (2) Edit Menu
- (3) Window Menu

## Edit Menu included:



copy  
cut  
paste  
undo

# June 1975 PR



of one page per second. The center also built a minicomputer-controlled text-editing display terminal, called Gypsy, which is now being used for editing books at Xerox' Ginn & Co., a Lexington (Mass.) textbook publisher.

the EDP world and the WP world are converging," says William Bethke, IBM vice-president.

He maintains that word processing must take advantage of EDP power, but he says the question is how. "Will we depend on machines already in EDP centers, machines now doing accounting, financial, and inventory applications?" Observers are convinced that IBM's answer will be a resounding "Yes."

Says a top executive of one big IBM competitor: "There is no doubt in my mind that the next IBM word-processing product will access the computer. But is that really what our marketplace needs?" he asks. If history is any teacher the answer is probably "No."

## The 'friendly' terminals

Hit a button called "cut," and the word or paragraph disappears. Punch another button labeled "paste" and the paragraph or word is inserted into the text where the pointer is located.

large-scale information management rather than numerical computation is

will take over many of the jobs that small business computers are now beginning to do. "More and more, WP will be used for what was EDP in the of-

face," predicts SRI's Purchase.

A key problem with the EDP display terminals used to communicate with a computer is the difficulty that the average office worker has in learning how to run them. People are forced to change their habits to fit the way the computer works. This "computer culture" is the source of many of the problems that word processing has run into, says William K. English, who heads the office communications group at Xerox' Palo Alto Research Center.

For this reason, much of the center's research in the past three years has been aimed at developing an office terminal that uses what English calls "the culture of people." By studying how an individual uses a terminal and how it affects his or her job, the center has come up with experimental terminals

ing changes in the wording of a document displayed on the TV screen is very easy. The user moves a hand-held movable controller (called a "mouse") over the desk top, and in response, an electronic pointer moves on the screen to the word or paragraph to be changed. Move the "mouse" left, and the electronic pointer moves left on the screen.

Hit a button called "cut," and the word or paragraph disappears. Punch another button labeled "paste" and the paragraph or word is inserted into the text where the pointer is located.

Moving the electronic pointer to the "in-basket" heading on the screen produces a list of memos and letters on the display that have arrived from other office terminals. The user points to any letter that he wants to read. Then he can either file the letter away in his



Goldman: "The phone is the biggest time waster that I know of."

simile system illustrates Xerox' distributed processing approach to the office of the future. Costs are too high now to build a commercial version of this system, but Xerox is betting on the continuing downward spiral in the cost of electronic circuitry.

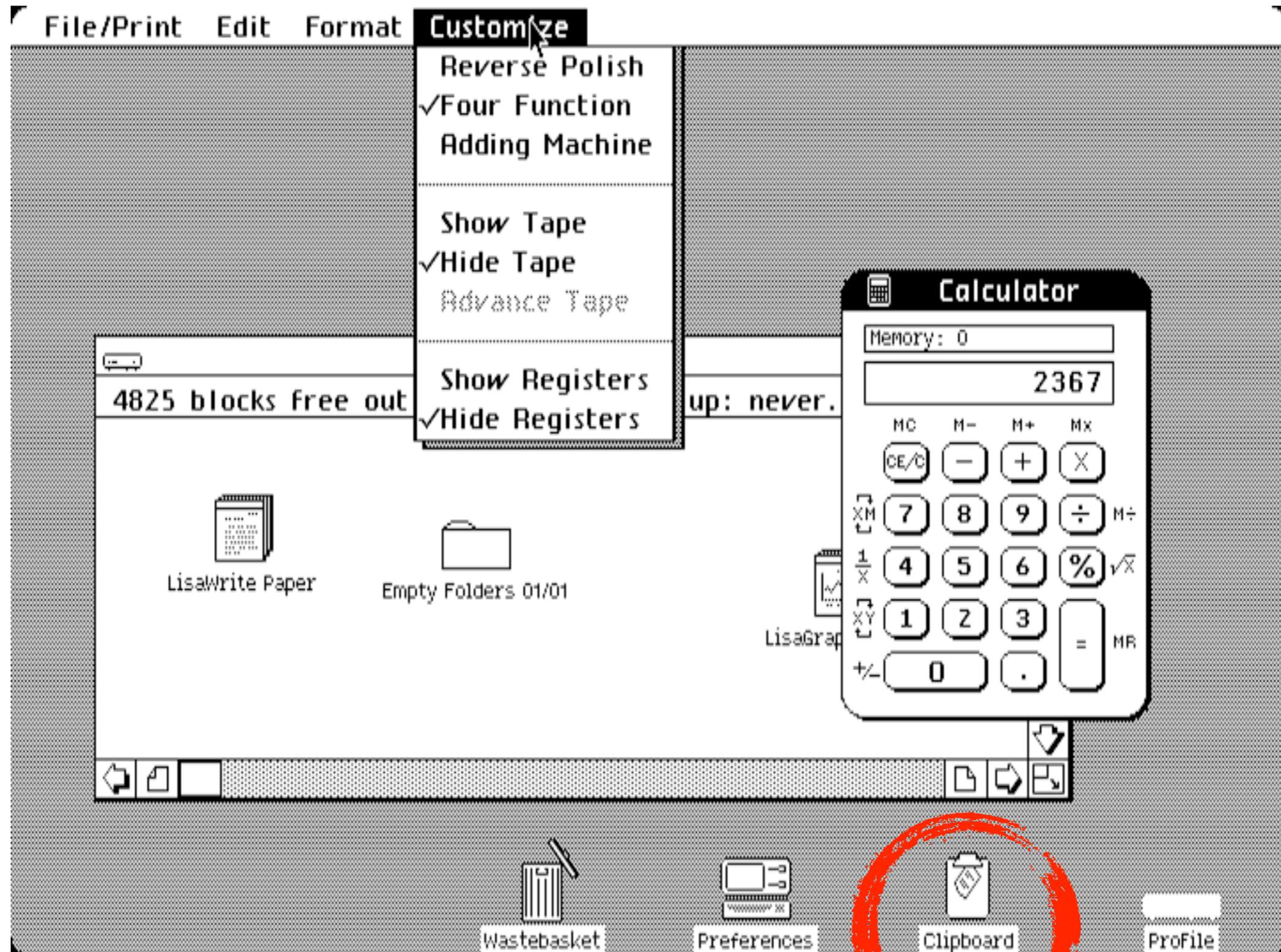
The Xerox scenario for the manager is certainly different from the one that IBM envisions. One former IBMer says that the company plans to provide minimum hardware for the manager in his office and to use its big central computer systems. This approach, of course, preserves IBM's greatest asset.

The big computer maker is not talking about what it is planning, but a similar point of view keeps surfacing in talks with IBM executives. Says William F. Laughlin, vice-president: "I don't think the executive wants that maze of equipment on his desk. By 1985 you would more likely find a terminal on the secretary's desk." And Robert B. LaDue, marketing director for word-

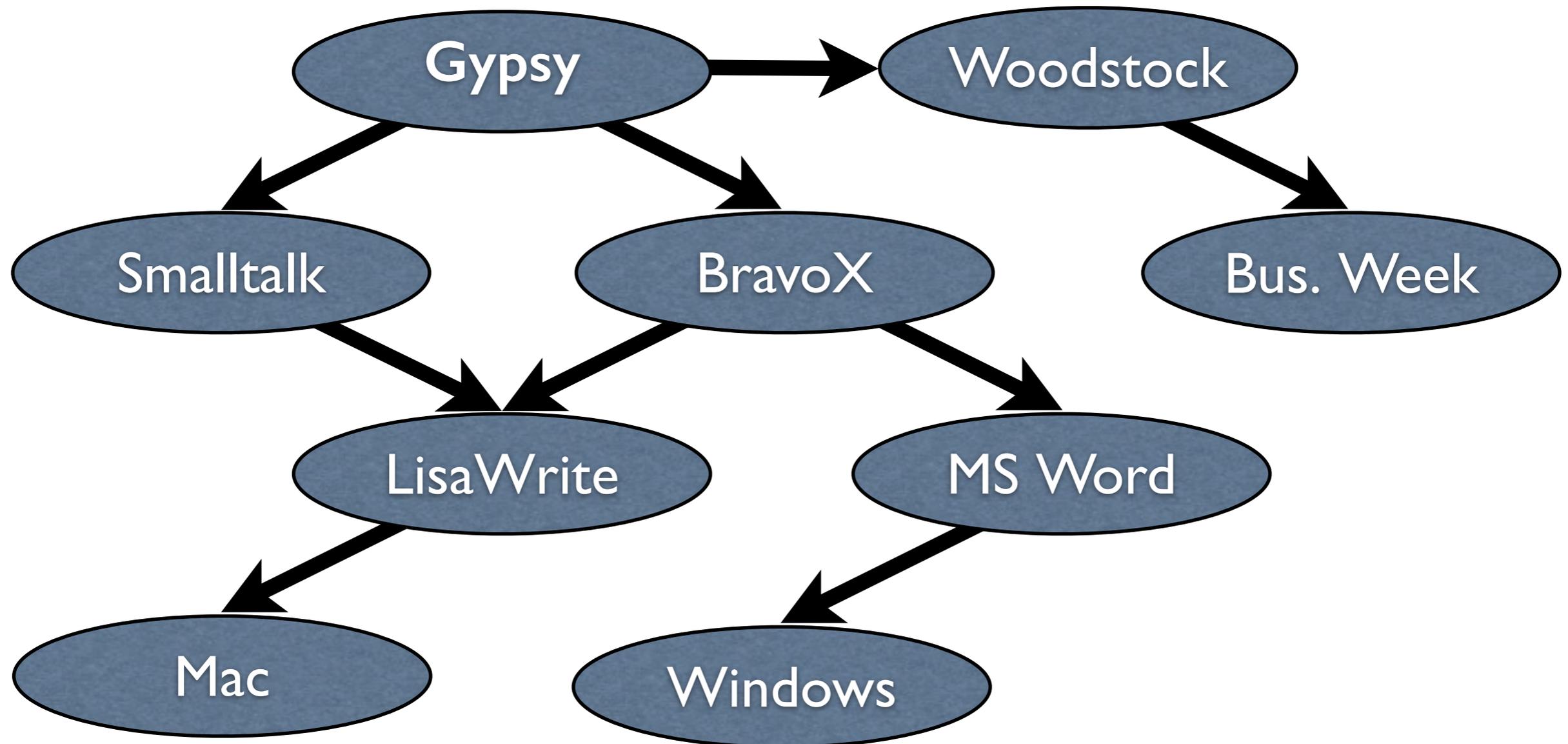
# Apple Lisa 1980-1983



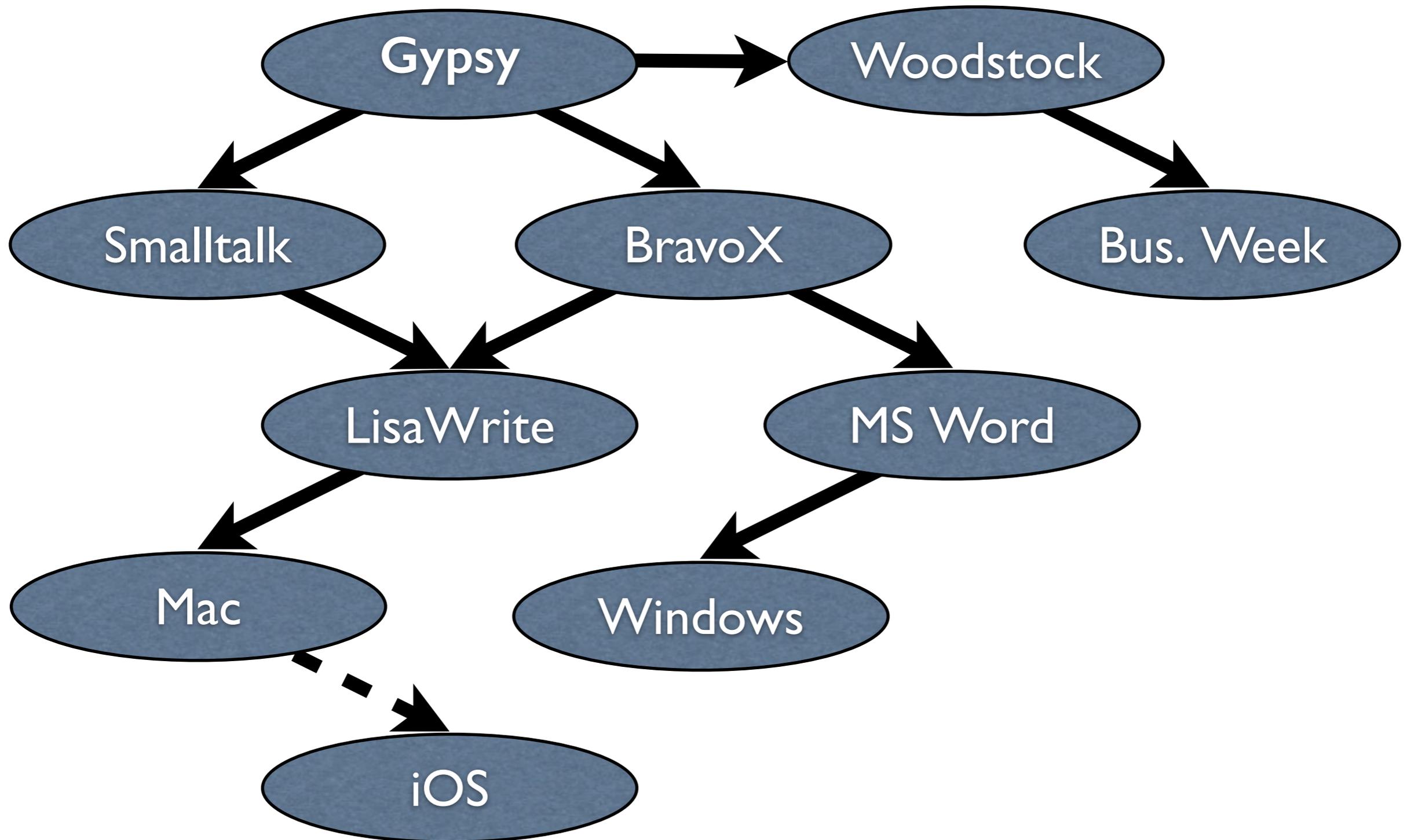
# Apple Lisa 1980-1983



# Cut & Paste Contagion



# Cut & Paste Contagion



# Gypsy's Modeless Text Editing Pattern

- Click to select an insertion point
- Double click to select a word
- Click and drag to select a passage
- Type to replace the selection by new text
- Cut to move the selection to a buffer
- Paste to replace the selection by the buffer
- Control-B to bold the selection, etc.
- Undo to undo the most recent command
- Edit a search query as you edit any text

# Summary

- Qualitative and quantitative user studies showed that a two-step Cut and Paste enabled faster editing and fewer errors.
- Those studies and subsequent mass market adoption validated the usability advantages of the modeless text editing pattern.

# Discussion

**Thank you**