

DEPARTMENT OF COMPUTER SCIENCE  
UNIVERSITY OF TORONTO

CSC318S

**THE DESIGN OF  
INTERACTIVE COMPUTATIONAL MEDIA**

Lecture 11 — 23 February 1998

INTERACTIVE DIALOGUE STYLES AND TECHNIQUES 2

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## 11.1 Direct manipulation

Shneiderman definition:

- Continuous representation of the object of interest
- Manipulation through physical actions  
or labeled button pushes
- Rapid, incremental, reversible operations
- Layered or spiral approach to learning

Examples

- WYSIWYG text editors (like Xerox Star. Microsoft Word)
- Spreadsheets
- Page layout systems
- Music score editors

## 11.2 Icons

Pros

- “Universality!?” , and therefore not dependent upon  
particular natural language
- Compactness
- Multi-dimensionality

Cons

- Limited number of concepts representable with ease  
and with clarity
- Hard to handle large # of similar objects (e.g., file 1, file  
2, ...)
- Need to learn a “new language”

The design problem: an integrated, coherent set of icons

*VIDEO — Animated Icons (Small, Baecker, et al. , Apple, 1989)*

Fig. 11.1 The HyperCard Tool Palette (Baecker, Small, and Mander, 1991, p. 2, in BGBG, 1995, p. 445)

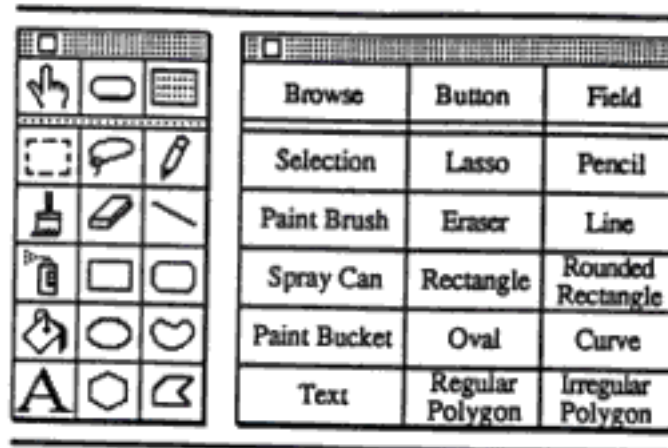


Fig. 11.2 Keyframes from Prototype Animations (Baecker, et al., 1991, p. 2, in BGBG, 1995, p. 445)

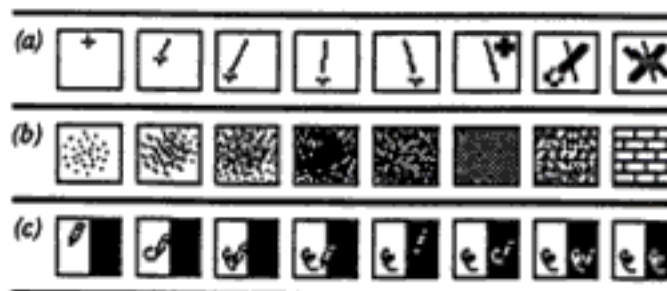


Figure 2: Keyframes from prototype animations (shown actual size). While it is difficult to get a sense of the animation from a static representation, imagine the animation flowing smoothly through the images shown.

- (a) the Line tool
- (b) the Spray Can tool
- (c) the Pencil tool

## 11.3 Windows and Graphical User Interfaces (GUIs)

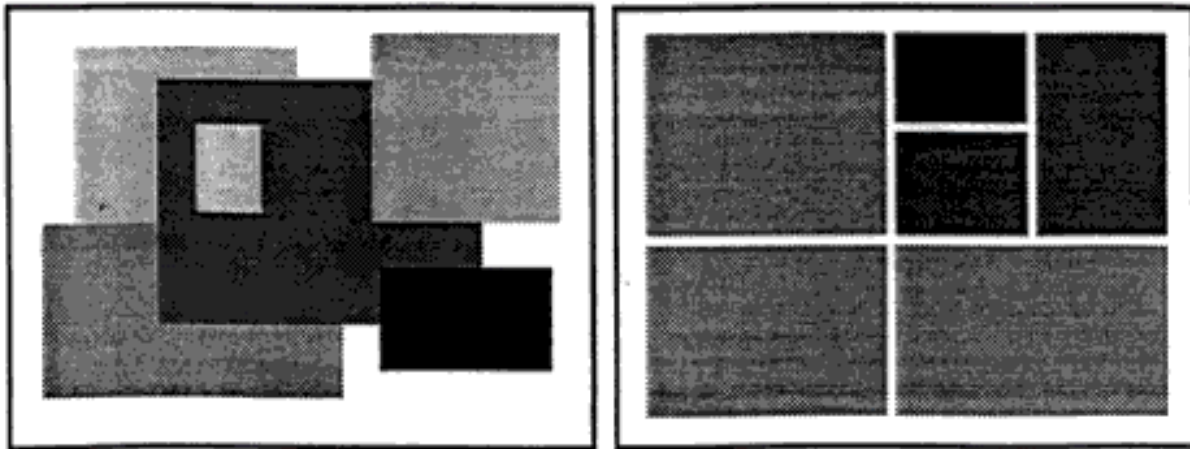
See Marcus, Aaron, *Graphic Design for Electronic Documents and User Interfaces*, ACM Press, 1992

### Windows

Multiple, concurrent, interleaved tasks with individual contexts

Tiled and overlapping windows (Fig. 11.3)

Figure 11.3. Tiled and overlapping windows (Marcus, in BGBG, 1995, p. 439)



Examples of windowing systems (Fig. 11.4)

Apple Macintosh OS

NextStep

Open Look GUI

OSF/Motif

Microsoft Windows

OS/2 Presentation Manager

### Graphical User Interfaces (GUIs)

The look and feel of a GUI

The underlying architecture of a GUI, e.g., built on top of the Mac Toolkit, X, or NeWS (more in CSC428)

# Components of GUI's

- Windows
- Menus
- Controls and control panels
- Query and message boxes
- Mouse/keyboard interface

Windows (Fig. 11.5)  
 Window controls (Fig. 11.6)  
 Menus (Fig. 11.6)

## The active window

*Figure 11.4. Windowing system component terminology (Marcus, 1992, p. 188, in BGBG, 1995, p. 468)*

	Macintosh	NextStep	OPEN LOOK	OSF/Motif	MS Windows	OS/2-PM
<b>Window Types</b>						
Window with Keyboard Focus	Active Window	Key Window	Input Area	Active Window	Active Window	Active Window
Child Window	Document Window	Standard Window	Base Window	Secondary Window	Document Window	Document Window
Modeless Dialog Box	Dialog Box	Panel	Pop-up Window	Modeless Dialog Widget	Modeless Dialog Box	Modeless Dialog Box
Modal Dialog Box	Modal Dialog Box	Attention Panel	Notice	Modal Dialog Widget	Modal Dialog Box	Modal Dialog Box
Query Box	Dialog Box	Panel	Command Window	Secondary Window	Dialog Box	Dialog Box
Message Box	Alert			Message Box	Message Box	Message Box
<b>Window Structure</b>						
Title Bar	Title Bar	Title Bar	Header	Title Area	Title Bar	Title Bar
Window Menu Bar			Control Area	Menu Bar	Menu Bar	Menu Bar
Message Area			Footer		Message Line	Message Line
<b>Window Controls</b>						
Close Control	Close Box	Close Button		System Menu Button	Control Menu Box	System Menu Box
Size Control	Size Box	Resize Button	Resize Corner	Border Resize Handle	Window Frame	Window Frame
Minimize Control		Miniaturizing Button		Minimize Button	Minimize Box	Minimize Box
Maximize Control	Zoom Box			Maximize Button	Maximize Box	Maximize Box
Restore Control	Zoom Box				Restore Box	Restore Box
Scrollbar	Scrollbar	Scroller	Scrollbar	Scrollbar	Scrollbar	Scrollbar
Scrollbar Handle	Scroll Box	Scroll Knob	Drag Area	Slider	Scroll Box	Scroll Box
Scrollbar Arrow	Scroll Arrow	Scroll Button	Arrow	Arrow	Scroll Arrow	Scroll Arrow
<b>Menu Types</b>						
Pull-Down Menu	Menu		Button Menu	Pull-down Menu	Drop-down Menu	Drop-down Menu
Implicit Pop-Up Menu		Menu	Pop-up Menu	Pop-up Menu	Contextual Menu	Contextual Menu
Explicit Pop-Up Menu	Pop-up Menu	Pop-up List	Button Menu			
Stay-Up Menu	Tear-off Menu	Detached Menu	Pinned Menu			

Figure 11.5. Overall appearance of windows (Marcus, 1992, pp. 190-1)

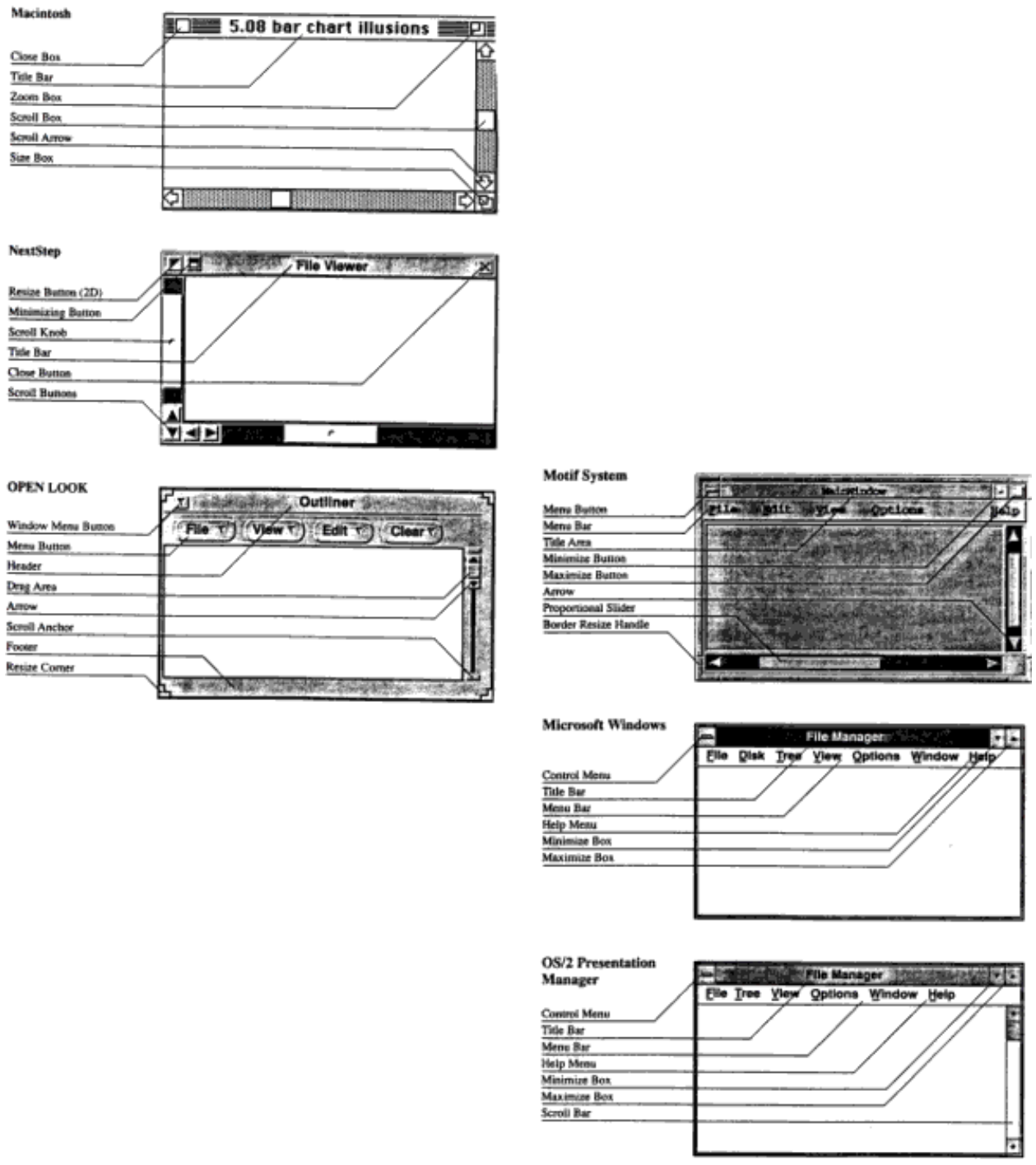
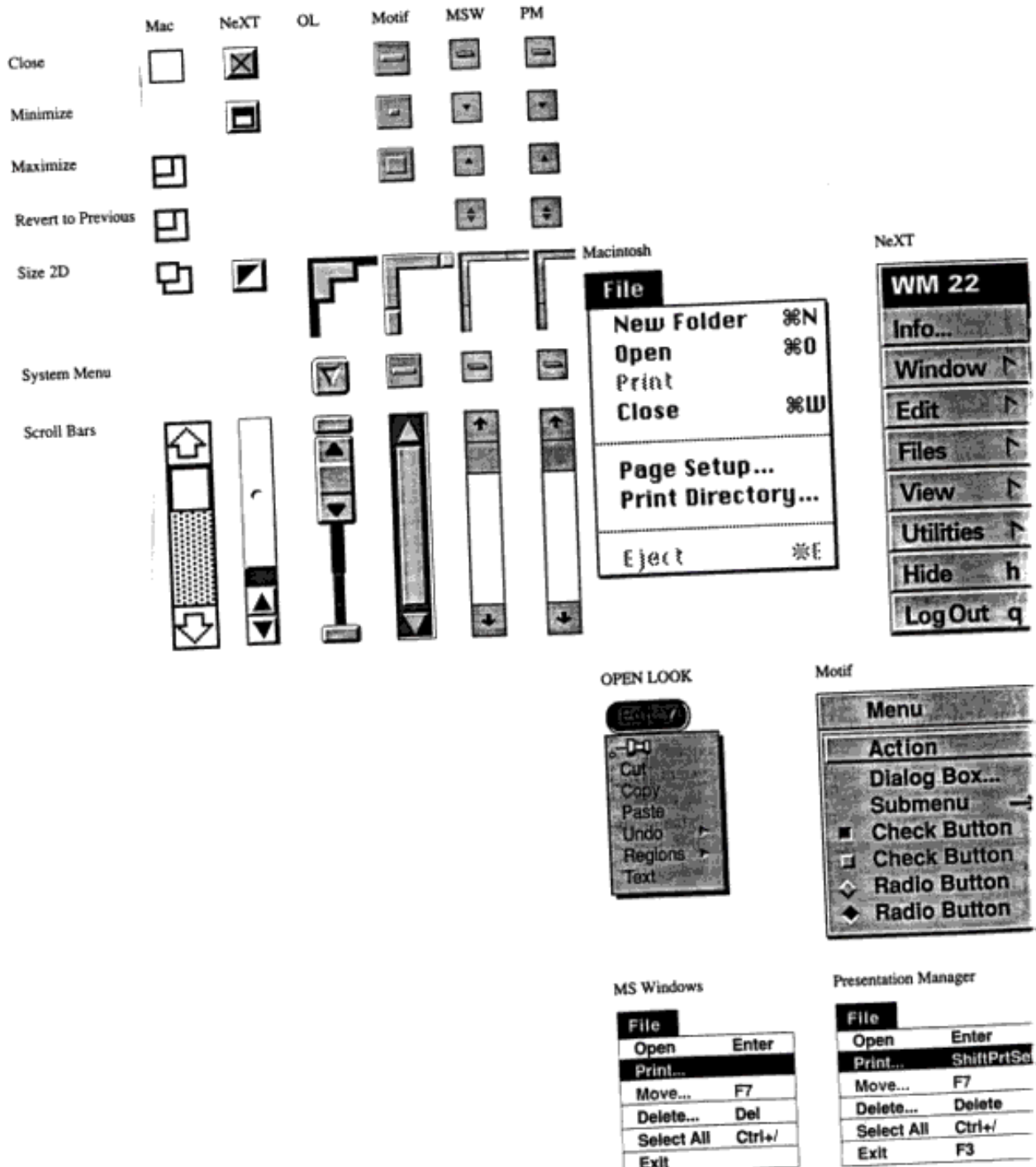


Figure 11.6. Window controls and menu galleries (Marcus, 1992, pp. 153, 156, in BGBG, 1995, pp. 465-468)



## 11.4 Tablet and mouse dialogues

### Tracking symbols, trackers, cursors

Is normally where attention is focused

Therefore, mode indicators and messages (such as error messages) should appear at that location

Use icons when possible, e.g., Buddha, hourglass, thumbs down symbol

Rectangular bit maps, raster-op hardware or firmware

### Pointing and selection

Menu selection (“point and click”)

Light buttons and paint pots (as in lecture 10)

### Positioning

Entering positions

Dragging to new position (“drag and drop”)

Positioning constraints and guidelines: grids and scales

### Motion vs position sensing

Position sensing devices better for drawing, but...

If used for multiple purposes, position sensitive controls have a nulling problem, since they retain position state, but motion sensitive devices OK.

Also, changing the Control-Display (C-D) ratio, or “gear ratio,” of position sensitive devices is difficult.

Many devices can be emulated by others, e.g., tablets, which can be motion or position sensitive, and provide more than 2 dimensions of control.

### Setting values

Graphical potentiometers

Rubber band lines, or rubber band anythings

Application of constraints



Example of rubber-band rectangle with constraints:

Selecting sets of files (that is, only names of files) in Mac finder by sweeping out area that includes desired files

Inking and painting

Equal space, equal time, rubber band

Controls on thickness, colour, etc.

Inking and painting with constraints

## 11.5 Gestural input

Direct use of gestures as data, e.g., drawing both objects and movements

*VIDEO — Picture- and gesture-driven animation — Genesys (Baecker, MIT Lincoln Lab, 1971, excerpted in The Dynamic Image, 1987)*

Literal gesture recognition (e.g., characters)

For example, use in Apple Newton and 3Com Pilot

Application-dependent symbols, e.g., specialized representations for alphabet, or for music editors

Gestures as command language

Command and argument in one sketch

Often extensible and trainable by user

*VIDEO — Pressure-sensitive tablet + gestural input techniques (Buxton, U of T, early 80s, excerpted in The Dynamic Image, 1987)*

Annotations via gestures (and voice notes)

*VIDEO — Freestyle (Wang Laboratories, SGVR 45, 1989)*

## 11.6 Comments and issues

Tasks are nearly always compound (e.g., selection + positioning)

Need for rapid and appropriate feedback during interaction

Important to have the actions “bind” naturally into a sentence, i.e., “chunking,” “appropriate gesture”

Many different ways to perform tasks — Need for consistency

Demonstrative versus descriptive input, as in specifying scope of a command  
Specification by *description* (keyboarded, symbolic)  
Specification by *demonstration* (sketched)

“Modeless” versus “moded” systems

Modeless — Can issue any command at any time

Moded — Set of legal commands dependent upon current state, or mode

Two-handed input

*VIDEO — Toolglasses and Magic Lenses (Xerox PARC, SGVR 97, 1994)*

## 11.7 A return to the model

Know the user

Understand the problem (task analysis)

Understand the context and constraints

Think about strengths and limitations of input and output media

Design the technique: gesture plus feedback

## 11.8 Some generic interaction techniques

Initiation, termination

- “Sign on” protocol

- “Sign off” protocol

”Dialogue mediation”

- “Go ahead” signal (Do it!)

- Interrupt capability (Now!)

- “I’m active” signal

- “I’m waiting” signal

- “Wait for X” signal

- Establish defaults

- Confirm critical actions

- Request terse or verbose communications

Context and history

- Undo

- Backup state automatically

- Backup state (user-initiated)

- Retrieve state

- Save, edit, replay input system (use of history)

Other communications

- Help button

- Mail to systems implementers, maintainers

- Mail to colleagues

- Mail to self

- Establish shard work space

- Access tutoring system

- Activate system monitoring into “dribble files” (use of history)

## 11.9 Perspective: characteristics of conversations

From Nickerson paper (1976)

Reflections upon human to human conversations

Most characteristics desirable for person to computer interaction

Some characteristics not necessarily achievable or desirable

Desirable characteristics

Bidirectionality

Mixed initiative

Apparentness of who is in control

Rules for transfer of control ("It's your turn.")

Sense of presence ("I'm listening.")

Nonverbal communication (the sounds of silence)

Intolerance for silence

Structure (of conversations)

Wide bandwidth

Shared situational context (needs AI)

Common world knowledge (needs mega-AI)

Shared special knowledge (needs AI)

Shared history (needs AI)

Not necessarily desirable or achievable

Informal language (needs mega-AI)

Peer status of participants (needs mega-AI)