• Graphical User Interfaces
  – windows/menus/controls
  – mouse/keyboard

• Pre-historic times
  – Douglas Engelbart, Stanford, **1962 - 1968**
    • 1st “mouse”: wooden box on wheels
  – Ivan Sutherland, MIT, **1963**
    • Sketchpad
Sketchpad: Ivan Sutherland, MIT, 1963
- Create engineering drawings (2000 : 1 scale)
- Ran on experimental “online” computer
- Physically huge due to 320 KB memory
- CRT, light pen
- First GUI
- New concepts: rubber-banding, zoom in/out, sketching perfect lines, corners, and joints.
**Engelbart 1968**

- Demo: mouse, text editing, copy/paste, etc.
  RealVideo clip:

**Xerox PARC: Alto computer, 1975**

Features:
- 8½ x 11 Bit-mapped display (WYSIWYG)
- Windows, icons, menus, pointer (WIMP)
- Ethernet…
1979: Jobs and Wozniak visit PARC
- June 1981: Xerox Star
  - Double-clickable icons
  - Overlapping windows
  - Dialog boxes
  - 1024x768 monochrome display
  - High price

January 1983
- Apple’s Lisa
  - pull down menus
  - menu bars
- Microsoft announces Windows
  - supposedly has overlapping/resizable windows
**Apple Lisa**

**Introduced:** January 1983  
** Released:** June 1983  
** Price:** US $9,995  
**How many?** 100,000 in two years  
**CPU:** Motorola 68000, 5 MHz  
**RAM:** 1 Meg  
**Display:** 12” monochrome, 720 X 364

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**1984**

- **January 1984**
  - Apple’s Macintosh  
  - 128Kb memory  
  - $2,495.00.
- **June 1984**
  - X windows (MIT)  
  - Customizable
August 1985: MS Windows ships

- Windows can be tiled, not overlapped
- Iconized programs on the bottom

1987

- Apple Mac II (color)
- Microsoft Windows 2.03
- 1988: Apple sues Microsoft and HP
• Today: faster, cheaper, higher-resolution, so cool you “want to lick it.”
• Same WIMPy setup
• (Amazing revolution in 3D graphics HW)

• Design for what the user knows
  – artists, businessmen, kids
Ideas for good GUI design

• Design for what the user knows
  – artists, businessmen, kids
• Avoid too many features at the top level
  – VCRs 1985/2001
• Distinguish beginner/power user, support both:
  – mouse menus for novice
  – keyboard, rapid data input for power user
• Study the user - a human
  • people learn more easily by recognition
    – list of data values rather than prompt for a number

• Different perspectives
  – use mnemonic
    • “of or helping the memory”
  – do not assume metaphor
    • “one thing is spoken of as if it were another”

• Metaphor:
  – small
  – not irritating to anyone

• Mnemonic:
- Be Consistent (example from Windows…)
- Visual feedback (how often? 7-10 seconds)
  - progress indicator that really works

- Audio feedback
  - use sparingly, e.g. warning for serious problems
Keyboard Support

• Very important for some power users: ability to customize
  – Emacs
  – VC++
• Some power users like mouse
  – need both

Other Things

• Employ technical writers to do text
• Presentation model
  – again:
    • be consistent

params results
play ok
Modal vs Modeless Dialogs

- Modal dialog
  - finite task
    - file open, save as dialogs
      - okay people handle one window at a time
- Modeless dialog
  - no fixed duration
    - search, history list
- Application window
  - data, multiple views, comparison

Controls Design

- Visual elements that user interacts with
  - Menu bar
    - max 10 items
  - Pull-down menu
    - max 12 items
  - Check Box
    - max 12 per group box
  - Radio Button
    - max 6 per group box
  - No more than three modeless windows at one time
3D Modeling

GUIs
SKETCH: An Interface for Sketching 3D Scenes.
Zeleznik, Herndon & Hughes. SIGGRAPH 1996.
• **Teddy: A Sketching Interface for 3D Freeform Design.** Igarashi, Matsuoka & Tanaka. SIGGRAPH 1999.