Interface Design Elements & Principles

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Human-Machine Communication

• How do people send instructions and questions to the computer?
• How do computers communicate information, instructions, and further questions to the user?
• Computer interfaces may be characterized as being one of three basic styles:
  – Command
  – Menu
  – Direct Manipulation
Command Line

- Command-based designs use a formal language with rigid limitations.
  - Single-letter commands are efficient but too restrictive
- Natural language interfaces are more expressive, but require much more typing on user's part and may raise expectations unrealistically.
  - Prone to syntax and typing error
- The rich language provided by a command interface may be difficult to remember, especially for first-time or infrequent users.
- Command abbreviations are helpful, but introduce ambiguity.
Menus

- Menus make choices and operations explicit.

- Advantages
  - Interface is easier to learn and remember
  - No problems with misspellings or improper use of syntax

- Disadvantages
  - Finite number of choices available
Direct Manipulation

- WYSIWYG provides a concrete, literal concept model

Advantages
- Fluent
- Instant feedback

Disadvantages
- Real-time response is required
- May require specialized input devices, such as graphics tablets or data gloves
Multimodal Interfaces

Although computer applications can use a mixture of styles, it’s often not a good idea to provide more than one way to control the program simultaneously.

– The advantages of the various styles can be leveraged by matching a style with the appropriate task, or by matching it to the skill level of the user (as in Expert Mode).
– Multiple style modes are confusing, burdening the user with more things to remember.
– Implementation takes longer, so less time is spent on making one interface really good.

Maya’s script editor can be confusing to animators
GUI Elements and Principles

**Elements**
- Windows
- Icons
- Menus
- Pointers
- Color
- Text
- Graphics
- Audio
- Animation
- Video

**Principles**
- Consistency
- Clarity
- Predictability
- Economy
- Transparency
- Modality
- Sensitivity
- Understandability
- Conviviality

**Product**
Windows

- Application window
- Dialog boxes
- Tool bars & palettes
- Alerts
Screen Layout

• Aspect Ratio & Orientation
  – The web and mobile devices make this challenging
The Golden Rectangle (Phi)

The Fibonacci Series yields a ratio of 1:1.61 (Phi) which is found throughout natural forms. The rectangle based on that ratio is called the Golden Rectangle. Above, the Twitter screen layout and the iPod’s proportions are based on Phi. Software tools now help designers use the Golden Mean.
The Rule of Thirds helps designers to find the points of emphasis in their interfaces and to balance their screen layouts.
For Western cultures that read left to right, the upper left corner of the screen is the most prominent part of the screen, followed by the upper right, and the two lower corners. The center of the screen actually has the least prominence (it’s the gutter of the book).
Case In Point...

Apple Menu:
- Restart
- Shut Down
- Log off

Finder:
- Directory
- Applications

Spotlight:
- Find Files

Trash:
- Eject
- Burn Media

Disks:
- Mount
- Along
- Right
- Edge
Capturing the User’s Attention

• Where the eye is drawn:
  – Moving pictures (video, animation)
  – Pictures (photos, graphics, illustrations)
  – Headlines (large, bold, or differently-colored text)
  – Body copy

• Visual prominence accrues to:
  – Larger regions of positive and negative space
  – Regions with greater contrast
  – Higher saturations of color
  – Warmer colors

An eye-tracking heat map of the NY Times online indicates where a user’s gaze has been directed.
Use of the Grid

Grids organize the presentation of a variety of data, especially dynamic data.
Avoid complication and clutter

With dialogs, alerts, and tool bars, avoid complexity and too many choices. Tools should be semantically organized.

Use dialogs and alerts sparingly. Dialogs and alerts can interrupt the flow of interaction and make users lose their place.
Icons

- Graphic icons are quickly recognized and remembered.
- Help overcome language barriers and literacy issues.
- Simple and consistent in style – they should be recognizable at a distance, and should scale well.
- Color palette is limited, and ability to show detail is low.
- A 50/50 balance of positive to negative space is usually the best design for readability.
- Abstract ideas are difficult to represent.
- Text aids, like cursor "tooltips" can be used.
- Icon size is dependent upon the input used (i.e. touch screen), and also the age of the user.
- Consideration of cultural differences in interpreting icons is important.
Minimize the number of nested menus to three, and the number of menu items to nine or less. Order the items semantically and in descending priority (i.e. frequency of use). Limit the number of icons used. Avoid cognitive overload.
Pointers

Cursors provide feedback to the user about the mode the application is in – editing, processing, etc. Cursors can have color, and can be animated to show that a process is taking place. But complex pointer icons can also confuse users.
Widgets

Widgets are standardized mini utilities such as calendars; but also include scroll bars, progress bars, sliders, etc. Scroll boxes in particular are over used, and often reflect a failure of design more than a useful feature.
Controls

Interface controls are modeled after an actual artifact, like a switch or a knob. In practice controls like dials may be harder to use in a computer interface than their actual counterparts, since there is no tactile feedback. Buttons with multiple states can be a distraction in the interface.
• Layers and Separates
  – Distinguishes different types of information
• Sets the context for graphs and tables
• Emphasizes important items
  – Saturated colors are "active", neutral grey is "disabled"
• Labels
  – Groups similar functions by color
• Contributes to the “mood” of the application
• Color is never perceived in isolation. Use strong colors in small quantities, against large areas of quiet colors. More saturated colors draw our attention immediately. Use them sparingly.

Color perception stems from natural phenomena, like atmospheric distortion and the blue shift. Warmer, more saturated colors advance, and cooler, less saturated colors recede.
UI Color Guidelines

- Use a limited palette of complementary colors
- Make sure your background *is* the background
- Don’t use light blue for text, but it’s great for backgrounds
- Older users need brighter colors to recognize them, and 10% of males have some form of color blindness
- Don’t use highly saturated colors from opposite ends of the spectrum in close proximity

*Use Complementary Colors*

*Warm colors move forward*

*Cool backgrounds recede*

*This is very hard to read.*

*Don’t Do This!*
Color Palettes

Windows palette
(256 colors)

Macintosh palette
(256 colors)

Web-safe palette
(216 colors)
Color Psychology: Warmer Colors

• Red
  – Rare in the natural world
  – Associated with fire, blood, danger
  – Commands attention

• Orange and Yellow
  – Color of the sun
  – Motivator, makes people happy and decide rapidly

• Green
  – Pastoral
  – Puts people at ease
Color Psychology: Cooler Colors

• Blue
  – Most common color in the natural world
  – Color of the sky and the ocean
  – Light blue conveys access and assistance
  – Dark blue conveys authority

• Violet
  – Infrequent color in nature
  – It’s unusual and exceptional
  – The color of royalty, intrigue and mystery
Color Psychology: Neutral Colors

- **Brown**
  - Color of the earth
  - Dependable and full of promise

- **Black**
  - Color of night
  - Formality (and fear)
  - Judicial
  - Funerals in western cultures

- **White**
  - Color of clouds
  - Purity
  - Weddings in western cultures
Text

• Legibility and quick comprehension are the primary goals.
• Screen resolution is much lower than print, and reading a lot of text can strain the user’s eyes. Keep the use of text to a minimum.
• Users scan more than they read, so use text in readily “consumable” chunks.
• The minimum point size for text should be no less than 12 point. Older users and children require larger font sizes.
• With few exceptions, DO NOT USE all capital letters. Capitals are harder to read (and may imply impatience with the user).

A good balanced text layout in Helvetica, but...
Typography

• Limit the use of styles to at most four: headlines, subheads, body copy, and captions.
• The use of **bold** and *italic* fonts should be consistent and limited.
• Choose fonts that support the theme of the interface.
  – Serif fonts (e.g. *Times*) are classical and formal. They are more legible than sans-serif fonts and are good for body copy.
  – Sans-Serif fonts (e.g. *Arial*) are modern and informal. Usually best for headlines.
• Specialty fonts and typographic designs (e.g. logos) might have to be rasterized for distribution. Some applications, such as Flash, allow developers to embed fonts in their executable files (.swf).

**Arial**
**Arial Black**
**Comic Sans MS**
**Courier New**
**Georgia**
**Impact**
**Times New Roman**
**Trebuchet MS**
**Verdana**

Above, the “core nine” cross-platform (web-safe) fonts.
Typography examples
Digital Media


• People learn better when multimedia messages are designed in ways that are consistent with how the human mind works and with research-based principles
Principles for managing essential processing

• **Multimedia principle**: People learn better from words and pictures than from words alone.

• **Segmenting principle**: People learn better when a multimedia lesson is presented in learner-paced segments rather than as a continuous unit.

• **Pre-training principle**: People learn better from a multimedia lesson when they know the names and characteristics of the main concepts.

• **Modality principle**: People learn better from animation and narration than from animation and on-screen text.
Principles for reducing extraneous processing

- **Coherence principle**: People learn better when extraneous words, pictures, and sounds are excluded rather than included.
- **Redundancy principle**: People learn better from animation and narration than from animation, narration, and on-screen text.
- **Signaling principle**: People learn better when the words include cues about the organization of the presentation.
- **Spatial contiguity principle**: People learn better when corresponding words and pictures are presented near rather than far from each other on the page or screen.
- **Temporal contiguity principle**: People learn better when corresponding words and pictures are presented simultaneously rather than successively.
Principles based on social cues

• **Personalization principle:** People learn better when the words are in conversational style rather than formal style.

• **Voice principle:** People learn better when words are spoken in a standard-accented human voice than in a machine voice or foreign-accented human voice.

• **Image principle:** People do not necessarily learn better from a multimedia lesson when the speaker’s image is added to the screen.
Mayer’s final principle

• **Individual differences principle**: Design effects are stronger for low-knowledge learners than for high-knowledge learners. Design effects are stronger for high-spatial learners than for low-spatial learners.