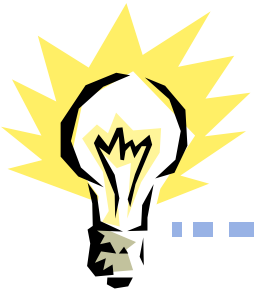# Usability Principles

Concepts, Principles, Guidelines
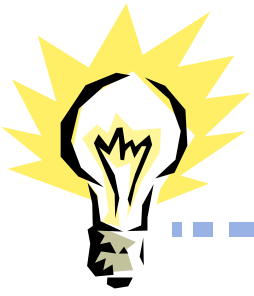
Rules? Cookbooks?

Agenda

➢ Usability Principles

- ❖ Why?
- ❖ Systems of categorization
- ❖ Levels of detail
- ❖ Example system of Principles

Good Design (Remember!)

"Every designer wants to build a high-quality interactive system that is admired by colleagues, celebrated by users, circulated widely, and imitated frequently." (Shneiderman, 1992, p.7)
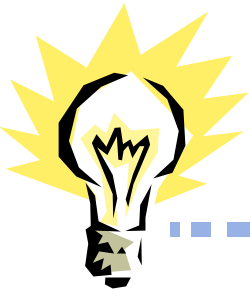
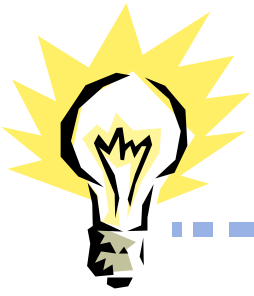*...and (almost) anything goes!...?...*

Why Principles & Guidelines?

➢ …Because, well, not *everything* goes…

➢ Prevent many bad designs, before they begin
➢ Evaluate existing designs on a scientific basis
➢ Guidelines based on previous designs, experimental findings
➢ Rules can all be "broken" (but usually in order to satisfy another principle)

Concepts, Principles, Guidelines

➢No "cookbooks"

➢No simple, universal checklists

➢Many concepts, principles, and guidelines

➢**Understand** the higher level <u>principles</u> to apply across situations, display types, etc.

➢**Implement** the standards and <u>guidelines</u>

...a few details...

Levels of Consideration
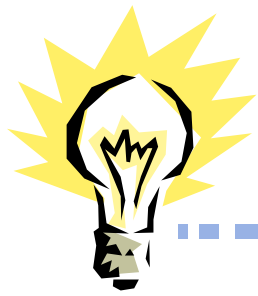
1. ## Meta-display level
   - ❖ Apply to the whole system, across media & across displays
   - ❖ Focus on this in Basic Layout Stage

2. ## Display Layout
   - ❖ Apply to groups of elements in a display
   - ❖ Focus on this in Prototyping and Redesign

3. ## Element level
   - ❖ Details about specific parts of a display
   - ❖ Colors, sound attributes, symbols

UI Design Principles (Dix et al.)

➢ Categories

1. Learnability
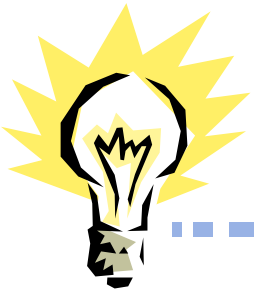   - support for learning for users of all levels

2. Flexibility
   - support for multiple ways of doing tasks

3. Robustness
   - support for recovery

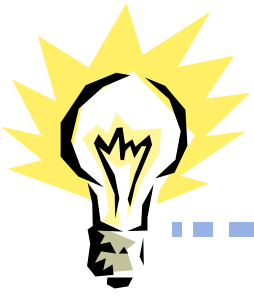➢ Think about these in terms of meta-display, display, and element levels

1. Learnability Principles

➢ Ease with which new users can begin effective interaction and achieve maximal performance

  ❖ Predictability

  ❖ Synthesizability

  ❖ Familiarity

  ❖ Generalizability

  ❖ Consistency
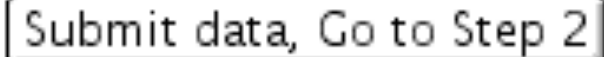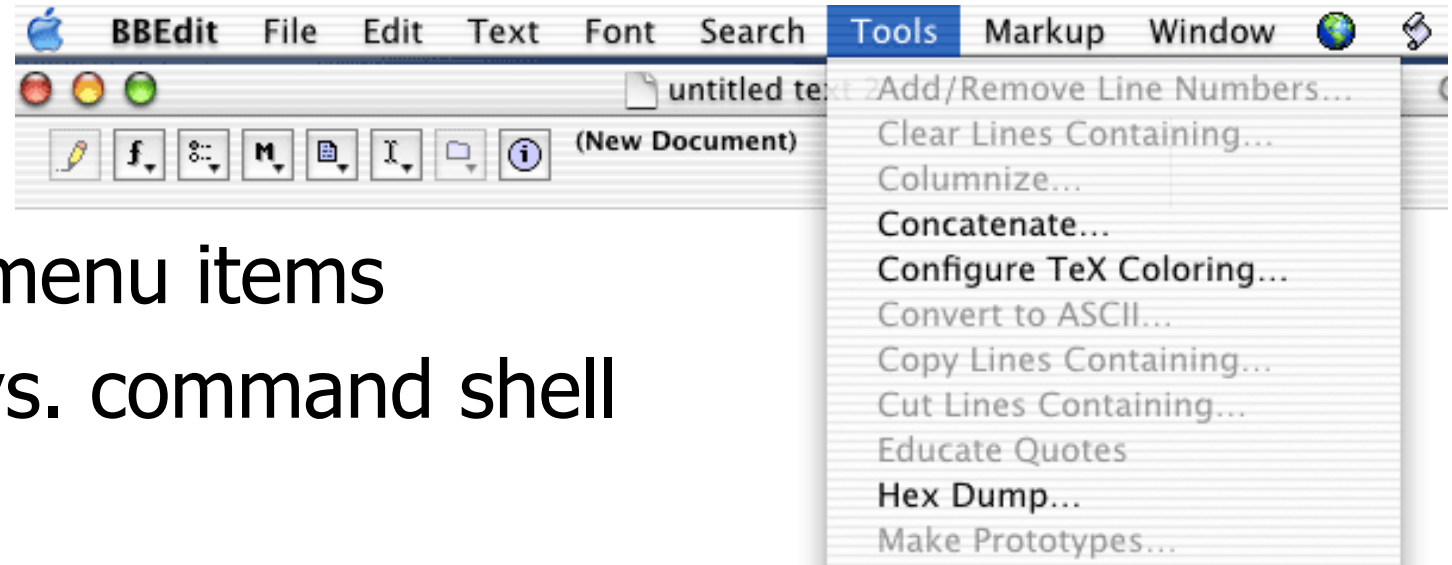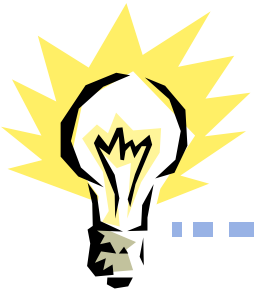
Predictability

➢ What will this action do?....   Done

vs.

Submit data, Go to Step 2

➢ Operation visibility - can see avail actions

BBEdit File Edit Text Font Search **Tools** Markup Window

Tools menu:
- Add/Remove Line Numbers…
- Clear Lines Containing…
- Columnize…
- **Concatenate…**
- **Configure TeX Coloring…**
- Convert to ASCII…
- Copy Lines Containing…
- Cut Lines Containing…
- Educate Quotes
- **Hex Dump…**
- Make Prototypes…

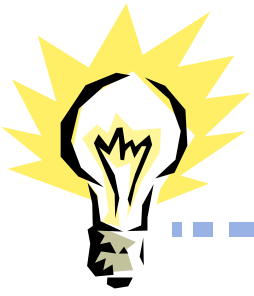❖ grayed menu items

❖ menus vs. command shell

Synthesizability

➢ Support for user in assessing the effect of past operations on current system state


```
acme.gatech.edu
{acmez:bw124:137} cp test01.txt temp/text01.txt
cp: cannot create temp/text01.txt: No such file or directory
{acmez:bw124:138}
```

Can the user figure out what caused this error?

- ❖ Moving a file in command line vs. GUI
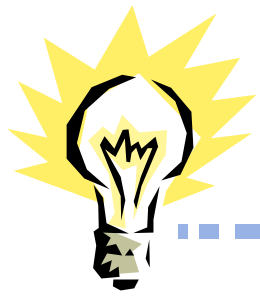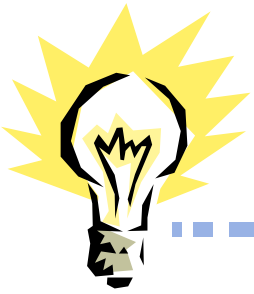- ❖ Is same feedback needed for all users, all apps?

Familiarity

➢ Does UI task leverage existing real-world or domain knowledge?

❖ Really relevant to first impressions

❖ Use of metaphors
- Potential pitfalls (see next page)

❖ Are there limitations on familiarity?
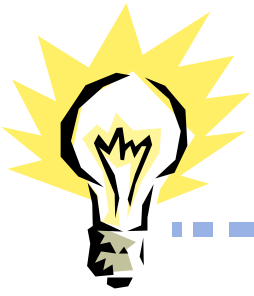- (e.g. parking lot colors and traffic light)
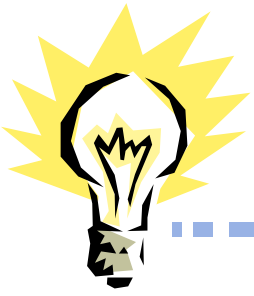
Familiarity ?

Generalizability

➢ Can knowledge of one system/UI be extended to other similar ones?

❖ Example: cut & paste in different applications

❖ Does knowledge of one aspect of a UI apply to rest of the UI?

- e.g. file browser in OS, file locater in MS-Word
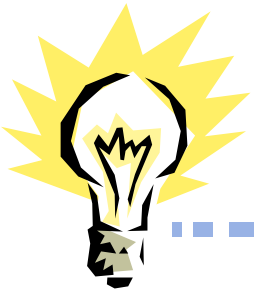
❖ Aid: UI Developers guidelines

Consistency

➢ Likeness in behavior between similar tasks/operations/situations

❖ In different things

- interacting
- output
- screen layout

➢ Is this always desirable for all systems, all users?

2. Flexibility Principles

➢ Multiplicity of ways that users and system exchange information

- ❖ Dialog Initiative
- ❖ Multithreading
- ❖ Task migratability
- ❖ Substitutivity
- ❖ Customizability
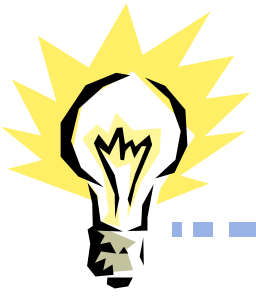
Dialog Initiative

➢ Not hampering the user by placing constraints on how dialog is done

  ❖ User pre-emptive
  - User initiates actions
  - More flexible, generally more desirable

  ❖ System pre-emptive
  - System does all prompts, user responds
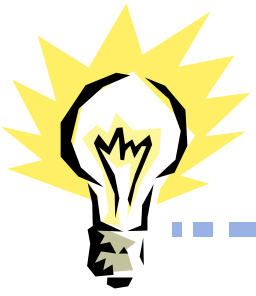 - Sometimes necessary

Multithreading

➢ Allowing user to perform more than one task at a time

➢ Two types

- ❖ Concurrent
  - Input to multiple tasks simultaneously
- ❖ Interleaved
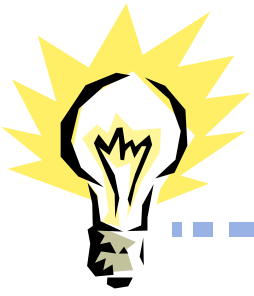 - Many tasks, but input to one at a time

Task migratability

➢ Ability to move performance of task to entity (user or system) who can do it better

   ❖ Auto-pilot/FMC in planes
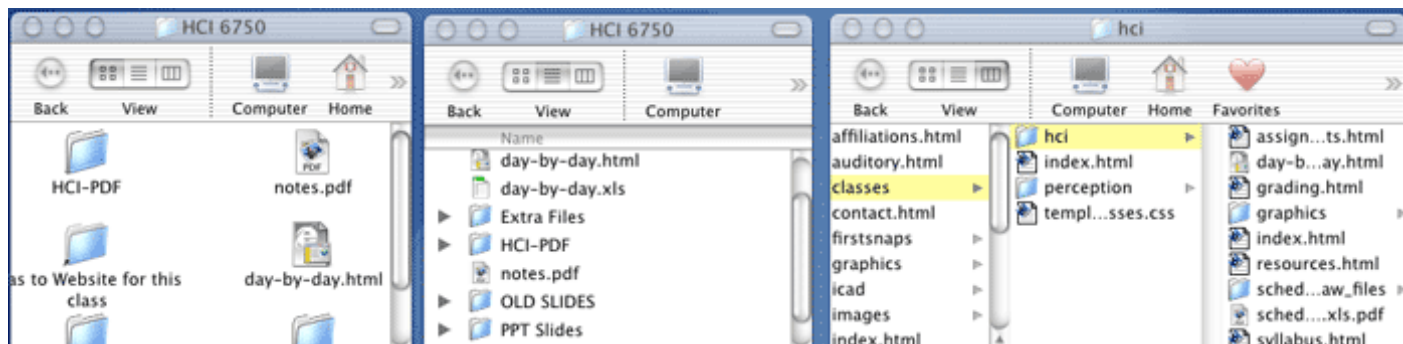
   ❖ Mobile phone → desktop (Mac)
   - Phone calls accessed on computer
   - Send directions to mobile phone

Substitutivity

➢ Flexibility in details of operations

    ❖ Allow user to choose interaction methods

    ❖ Allow different ways to
- perform actions
- specify data
- configure

    ❖ Allow different ways of presenting output
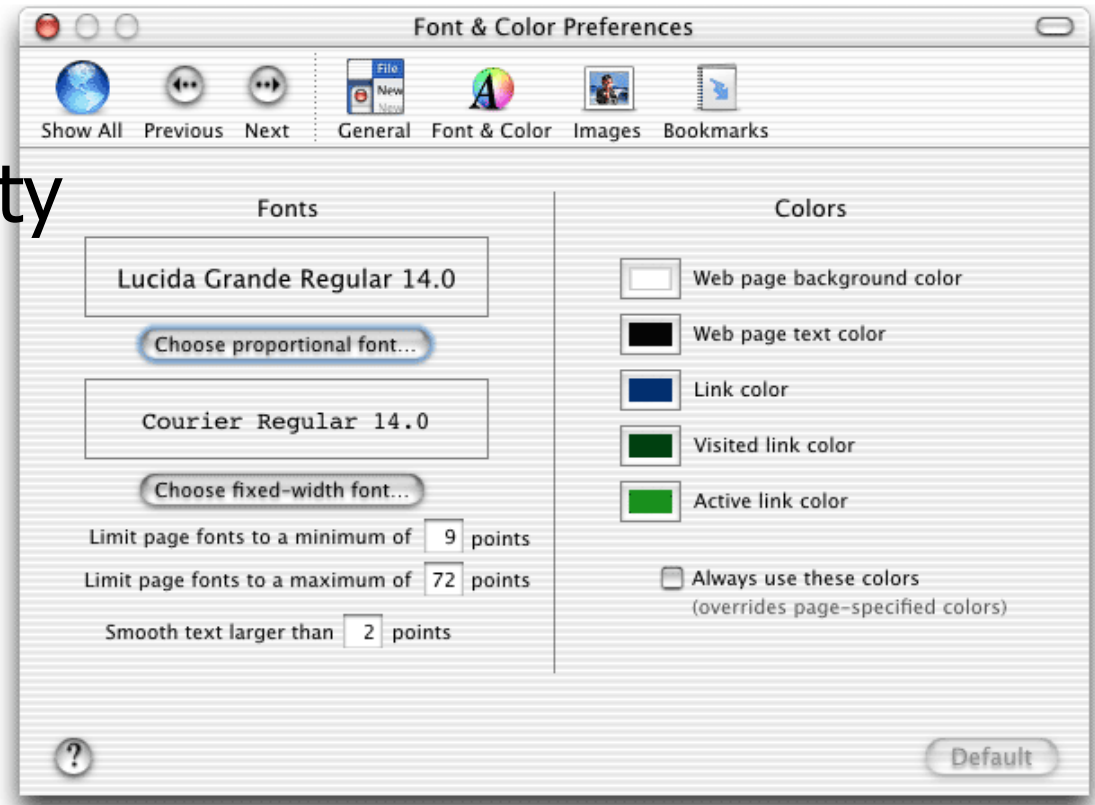- to suit task, user

Customizability

➢ Ability of user to modify interface

  ❖ By user - adaptability

  - Is this a good thing?

  ❖ By system - adaptivity

  - Is this a good thing?

Font & Color Preferences

Show All Previous Next General Font & Color Images Bookmarks

Fonts

Lucida Grande Regular 14.0

Choose proportional font...

Courier Regular 14.0

Choose fixed-width font...

Limit page fonts to a minimum of 9 points
Limit page fonts to a maximum of 72 points
Smooth text larger than 2 points

Colors

Web page background color
Web page text color
Link color
Visited link color
Active link color

Always use these colors
(overrides page-specified colors)

Default

3. Robustness Principles

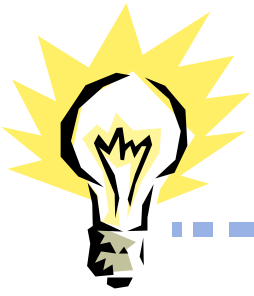➢ Supporting user in determining successful achievement and assessment of goals

- ❖ Observability
- ❖ Recoverability
- ❖ Responsiveness
- ❖ Task Conformance

Observability

➢ Can user determine internal state of system from what she perceives?
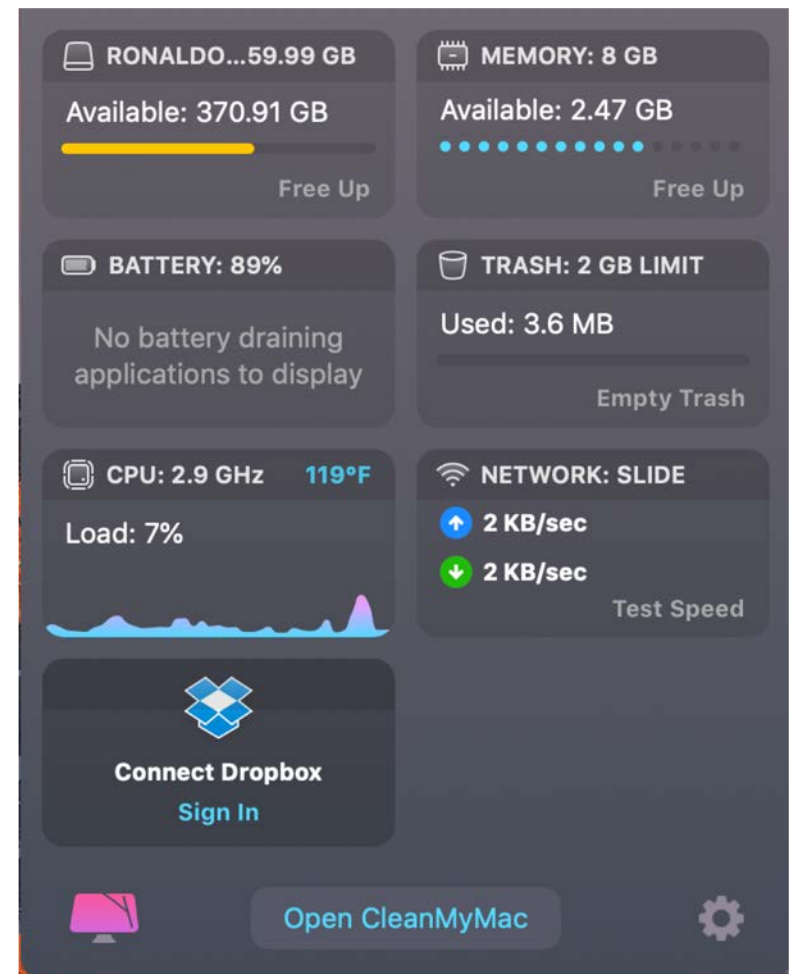
❖ **Browsability**

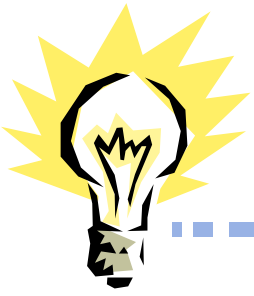- Explore current state (without changing it)

❖ **Reachability**

- Navigate through observable states

❖ **Persistence**

- How long does observable state persist?
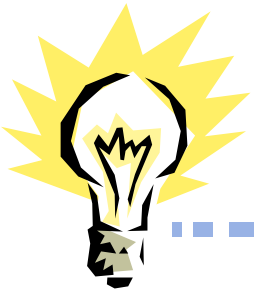
Recoverability

➢ Ability to take corrective action upon recognizing error

  ❖ "UNDO"

  ❖ Difficulty of recovery procedure should relate to difficulty of original task

  ❖ Forward recovery

    • Ability to fix when we can't undo

  ❖ Backward recovery

    • Undo previous error(s)

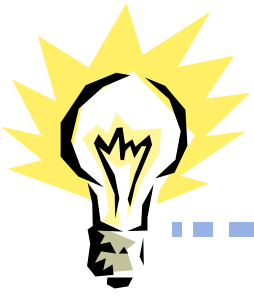   • Un-send an email in Gmail (within 10 seconds)

Responsiveness

➢ Users perception of rate of communication with system

- ❖ Response time
  - Time for system to respond in some way to user action(s)

- ❖ Users perceptions not always right

- ❖ Consistency important
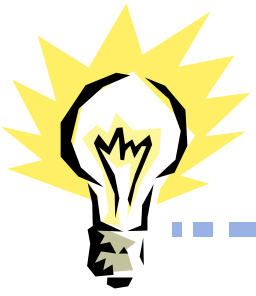
- ❖ Response OK if matches user expectations

Task Conformance

➢ Does system support all tasks user wishes to perform in expected ways?

- ❖ Task completeness
  - Can system do all tasks of interest?
- ❖ Task adequacy
  - Can user understand how to do tasks?

- ❖ Does it allow user to define new tasks?

And Don't Forget Comfort!

Application of Principles

➢ In doing design and implementation of your project, revisit this list

➢ Assess your design against these usability principles

➢ *REMEMBER: There are other principles! (see the end of this lecture's slides)*

Project

> Who are your target users, and what are they trying to do?
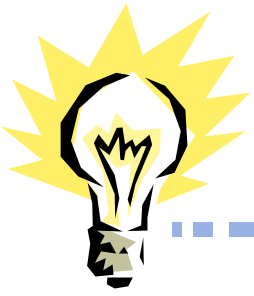
> How will you discover their challenges??

Upcoming

➢ Know your user!
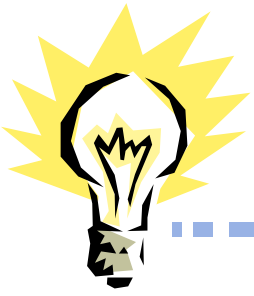- ❖ Physical
- ❖ Cognitive
- ❖ Motor
- ❖ Affective
- ❖ Motivation

Some Practical Principles

➢ The following pages contain a number of different, practical guidelines at each of the three levels (meta, display, and element levels)

➢ Some are the same or similar to ones we have discussed in class

➢ Some are more specific

➢ They have proven useful to me, but, of course, your mileage may vary

Meta-display Principles, I

➢ Navigation model

  ❖ Decide on one navigation metaphor (e.g., menu structure vs. home page), and use it consistently.

➢ Consistent navigation cues

  ❖ Families of logos, color schemes, and sounds used to indicate displays are related. Be subtle, consistent, and don't forget aesthetics!

➢ Fail-safe design principle

  ❖ Allow user to go back to previous items, steps, screens, etc. Allow user to undo as many actions as possible. Provide a true "Quit" or "Cancel" option.

Meta-display Principles, II

➢ Open-ended vs. Task completion model
  ❖ Distinguish between browsing (open-ended) interaction, and task completion behavior.

➢ Concert vs. Conversation model
  ❖ A continuum of interaction types from passive recipient of the information ("concert") to ask-and-respond dialog between the user and the system ("conversation").

➢ Computer vs. Appliance model
  ❖ May need to avoid "computerese" and jargon.

Meta-display Principles, III

➢ Logo/icon principle

❖ Top level has a logo (or melody). Lower levels have icon version of logo (or "theme" of melody).

➢ Family of logos principle

❖ Related applications have icons (and earcons) that form a "family;" in fact, a simple symbolic language to help users navigate.

➢ Process preview and progress indicators

❖ Provide a preview or summary of what is to come, and provide an indication of how far along the user is at all times.

Display Level Principles, I

➢ Compatibility (cognitive and physical)
   ❖ Left is left, up is up. Align display dimensions (in all modalities!) with real-world data dimensions.

➢ Familiarity principle
   ❖ Provide users with interface items that relate to their real world.

➢ Appropriate medium/modality
   ❖ Choose the best medium to display a given type of information (like function allocation).

➢ Population stereotypes and mappings
   ❖ Where possible, build on the expectancies of your user population (red = stop; high pitch = hot).
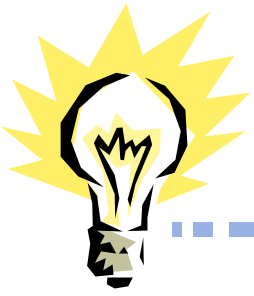
Display Level Principles, II

➢ Process flow = display flow

  ❖ (Western) readers work left-to-right, top-to-bottom. If there is a most frequent order of actions, design display to correspond (left or up = "back;" right or down = "continue").

➢ Conceptual size = hierarchical position

  ❖ Items, objects, groups that are larger (even conceptually) or hierarchy are displayed before smaller items (take note of process flow).

➢ Group like items

  ❖ Items similar in content or function should be grouped together n space or time. They should share spatial, physical, or temporal attributes.

Display Level Principles, III

➤ Continuous vs. Discrete data
  - ❖ Does data "flow" or is it displayed in "chunks"?
➤ Object + action vs. Action + object (action grammar)
  - ❖ Is an object selected, then an action indicated, or vice versa?
➤ Most important info in "center"
  - ❖ Center the important info in the display space (both visual and auditory). Controls in the periphery.
➤ Avoid modes
  - ❖ Each display should have one meaning only, and certainly only one meaning with a screen's context.

Element Level Guidelines, I

- *A few "controls" guidelines...*

➢ Label-Action match

❖ Controls say what they do, and do what they say. Consistent both within and across applications. Note: "OK" is not okay!

➢ Button location / icon /action compatibility

❖ (1) Control icon is compatible with action

❖ (2) Control location is compatible with the action (and with the icon)

➢ Consistent menus

❖ Menus should be consistent within and across applications. Most frequently used options located to the top and left.
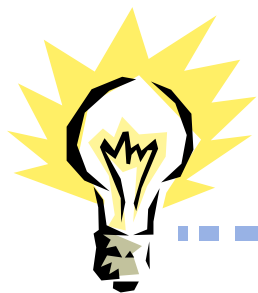
Element Level Guidelines, II

- *Several auditory guidelines...*

➢ Duration: 100 ms minimum

➢ Loudness: 10-15 dB over ambient; max 90 dB

➢ Onset ("attack") rate: 1-5 dB per second; 20 ms minimum

➢ Frequency: 300 - 3000 Hz. Varies with age.

➢ Levels of data in a dimension:

    ❖ Intensity (pure tones)   4-5

    ❖ Frequency   4-7

    ❖ Duration   2-3
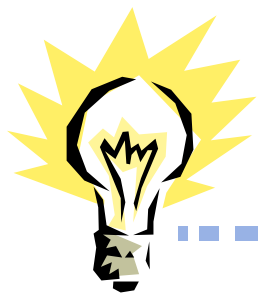
Element Level Guidelines, III

- *More auditory guidelines...*

➢ Appropriate spectrum

- ❖ Complex spectral features for warning or detection; transients for localization; simple spectrum for discrimination

➢ Avoid similar frequencies

- ❖ (Leads to "beating", poor discrimination)

➢ Use population expectancies for mappings

- ❖ Louder, brighter, faster, higher pitch = "more" or "up"
- ❖ Rising pitch = "moving up" or "getting full"
- ❖ Major key, bright spectrum = "happy" or "good"

Note: Make sure you know which population stereotypes apply (e.g., sighted vs. blind listeners)