

CHAPTER 12:

Advancing the User Experience

*Designing the User Interface:
Strategies for Effective Human-Computer Interaction*

Sixth Edition

Ben Shneiderman, Catherine Plaisant,
Maxine S. Cohen, Steven M. Jacobs, and Niklas Elmqvist

*in collaboration with
Nicholas Diakopoulos*

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Advancing the User Experience

Topics

1. Introduction
2. Display Design
3. View (Window) Management
4. Animation
5. Web Page Design
6. Color
7. Non-anthropomorphic Design
8. Error Messages

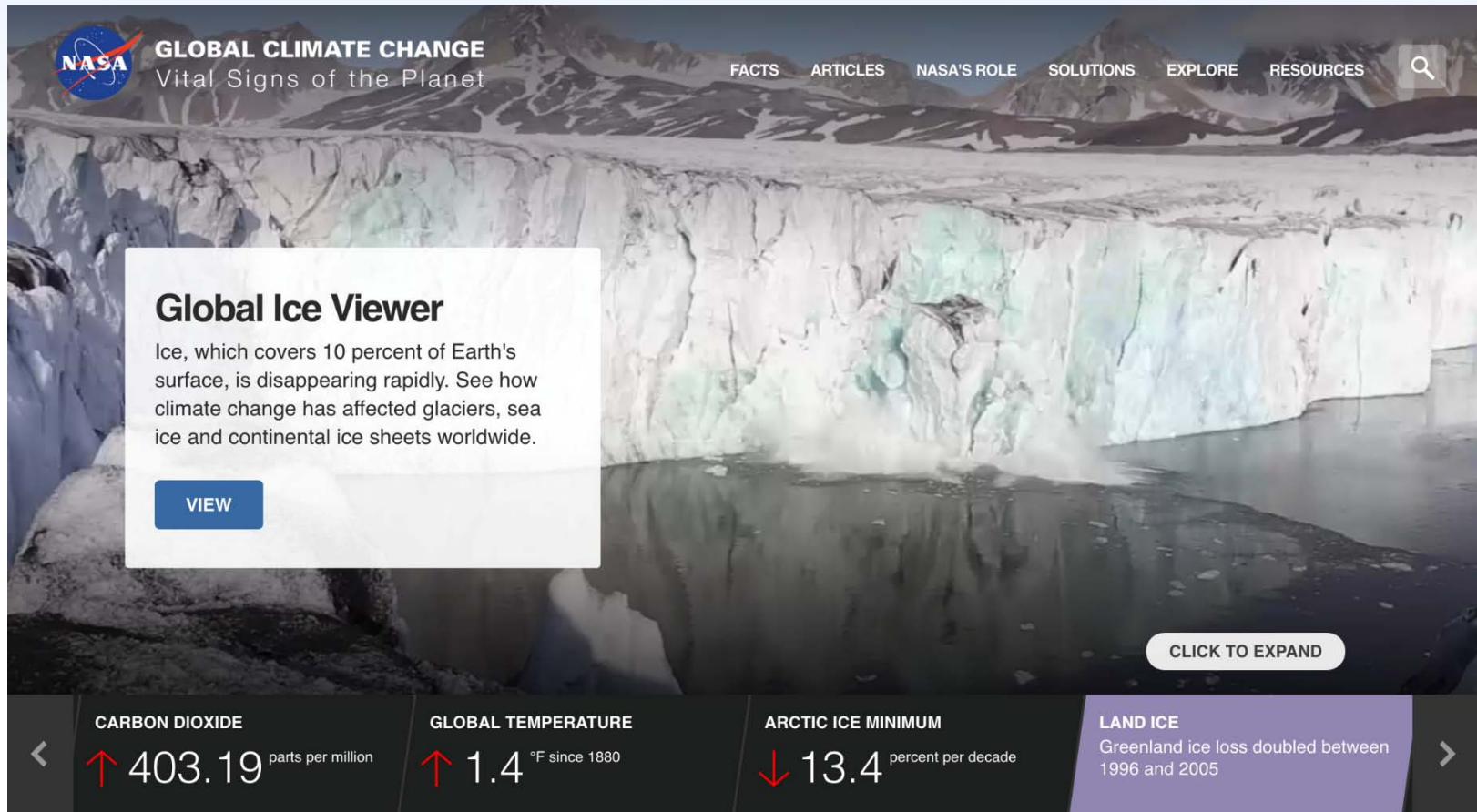
Introduction

- Interface design is edging closer to match the art, trendiness, and techniques taught in design schools
 - In an era of smartphones, tablets, the thinnest of laptops, and wearables, competition over design has intensified
 - This chapter deals with design matters that are functional issues within User Experience evaluation criteria


Display design

- Effective display designs must provide all the necessary data in the proper sequence to carry out the task
- Mullet and Sano's categories of design principles:
 - **Elegance and simplicity:** unity, refinement and fitness
 - **Scale, contrast, and proportion:** clarity, harmony, activity, and restraint
 - **Organization and visual structure:** grouping, hierarchy, relationship, and balance
 - **Module and program:** focus, flexibility, and consistent application
 - **Image and representation:** immediacy, generality, cohesiveness, and characterization
 - **Style:** distinctiveness, integrity, comprehensiveness, and appropriateness

Display design (continued)



Webby Award winner NASA climate web site illustrating an elegant visual design
<http://climate.nasa.gov/>

- 
- Ensure that any data that a user needs, at any step in a transaction sequence, are available for display.
 - Display data to users in directly usable forms; do not require that users convert displayed data.
 - Maintain a consistent format for any particular type of data display from one display to another.
 - Use short, simple sentences.
 - Use affirmative statements, rather than negative statements.
 - Adopt a logical principle by which to order lists; where no other principle applies, order lists alphabetically.
 - Ensure that labels are sufficiently close to their data fields to indicate association yet are separated from their data fields by at least one space.
 - Left-justify columns of alphabetic data to permit rapid scanning.
 - Label each page in multipaged displays to show its relation to the others.
 - Begin every display with a title or header, describing briefly the contents or purpose of the display; leave at least one blank line between the title and the body of the display.
 - For size coding, make larger symbols be at least 1.5 times the height of the next-smaller symbol.
 - Consider color coding for applications in which users must distinguish rapidly among several categories of data, particularly when the data items are dispersed on the display.
 - When you use blink coding, make the blink rate 2 to 5 Hz, with a minimum duty cycle (ON interval) of 50%.
 - For a large table that exceeds the capacity of one display frame, ensure that users can see column headings and row labels in all displayed sections of the table.
 - Provide a means for users (or a system administrator) to make necessary changes to display functions, as data-display requirements may change (as is often the case).

Samples of the 162 data-display guidelines from Smith and Mosier

Display design (continued)

- **Field layout**

- Blank spaces and separate lines can distinguish fields.
- Names in chronological order, alignment of dates, familiar date separators.
- Labels are helpful for all but frequent users.
- Distinguish labels from data with case, boldfacing, etc.
- If boxes are available they can be used to make a more appealing display, but they consume screen space.
- Specify the date format for international audiences
- Other coding categories – background shading, color, and graphic icons

Display design (continued)

- **Empirical results**
 - Structured form superior to narrative form
 - Improving data labels, clustering related information, using appropriate indentation and underlining, aligning numeric values, and eliminating extraneous characters improves performance
 - Performance times improve with fewer, denser displays for expert users
 - Screen contents should contain only task-relevant information
 - Consistent location, structure, and terminology across displays important

Display design (continued)

- **Sequence of displays**
 - Should be similar throughout the system for similar tasks, but exceptions will certainly occur
 - Within a sequence, users should be offered some sense of how far they have come and how far they have to go to reach the end
 - It should be possible to go backwards in a sequence to correct errors, to review decisions, or to try alternatives

Display design (continued)



- U.S. Navy air traffic control work environment, with multiple specialized data-intensive displays
<https://www.transportation.gov/fastlane/helping-americas-veterans-secure-promising-future>

Display design (continued)

CHI 2016 Attendee Registration [\(View Details\)](#)



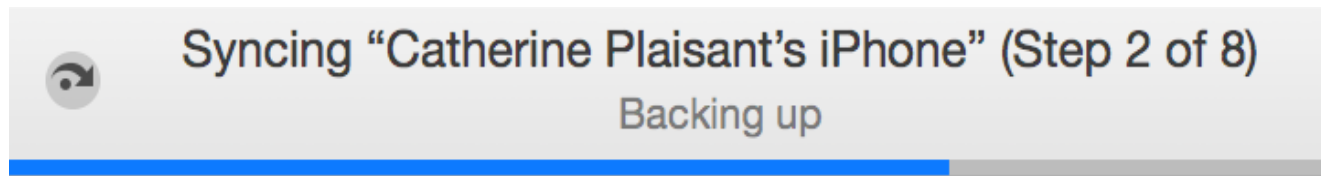
Details

Registrant	Email	Type	Actions
+ Steven Jacobs	steven.jacobs@nau.edu	ACM or SIGCHI Professional Member (please have your ACM or SIGCHI number available)	Make Changes

- This page from ACM SIGCHI CHI 2016 web site allows users to register for the conference. The progress indicator in the middle indicates the user is working in the 3rd step of a 4-step sequence of displays, giving users a sense of how far they have gone.



Display design (concluded)



- An example of progress indicator with the status of a backup process in iTunes

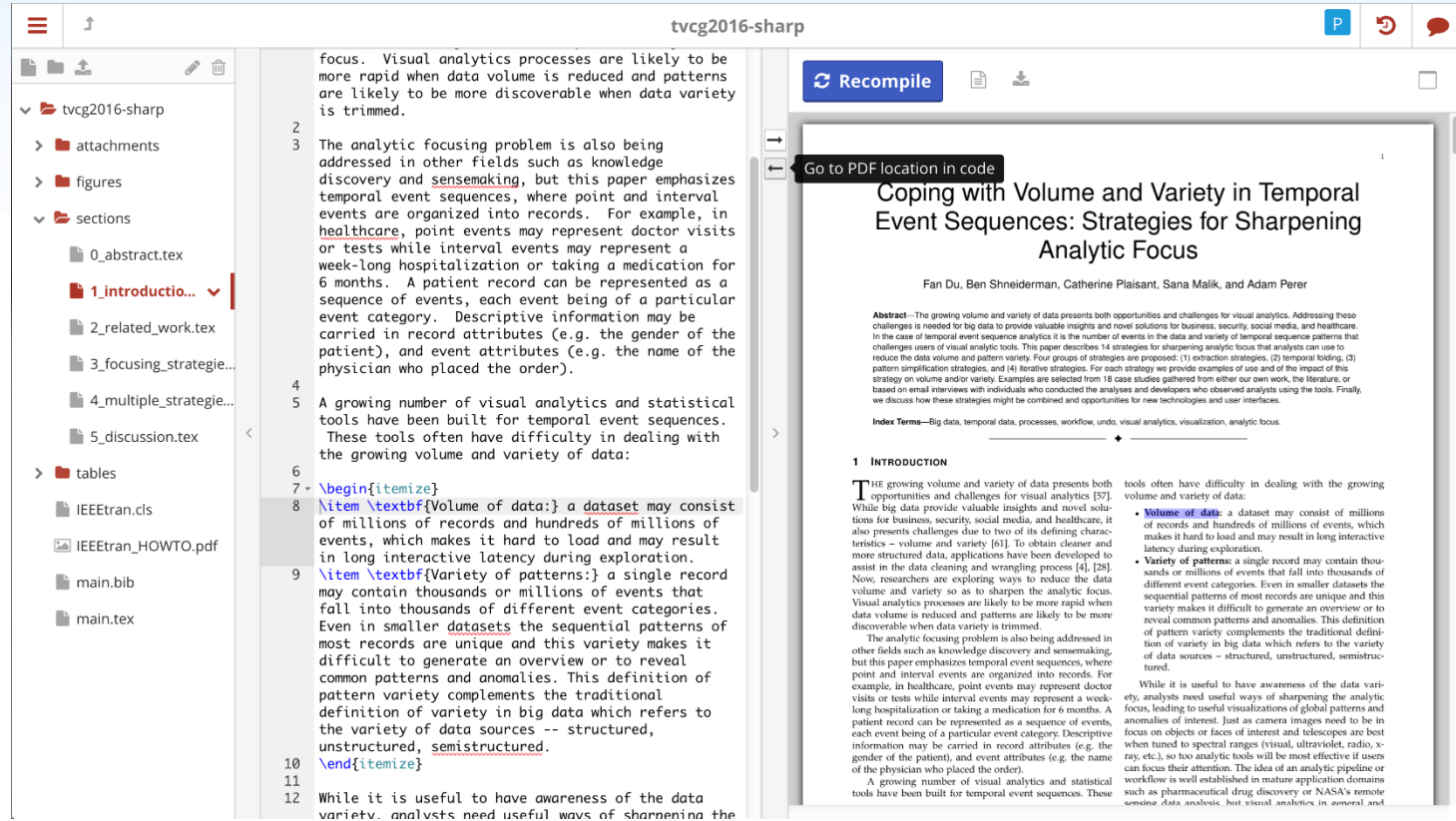
View (Window) Management

- Design considerations
 - Users need to consult multiple sources rapidly
 - Minimally disrupt user's task
 - With large displays, eye-head movement and visibility are problems
 - With small displays, windows can too small to be effective
 - Need to offer users sufficient information and flexibility to accomplish task, while reducing *window housekeeping* actions, distracting clutter, eye-head movement
 - opening, closing, moving, changing size
 - time spent manipulating windows instead of on task
 - Can apply direct-manipulation strategy to windows
 - Rooms - a form of window macro that enables users to specify actions on several windows at once

View (Window) Management (continued)

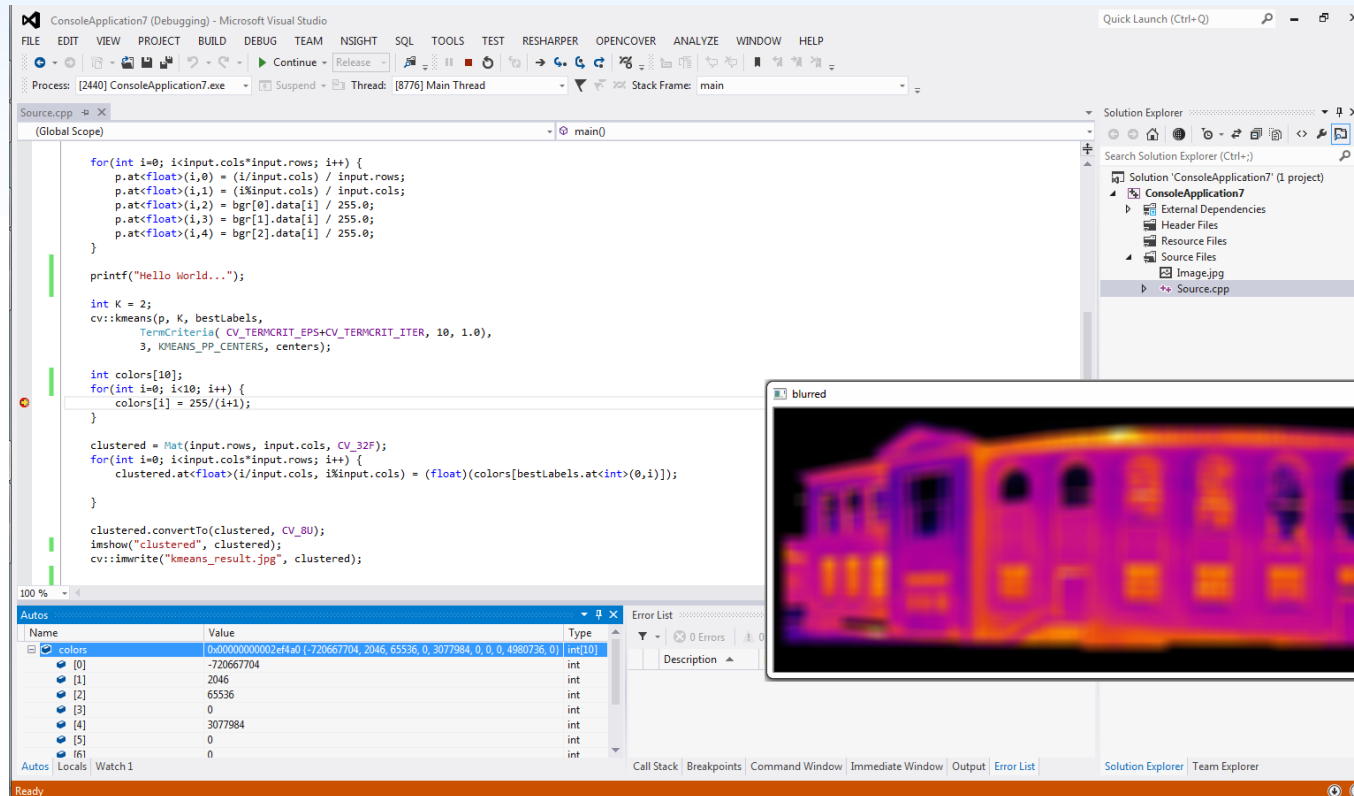
- Coordinating multiple windows
 - Designers may break through to the next generation of window managers by developing *coordinated windows*, in which windows appear, change contents, and close as a direct result of user actions in the task domain
 - A careful study of user tasks can lead to task-specific coordination
 - Consider these factors in interface design:
 - Synchronized scrolling
 - Hierarchical browsing
 - Opening/closing of dependent windows
 - Saving/opening of window state
 - Tabbed browsing
 - Tiled or overlapping windows
 - Ribbon interface
 - Design patterns
 - Start menu

View (Window) Management (continued)

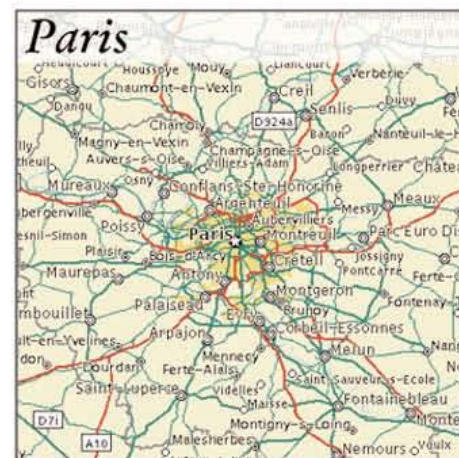


- **Hierarchical browsing:** ShareLaTeX allows users to edit a structured LaTeX document and see the resulting formatted document
 - On the left is the hierarchical list of document sections
 - The “1. Introduction” section is selected and highlighted in red, and its text can be edited in the middle
 - The preview of the output is shown on the right
 - After selecting a passage in one view it is possible to see the corresponding location on the other view

View (Window) Management (continued)



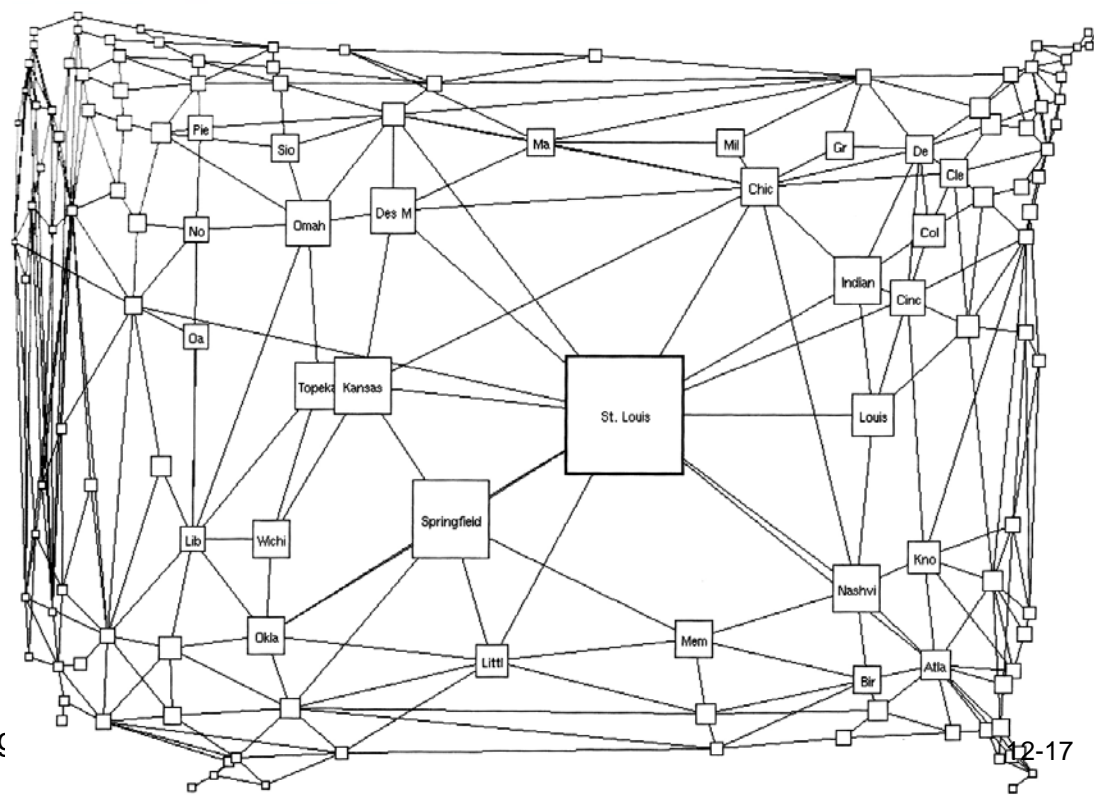
- Example of Visual Studio Integrated Development Environment illustrating **coordinated window views**
 - The project files are listed on the right, in a hierarchical browser
 - The selected file (i.e. “source .cpp”) is highlighted in the list and displayed on the left
 - A breakpoint was set in the code (red dot) at the line starting with “color[i]” so the bottom left window shows the values of the color array of the breakpoint
 - All windows are titled, except for the output window (the colorful image of heat sensor data) which overlaps all the other windows



COORDINATED PAIRS

Browsing large views:

- Zoom factors: 5-30
 - Larger suggests an intermediate view is needed
- Semantic zooming
- Side by side placement, versus fisheye view



View (Window) Management (concluded)

- **Image browsing**
 - The design of image browsers should be governed by the users' tasks, which can be classified as follows:
 - Image generation
 - Open-ended exploration
 - Diagnostics
 - Navigation
 - Monitoring

Animation

- The use of animation has grown significantly
- Examples include:
 - Keeping user oriented during transition
 - Indicating an affordance, inviting interaction
 - Entertaining
 - Indicating background activity (e.g. progress bar)
 - Storytelling
 - Alerting
 - Providing a virtual tour (e.g. for architectural designs)
 - Explaining a process

Animation (concluded)



- Gapminder uses animation to compare the income per person of 5 countries changed over time
 - The round markers leave a trace behind so we can see it in the printed as well
 - Here the user has selected India and is replaying the animation for that country (Gapminder.org)



Web page design

Top 10 Mistakes

1. Burying information too deep in a website
2. Overloading pages with too much material
3. Providing awkward or confusing navigation
4. Putting information in unexpected places on the page
5. Not making links obvious and clear
6. Presenting information in bad tables
7. Making text so small that many users cannot read it
8. Using color combinations for text that many users cannot read
9. Using bad forms
10. Hiding (or not providing) features that could help users

The top ten mistakes of web-based presentation of information (Tullis)

Web page design (concluded)

- **Numerous guidelines for web designers** are available on the Web and can be incorporated into your design process to ensure consistency and adherence to emerging standards
- Examples include:
 - *The Java Look and Feel Design Guidelines*, (Oracle, 2015)
 - *Research-Based Web Design & Usability Guidelines* (Usability, 2015)
 - *World Wide Web Consortium's Web Accessibility Initiative* (WAI, 2015)
 - *The Web Style Guide* (Lynch and Horton, 2008)

There are numerous web sites that address web design, some of which were created as companions to relevant books:

- *Web 2.0 How-To Design Guide* (Hunt, 2015)
- *Web Bloopers* (Johnson, 2003 --- updated 2008 online)
- *Building Scalable Web Sites: Building, Scaling, and Optimizing the Next Generation of Web Applications* (Henderson, 2006)

Color

- Color can:
 - Soothe or strike the eye
 - Add accents to an uninteresting display
 - Facilitate subtle discriminations in complex displays
 - Emphasize the logical organization of information
 - Draw attention to warnings
 - Evoke strong emotional reactions of joy, excitement, fear, or anger

Color (continued)

- Guidelines
 - Use color conservatively
 - Limit the number and amount of colors
 - Recognize the power of color to speed or slow tasks
 - Color coding should support the task
 - Color coding should appear with minimal user effort
 - Color coding should be under user control
 - Design for monochrome first
 - Consider the needs of color-deficient users
 - Color can help in formatting
 - Be consistent in color coding
 - Be alert to common expectations about color codes
 - Be alert to problems with color pairings
 - Use color changes to indicate status changes
 - Use color in graphic displays for greater information density



Color (continued)

Guidelines for using color

- Use color conservatively: Limit the number and amount of colors.
- Recognize the power of color to speed or slow tasks.
- Ensure that color coding supports the task.
- Make color coding appear with minimal user effort.
- Keep color coding under user control.
- Design for monochrome first.
- Consider the needs of color-deficient users.
- Use color to help in formatting.
- Be consistent in color coding.
- Be alert to common expectations about color codes.
- Be alert to problems with color pairings.
- Use color changes to indicate status changes.
- Use color in graphic displays for greater information density.

Benefits of using color

- Various colors are soothing or striking to the eye.
- Color can improve an uninteresting display.
- Color facilitates subtle discriminations in complex displays.
- A color code can emphasize the logical organization of information.
- Certain colors can draw attention to warnings.
- Color coding can evoke more emotional reactions of joy, excitement, fear, or anger.

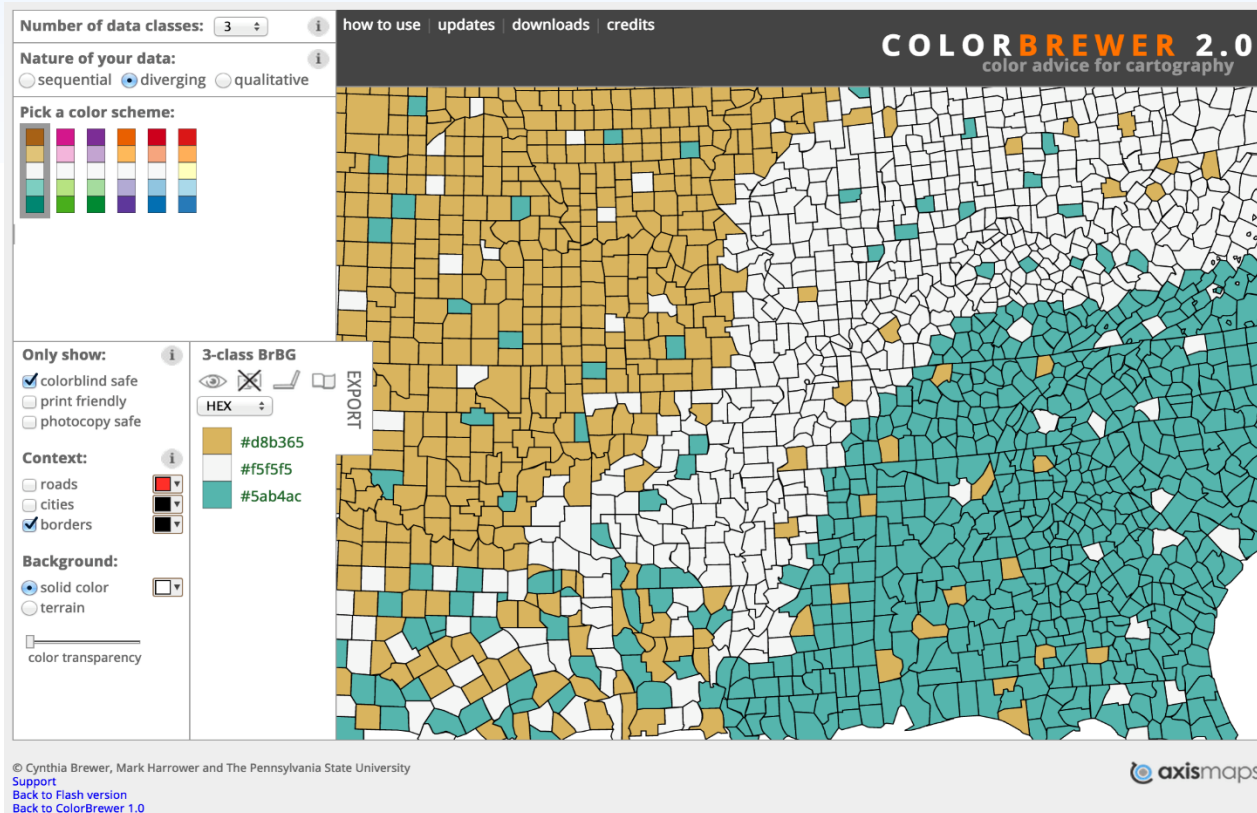
Dangers of using color

- Color pairings may cause problems.
- Color fidelity may degrade on other hardware.
- Printing or conversion to other media may be a problem.

Color (continued)

- Practical example
 - “Inspired Electronic Health Records (EHRs): Designing for Clinicians” e-book at <http://inspiredehrs.org/>
 - Visit their web site on an excellent treatment on use of HCI design principles including color (what to use and what not to use)
 - A video of patient medication reconciliation with animation and spatial layout is at this link:
<https://www.youtube.com/watch?v=YXkq9hQppOw>

Color (concluded)



- ColorBrewer helps designers select color schemes for maps and other graphics (Brewer et al, 2015)
 - Controls also allow users to narrow down the choices to colors that are visible to users with color impairments

Non-anthropomorphic design

- Concerns

- attributions of intelligence, autonomy, free will, etc. can deceive, confuse, and mislead users
- important to clarify differences between people and computers
- users and designers must accept responsibility for misuse of computers
- although attractive to some people, an anthropomorphic interface can produce anxiety in others
 - computers can make people feel dumb
 - computers should be transparent and support concentrating on the task in hand
- mature technology should avoid Mumford's obstacle of animism
- anthropomorphic interfaces may distract users
 - Microsoft's ill-fated [Clippy](#) character was intended to provide help suggestions
 - Amused some, but annoyed many
 - Disruptive interference
 - Lacked appropriate emotional expressions

Non-anthropomorphic design (concluded)

- Advocates of anthropomorphic interfaces suggest that they may be most useful as teachers, salespeople, therapists, or entertainment figures
- An alternative design is to present a human author of a package through prerecorded audio or video
- Guidelines
 - Be cautious in presenting computers as people.
 - Design comprehensible, predictable, and controllable interfaces.
 - Use appropriate humans for introductions or guides.
 - Use cartoon characters in games or children's software, but usually not elsewhere
 - Provide user-centered overviews for orientation and closure.
 - Do not use 'I' pronouns when the computer responds to human actions.
 - Use "you" to guide users, or just state facts.

Error messages

- Constructive guidance and positive tone
 - Messages should, where possible, indicate what users should do to correct the problem
 - Unnecessarily hostile messages using violent terminology can disturb non-technical users:
 - FATAL ERROR, RUN ABORTED
 - CATASTROPHIC ERROR: LOGGED WITH OPERATOR
 - Negative terms such as ILLEGAL, ERROR, INVALID, BAD should be eliminated or used infrequently
 - Other examples:
 - Poor:** SYNTAX ERROR
Better: Unmatched left parenthesis
 - Poor:** INVALID DATA
Better: Days range from 1 to 31
 - Poor:** BAD FILE NAME
Better: The file C:\demo\data.txt was not found
 - Poor:** ???
Better: Touch icon twice to start app



Error messages (concluded)

End product

- Be as specific and precise as possible. Determine necessary, relevant error messages.
- Be constructive. Indicate what the user needs to do.
- Use a positive tone. Avoid condemnation. Be courteous.
- Choose user-centered phrasing. State the problem, cause, and solution.
- Consider multiple levels of messages. State brief, sufficient information to assist with the corrective action.
- Maintain consistent grammatical forms, terminology, and abbreviations.
- Maintain consistent visual format and placement.

Development process

- Increase attention to message design.
- Establish quality control.
- Develop and enforce guidelines.
- Carry out usability tests.
- Consider conducting “error handling” reviews.
- Record the frequency of occurrence for each message.