

Vorlesung Advanced Topics in HCI (Mensch-Maschine-Interaktion 2)

Ludwig-Maximilians-Universität München
LFE Medieninformatik
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SS2005
<http://www.medien.ifi.lmu.de/>

Site Elements

<http://www.webstyleguide.com>

- When designing a site the basic site element can help to create a clear design, examples are:
 - Home pages
 - Information pages ("the meat")
 - Menus and subsites
 - Resource lists, "other related sites" pages
 - Site guides
 - "What's new?" pages
 - Search features
 - Contact information and user feedback
 - Bibliographies and appendixes
 - FAQ pages
 - Custom server error pages

Site Elements – Home page

<http://www.webstyleguide.com>

- Logical entry point to a site, often the most visited page on a site
- First impression – everything that is really important has to be visible without scrolling
- All pages in the site should link back to this page
- Typical function
 - Show important content and news
 - Link to all parts of the site (home for navigation)
- Home page types
 - Link/navigation/menu page
 - News pages
 - Path-oriented pages (dividing the visitors - *information for ...*)
 - Splash screens/cover page (be careful! hard to make them useful!)
 - Combined (Navigation with paths, news integrated)
- Home pages have often a distinctive layout within a site

Home Pages – Example 1



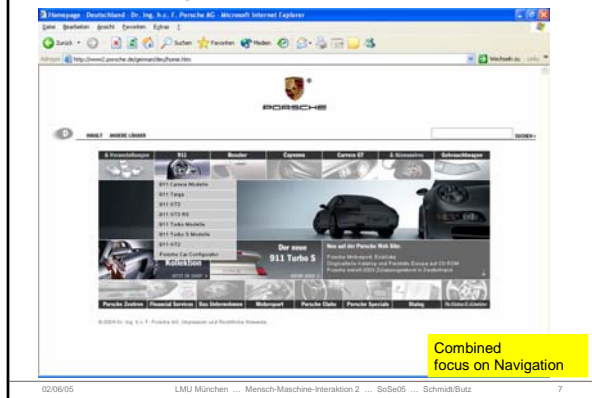
Home Pages – Example 2



Home Pages – Example 3



Home Pages – Example 3



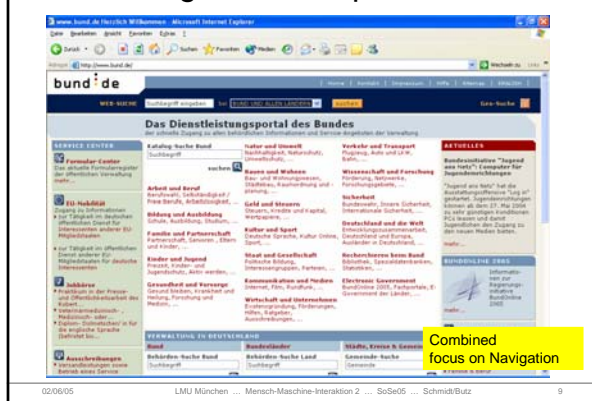
Combined focus on Navigation

Home Pages – Example 4



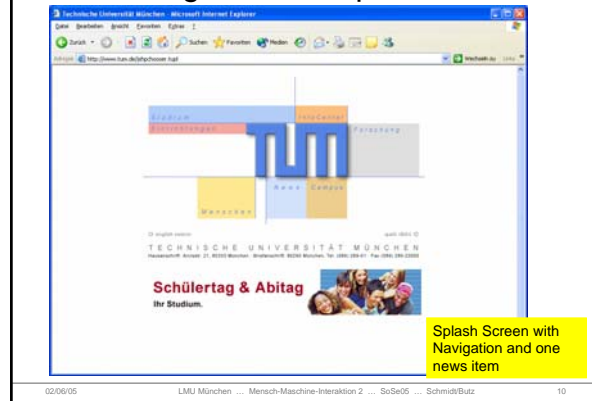
Navigation / Menu

Home Pages – Example 5



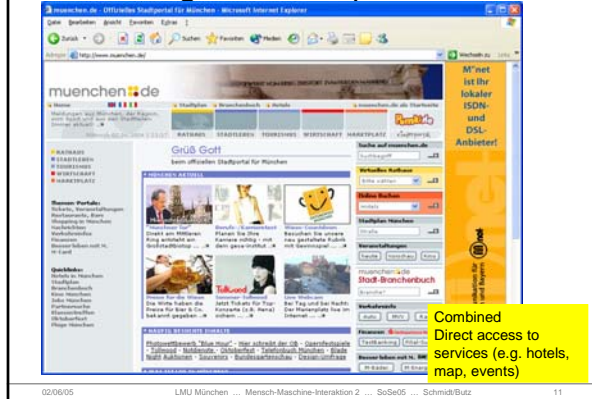
Combined focus on Navigation

Home Pages – Example 6



Splash Screen with Navigation and one news item

Home Pages – Example 7



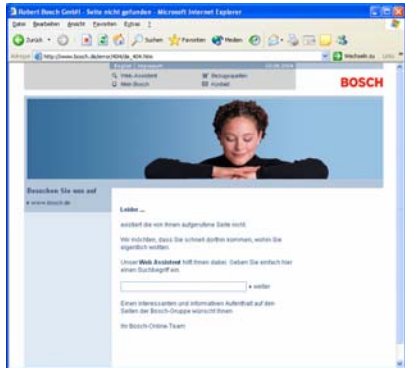
Combined Direct access to services (e.g. hotels, map, events)

Site Elements – Search, Site Guides

<http://www.webstyleguide.com>

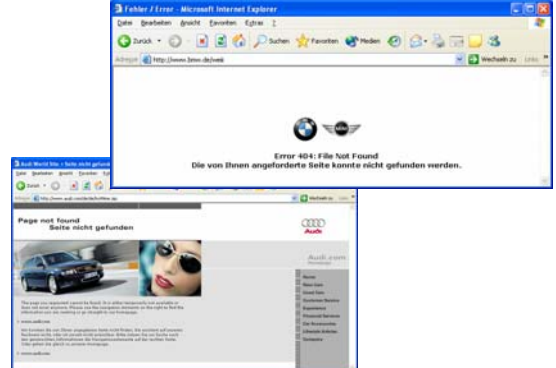
- Site Guides / Site Maps
 - Provide an overview (you can't flip through the pages of a web site)
 - extent & size
 - organization
 - and context
 - Tables of contents
 - keyword indexes of the information in your Web
- Search
 - For large sites a "must"
 - Update the search content for each change or on daily basis
 - Complement to navigation and site guide – not replacement
- "What is new"
 - If pages change often and visitors look for new content
 - For regular visitors
 - Listing of recent changes / additions
 - E.g. online software archive

Custom Error Pages



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Custom Error Pages



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Accessibility & Universal Design

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Accessibility & Universal Design

- Why is it an Issue? Why is it important?
- Types of Disabilities
- Design Principles
- Assistive Technologies
- Web Content Accessibility
- Accessible Software

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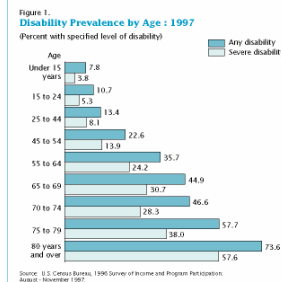
Accessibility & Universal Access ... why is it important?

- Figures from the USA
 - In 1997, 52.6 million people (19.7 percent of the population) had some level of disability
 - 33.0 million (12.3 percent of the population) had a severe disability.
 - About 10.1 million individuals (3.8 percent of the population) needed personal assistance
 - 2.2 million used a wheelchair.
 - Another 6.4 million used some other ambulatory aid such as a cane, crutches, or a walker.
 - About 7.7 million individuals and letters in ordinary newspaper print; of them, 1.8 million were unable to see.

From <http://www.census.gov/hhes/www/disable/sipp/disab97/asc97.html>

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Accessibility & Universal Access ... why is it important?



From <http://www.census.gov/hhes/www/disable/sipp/disab97/asc97.html>

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Accessibility & Universal Access ... why is it important?

- Figures from Germany
 - 155.000 blind people
 - 500.000 visually impaired
 - 1,1 Million have motor deficiencies (movement and control of body parts)
 - 236.000 are hard of hearing or deaf
- Assistive technologies
 - use associative technologies is widespread in these groups (~30%)
 - Large screens and magnified presentation
 - Braille Displays
 - Text to speech (screen readers)
 - Speech input and speech control
 - Special keyboards and input devices (if motor control for standard mouse and keyboard is not sufficient)
- Source: <http://www.behinderten-ratgeber.de/forum/statistiken1.htm>

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Accessibility & Universal Access ... why is it important?

- Legal requirements
 - In Germany:
 - Behindertengleichstellungsgesetz
<http://www.behindertenbeauftragter.de/gesetzgebung/behindertengleichstellungsgesetz>
 - Verordnung zur Schaffung barrierefreier Informationstechnik nach dem Behindertengleichstellungsgesetz
<http://www.behindertenbeauftragter.de/gesetzgebung/behindertengleichstellungsgesetz/rechtsverordnung/v011bgg>
 - USA
 - Section 508
<http://www.section508.gov/>
- Timeframe (Germany)
 - 31. December 2005 for general information
 - 31. December 2003 for information that is targeted at people with disabilities

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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar

Types of disabilities

- Visual
 - Blindness
 - Low vision
 - Color blindness
- Hearing
- Motor skills
- Cognitive disability
 - Reading disorders
 - Attention disorders
 - Memory impairments

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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Blindness

- User cannot see visual content
 - Pictures, diagrams, animations, etc.
- May use a screen reader to get information
 - Cannot scan a page quickly
 - Must navigate linearly through text
- Solutions
 - Provide structure to text for easy navigation
 - Add text or audio descriptions to images/video
 - Follow standards for maximum compatibility with screen readers

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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
Brandon Goldsworthy, Shaun Kane, Tony Sindelar

Low vision

- Many types
 - Poor vision quality
 - Partially occluded vision
- Very common in seniors
- Low-contrast text difficult to read
- Solutions
 - Allow font resizing
 - Allow color schemes to be changed
 - Add text or audio descriptions to images/video

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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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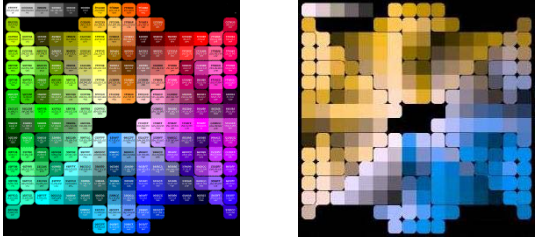
Color blindness

- Inability to distinguish between certain colors
 - Affects 10% of males
 - Often have problems with red and green
- Solutions
 - Allow color schemes to be changed
 - Don't differentiate on hue alone
 - Saturation
 - Value
 - Shape

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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Color blindness



What most people see What color-blind users see

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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Color blindness



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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Is this accessible?



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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Better



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From: http://portal.cs.umass.edu/fundamentals/Usability_05_Accessibility.pdf
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Hearing impairment

- User cannot hear audio content
- This one is easy to test for
 - Turn off your speakers!
- Solution
 - Provide captioning for all audio content

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Impaired motor skills

- Difficulty using mouse and keyboard
 - Inaccuracy while clicking
 - Slow input
 - May use specialized input device
- Solutions
 - Do not require precise clicking
 - Allow alternate input methods
 - Keyboard
 - Mouse
 - Voice

Cognitive disabilities

- Many types
 - Learning disabilities
 - Attention deficit disorder
 - Memory impairments
 - Impairments of intelligence
- May have difficulty focusing on or processing information
- Solutions
 - Clear, simple design
 - Simple navigation
 - Avoid distracting elements (video, navigation)

Universal design principles

- Equitable Use
 - The design is useful and marketable to people with diverse abilities
- Flexibility in Use
 - The design accommodates a wide range of individual preferences and abilities
- Simple and Intuitive Use
 - Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
- Perceptible Information
 - The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.


Universal design principles

- Tolerance for Error
 - The design minimizes hazards and the adverse consequences of accidental or unintended actions
- Low Physical Effort
 - The design can be used efficiently and comfortably and with a minimum of fatigue
- Size and Space for Approach and Use
 - Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility

Assistive Technologies Screenreader

- Software that reads what is on the screen
- Provides navigation
- Integrates with application software
- Example: JAWS
 - Includes a software speech synthesizer
 - Can output to Braille display
 - Demo: http://www.freedomscientific.com/fs_downloads/jaws.asp
- Example: IBM Home page reader
 - Especially designed for web browsing
 - Reads text, table, frames, forms, ALT-tags
 - Works with selected JavaScript code and Plug-Ins
 - Demo: <http://www-5.ibm.com/de/accessibility/hpr.html>

Assistive Technologies Braille Displays

- 
- <http://www.accesstech.ch/>
- Used with a JAWS screen reader
 - refreshable Braille cells act as a tactile monitor (e.g. 44-, 70- and 84-cells)
 - Unidirectional advance bars and Whiz Wheels for navigation. . .
 - buttons are individually (Navigation controls are on the display)
 - >5000 €
- <http://www.sightandsound.co.uk/>

Assistive Technologies Braille Printer



- E.g. Basic-S Printer
- Speed
 - 150 PPH (pages per hour) or 39 CPS (characters per second).
- Technology
 - 6 High quality hardened hammers forming against hardened steel anvils

<http://www.sightandsound.co.uk/>

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Assistive Technologies Speech input, Voice control

- Software to input text and commands to the system

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Assistive Technologies Screen Magnification

- Demo
- Problems with fonts and bitmaps

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Web Content Accessibility Guidelines 1.0

- <http://www.w3.org/TR/WCAG10/>

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Web Accessibility Evaluation

- Guidelines available from W3C
<http://www.w3.org/TR/2004/WD-WCAG20-20040311/>
- Guidelines are divided into three categories of success criteria:
 - Level 1 success criteria:
 - do not specify how information is presented
 - are reasonably applicable to all Web sites
 - some are machine-testable. Others require human judgment. Success criteria that require human testing yield consistent results among multiple testers.
 - Level 2 success criteria:
 - may require an author to present content in particular ways
 - are reasonably applicable to all Web sites
 - some are machine-testable. Others require human judgment. Success criteria that require human testing yield consistent results among multiple testers.
 - Level 3 success criteria:
 - are additional criteria that go beyond Level 1 and 2 that may be applied to make sites accessible to more people with all or particular types of disability
 - Conformance
 - WCAG 2.0 A, WCAG 2.0 A+, WCAG 2.0 AA, WCAG 2.0 AAA

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QUICK TIPS TO MAKE ACCESSIBLE WEB SITES

<http://www.w3.org/WAI/References/QuickTips/>

- **For Complete Guidelines & Checklist:** www.w3.org/WAI
- **Images & animations:** Use the **alt** attribute to describe the function of each visual.
- **Image maps.** Use the client-side **map** and text for hotspots.
- **Multimedia.** Provide captioning and transcripts of audio, and descriptions of video.
- **Hypertext links.** Use text that makes sense when read out of context. For example, avoid "click here."
- **Page organization.** Use headings, lists, and consistent structure. Use **CSS** for layout and style where possible.
- **Graphs & charts.** Summarize or use the **longdesc** attribute.
- **Scripts, applets, & plug-ins.** Provide alternative content in case active features are inaccessible or unsupported.
- **Frames.** Use the **noframes** element and meaningful titles.
- **Tables.** Make line-by-line reading sensible. Summarize.
- **Check your work.** Validate. Use tools, checklist, and guidelines at <http://www.w3.org/TR/WCAG>

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Software to check guideline some examples...

- Bobby: <http://bobby.watchfire.com/bobby/html/en/index.jsp>
"This free service will allow you to test web pages and help expose and repair barriers to accessibility and encourage compliance with existing accessibility guidelines, such as Section 508 and the W3C's WCAG. To learn about products to test websites of all sizes for accessibility issues, please visit the [accessibility section on www.watchfire.com](http://www.watchfire.com)."
- A-prompt: <http://aprompt.snow.utoronto.ca/>
"Web authors can use A-Prompt to make their Web pages accessible to people with disabilities. The A-Prompt software tool examines Web pages for barriers to accessibility, performs automatic repairs when possible, and assists the author in manual repairs when necessary. These enhanced Web pages are available to a larger Internet audience."
- <http://www.anybrowser.com/>
- <http://www.barrierekompass.de/>
- <http://validator.w3.org/>

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References

- <http://www.w3.org/WAI>
- <http://www.evaluiere.de/infos/links/barriere.htm#behindertengerecht>
- <http://www.barrierefreies-webdesign.de/bitv/anforderungen.php>
- <http://www.wob11.de/info/doc/tipps+tools.htm>

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Chapter 2: Information Visualization

Table of Content

- Information & representation
- What is information visualization
- Perception basics
- Standard techniques
- Principles and Taxonomy
- Options for visualization & Examples

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"Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space."

-- Edward R. Tufte

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Representation

- What is a good Representation?
 - Capture and present the essential
 - Deliberately hide irrelevant parts
 - Appropriate for the recipient and his/her abilities
 - To understand and interpret by the recipient
 - Appropriate for the task
- "Solving a problem simply means representing it so as to make the solution transparent" (Simon, 1981)
- Allow people to look at the presentation and draw the "right" conclusions!

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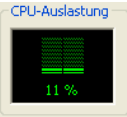
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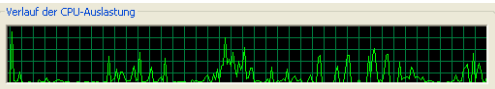
Representations

Physischer Speicher (KB)	
Insgesamt	514544
Verfügbar	177396
Systemcache	204792

- Figures / numbers



- Numbers in bar graph
- Plot with history



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How to read representations

- Read the plain facts
- Compare representations (visual calculations)
- Identify patterns
- Make interpretations
- Can be enhanced by active diagrams
 - Allow interactive manipulation

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External aids for thinking

The power of the unaided mind is highly overrated. Without external aids, memory, thought, and reasoning are all constrained. But human intelligence is highly flexible and adaptive, superb at inventing procedures and objects that overcome its own limits. The real powers come from devising external aids that enhance cognitive abilities. How have we increased memory, thought, and reasoning? By the inventions of external aids: It is things that make us smart. (Norman, 1993)

- External cognition
 - Internal and external representation and processing weave together in thought
- External cognitive aids can enhance cognition
- An important class of external cognitive aids that make us smart are graphical inventions
 - Charts for navigation
 - Diagrams

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Use of visual representations

- Pictures and diagrams are used to communicate existing ideas and thoughts
- Graphical representations can help in developing and formulating ideas and thoughts
- Using visual representations "to think"

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Information – to visualize

- What is "Information"?
 - Entities, concepts, things, items that may not have a direct physical correspondence
 - Information is often abstract
- Large sets of data and information
 - Great amount of data
 - Information is generated in many processes
- visualize: to form a mental image or vision of ...
- visualize: to imagine or remember as if actually seeing. (American Heritage dictionary, Concise Oxford dictionary)

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What is Information Visualization

- The use of computer-supported, interactive visual representations of data to amplify cognition. (Card, Mackinlay Shneiderman '98)
- "Transformation of the symbolic into the geometric" (McCormick et al., 1987)
- "... augmenting ... natural intelligence in the best possible way, ... finding the artificial memory that best supports our natural means of perception." (Bertin, 1983)
- "The depiction of information using spatial or graphical representations, to facilitate comparison, pattern recognition, change detection, and other cognitive skills that make use of the visual system." (Hearst, 2003, CHI-Tutorial)

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Information Visualization

- The basic idea
 - Finding for information items an appropriate and meaningful mapping into a 2-D or 3-D physical space.
 - Creating a visual representation that helps to understand data and is useful for analysis and decision-making
- Visual representation are helpful
 - External cognition
 - frame of reference
 - "temp storage" for thinking
- "The purpose of visualization is insight, not pictures"
 - Insight – understanding, discovery, decision making, explanation

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Definition by Shneiderman

Compact graphical presentation and user interface for manipulating large numbers of items ($10^2 - 10^6$), possibly extracted from far larger datasets.

Enables users to make discoveries, decisions, or explanations

about

patterns (trend, cluster, gap, outlier...), groups of items, or individual items.

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Information Visualization is applicable to:

- Text, documents, text archives
- Databases
- Statistics
- Financial data, business data
- Geographic data
- Network information, internet information
- Software
- ...

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What tasks are supported by Information Visualization?

- Search
 - Finding a specific information in a data set
- Browse
 - survey, inspect, look for interesting information
- Analysis
 - Comparison-Difference, find outliers and extremes, spot patterns
- Many more...
 - Categorize, Associate
 - Locate, Rank
 - Identify, Reveal
 - Monitor, Maintain awareness

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Examples

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