

Module-1 Section 1.4

Direct Manipulation
Web User Interface



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 - Definition, Intention
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Direct Manipulation

- Who? When?
 - Ben Shneiderman first coined the term “Direct Manipulation” in 1983.
- Definition
 - It is a human computer interaction style which involves continuous representation of objects of interest, and rapid, reversible, incremental actions and feedback
- Intention
 - To allow user to directly manipulate objects presented to them, using actions that corresponds to the physical world
 - Having a real world metaphor for objects and actions make it easier for a user to learn and use an interface (i.e., natural interface)
- Example
 - Drawing a rectangle in MS Word
 - Changing the size of rectangle from a drag handle
 - Activating the object (changes its visual appearance thus feedback is immediate)



Shneiderman, B. 1983. *Direct Manipulation: A Step Beyond Programming Languages*. Computer **16** (8), pp. 57–69. ([Access-controlled archival copy](#) available in ACM Digital Library.)



Direct manipulation - Ben Shneiderman



Current Position

Professor: **Computer Science, UMIACS**

Founding Director: **Human Computer Interaction Lab** (1983-2000)

Affiliate Professor: **Institute for Systems Research**

Affiliate Professor: **College of Information Studies** - Maryland's iSchool

Research Interests

Human-Computer Interaction, User Interface Design, Information Visualization, and Social Media

Academic Degree

Ph.D., SUNY at Stony Brook, 1973

New Books

- Shneiderman, B., *Twin-Win Research: Your Guidebook for Accelerating Campus Discovery and Innovation: Second Edition*, Morgan & Claypool (2019):



Direct manipulation - Characteristics

- Continuous representation of the object of interest
 - Usability heuristic
 - Example: Drag and drop
- Physical actions instead of complex syntax
 - Actions are invoked physically via click, Button press, Menu Selection & touch gestures
- Continuous feedback and reversible, incremental actions
 - Easy to validate that each action caused the right result
 - Drag & drop vs mv command (mistakes...)
- Rapid learning
 - Don't have to learn and remember complex syntax.



Skeuomorphism

- Based on direct manipulation
- Not all direct manipulation need to be skeuomorphic and sometimes as flat interface
- Is the design concept of making items represented
- Based on resemblance with a physical object in the real world



WEB USER INTERFACE

- Initial designs focus on content not data
 - Web page design (Navigation environment)
 - Web application design (collect and process data)

	GUI	WEB
Devices	User hardware variations limited. User hardware characteristics well defined. Screens appear exactly as specified.	User hardware variations enormous. Screen appearance influenced by hardware being used.
User Focus	Data and applications.	Information and navigation.
Data/ Information	Typically created and used by known and trusted sources. Properties generally known. Typically placed into system by users or known people and organizations. Typically organized in a meaningful fashion. A notion of private and shared data exists.	Full of unknown content. Source not always trusted. Often not placed onto the Web by users or known people and organizations. Highly variable organization. Privacy often suspect.
User Tasks	Install, configure, personalize, start, use, and upgrade programs. Open, use, and close data files. Fairly long times spent within an application. Familiarity with applications often achieved.	Link to a site, browse or read pages, fill out forms, register for services, participate in transactions, download and save things. Movement between pages and sites very rapid. Familiarity with many sites not established.
User's Conceptual Space	Controlled and constrained by program.	Infinite and generally unorganized.
Presentation Elements	Windows, menus, controls, data, toolbars, messages, and so on. Many transient, dynamically appearing and disappearing. Presented as specified by designer. Generally standardized by toolkits and style guides.	Two components – browser and page. Within page, any combination of text, images, audio, video, and animation. May not be presented as specified by the designer – dependent on browser, monitor, and user specifications. Little standardization.



GUI VS WEBUI

	GUI	WEB
Navigation	Through menus, lists, trees, dialogs, and wizards. Not a strong and visible concept. Constrained by design. Generally standardized by toolkits and style guides.	Through links, bookmarks, and typed URLs. Significant and highly visible concept. Few constraints, frequently causing a lost "sense of place." Few standards. Typically part of page design, fostering a lack of consistency.
Context	Enables maintenance of a better sense of context. Restricted navigation paths. Multiple viewable windows.	Poorer maintenance of a sense of context. Single-page entities. Unlimited navigation paths. Contextual clues become limited or are difficult to find.
Interaction	Interactions such as clicking menu choices, pressing buttons, selecting list choices, and cutting/copying/pasting occur within context of active program.	Basic interaction is a single click. This can cause extreme changes in context, which may not be noticed.
Response Time	Nearly instantaneous.	Quite variable, depending on transmission speeds, page content, and so on. Long times can upset the user.
Visual Style	Typically prescribed and constrained by toolkits. Visual creativity allowed but difficult. Little significant personalization.	Fosters a more artistic, individual, and unrestricted presentation style. Complicated by differing browser and display capabilities, and bandwidth limitations. Limited personalization available.



GUI VS WEBUI

	GUI	WEB
Consistency	<p>Major objective exists within and across applications. Aided by platform toolkit and design guidelines.</p> <p>Universal consistency in GUI products generally created through toolkits and design guidelines.</p>	<p>Sites tend to establish their own identity.</p> <p>Standards frequently set within a site.</p> <p>Frequent ignoring of GUI guidelines for identical components, especially controls.</p>
User Assistance	<p>Integral part of most systems and applications.</p> <p>Accessed through standard mechanisms.</p> <p>Documentation, both online and offline, usually provided.</p> <p>Personal support desk also usually provided.</p>	<p>No similar help systems.</p> <p>The little available help is built into the page.</p> <p>Customer service support, if provided, oriented to product or service offered.</p>
Integration	<p>Seamless integration of all applications into the platform environment a major objective.</p> <p>Toolkits and components are key elements in accomplishing this objective.</p>	<p>Apparent for some basic functions within most Web sites (navigation, printing, and so on).</p> <p>Sites tend to achieve individual distinction rather than integration.</p>
Security	<p>Tightly controlled, proportional to degree of willingness to invest resources and effort.</p> <p>Not an issue for most home PC users.</p>	<p>Renowned for security exposures.</p> <p>Browser-provided security options typically not understood by average users.</p> <p>When employed, may have function-limiting side effects.</p>
Reliability	<p>Tightly controlled in business systems, proportional to degree of willingness to invest resources and effort.</p>	<p>Susceptible to disruptions caused by user, telephone line and cable providers, Internet service providers, hosting servers, and remotely accessed sites.</p>

