

Week 11-2

Interface Patterns and Types

SFWRENG 4HC3/6HC3 Human Computer Interfaces

** Slides adapted from previous and current instructors of COMPSCI/SFWRENG 4HC3/6HC3
(Danny Papagiannis, Geneva Smith) and CSE 440 from University of Washington (Amy Zhang)*

Week 11 Overview

- **Monday**
 - ~~Interface Implementations~~
- **Wednesday**
 - **Interface Design Patterns**
 - **Interface Types**
- **Friday**
 - Interface Types
 - Interaction Types

What is a design pattern?

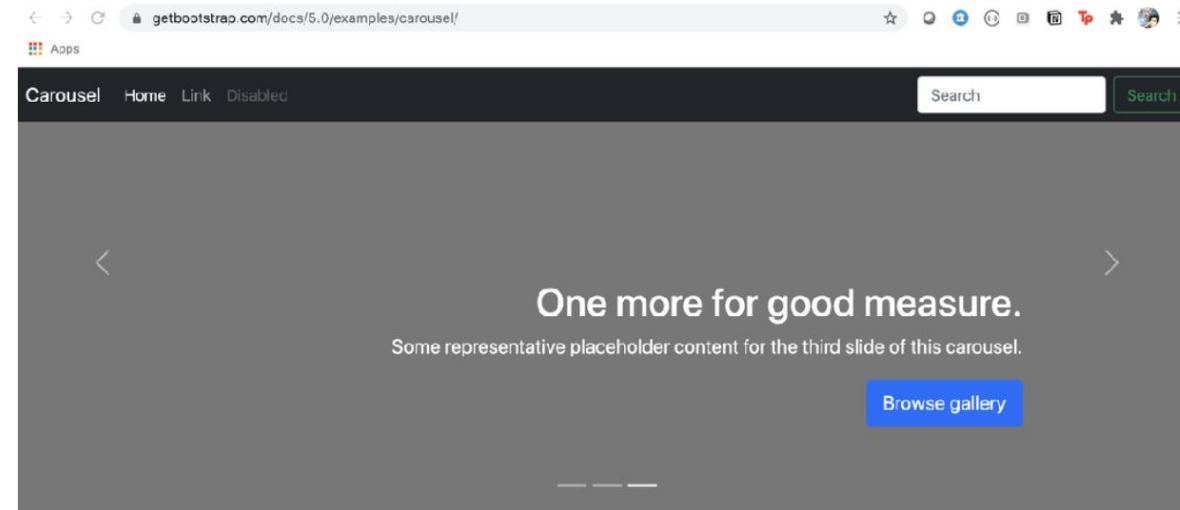
“... a general repeatable solution to a commonly-occurring usability problem in interface design...”

- Different from design principles in that they provide abstractions of tangible **solutions**, as opposed to guidelines to follow.
- Patterns often **incorporate principles**.
- UI toolkits oftentimes incorporate patterns.

Design Pattern: Example

UI Toolkit: Bootstrap

- ...includes the **design pattern**:
 - picture carousel landing page
- ...can incorporate important **design principles** such as:
 - flexibility and efficiency of use (a heuristic we will talk later)



Design Pattern: Activity

Here is a really old website! Take **2 minutes** to see if you can **spot some interface design patterns**. What are some patterns that are still used today?

half.com
by **ebay**

NEW: Counting Crows: *Hard Candy* \$11.88 Save 37%! my account cart ? help **ebay** home sign in

Home Books Music DVDs/Movies Video Games Computers & Software Electronics Everything Else...

Gift Certificates Wish List Pre-Orders Sell Your Stuff New Users

Search: All Categories go

The Smartest Place to Buy and Sell Books, Music, Computers, Electronics, DVDs & more...

Welcome
[Learn about Buying](#)
[Learn about Selling](#)
[Register Now!](#)
[Announcement Board](#)
Updated Jun 13, 2002

DESKTOP LIQUIDATION CENTER as low as **\$249!**

Categories
Books
[Textbooks, Fiction, Biography, Cooking, Business, & more...](#)
Music
[Rock, Hip Hop/Rap, Country, Pop, eBay items, & more...](#)
Movies/DVDs
[Action, Comedy, Children's, Romance, Animation, & more...](#)
Games
[PS2, Xbox, GameCube, Dreamcast, N64, & more...](#)

New CD Releases!
only **\$11.88**
More Hot New Releases!

Advance Orders
 The Simpsons: Complete 2nd Season (DVD) \$34.97
Save 30%!
[The Sopranos: Complete 3rd Season \(DVD\) \\$67.99](#) Save 32%!
[Tom Clancy: Red Rabbit \(Hardcover\) \\$19.40](#) Save 33%!

In Computers
Gateway Desktop Under \$400!
~~\$399.00~~
Includes an 800MHz Intel Celeron processor, 256MB RAM, 20GB hard drive, DVD-ROM drive, and more!
Save Over \$100 on Dell Latitude CPx!
~~\$639.00~~
Get the best quality at the best price with the Dell Latitude CPx featuring an Intel Pentium III@ 500 MHz processor, 256 MB RAM and 12 GB hard drive.
Gateway Desktop Under \$500
~~\$499.00~~
Includes a 1GHz Intel Pentium III processor, 256MB RAM, 20GB hard drive, CD-RW drive, 250MB ZIP Drive, and more!
[More great deals...](#)

Music
Red Hot Price for the Chili Peppers' New CD: \$11.88!
Evolving after the popularity of *Californication*, the Chili Peppers release a new album featuring the hit song "By the Way".

In-Stock Now!	Our Price	List Price
Weezer , Weezer	\$6.99	\$18.97
Gutterflower , Goo Goo Dolls	\$9.00	\$18.98
The Slim Shady LP , Eminem	\$2.98	\$18.97
Echoes , Pink Floyd	\$11.54	\$24.97
18 , Moby	\$10.99	\$18.98

Movies
Just Released: The Royal Tenenbaums for \$18.45
Wes Anderson (*Rushmore*) directs a motley crew of talented actors in this hysterical comedy about the rise and fall of an eccentric family.

In-Stock Now!	Our Price	List Price
Monster's Ball (DVD)	\$11.25	\$24.99

Design Pattern: Activity

Logo: Site logo in top-left corner, probably clickable to get to homepage

The screenshot shows the half.com by eBay website. The logo, which says "half.com by eBay", is highlighted with a red rectangle in the top-left corner. The website features a navigation bar with categories like Home, Books, Music, DVDs/Movies, Video Games, Computers & Software, Electronics, and Everything Else... Below this is a search bar with a "go" button. The main content area is divided into several sections: "Welcome" with links to learn about buying/selling and a register link; "New CD Releases!" featuring a "Red Hot Price for the Chili Peppers' New CD: \$11.88!" and a "More Hot New Releases!" link; "Advance Orders" for TV shows like "The Simpsons" and "The Sopranos"; "In Computers" with deals on Gateway and Dell desktops; and "Categories" on the left listing Books, Music, Movies/DVDs, and Games. A table titled "In-Stock Now!" lists various CDs with their prices. The bottom section features "Just Released: The Royal Tenenbaums for \$18.45" and another "In-Stock Now!" table for movies like "Monster's Ball".

half.com
by eBay

NEW: Counting Crows: *Hard Candy* \$11.88 Save 37%!

my account cart help **eb** home sign in

Home Books Music DVDs/Movies Video Games Computers & Software Electronics Everything Else...

Gift Certificates Wish List Pre-Orders Sell Your Stuff New Users

Search: All Categories go

The Smartest Place to Buy and Sell Books, Music, Computers, Electronics, DVDs & more...

Welcome
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[Learn about Selling](#)
[Register Now!](#)
[Announcement Board](#)
Updated Jun 13, 2002

DESKTOP LIQUIDATION CENTER as low as \$249!

Categories
Books
[Textbooks](#), [Fiction](#), [Biography](#), [Cooking](#), [Business](#), & more...
Music
[Rock](#), [Hip Hop/Rap](#), [Country](#), [Pop](#), [eBay items](#), & more...
Movies/DVDs
[Action](#), [Comedy](#), [Children's](#), [Romance](#), [Animation](#), & more...
Games
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New CD Releases!
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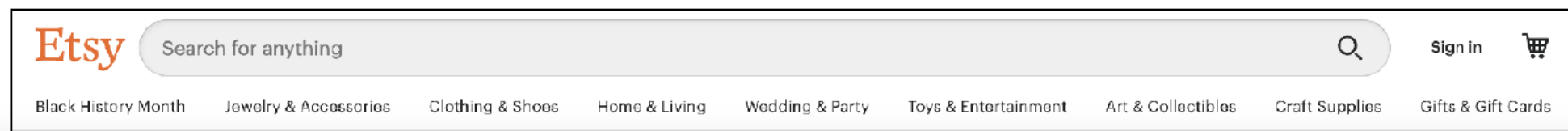
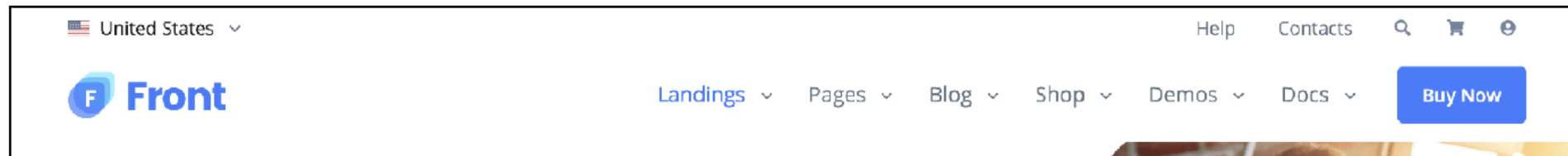
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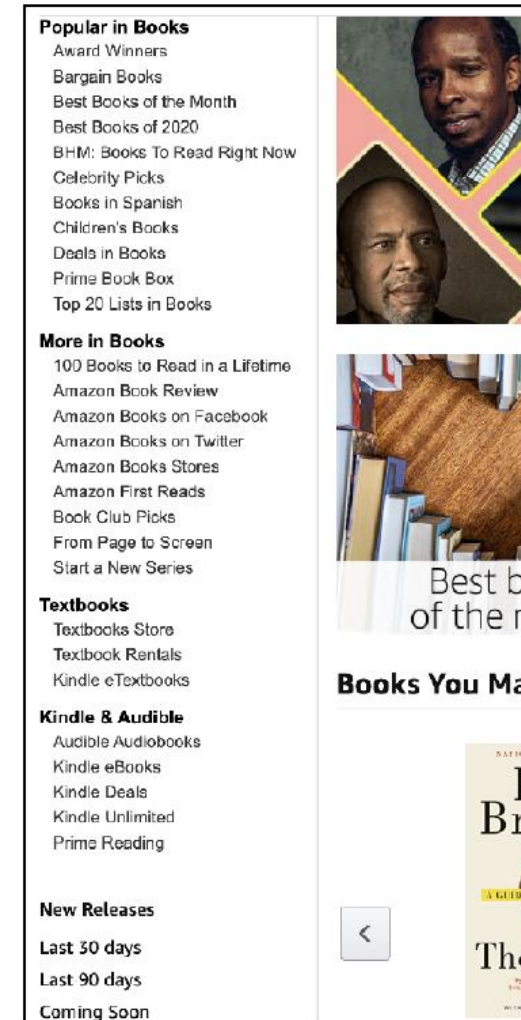
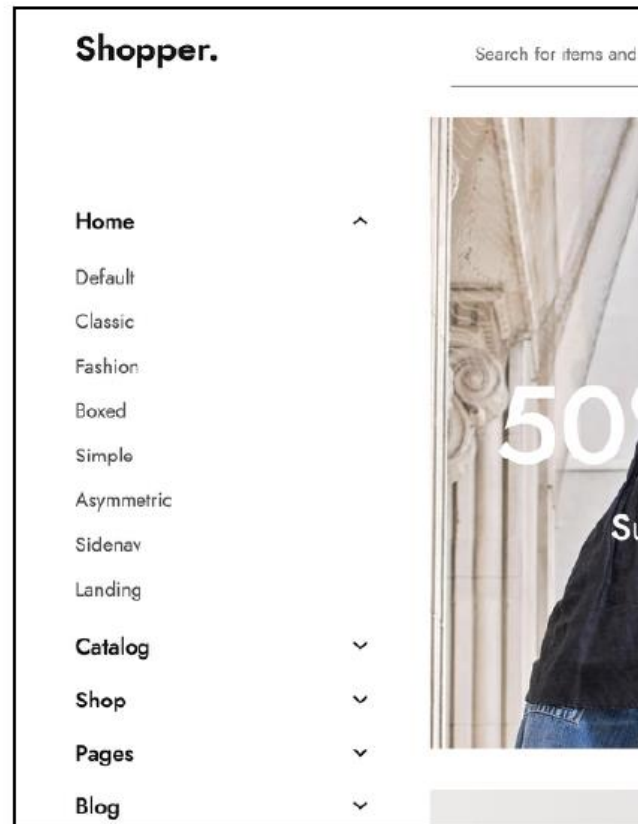
Design Pattern: Activity



Navbars:
navbar and
search at the
top, account
settings, cart in
top right



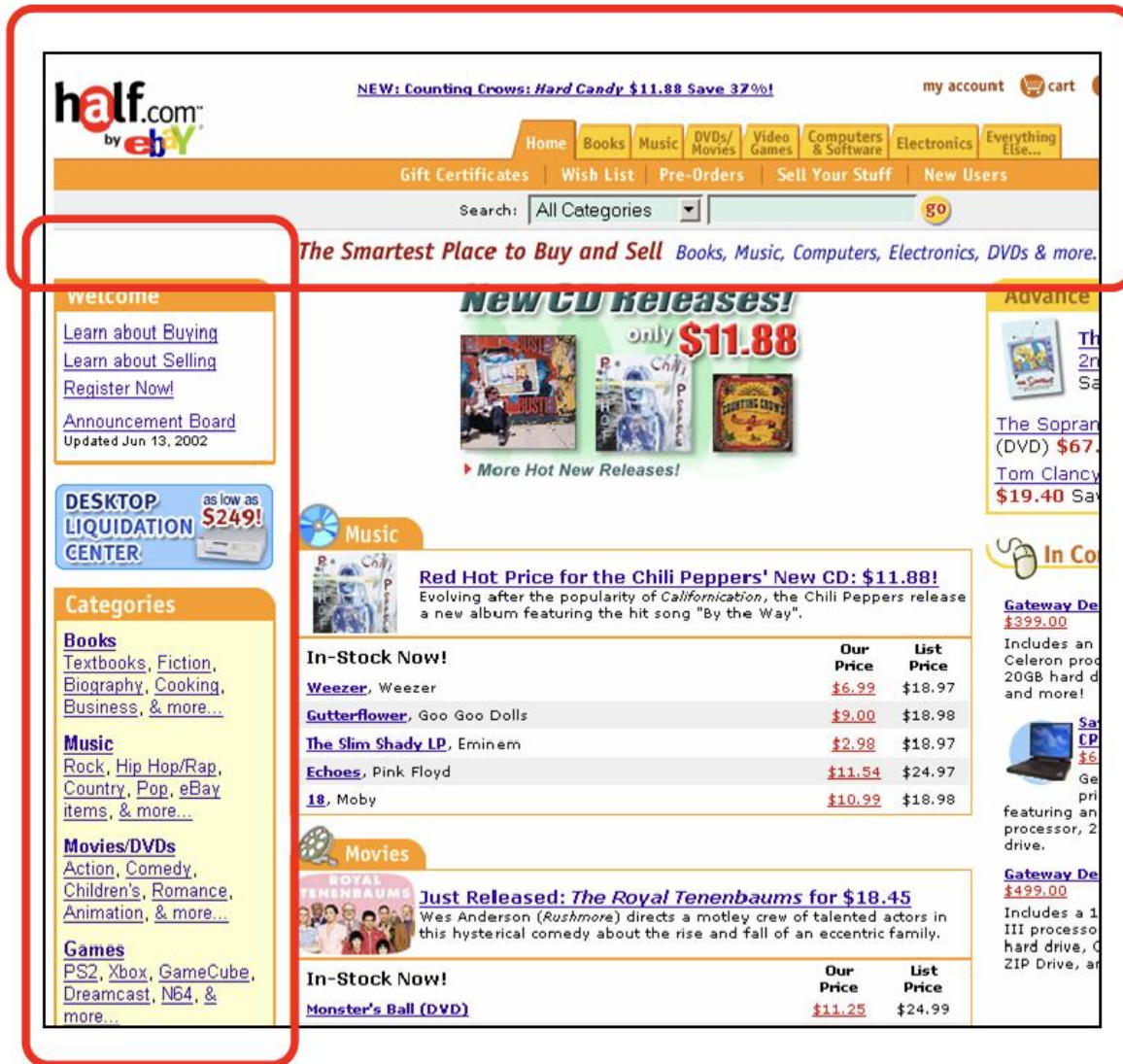
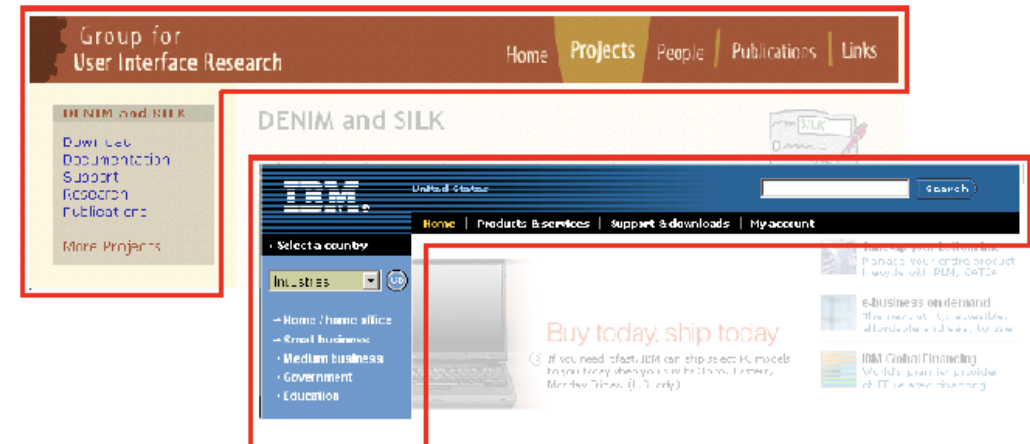
Design Pattern: Activity



Sidebars
faceted
browsing

Design Pattern: Activity

The "L" shape navigation



Design Pattern: Activity

Announcement Board
Updated Jun 13, 2002

DESKTOP LIQUIDATION CENTER
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Tables: Tabular view of data.
Alternate colors of rows, etc.

Striped rows

Use `.table-striped` to add zebra-stripping to any table row within the `<tbody>`.

#	First	Last	Handle
1	Mark	Otto	@mdo
2	Jacob	Thornton	@fat
3	Larry the Bird		@twitter

Design Pattern: Activity

Grid Layout: with header, 3 columns, and a main center column

These layouts have been with us since paper newspapers and pamphlets!



The screenshot shows the half.com by eBay website, which is a classic example of a 3-column grid layout. The layout is organized as follows:

- Header:** Contains the site logo, navigation links (Home, Books, Music, DVDs/Movies, Video Games, Computers & Software, Electronics, Everything Else...), and a search bar.
- Menu (Left Column):** Includes a 'Welcome' section with links to 'Learn about Buying', 'Learn about Selling', 'Register Now!', and 'Announcement Board'. Below this is a 'DESKTOP LIQUIDATION CENTER' banner and a 'Categories' section with links for 'Books' (Textbooks, Fiction, Biography, Cooking, Business, & more...) and 'Music' (Rock, Hip Hop/Rap, Country, Pop, eBay).
- Main (Center Column):** Features a large 'New CD Releases!' section with a 'Red Hot Price for the Chili Peppers' New CD: \$11.88!' and a table of 'In-Stock Now!' items. Below this is a 'Movies' section with a 'Just Released: The Royal Tenenbaums for \$18.45' and another 'In-Stock Now!' table.
- Right Column:** Contains 'Advance Orders' for 'The Simpsons: Complete 2nd Season' and 'The Sopranos: Complete 3rd Season', and 'In Computers' section with 'Gateway Desktop Under \$400!' and 'Save Over \$100 on Dell Latitude CPx!'.
- Footer:** A single row at the bottom with a 'More great deals...' link.

	Our Price	List Price
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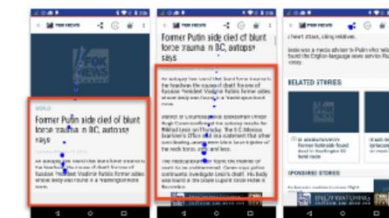
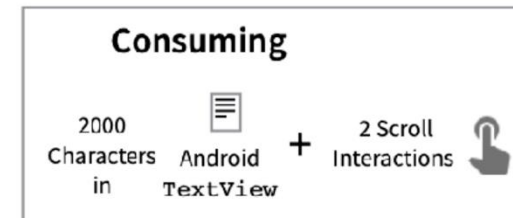
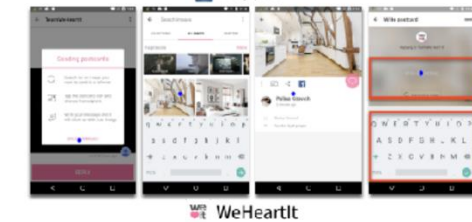
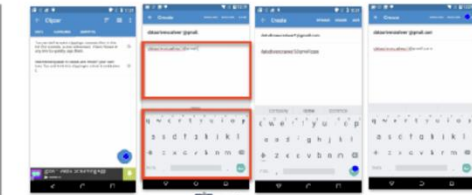
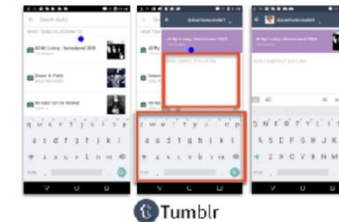
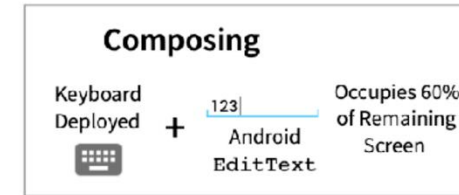
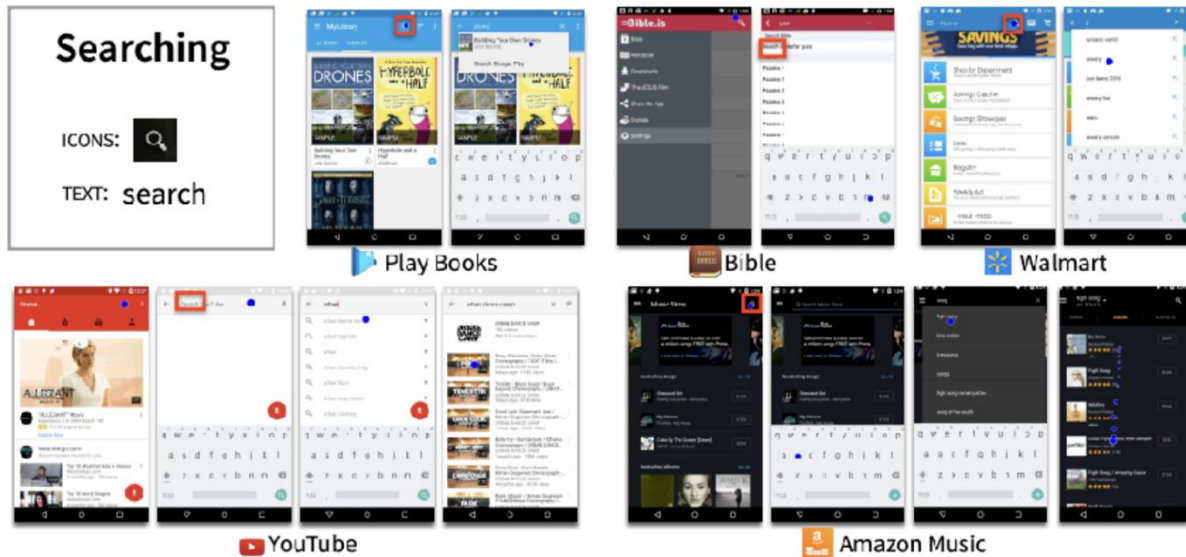
Design Pattern: Common User Flows

- Shopping checkout: shipping -> billing -> summary -> place order
- **User flows** are an important component of user experience (UX) design and consists of a **sequence of UI states** that represent **semantically meaningful tasks** such as searching or composing.

The screenshot shows the checkout process on the half.com website. At the top, there's a navigation bar with the half.com logo and a checkout progress indicator showing three steps: 1 Shipping, 2 Billing, and 3 Place Order. A 'Secure Shopping' icon is also present. Below the progress bar, the heading 'Step 1 - Choose Shipping Address' is displayed. The main content area is titled 'Ship my order to:' and contains a box with a pre-filled shipping address: 'Jason Hong, 387 Soda Hall Computer Science UC Berkeley, Berkeley, CA 94720'. A red 'Use This Address' button is next to the address. Below this, the word 'OR' is shown. Underneath, there's a section titled 'Enter a new shipping address:' with two input fields: 'Name' and 'Street address'.

Design Pattern: Common User Flows

Common mobile app UI flows



Deka, Biplab, Zifeng Huang, and Ranjitha Kumar. "ERICA: Interaction mining mobile apps." *Proceedings of the 29th Annual Symposium on User Interface Software and Technology*. 2016.

Design Pattern & Design System

- **Design/UI Patterns**
 - Components
 - Templates
- **Building Blocks**
 - Color Schemes
 - Icons/Image Assets
- **Rules**
 - Implementation Guidelines
 - Do's and Don'ts

Example:

Fluent (Microsoft)

Material Design (Google)

Carbon Design System (IBM)

Design System: Material Design

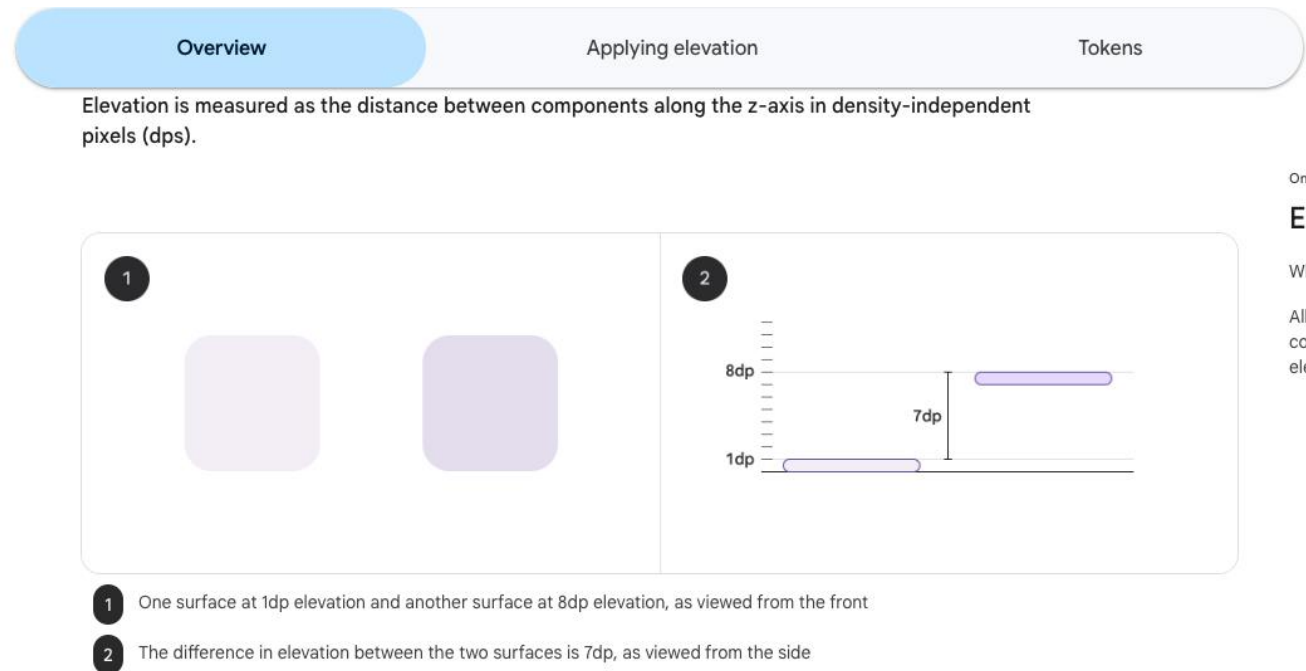
<https://m3.material.io/>

- **Styles**

- Elevation
- Motion

- **Components**

- FAB
- Cards



On this page

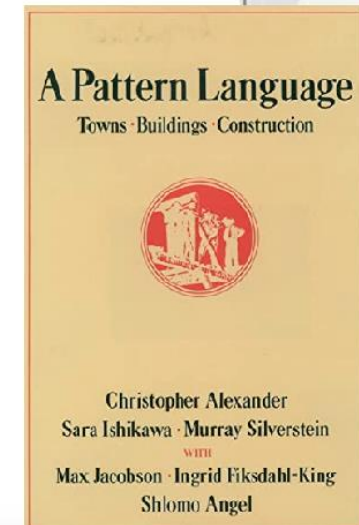
Elevation

What's new

All surfaces and components have elevation values

Design Pattern in General

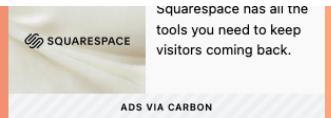
- Very popular in **software engineering and OOP** after the mid 90s.
 - **Model-View-Controller** (MVC) is a common software design pattern for developing UIs.
- A 1970s book talks about “**pattern languages**” and relates it to architecture and the planning of cities and towns. This book later influenced **software engineering and the first wiki**.



UI Patterns for Your Project

- **Don't need to reinvent the wheel!**
- You want to focus on where your UI is interesting and innovative, not in the login flow (probably)
- **Find patterns for your high-fidelity prototype**
 - <https://ui-patterns.com/patterns>
- Many more out there!

Design patterns



User Interface Design patterns are recurring solutions that solve common design problems. Design patterns are standard reference points for the experienced user interface designer.

Design patterns provide a common language between designers. They allow for debate over alternatives, where merely mentioning the name of a design pattern implicitly carries much more meaning than merely the name.

Dwell into the patterns below to learn a common language of web design.



Become a confident designer

Practical cards to quickly understand and apply complex concepts that will move your product forward

Stop winging it and bring hard facts about we behave, decide, and take action to the table.

[Get our cards](#)

User Interface Design Patterns

Getting input

Forms

Password Strength Meter
Morphing Controls
Structured Format
Expandable Input
Drag and drop
Keyboard Shortcuts
Rule Builder

Navigation

Tabs

Navigation Tabs
Module Tabs

Jumping in hierarchy

Shortcut Dropdown
Breadcrumbs
Fat Footer

Dealing with data

Tables

Table Filter
Sort By Column
Alternating Row Colors

Formatting data

Frequently Asked Questions (FAQ)
Dashboard

Social

Reputation

Collectible Achievements
Testimonials
Leaderboard

Social interactions

Activity Stream
Reaction

Design Pattern: Why

- Design is about **finding solutions** to problems
- Many problems are **shared**
- Some solutions are **better** than others
- Designers often **reinvent** because they don't realize a pattern exists
 - Sometimes it's better to **reuse** a common solution for a common problem (cognition!)
- Design patterns are **a tool for knowledge sharing**

Design Pattern: Creativity

- Patterns come from **successful examples**
 - Sites that are so successful that lots of people are familiar with their paradigms
 - Interaction techniques/metaphors that work well across many sites (e.g., shopping carts)
- Not too general and not too specific
 - You need to specialize to your needs •
- Patterns let you focus on the hard, unique problems of your design situation
- Patterns help design without over-constraining

Design Pattern: Pre-Patterns

- Patterns require **broad** adoption and examples
 - **Many** version of the same basic idea
 - Shown **successful** in many contexts
 - That is what makes them patterns
- This is challenging in **novel** domains
- Pre-patterns are based in weaker evidence
 - Can help **speed diffusion** of techniques and results
 - Can help see **relationships** among ideas

Pre-Patterns, Anti-Patterns, Dark Patterns

- When you see advice, **consider its depth**
 - Result of an individual study
 - Pre-pattern based on some meta-analysis
 - Established pattern
- Be aware of misapplying patterns
- And be aware of anti-patterns (e.g., “Click here”)
- Don’t recreate dark patterns
 - **Unethical patterns** that trick users



TODAY'S SALE! - VALID ONLINE ONLY - *Up To 45% Off + Free Local Delivery


① Delivery Info ② Billing Info ③ Review & Place Order

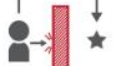
Need assistance? We are here to help! Call us any time at 877-638-3303


Log in to apply your points or discounts and earn even more points towards future purchases


SHOPPING CART


Item	Qty	Price	Subtotal
 Dreaming of Tuscany Selected: "As Shown" <small>2nd choice: similar as possible, same look and feel</small>	1	\$52.99	\$52.99
 Greeting Card Service Selected: "STANDARD"	1	\$3.99	\$3.99

**NAGGING**
Redirection of expected functionality that persists beyond one or more interactions.

**OBSTRUCTION**
Making a process more difficult than it needs to be, with the intent of dissuading certain action(s).

**SNEAKING**
Attempting to hide, disguise, or delay the divulging of information that is relevant to the user.

**INTERFACE INTERFERENCE**
Manipulation of the user interface that privileges certain actions over others.

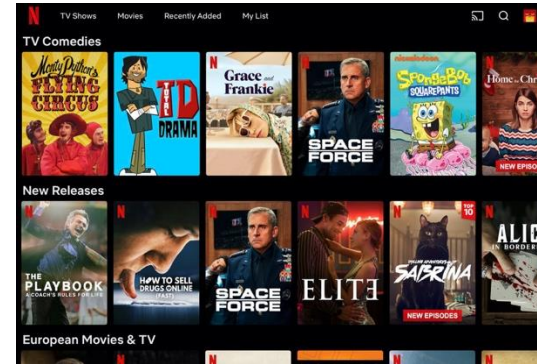
**FORCED ACTION**
Requiring the user to perform a certain action to access (or continue to access) certain functionality.

Kai Lukoff, Alexis Hiniker, Colin M. Gray, Arunesh Mathur, and Shruthi Sai Chivukula. 2021. What Can CHI Do About Dark Patterns? In Extended Abstracts of the 2021 CHI Conference on Human Factors in Computing Systems (CHI EA '21)

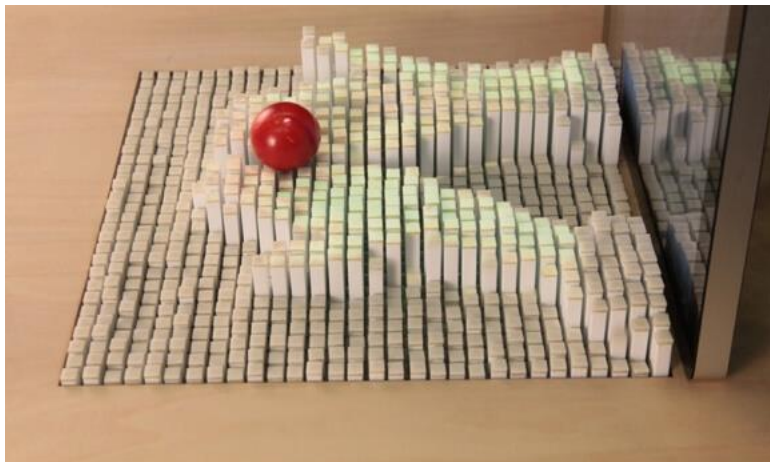
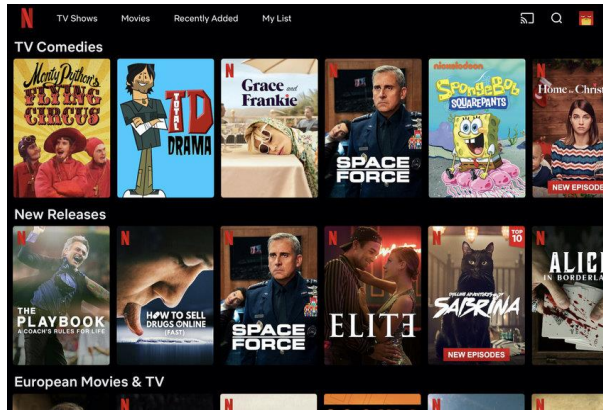
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What is an interface?



Computing Interfaces



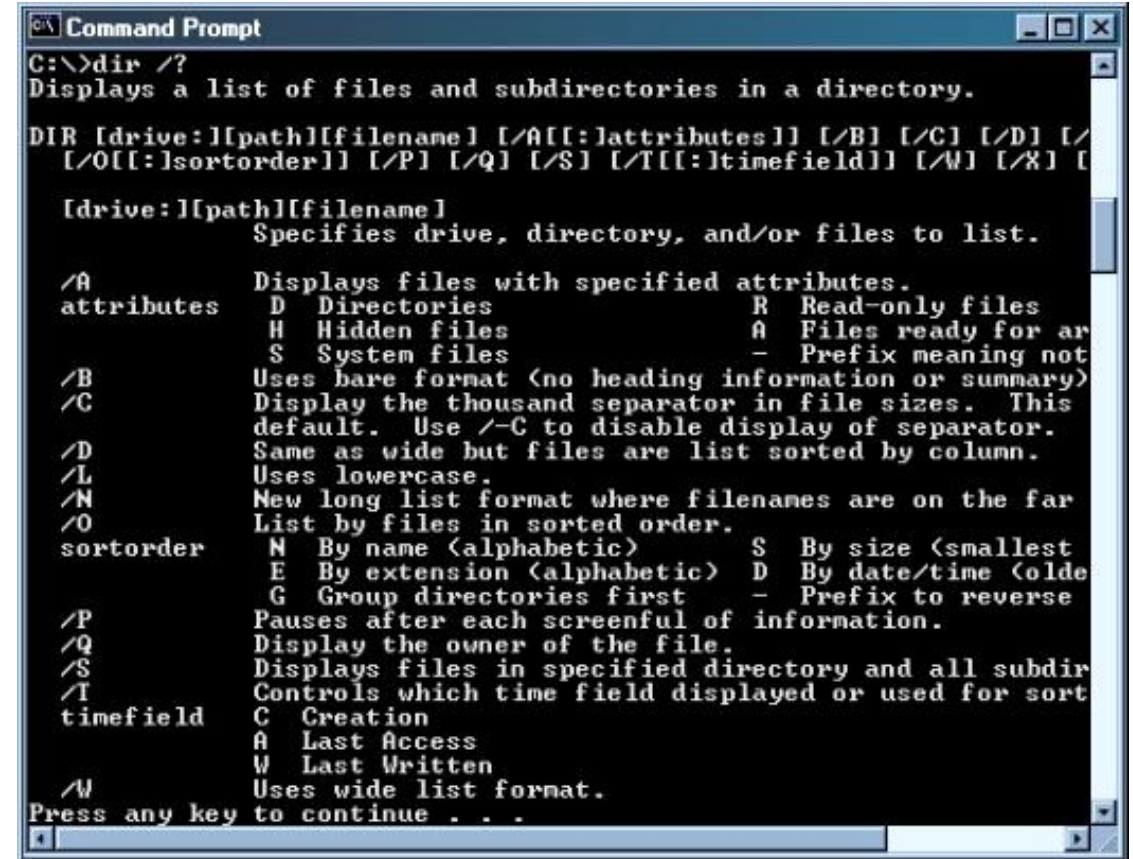
Interface Types: Overview

- Command Line Interface
- Graphical User Interface (GUI)
- Mobile Interface
- Touch/Multitouch Interface
- Gesture-based Interface
- Tangible Interface
- Voice User Interface
- Conversational Interface
- Wearable Interface
- Augmented Reality Interface (AR)
- Virtual Reality Interface (VR)
- Robots/Drones

NATURAL INTERFACE

Command Line Interface (CLI)

- **Text or button-based** (e.g., Ctrl+Alt+Del)
- Can be **easier and faster** than equivalent menu-based systems



```
Command Prompt
C:\>dir /?
Displays a list of files and subdirectories in a directory.

DIR [drive:][path][filename] [/A[[:attributes]]] [/B] [/C] [/D] [/O[[:sortorder]]] [/P] [/Q] [/S] [/T[[:timefield]]] [/W] [/X] [

[drive:][path][filename]
    Specifies drive, directory, and/or files to list.

/A      Displays files with specified attributes.
attributes  D Directories                      R Read-only files
              H Hidden files                    A Files ready for archiving
              S System files                    - Prefix meaning not to recurse

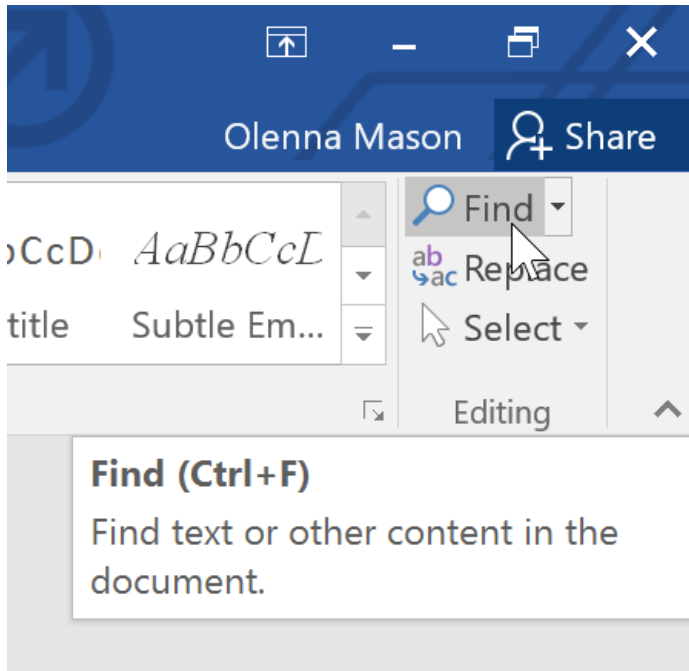
/B      Uses bare format (no heading information or summary)
/C      Display the thousand separator in file sizes. This is the default. Use /-C to disable display of separator.
/D      Same as /W but files are listed sorted by column.
/L      Uses lowercase.
/N      New long list format where filenames are on the far left.
/O      List by files in sorted order.
sortorder  N By name (alphabetic)                S By size (smallest to largest)
              E By extension (alphabetic)          D By date/time (oldest to newest)
              G Group directories first            - Prefix to reverse sort order

/P      Pauses after each screenful of information.
/Q      Display the owner of the file.
/S      Displays files in specified directory and all subdirectories.
/T      Controls which time field is displayed or used for sorting.
timefield  C Creation
              A Last Access
              W Last Written

/W      Uses wide list format.

Press any key to continue . . .
```

Command Line Interface (CLI)



Expert Users

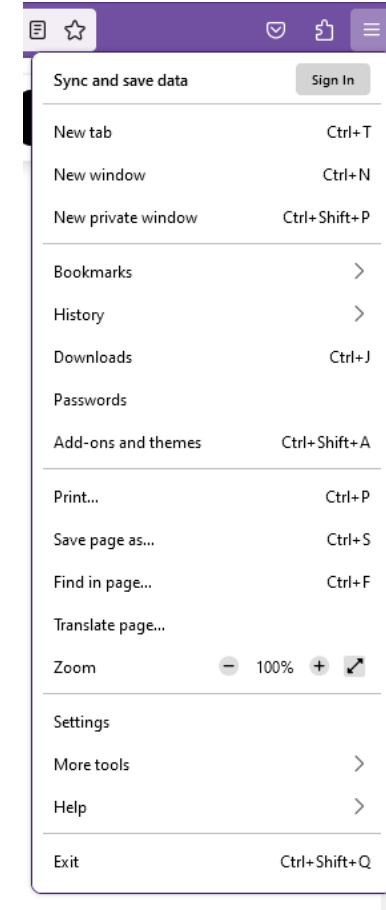
```
aditya314@ubuntu: ~  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Templates  
-rw-rw-r-- 1 aditya314 aditya314  0 Apr 27 02:55 Untitled Document  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Videos  
-rw-rw-r-- 1 aditya314 aditya314 268 Mar  5 04:17 xyz.txt  
aditya314@ubuntu:~$ chmod o+x xyz.txt  
aditya314@ubuntu:~$ ls -l  
total 52  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Desktop  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Documents  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Downloads  
-rw-r--r-- 1 aditya314 aditya314 8980 Mar  5 01:05 examples.desktop  
-rw-rw-r-- 1 aditya314 aditya314  0 Mar  5 03:53 ggf.txt  
-rw-rw-r-- 1 aditya314 aditya314  0 Apr 27 02:47 listfile  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Music  
drwxrwxr-x 2 aditya314 aditya314 4096 Mar  5 03:53 new one  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Pictures  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Public  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Templates  
-rw-rw-r-- 1 aditya314 aditya314  0 Apr 27 02:55 Untitled Document  
drwxr-xr-x 2 aditya314 aditya314 4096 Mar  5 01:21 Videos  
-rw-rw-r-x 1 aditya314 aditya314 268 Mar  5 04:17 xyz.txt
```

Batch Operation

Command Line Interface (CLI)

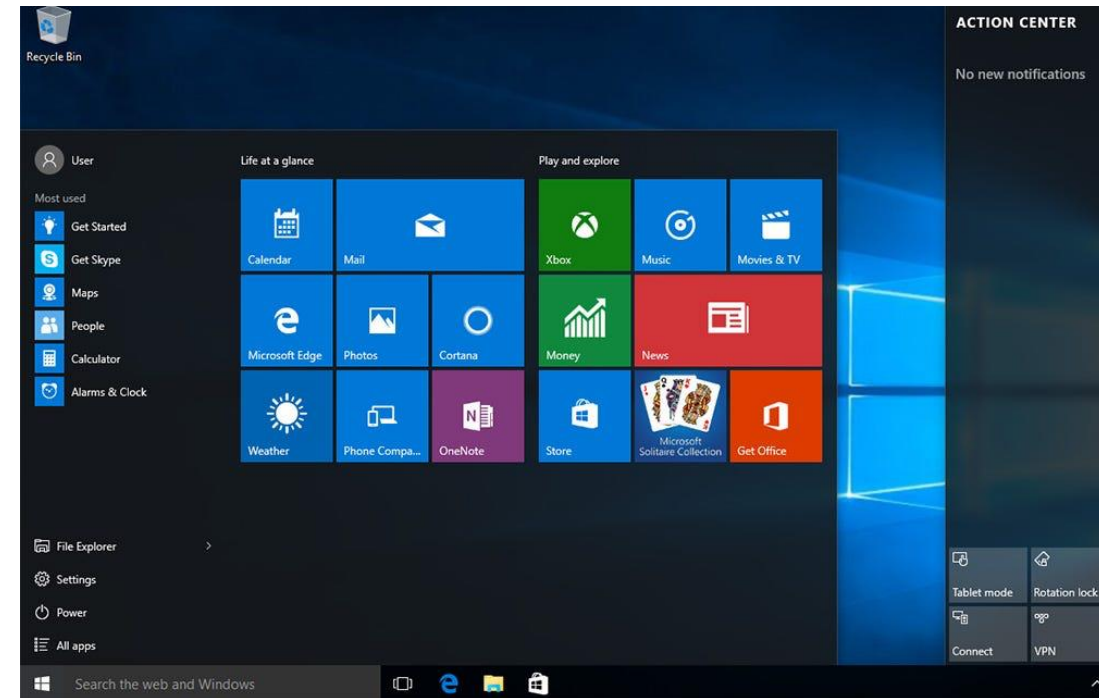
Design Considerations:

- Form of commands (e.g., names)
- Command syntax (e.g., how to combine commands)
- Organization of commands (e.g., structuring options)
- Consistency is critical (e.g., the first three letters of a command as an abbreviation)



Graphical User Interface (GUI)

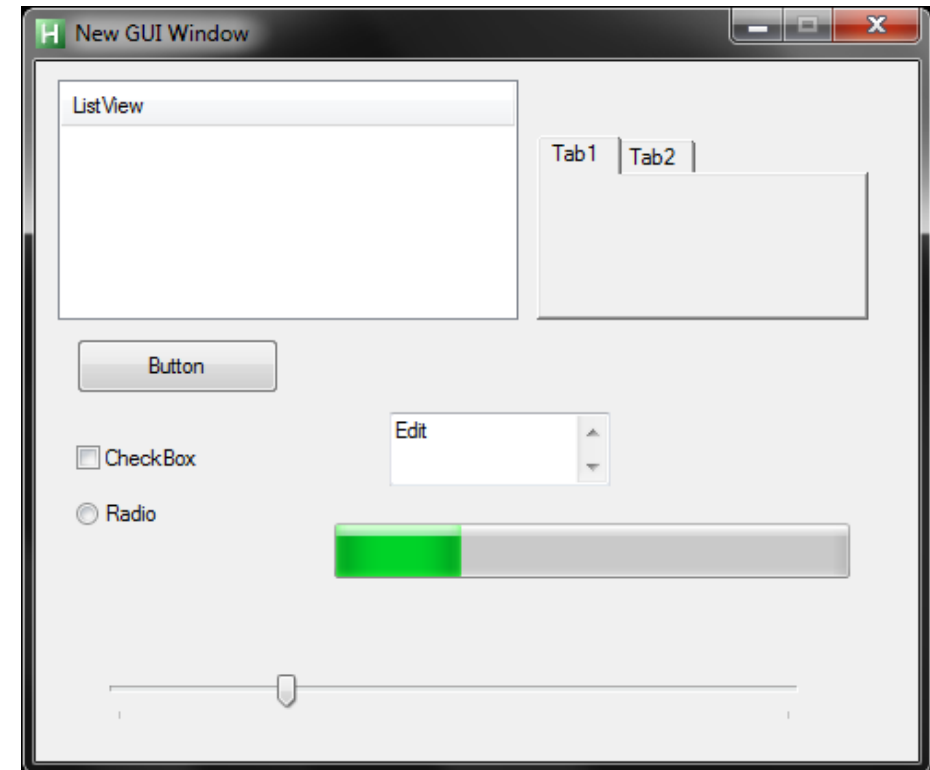
- Visual interface, including the use of color, typography, and imagery
- Original GUI was a **WIMP** (Windows, Icons, Menus, Pointers)
- Widget: standard representation of a user control



Graphical User Interface: WIMP

Window

- Sections of the screen that you can scroll, stretch, overlap, open, close, and move with a mouse
- Includes **widgets** such as dialogue boxes and interactive forms



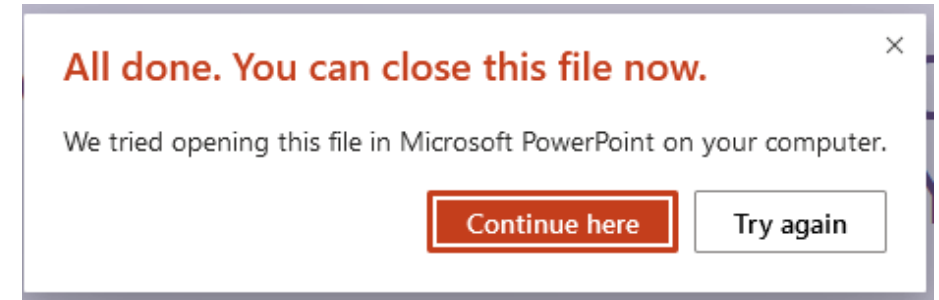
WIMP: Window

Pros

- Allows users to do multiple tasks with limited screen space
- Can guide users' interactions (e.g., setup wizards)

Cons

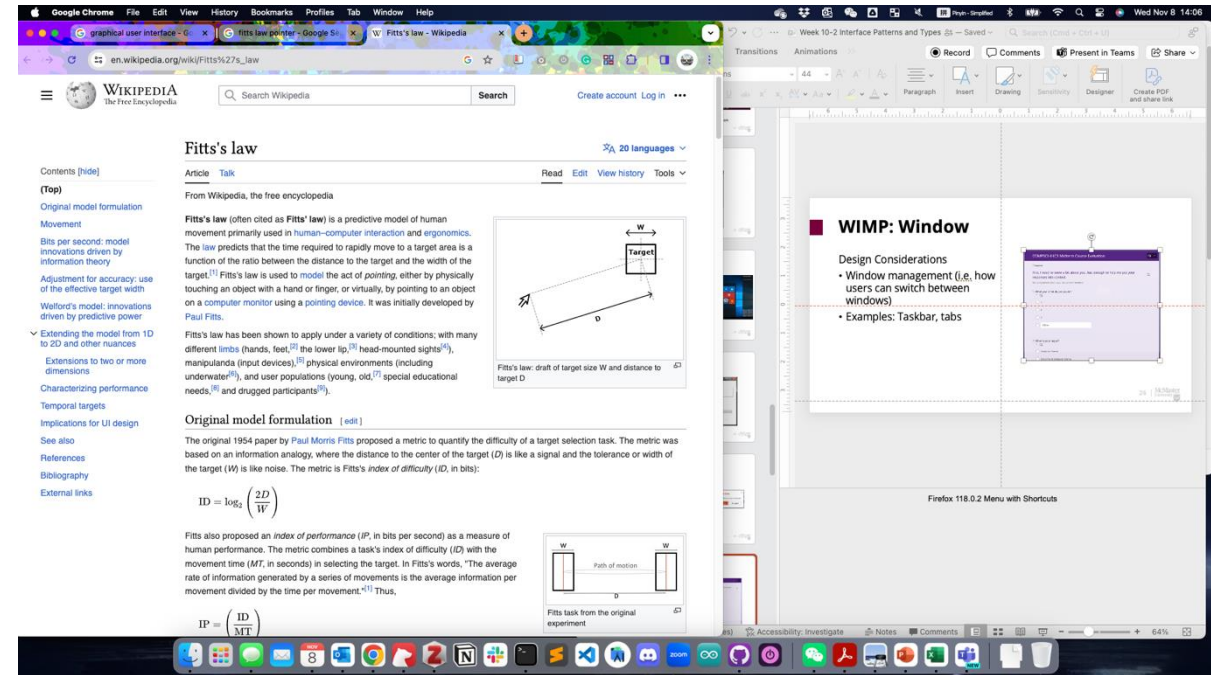
- Can have too much information at once



WIMP: Window

Design Considerations

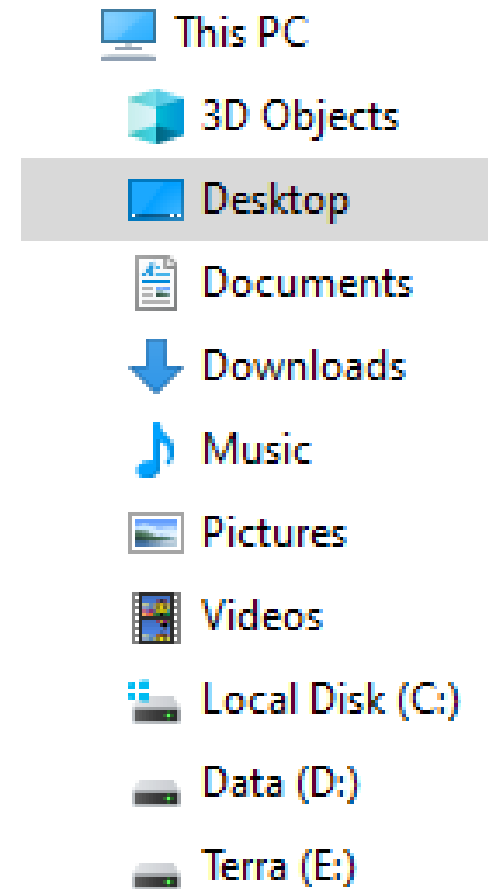
- Window management (i.e., how users can switch between windows)
- Examples: Taskbar, tabs



Graphical User Interface: WIMP

Icons

- Pictograms and ideograms representing applications, objects, commands, and tools
- Activated/opened by clicking on them
- Convey tools, status, categories, abstract functions
- Designed to be inviting, emotionally appealing, memorable, distinctive



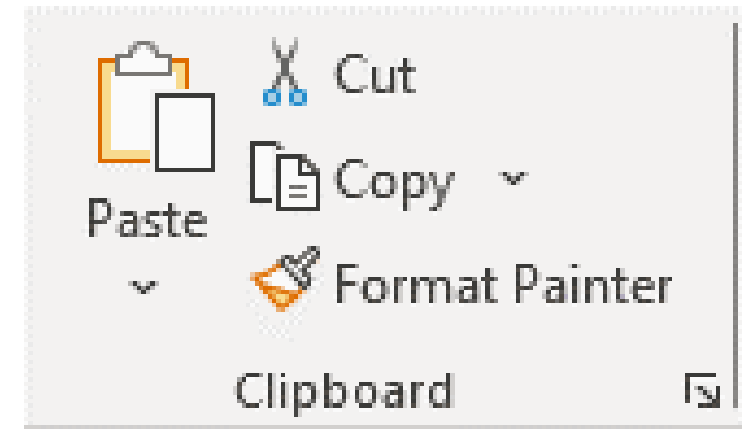
WIMP: Icons

Pros

- Help build the users' conceptual model via metaphors (e.g., desktop)
- Might be easier to learn/remember compared to text for non-expert users

Cons

- Simplicity might require additional cues to infer meaning from



WIMP: Icons

Design Considerations

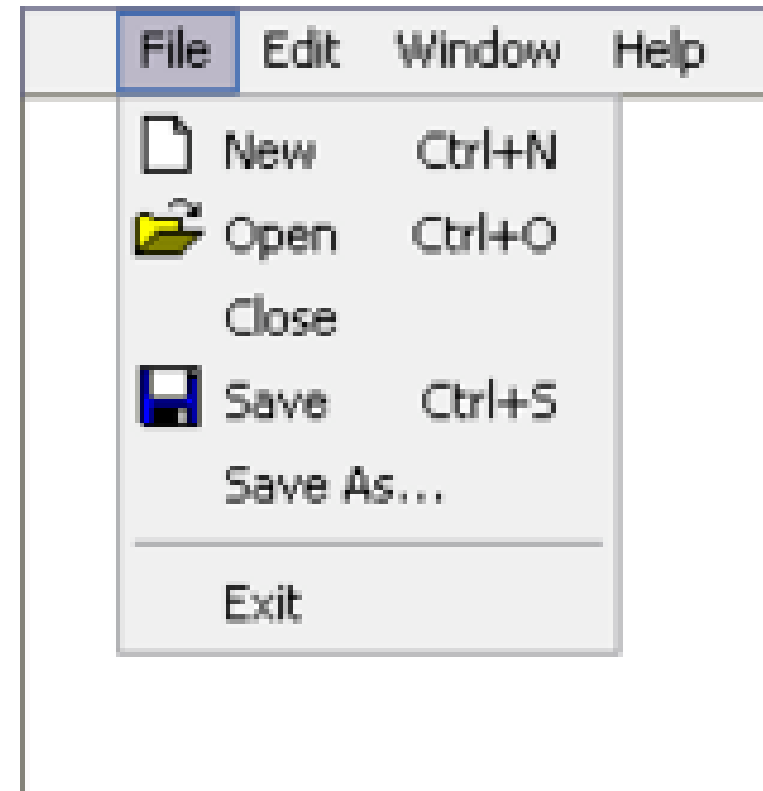
- Simplicity might require additional cues to infer meaning from (e.g., a Magnifying Glass 🔍 for searching when next to a search bar rather than zooming; text labels/tooltips)
- Styles for icon categories (e.g., business, utilities, entertainment/leisure)
- Follow existing guidelines and style guides



Graphical User Interface: WIMP

Menu

- Lists of options that can be scrolled through and selected from
- Similar behaviour as a restaurant menu
- Typically ordered from most to least frequently used, grouped by similarity



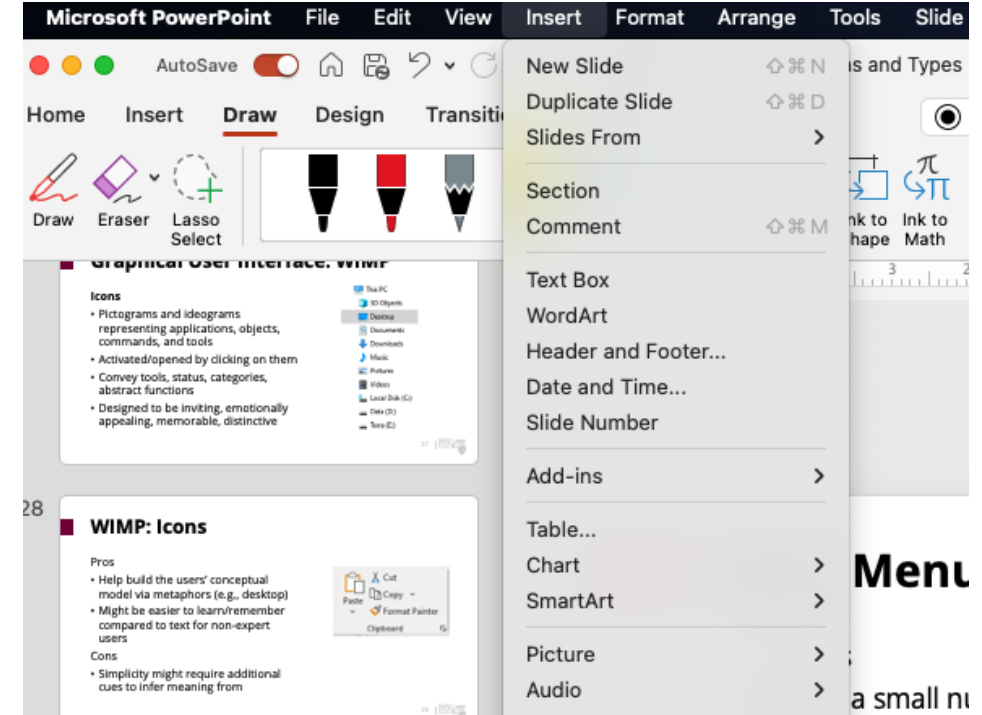
WIMP: Menu

Pros

- Displaying a small number of options at the same time
- Can provide context-sensitive options

Cons

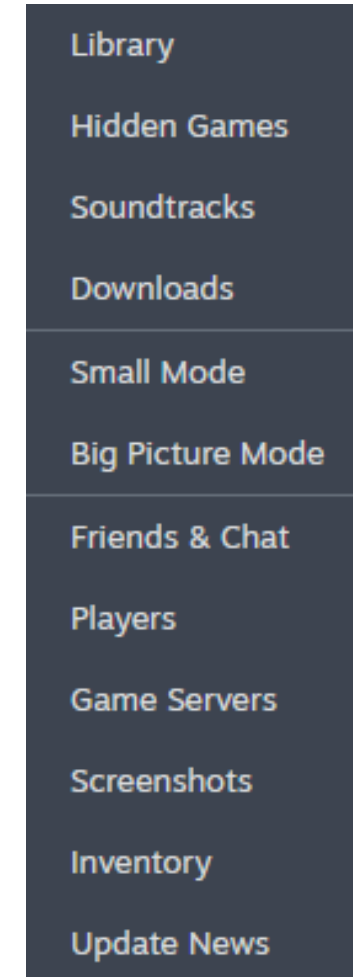
- Deeply nested menus tedious to navigate
- Can require precise cursor control



WIMP: Menu

Design Considerations

- Terms for menu options (e.g., length, distinguishable from other options)
- Separating options that could lead to errors (e.g., “Quit” and “Save” next to each other)
- How many options/nested menus to show at once



Graphical User Interface: WIMP

Pointer

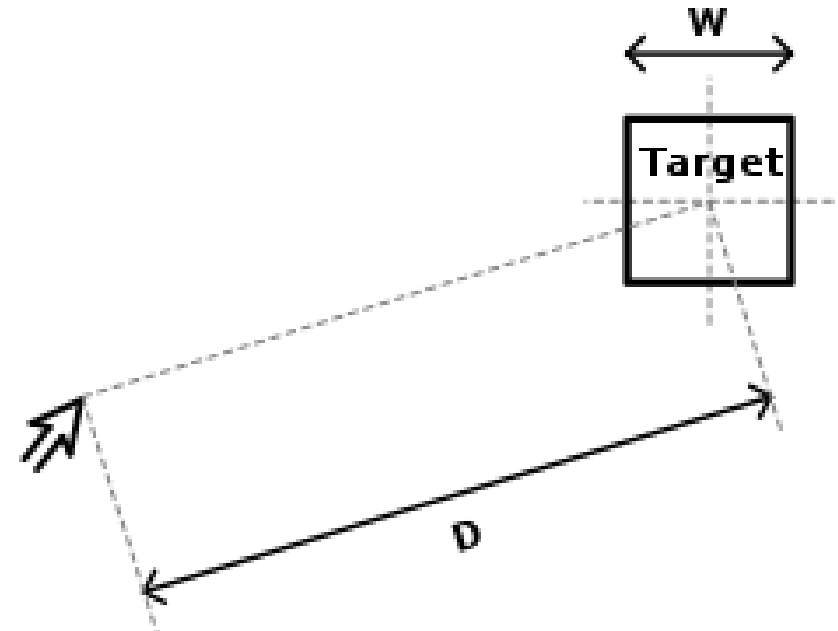
- A mouse-controlled cursor
- Entry point to windows, menus and icons on the screen
- Might also act as icons in some context-specific situations



WIMP: Pointer

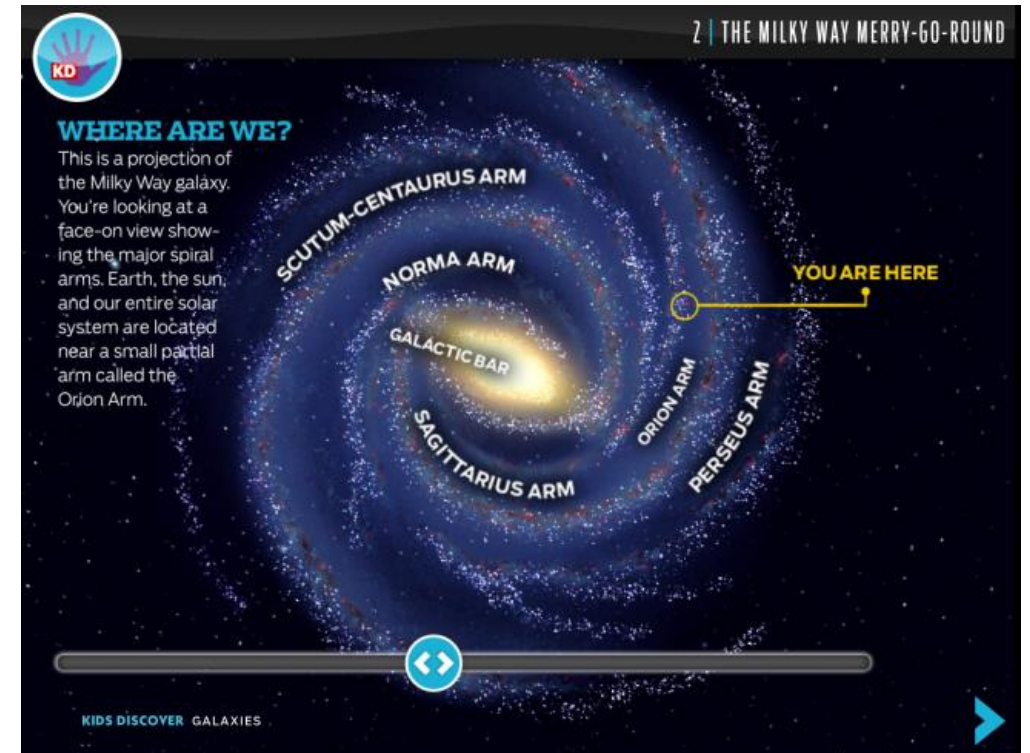
Fitts' Law

- The amount of time required for a person to move a pointer (e.g., mouse cursor) to a target area is a function of the distance to the target divided by the size of the target
- Thus, the **longer the distance** and the **smaller** the target's **size, the longer it takes**



Graphical User Interface: Multimedia

- Combines different media (e.g., graphics, text, video, sound, animations) to represent information in multiple ways
- Links elements with **interactivity** (e.g., interacting with an image causes a video to play)
- Easier to learn, better understanding of content, more engaging and pleasant

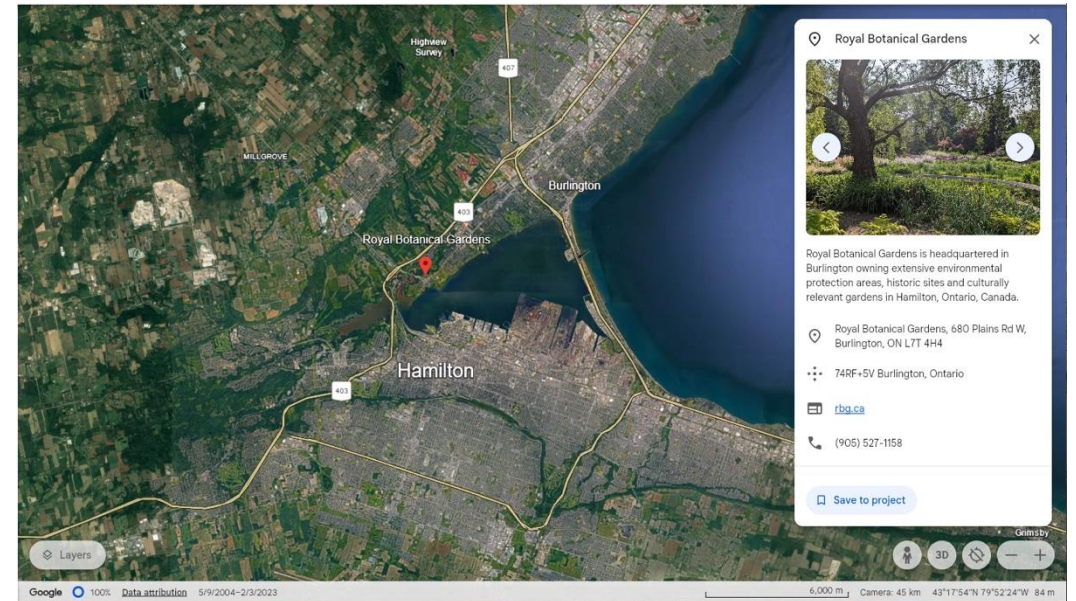


Kids Discover: Galaxies for iPad

Graphical User Interface: Multimedia

Design Considerations

- Encourage users to interact with different types of media (e.g., video vs. text)
 - Try interactive activities/tasks that they need the media to complete
- Cross/Dynamic Linking: information in different windows change relative to each other



Google Earth

Mobile Interface

- Useful for users that need:
 - Real-time data or information while **moving around**
 - Contextual information (e.g., from QR codes in the physical space)
- Often have some sensors (e.g., accelerometer, gyroscope, LiDAR)



Mobile Interface

Design Considerations

- **Small** screen, **limited** control and navigation space
- Size of “soft” controls (e.g., simulated buttons)
 - The average fingertip is 1–2 cm



Interface Types: Overview

- ~~Command Line Interface~~
- ~~Graphical User Interface (GUI)~~
- ~~Mobile Interface~~
- Touch/Multitouch Interface
- Gesture-based Interface
- Tangible Interface
- Voice User Interface
- Conversational Interface
- Wearable Interface
- Augmented Reality Interface (AR)
- Virtual Reality Interface (VR)
- Robots/Drones

Week 11 Overview

- **Monday**
 - ~~Interface Implementations~~
- **Wednesday**
 - ~~Interface Design Patterns~~
 - ~~Interface Types~~
- **Friday**
 - **Interface Types: continued**
 - **Interaction Types**