

Week 11-1

Interface Implementation

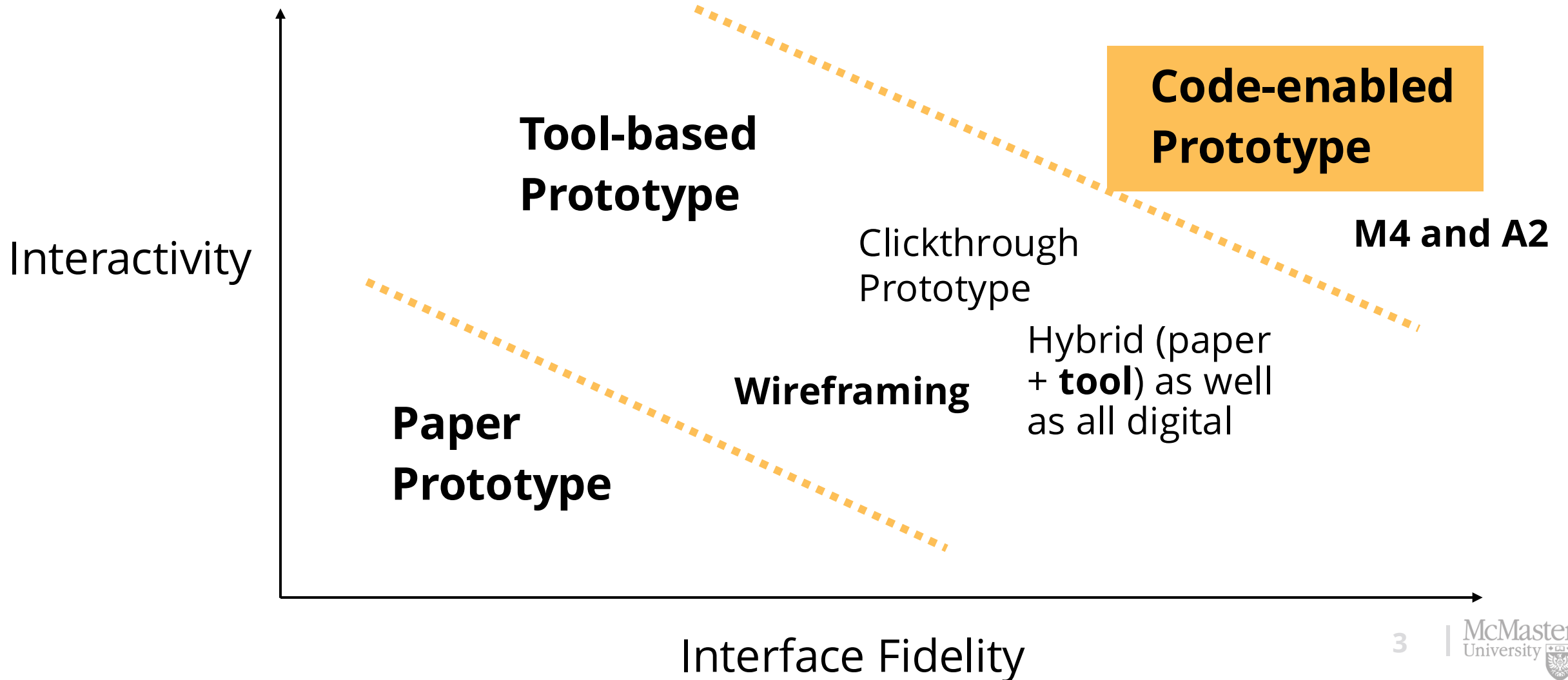
SFWRENG 4HC3/6HC3 Human Computer Interfaces

** Slides adapted from previous instructors of COMPSCI/SFWRENG 4HC3/6HC3
and the CSE 440 from University of Washington*

Week 11 Overview

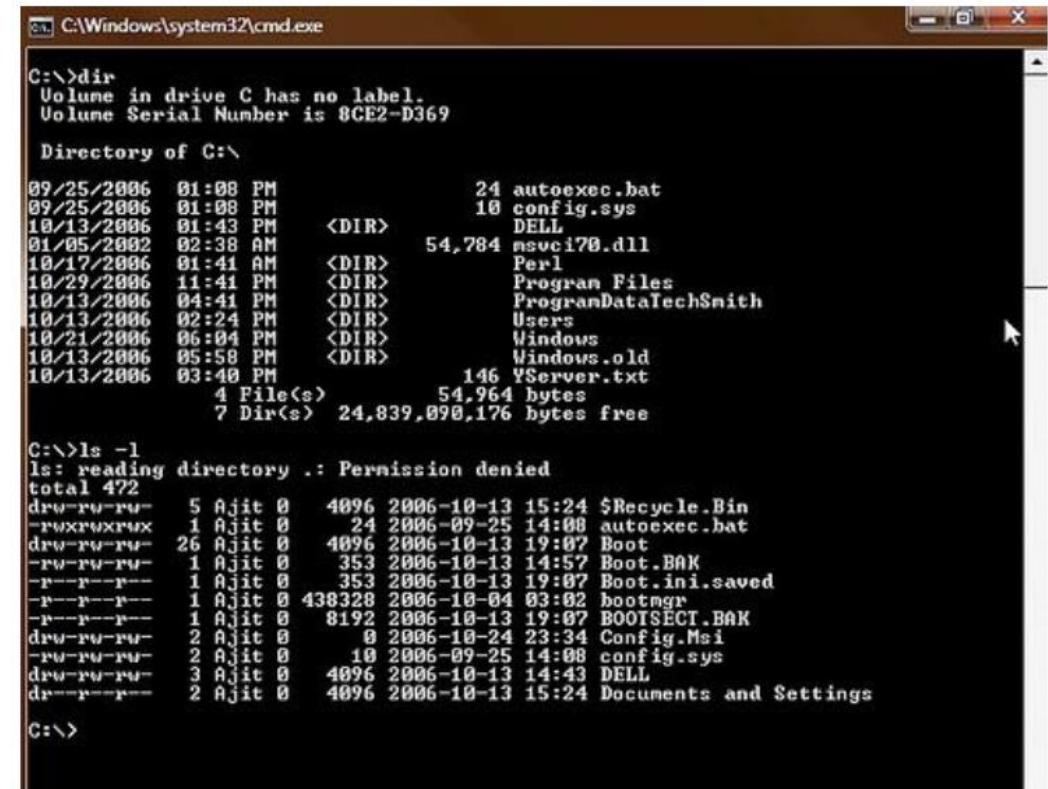
- **Monday**
 - **Interface Implementations**
 - **Interface Design Patterns**
- **Wednesday**
 - Interface Types
- **Friday**
 - Interface Types
 - Interaction Types

Low-High Fidelity Prototypes



Sequential Programs

- Program takes control, prompts for input
- Person waits on the program
- Program says when it is ready for more input, which the person then provides



```
C:\Windows\system32\cmd.exe

C:\>dir
Volume in drive C has no label.
Volume Serial Number is 8CE2-D369

Directory of C:\

09/25/2006  01:08 PM                24 autoexec.bat
09/25/2006  01:08 PM                10 config.sys
10/13/2006  01:43 PM                <DIR>      DELL
01/05/2002  02:38 AM           54,784 msoci70.dll
10/17/2006  01:41 AM                <DIR>      Perl
10/29/2006  11:41 PM                <DIR>      Program Files
10/13/2006  04:41 PM                <DIR>      ProgramDataTechSmith
10/13/2006  02:24 PM                <DIR>      Users
10/21/2006  06:04 PM                <DIR>      Windows
10/13/2006  05:58 PM                <DIR>      Windows.old
10/13/2006  03:40 PM                146 VServer.txt
               4 File(s)          54,964 bytes
               7 Dir(s)    24,839,090,176 bytes free

C:\>ls -l
ls: reading directory .: Permission denied
total 472
drwxr-xr-x  5 Ajit 0   4096 2006-10-13 15:24 $Recycle.Bin
-rwxr-xr-x  1 Ajit 0    24 2006-09-25 14:08 autoexec.bat
drwxr-xr-x 26 Ajit 0   4096 2006-10-13 19:07 Boot
-rw-rw-rw-  1 Ajit 0   353 2006-10-13 14:57 Boot.BAK
-r--r--r--  1 Ajit 0   353 2006-10-13 19:07 Boot.ini.saved
-r--r--r--  1 Ajit 0 438320 2006-10-04 03:02 bootmgr
-r--r--r--  1 Ajit 0   8192 2006-10-13 19:07 BOOTSECT.BAK
drwxr-xr-x  2 Ajit 0     0 2006-10-24 23:34 Config.Msi
-rw-rw-rw-  2 Ajit 0    10 2006-09-25 14:08 config.sys
drwxr-xr-x  3 Ajit 0   4096 2006-10-13 14:43 DELL
dr--r--r--  2 Ajit 0   4096 2006-10-13 15:24 Documents and Settings

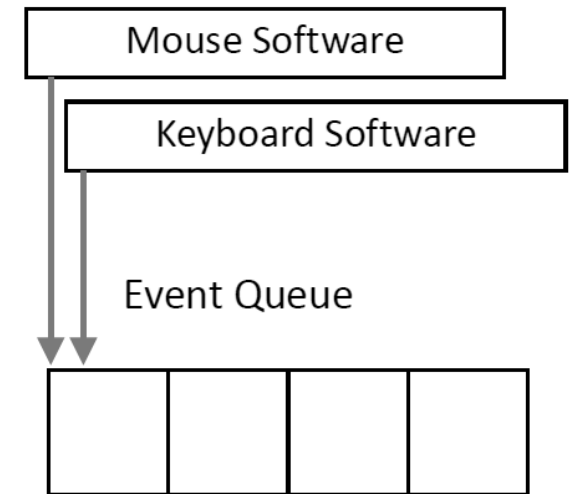
C:\>
```

Sequential Programs: Basic Setup

```
while true {  
    print "Prompt for Input"  
    input = read_line_of_text()  
    output = do_work(input)  
    print output  
}
```

Event-Driven Programs

- Flow of the program execution is determined by **events**
 - User interaction: “mouse down”, “item drag”, “key up”
 - Also, messages from operation system, etc.
- All events go into a queue
 - Ensures events are handled in order
- How many event queues does your operating system have?
 - One per top-level application!



Event-Driven Programs: Basic Setup

```
do {  
    e = read_event()  
    dispatch_event(e)  
    update_display()  
} while (e.type != QUIT)
```



Input



Processing



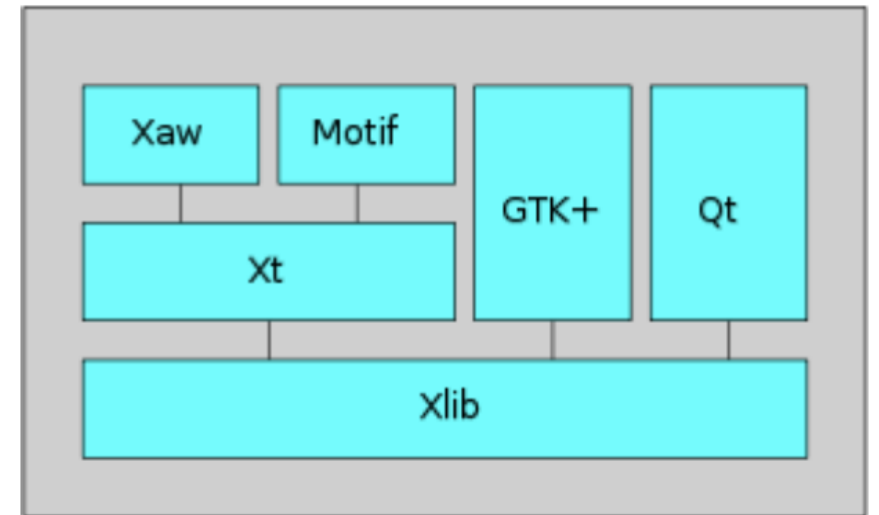
Output

Event-Driven Programs: Basic Setup

In the 1990s:

“One of the most complex aspects of Xlib programming is **designing the event loop**, which must take into account **all of the possible events** that can occur in a window.”

Nye & O'Reilly, X Toolkit Intrinsic Programming Manual, vol. 4, 1990, p. 241.



Toolkits for Interface Implementation

We use **toolkits** because they

- Identify common or important practices
- Package those practices into a framework
- Make it easy to follow those practices
- Make it easier to focus on our application

What other **benefits**?

- Faster = more iterative design
- Implementation is generally better in the toolkit
- Consistency across applications using same toolkit

Web Toolkit: Example

Raw event handling and
Document Object Model
(DOM) manipulation via
JavaScript

```
var myElementsArray =  
document.querySelectorAll('.btn');  
  
myElementsArray.forEach(function(element, index){  
  
    element.addEventListener("click", function(){  
        //inside my click event!  
  
    });  
});
```

Web Toolkit: Example

...or Vue.js

```
// JavaScript
function warn(message, event) {
  // now we have access to the native event
  if (event) { event.preventDefault() }
  alert(message)
}

<!-- HTML -->
<button @click="warn('Form cannot be
submitted yet.', $event)"> Submit </button>
```

Web Toolkit: Example

Another level up: interactions, widgets, components, and templates

Examples: Material UI, Bootstrap (on various web development frameworks)

Bootstrap includes several predefined button styles, each for a purpose, with a few extras thrown in for more control.



```
<button type="button" class="btn btn-primary">Pr
```

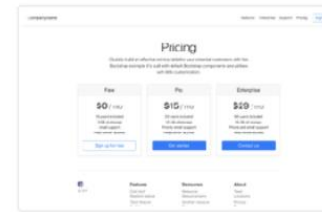
Custom Components

Brand new components and templates to help folks quickly get started with Bootstrap and demonstrate best practices for adding onto the framework.



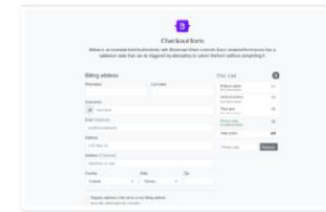
[Album](#)

Simple one-page template for photo galleries, portfolios, and more.



[Pricing](#)

Example pricing page built with Cards and featuring a custom header and footer.



[Checkout](#)

Custom checkout form showing our form components and their validation features.



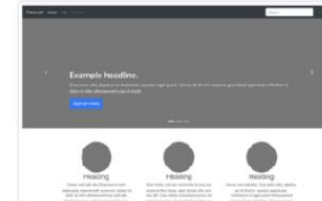
[Product](#)

Lean product-focused marketing page with extensive grid and image work.



[Cover](#)

A one-page template for building simple and beautiful home pages.



[Carousel](#)

Customize the navbar and carousel, then add some new components.



[Blog](#)

Magazine like blog template with header, navigation, featured content.

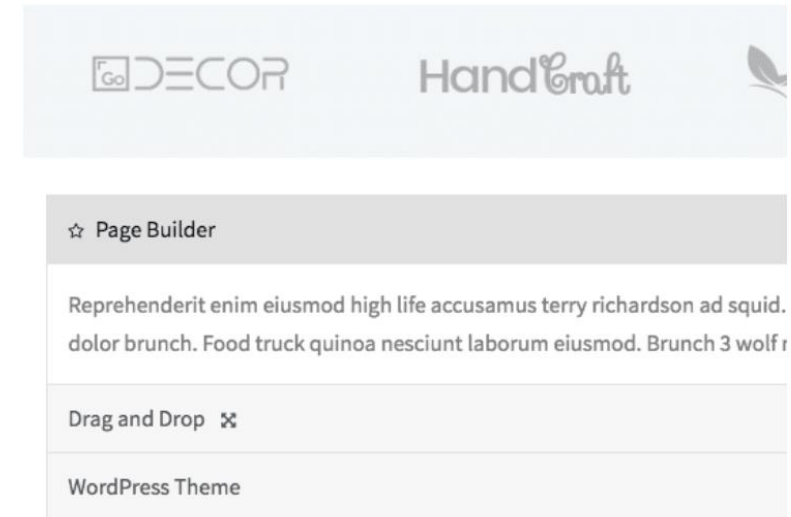
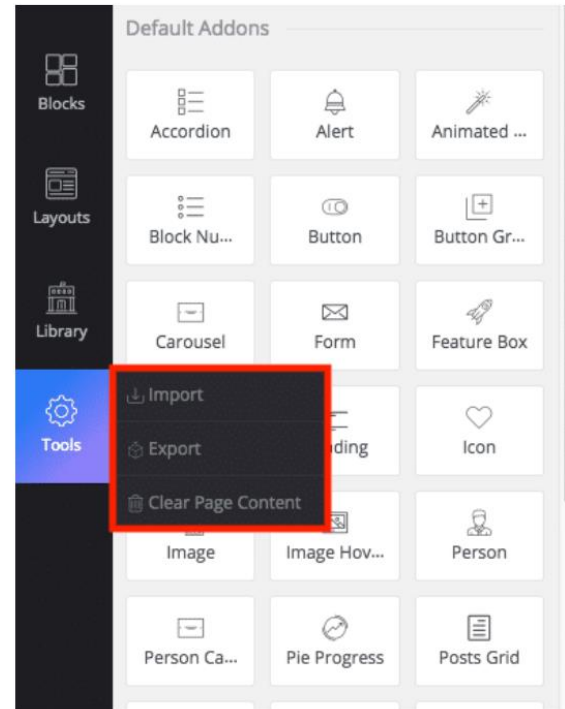


[Dashboard](#)

Basic admin dashboard shell with fixed sidebar and navbar.

Web Toolkit: Example

GUI Builder: Wix,
Wordpress,
Squarespace, Webflow,
Framer



Interactive Web Visualization: Example

Raw JavaScript

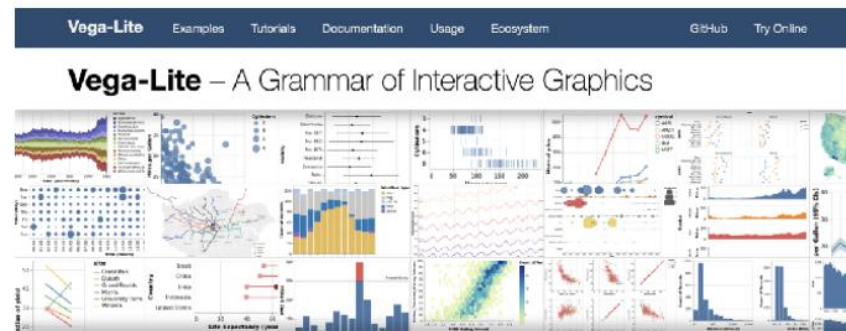
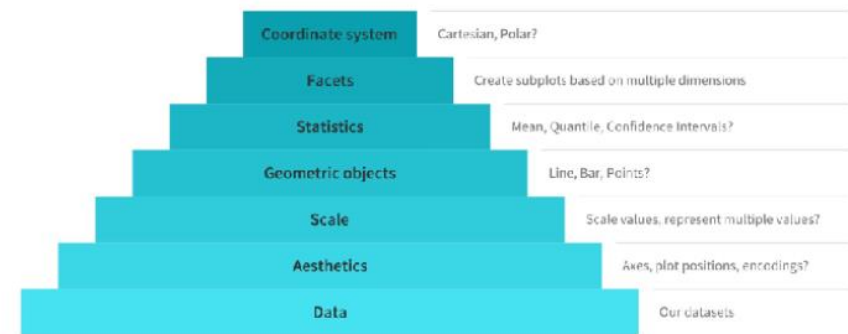
d3.js (JavaScript library)

Vega (visualization grammar)

Vega-Lite (simplified grammar)

Voyager (web-based GUI builder)

Major Components of the Grammar of Graphics



Animation Toolkit: Example

There are some common animation techniques used in the example here.



Animation Toolkit : Example

Slow in and Slow out

Objects with mass must
accelerate and decelerate

Interesting frames are typically
**at ends, tweaks perception
to emphasize these poses**

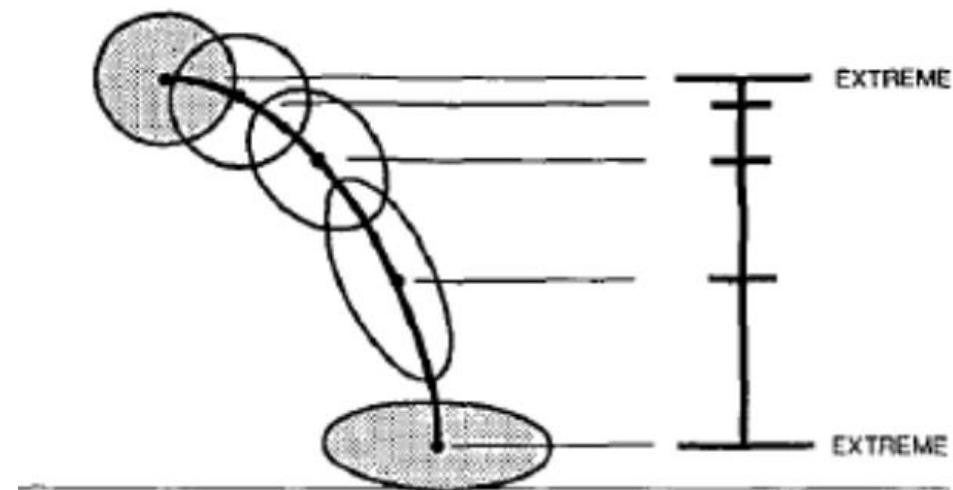


FIGURE 9. Timing chart for ball bounce.

Animation Toolkit: Example

What can UI design/toolkits also **learn from animation**?

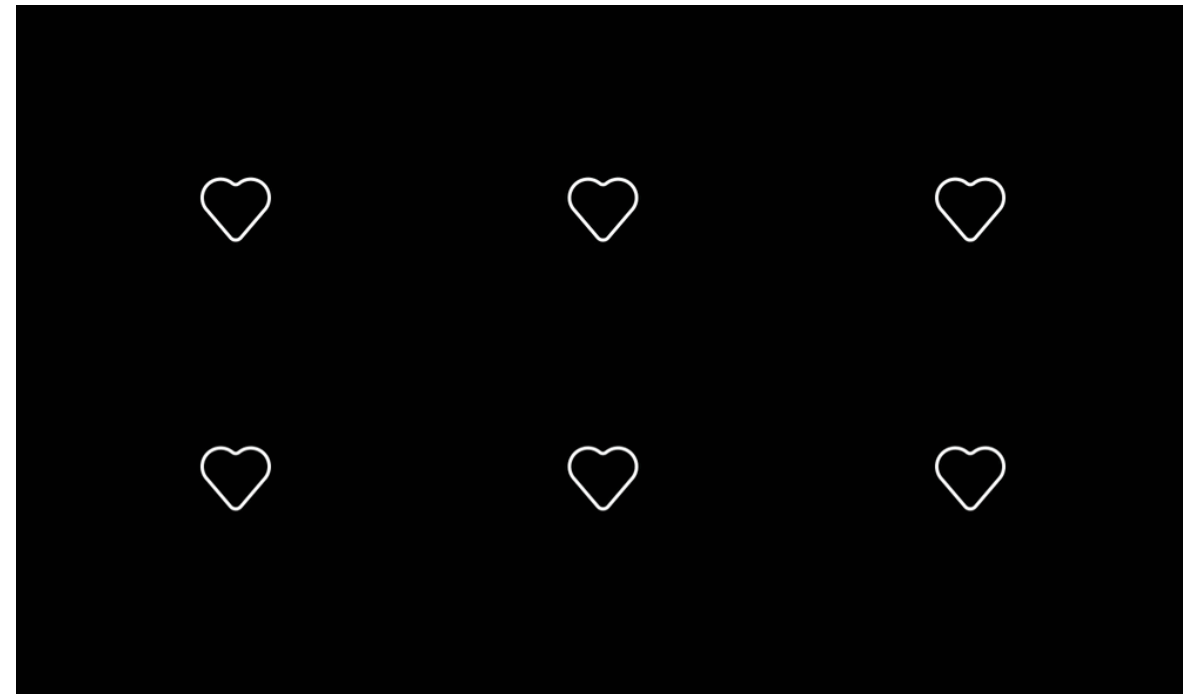
- **Solidity:** Desktop objects should appear to be solid objects
- **Exaggeration:** Exaggerate physical actions to enhance perception
- **Reinforcement:** Use effects to drive home feeling of reality

Using principles of animation makes it **easier** for the user to **track objects** and understand **what is changing** on the screen.

Bay-Wei Chang and David Ungar. 1993. Animation: from cartoons to the user interface. In Proceedings of the 6th annual ACM symposium on User interface software and technology (UIST '93).

Animation Toolkit: Example

- Animation is now in almost every major UI toolkit out there!
 - Relating to perception
- Apps also have their unique animation design
 - Also known as micro interaction design/motion design
- Spotify's Heart design example:
<https://spotify.design/article/bringing-the-spotify-heart-to-life>



Toolkits for Interface Implementation

- Raw JavaScript might be enough for your project, but if you are looking into additional wrapper (framework):
 - Vue.js
 - React.js (more advanced web dev)
- For HTML/CSS toolkit (available in different frameworks as well):
 - Bootstrap
 - Material UI
- For graphical builder:
 - Wix
 - Webflow

UI Toolkits: Bootstrap

<https://getbootstrap.com/>

- Responsive
 - Breakpoints
 - Grid
- Forms
- Components
 - Buttons
 - Card
 - Carousel

The screenshot displays the Bootstrap 5 documentation website. The top navigation bar is purple with links for Docs, Examples, Icons, Themes, and Blog. A search bar and version selector (v5.3) are also present. The left sidebar lists the site's structure, with 'Grid' highlighted under the 'Layout' section. The main content area is titled 'Grid system' and includes a 'View on GitHub' button. The text explains that Bootstrap's grid is a mobile-first flexbox system with 12 columns, six responsive tiers, Sass variables, and mixins. An 'Example' section describes how the grid uses containers, rows, and columns. A light blue callout box provides a link to a CSS Tricks flexbox guide for users unfamiliar with flexbox. Below the text is a visual example of a three-column grid layout with purple boxes labeled 'Column'. At the bottom, there is a code editor showing the HTML structure for the grid.

Grid system [View on GitHub](#)

Use our powerful mobile-first flexbox grid to build layouts of all shapes and sizes thanks to a twelve column system, six default responsive tiers, Sass variables and mixins, and dozens of predefined classes.

Example

Bootstrap's grid system uses a series of containers, rows, and columns to layout and align content. It's built with [flexbox](#) and is fully responsive. Below is an example and an in-depth explanation for how the grid system comes together.

New to or unfamiliar with flexbox? [Read this CSS Tricks flexbox guide](#) for background, terminology, guidelines, and code snippets.

Column Column Column

HTML

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What is a design pattern?

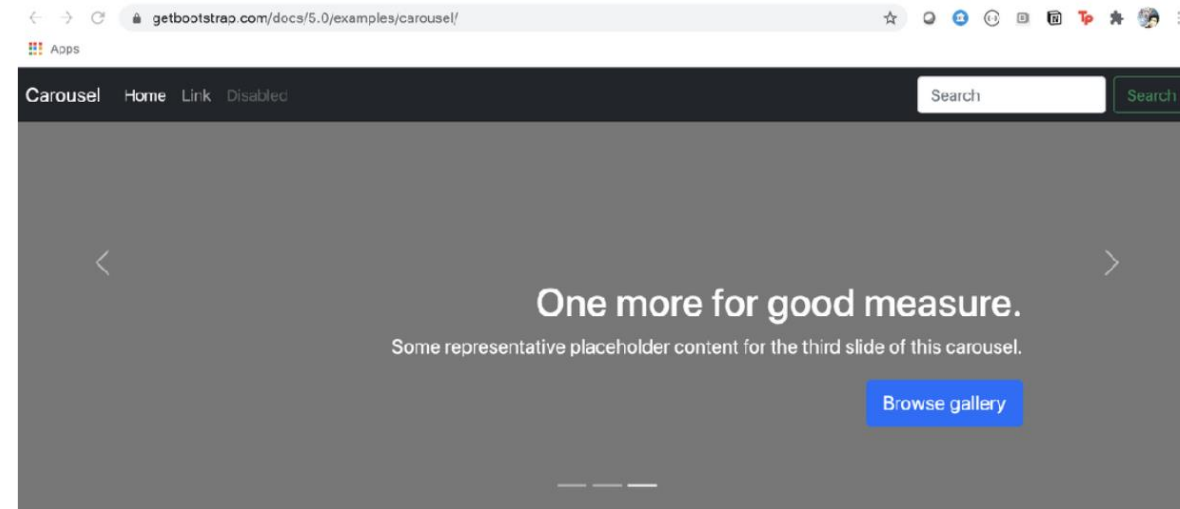
“... a general repeatable solution to a commonly-occurring usability problem in interface design...”

- 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 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
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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" listing Books, Music, Movies/DVDs, and Games. A table titled "In-Stock Now!" lists various CDs and their prices. The bottom right corner has a link to "More great deals..."

half.com
by **eBay**

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

my account cart help **eb**y 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

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In Computers

Gateway Desktop Under \$400!
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Includes an 800MHz Intel Celeron processor, 256MB RAM, 20GB hard drive, DVD-ROM drive, and more!

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Movies

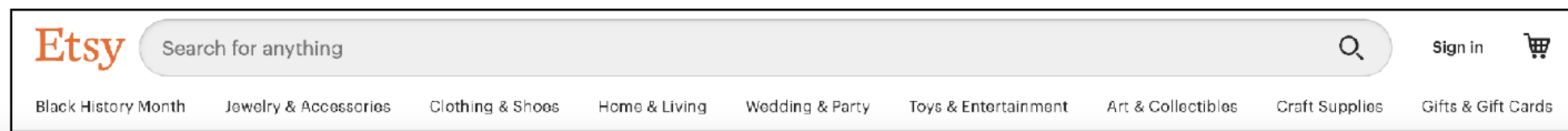
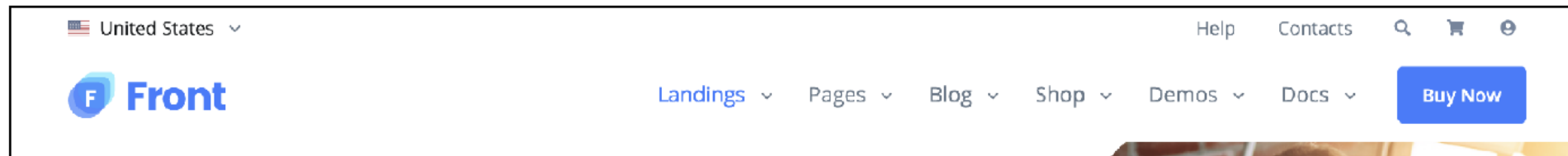
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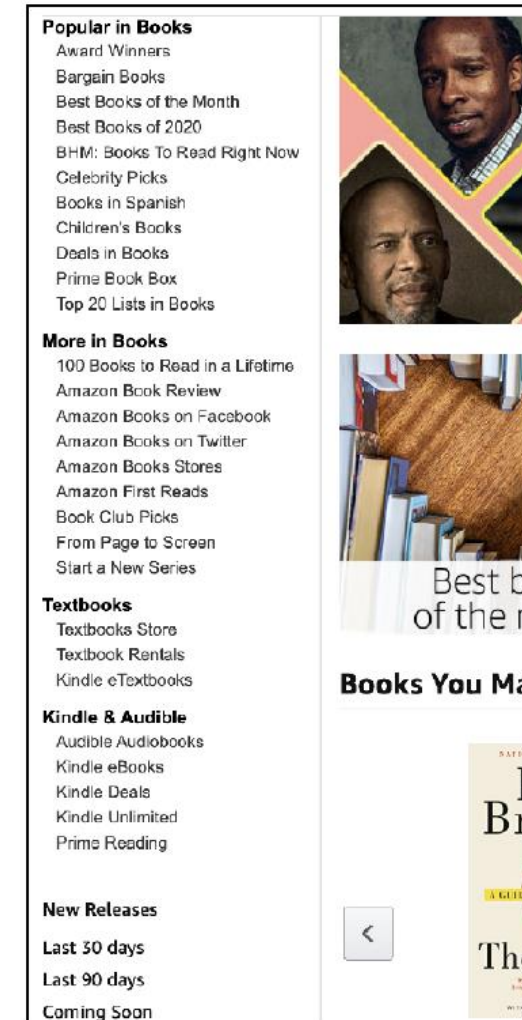
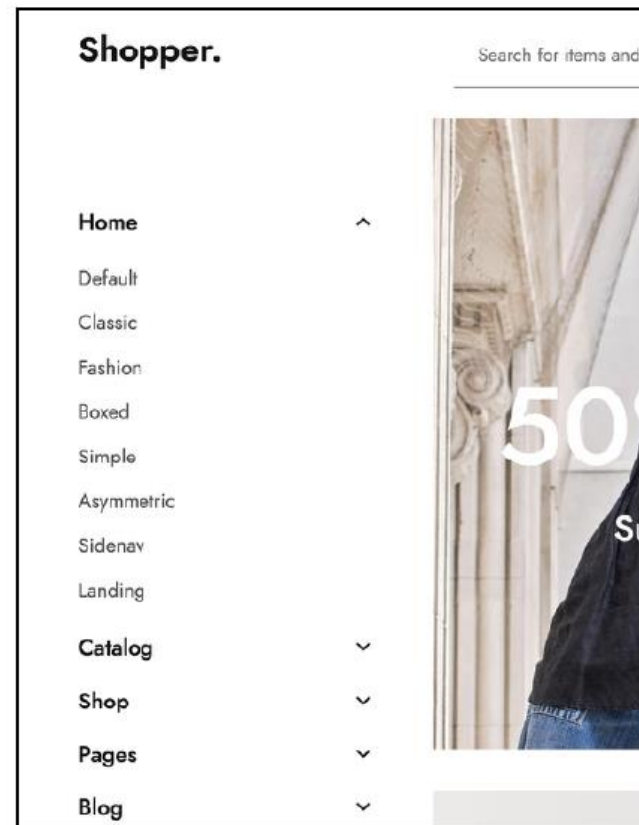
Design Pattern: Activity



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



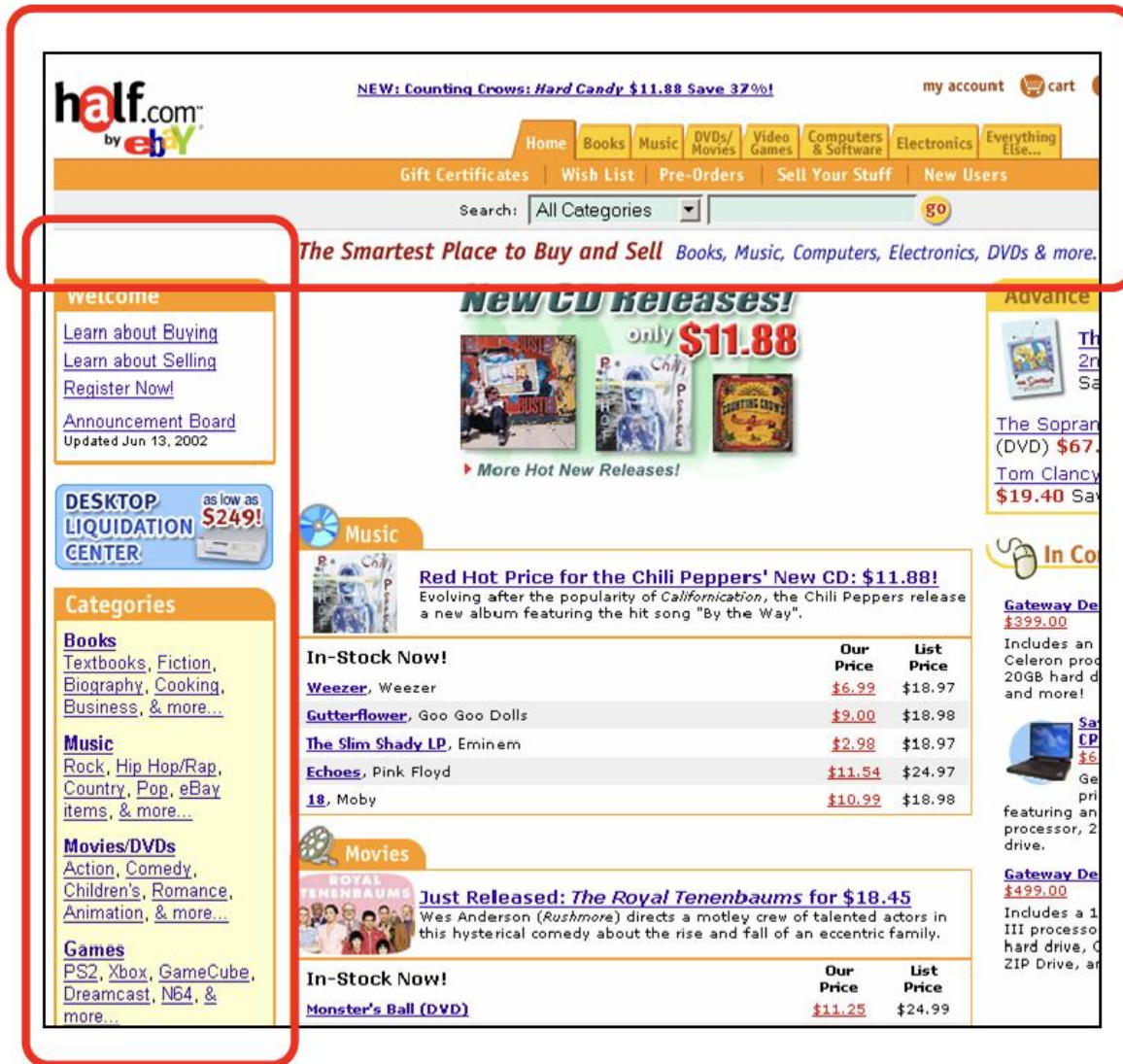
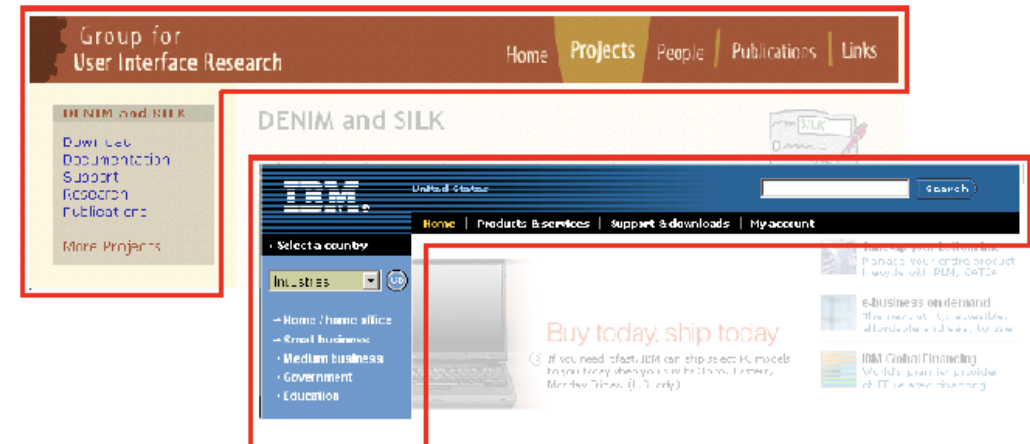
Design Pattern: Activity



Sidebars
faceted
browsing

Design Pattern: Activity

The "L" shape navigation



Design Pattern: Activity

Announcement Board
Updated Jun 13, 2002

DESKTOP LIQUIDATION CENTER
as low as \$249!

Categories

Books
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Movies/DVDs
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More Hot New Releases!

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Gateway Desktop Under \$500
~~\$499.00~~
Includes a 1GHz Intel Pentium

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 website, which is a classic example of a grid-based web design. The layout is organized into several distinct sections:

- Header:** Includes the half.com logo, a navigation bar with categories like Home, Books, Music, DVDs/Movies, Video Games, Computers & Software, Electronics, and Everything Else... It also features a search bar and links for my account, cart, help, home, and sign in.
- Navigation Bar:** Contains links for Gift Certificates, Wish List, Pre-Orders, Sell Your Stuff, and New Users.
- Search Bar:** A simple search input field with a 'go' button.
- Main Content Area:** Divided into three columns:
 - Left Column:** Features a 'Welcome' section with links to 'Learn about Buying', 'Learn about Selling', 'Register Now!', and an 'Announcement Board' (Updated Jun 13, 2002). Below this is a 'DESKTOP LIQUIDATION CENTER' advertisement and a 'Categories' section listing Books (Textbooks, Fiction, Biography, Cooking, Business, & more...) and Music (Rock, Hip Hop/Rap, Country, Pop, eBay).
 - Center Column:** The largest section, featuring a 'New CD Releases!' banner for the Chili Peppers' new CD at \$11.88. Below this is a 'Music' section with a 'Red Hot Price for the Chili Peppers' New CD: \$11.88!' and a table of 'In-Stock Now!' items. The table lists items like Weezer, Gutterflower, The Slim Shady LP, Echoes, and 18, with their respective 'Our Price' and 'List Price'. Below the music section is a 'Movies' section featuring 'The Royal Tenenbaums' for \$18.45 and another 'In-Stock Now!' table listing 'Monster's Ball (DVD)'.
 - Right Column:** Features 'Advance Orders' for 'The Simpsons: Complete 2nd Season (DVD)' at \$34.97, 'The Sopranos: Complete 3rd Season (DVD)' at \$67.99, and 'Tom Clancy: Red Rabbit (Hardcover)' at \$19.40. Below this is an 'In Computers' section with 'Gateway Desktop Under \$400!' at \$399.00 and 'Save Over \$100 on Dell Latitude CPx!' at \$639.00. It also includes another 'Gateway Desktop Under \$500' at \$499.00. A 'More great deals...' link is at the bottom right.

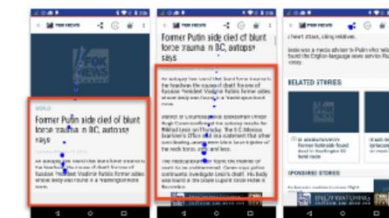
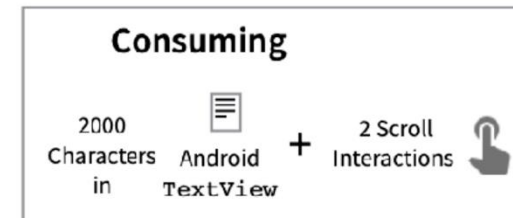
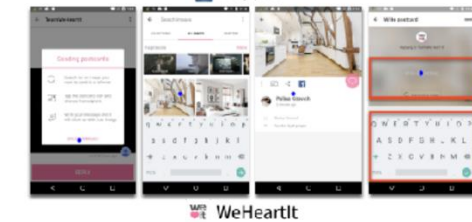
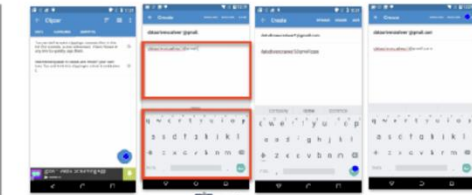
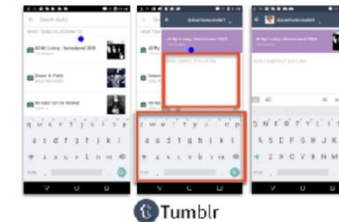
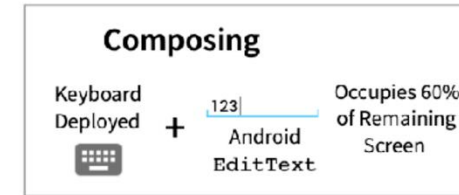
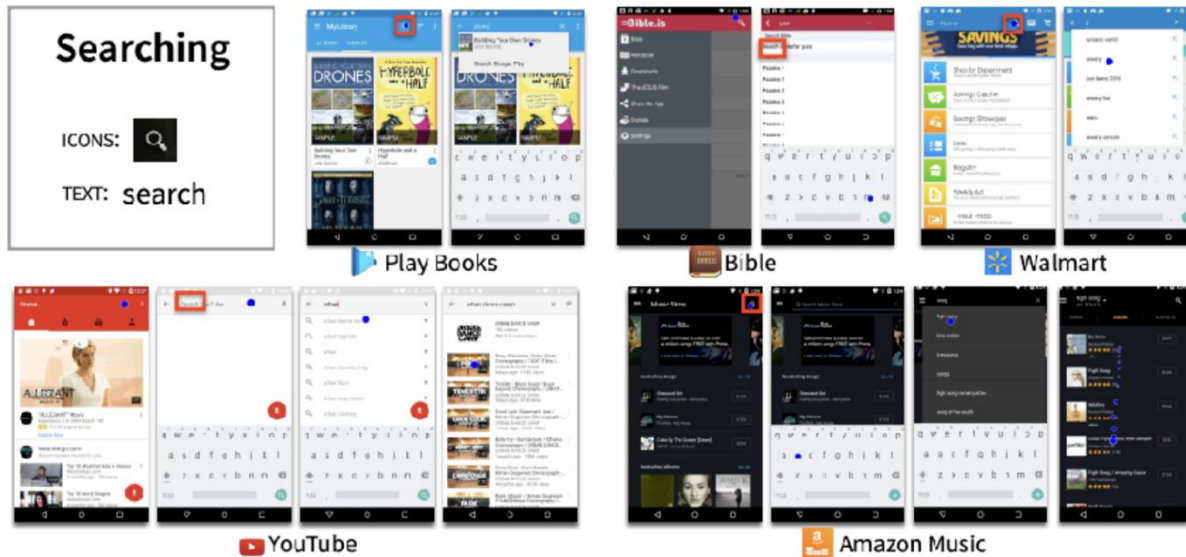
Design Pattern: Common User Flows

- 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 Half.com checkout process. At the top, the Half.com logo is on the left, and a yellow navigation bar on the right contains the text "Checkout" and a sequence of steps: "1 Shipping", "2 Billing", and "3 Place Order". A "Secure Shopping" icon with a padlock is also present. Below the navigation bar, the heading "Step 1 - Choose Shipping Address" is underlined. The main content area is titled "Ship my order to:" and contains a box with the address "Jason Hong, 387 Soda Hall Computer Science UC Berkeley, Berkeley, CA 94720" and a red "Use This Address" button. Below this, the word "OR" is displayed. The section "Enter a new shipping address:" follows, with a form containing two input fields labeled "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

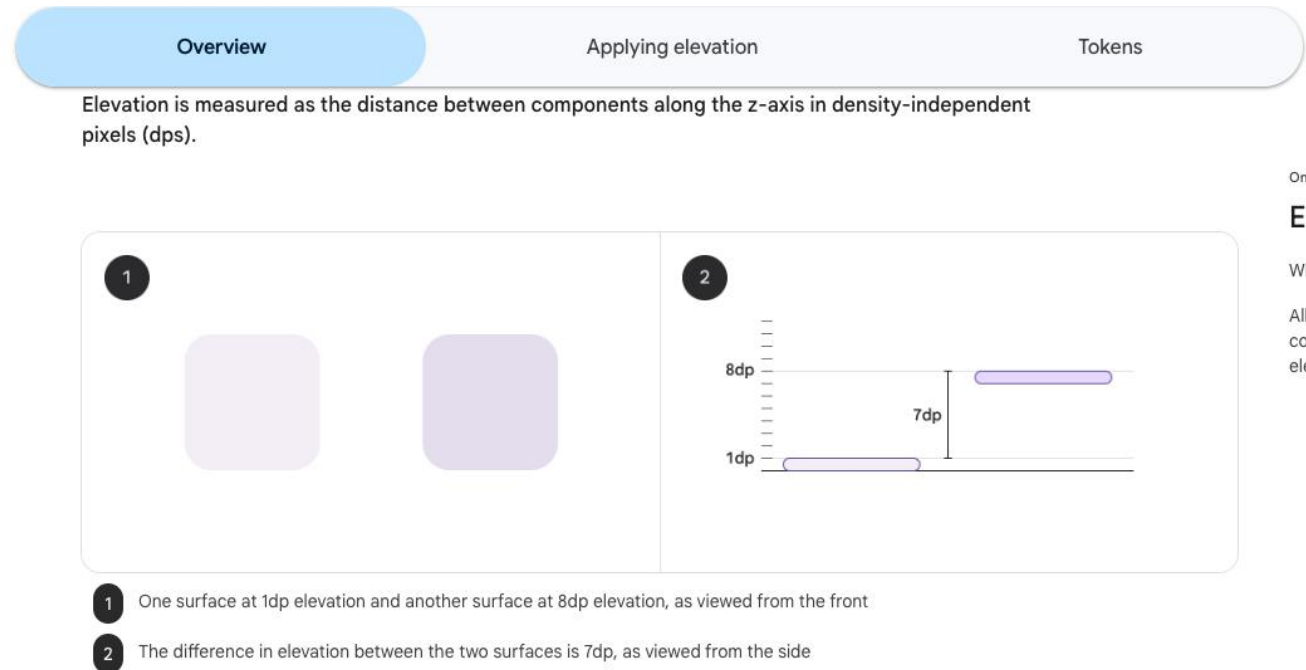
<https://m3.material.io/>

- **Styles**

- Elevation
- Motion

- **Components**

- FAB
- Cards



On this page

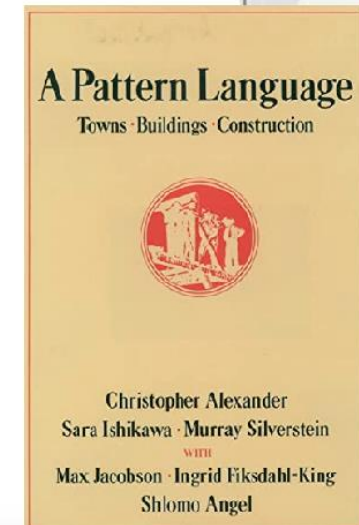
Elevation

What's new

All surfaces and components have elevation values

Design Pattern in General

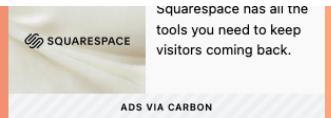
- Very popular in **software engineering and OOP** after the mid 90s.
 - **Model-View-Controller** (MVC) is a common software design pattern for developing UIs.
- A 1970s book talks about “**pattern languages**” and relates it to architecture and the planning of cities and towns. This book later influenced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

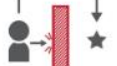
Need assistance? We are here to help! Call us any time at 877-638-3303


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)

Week 11 Overview

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