

CSE 440: Introduction to HCI

User Interface Design, Prototyping, and Evaluation!

Lecture 16: Interface Implementation

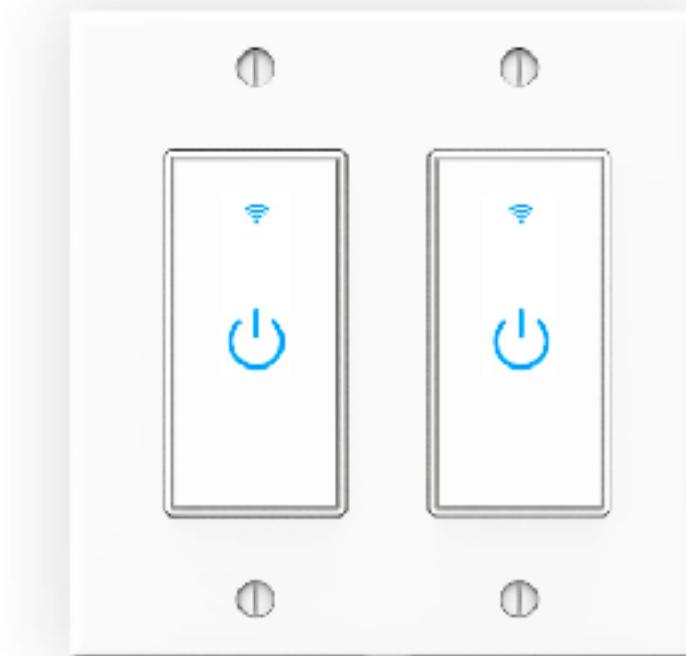
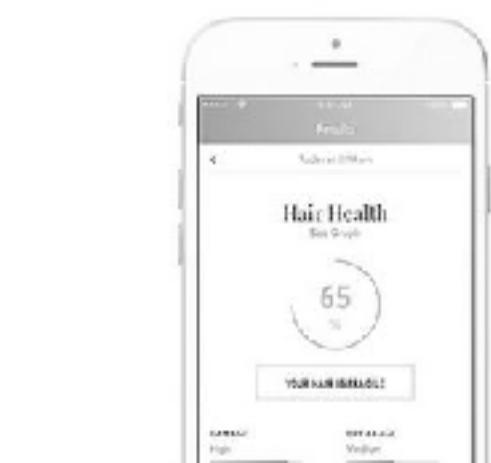
Instructor: Amy Zhang, 11/30/2021

Today's Topics

- UI Hall of Fame and Shame
- Interface Implementation
 - UI toolkits
 - Design patterns
- Where are we now?
- Any remaining class time for group work on 3d!

UI Hall of Fame and Shame

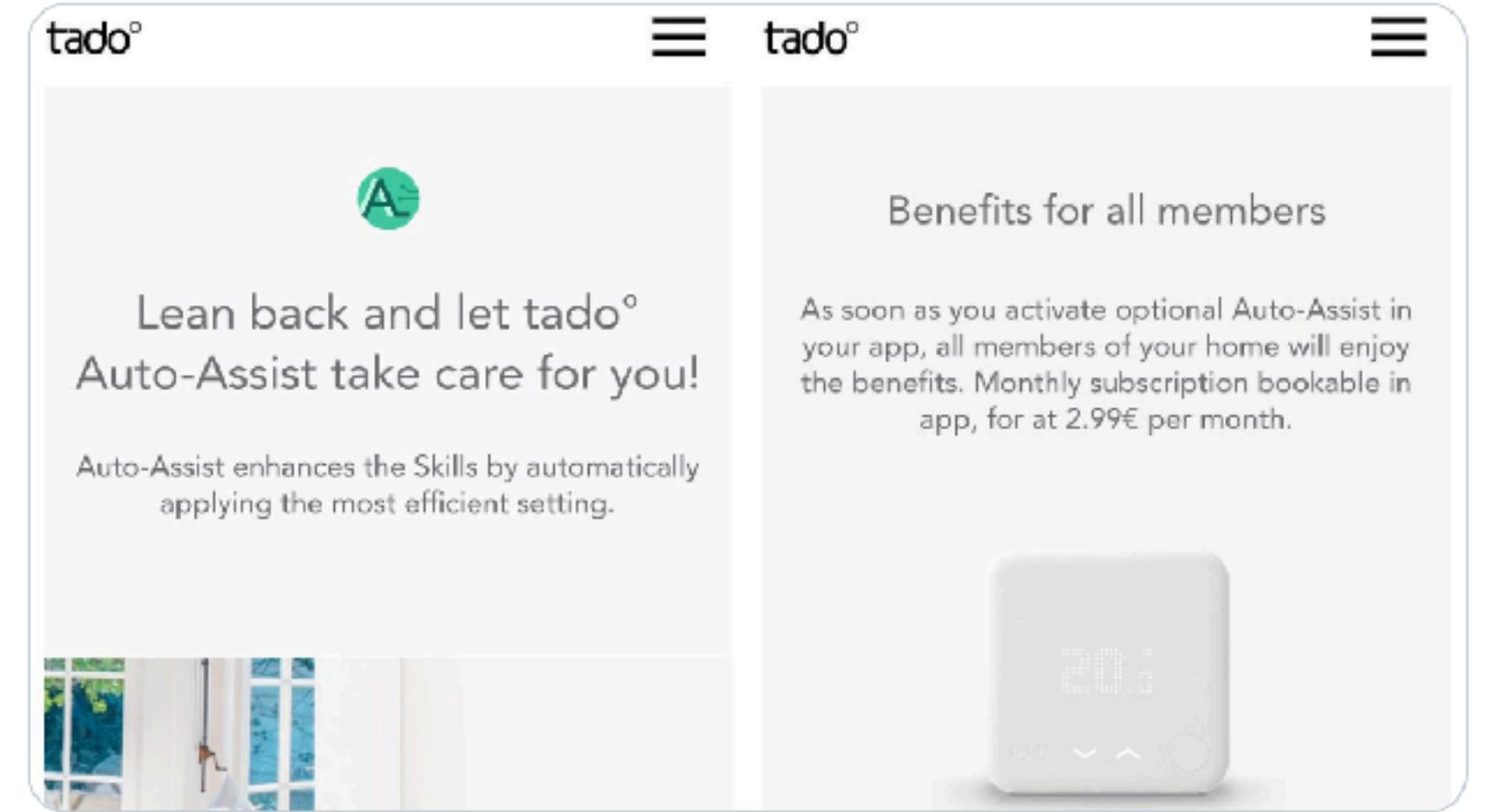
The “internet of things”



In other words, connect all your devices and appliances to the internet!

Pros? Cons?





tado°

Internet of Shit
@internetofshit

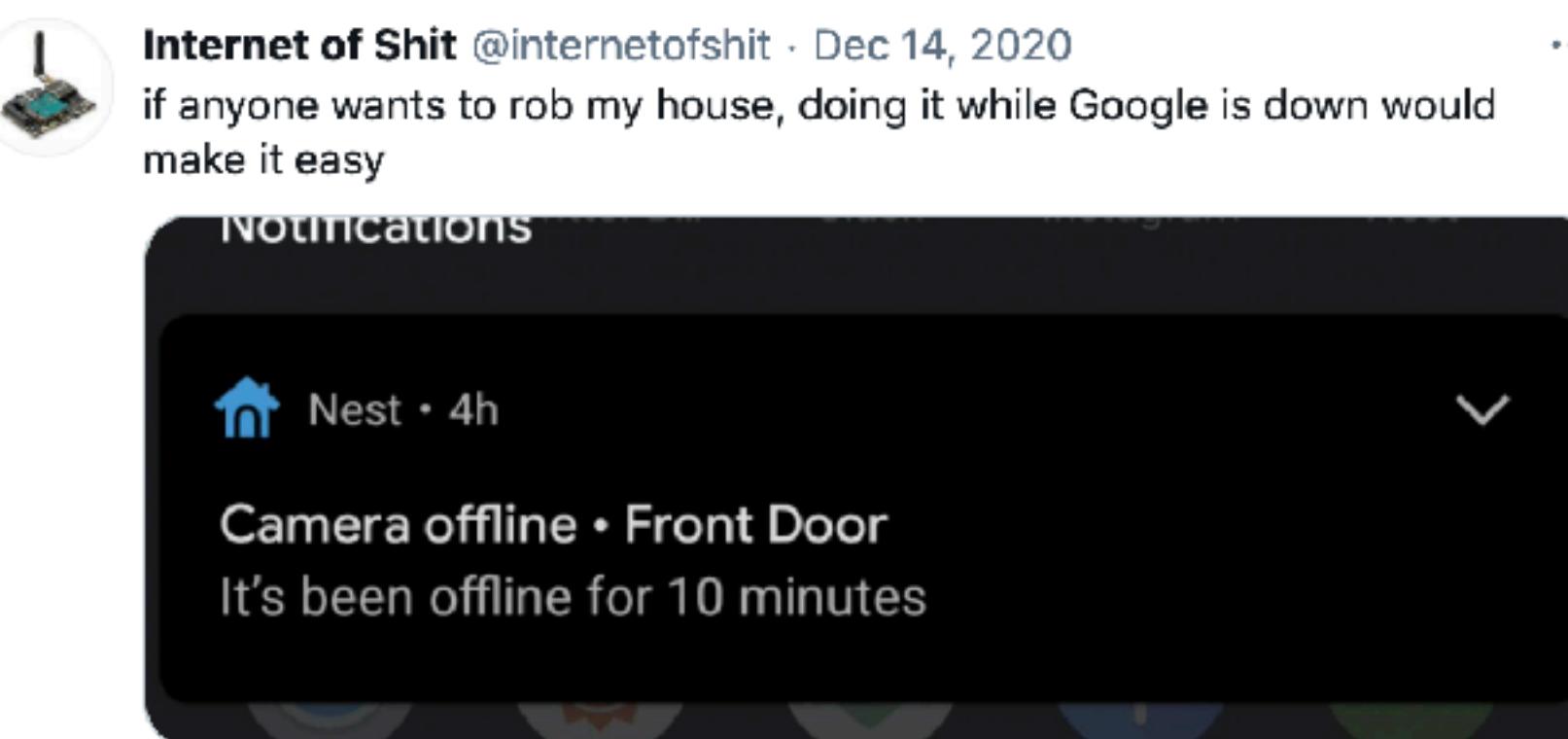
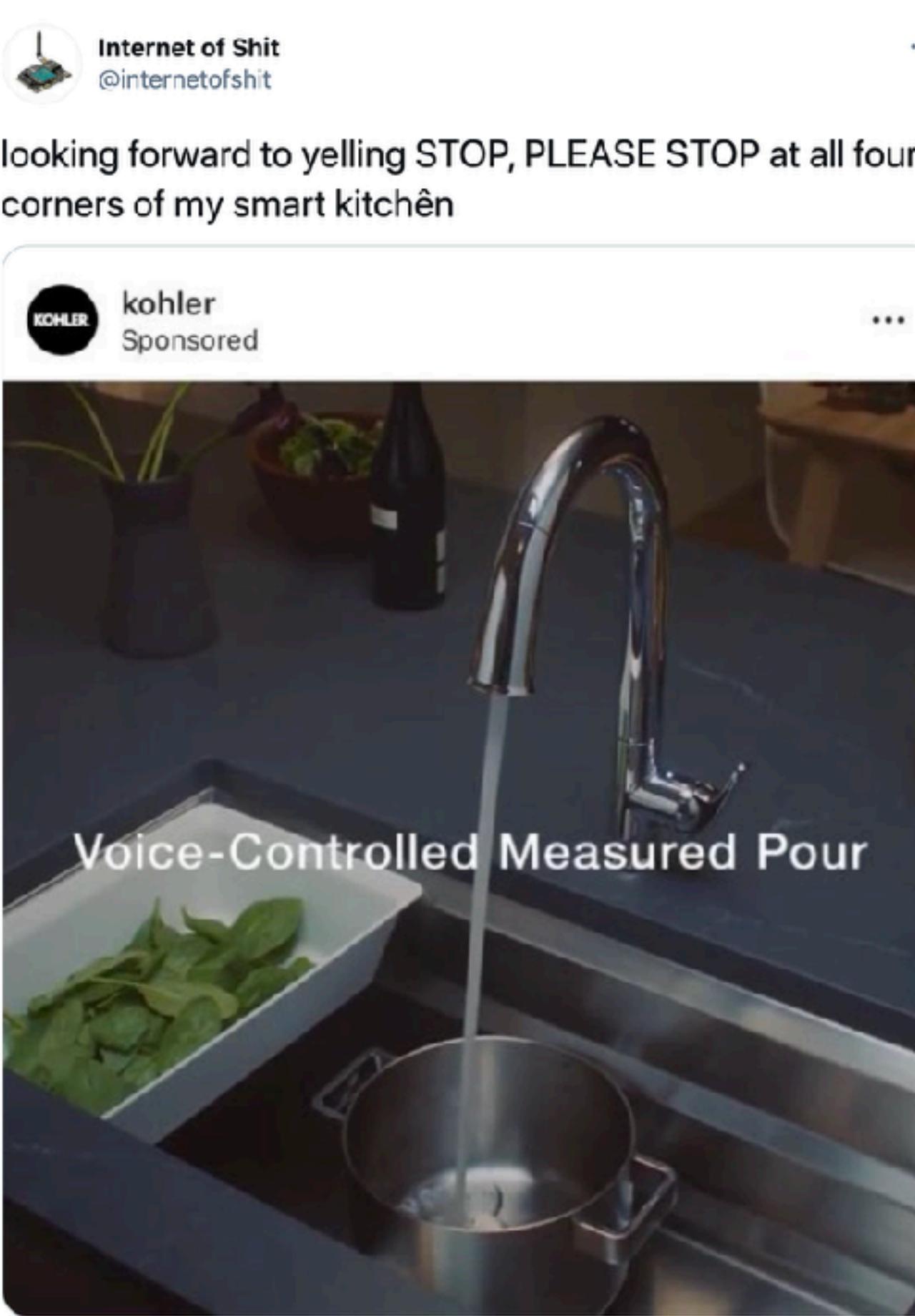
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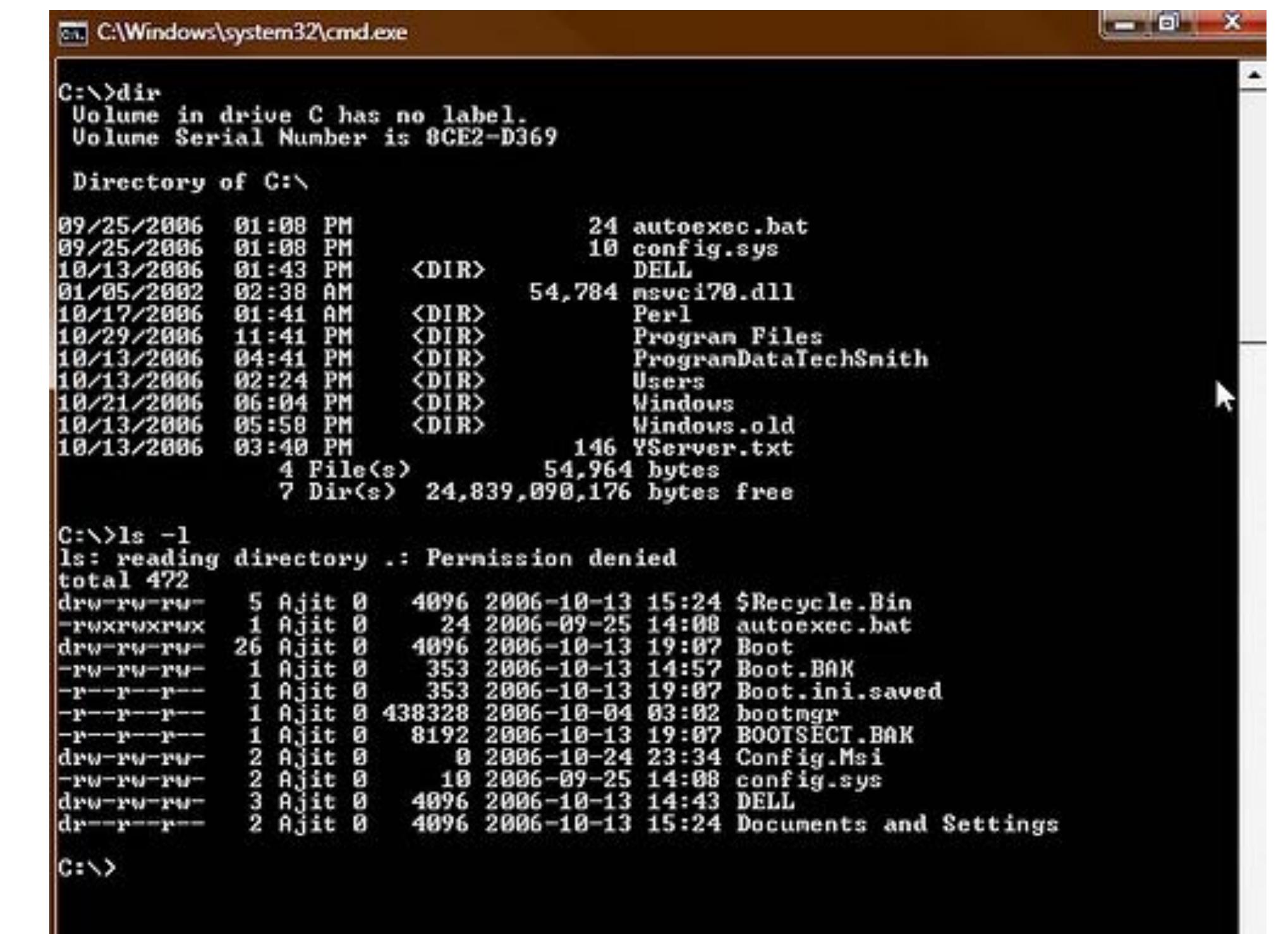
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Interface Implementation: UI Toolkits

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

Directory of C:\

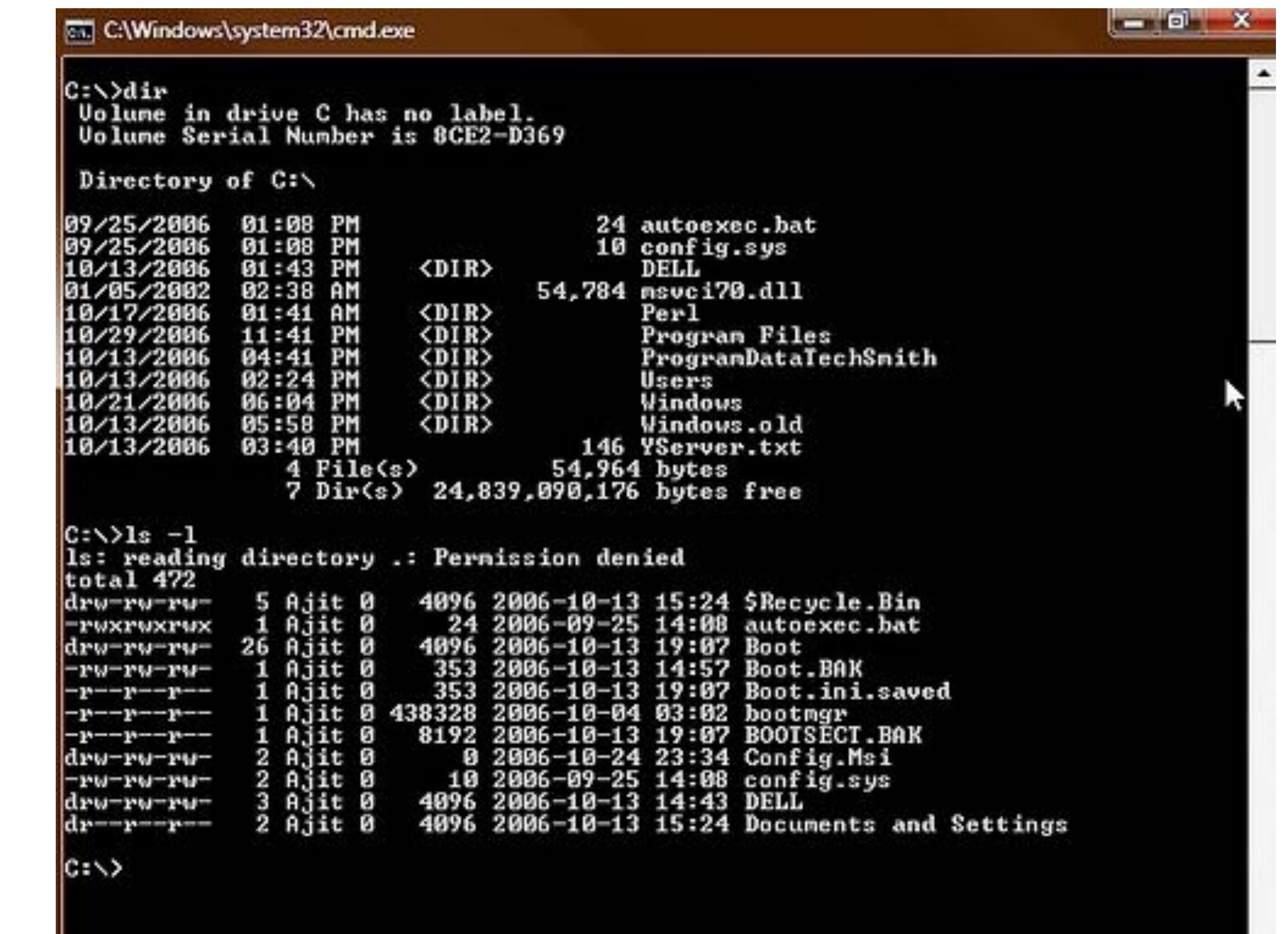
09/25/2006  01:08 PM                24 autoexec.bat
09/25/2006  01:08 PM                10 config.sys
10/13/2006  01:43 PM            <DIR>          DELL
01/05/2002  02:38 AM            54,784 msvcitz.dll
10/17/2006  01:41 AM            <DIR>          Perl
10/29/2006  11:41 PM            <DIR>          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 YServer.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
drw-rw-rw-  5 Ajit 0    4096 2006-10-13 15:24 $Recycle.Bin
-rwxrwxrwx  1 Ajit 0    24 2006-09-25 14:08 autoexec.bat
drw-rw-rw-  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  438328 2006-10-04 03:02 bootmgr
-r--r---r-- 1 Ajit 0    8192 2006-10-13 19:07 BOOTSECT.BAK
drw-rw-rw-  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
drw-rw-rw-  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 software loop

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



The screenshot shows a Windows Command Prompt window titled 'C:\Windows\system32\cmd.exe'. It displays two directory listings:

Directory of C:

Date	Time	File/Folder	Size
09/25/2006	01:08 PM	autoexec.bat	24 bytes
09/25/2006	01:08 PM	config.sys	10 bytes
10/13/2006	01:43 PM	<DIR>	DELL
01/05/2002	02:38 AM		54,784 bytes
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 bytes
		4 File(s)	54,964 bytes
		7 Dir(s)	24,839,090,176 bytes free

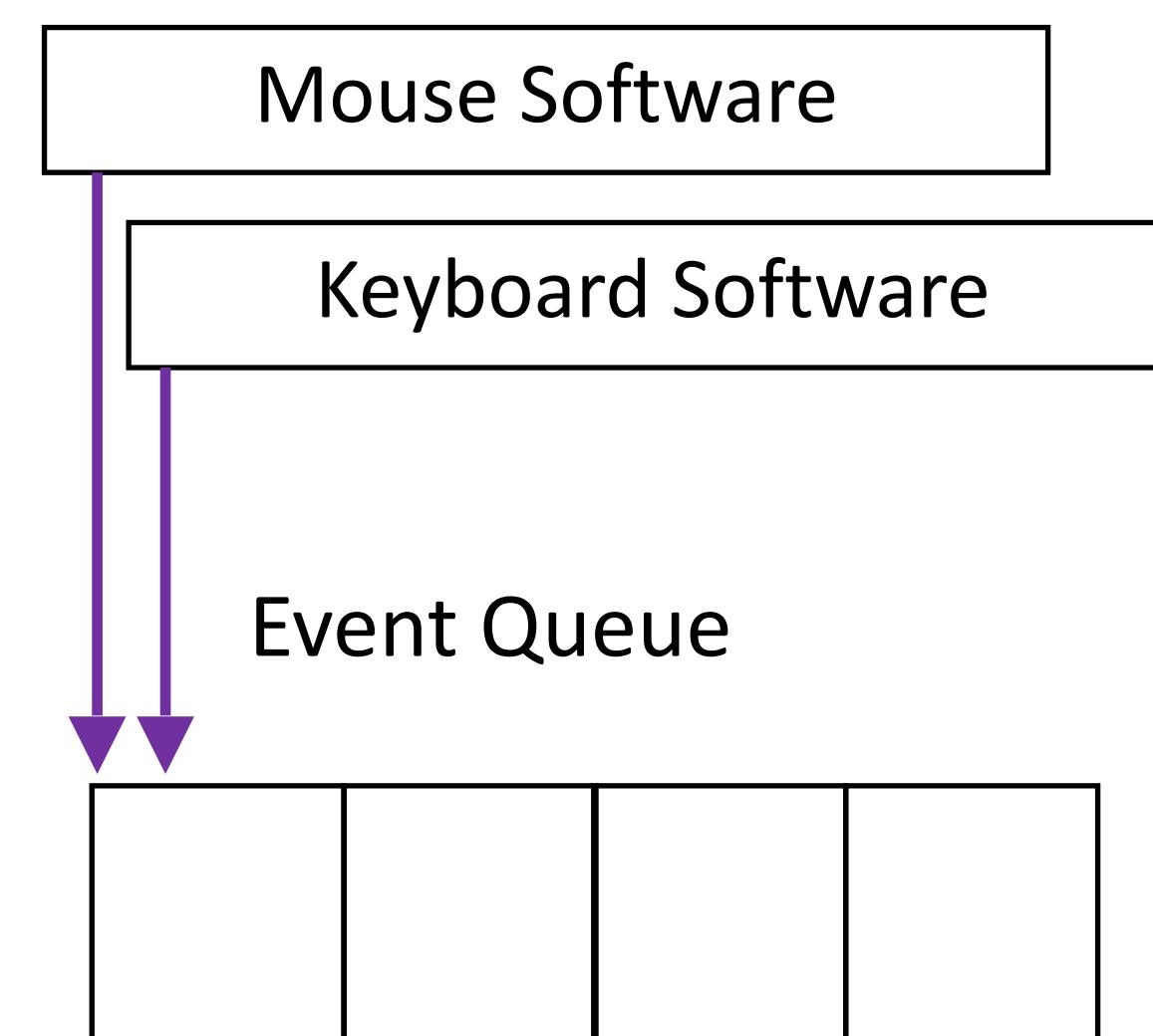
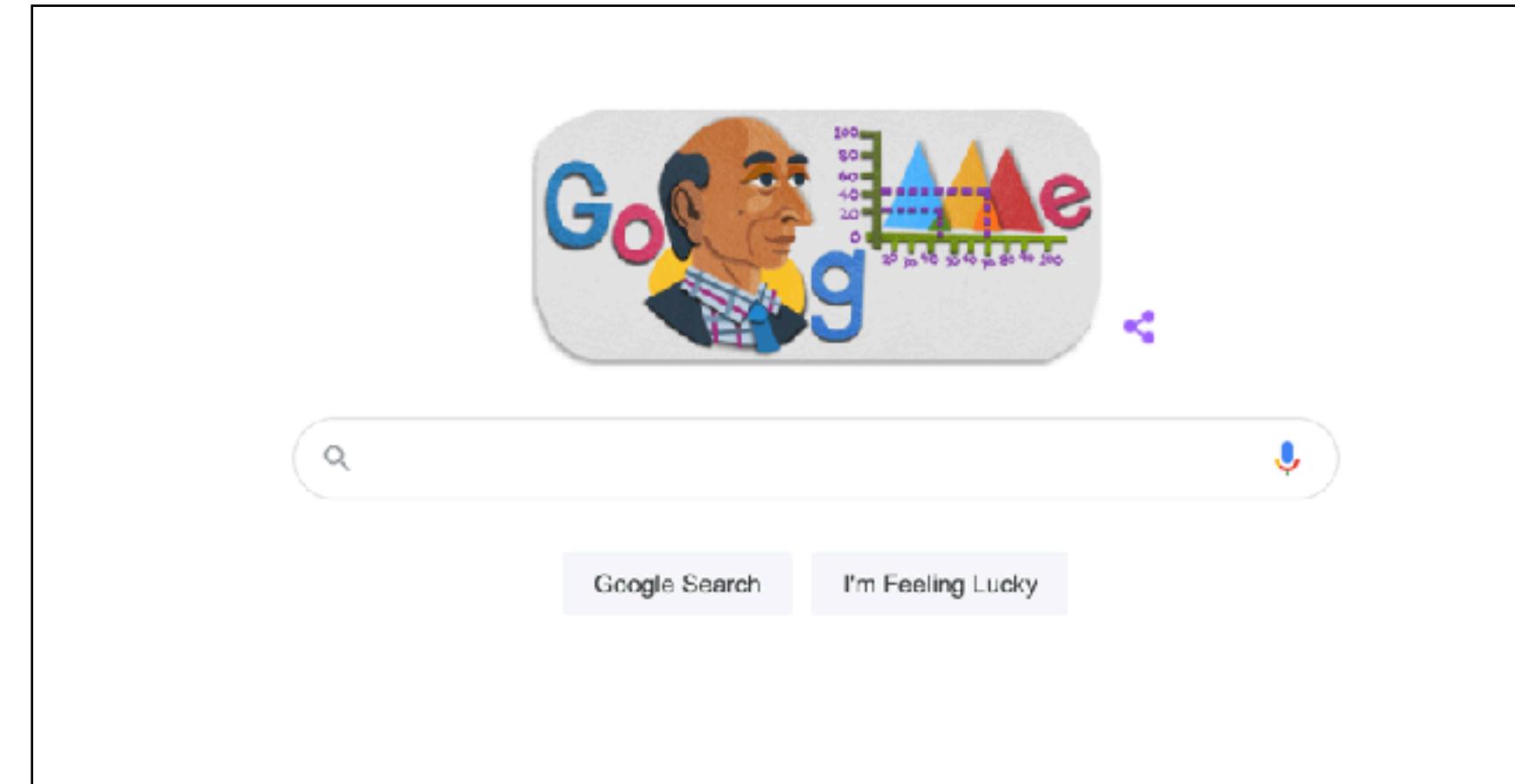
C:\>ls -l

File Type	Owner	Size	Date	Time	Name
drw-rw-rw-	Ajit	4096	2006-10-13	15:24	\$Recycle.Bin
-rwxrwxrwx	Ajit	24	2006-09-25	14:08	autoexec.bat
drw-rw-rw-	Ajit	4096	2006-10-13	19:07	Boot
-rw-rw-rw-	Ajit	353	2006-10-13	14:57	Boot.BAK
r--r--r--	Ajit	353	2006-10-13	19:07	Boot.ini.saved
r--r--r--	Ajit	438328	2006-10-04	03:02	bootmgr
r--r--r--	Ajit	8192	2006-10-13	19:07	BOOTSECT.BAK
drw-rw-rw-	Ajit	0	2006-10-24	23:34	Config.Msi
-rw-rw-rw-	Ajit	10	2006-09-25	14:08	config.sys
drw-rw-rw-	Ajit	4096	2006-10-13	14:43	DELL
dr--r--r--	Ajit	4096	2006-10-13	15:24	Documents and Settings

C:\>

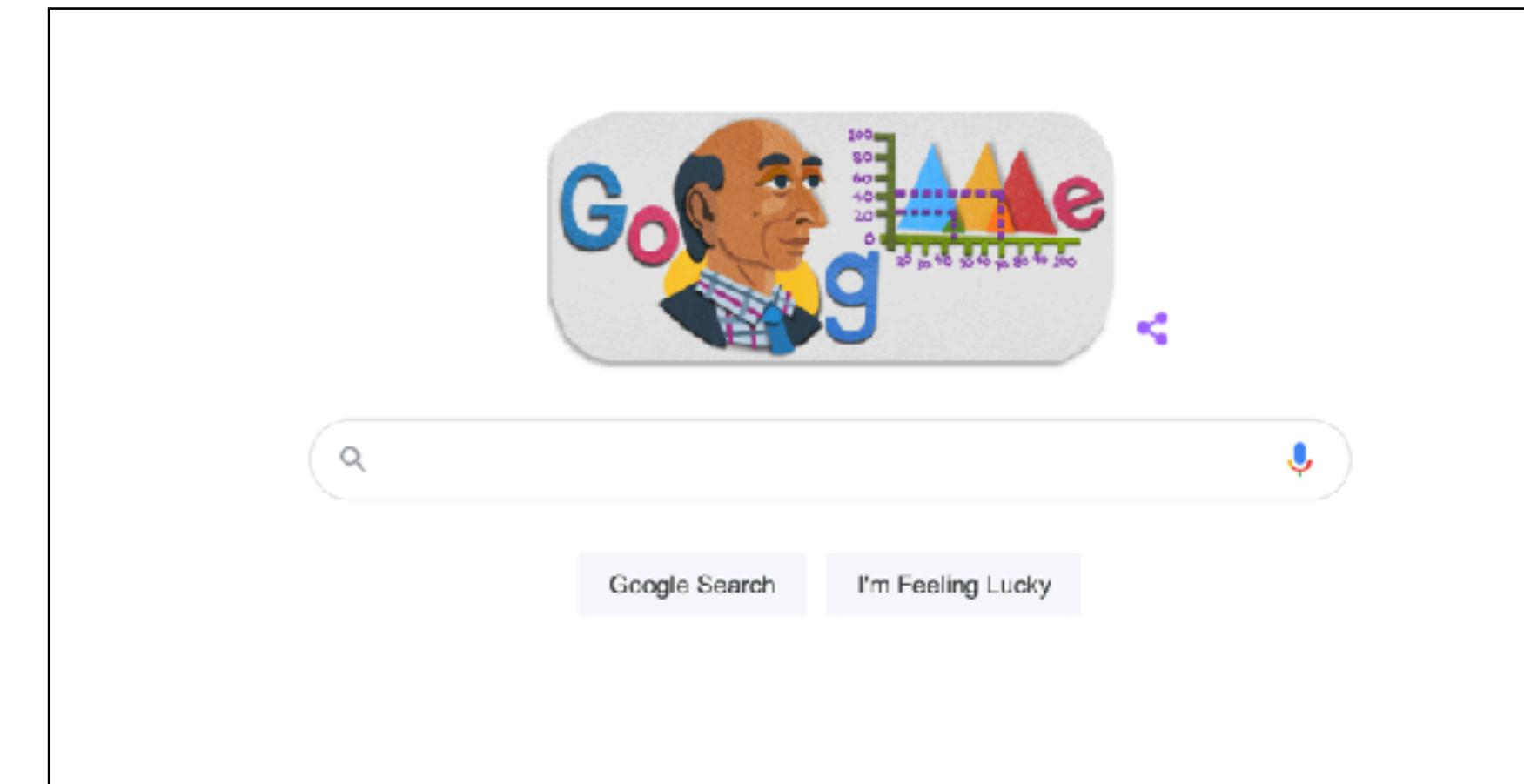
Event-Driven Programs

- 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 software loop

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

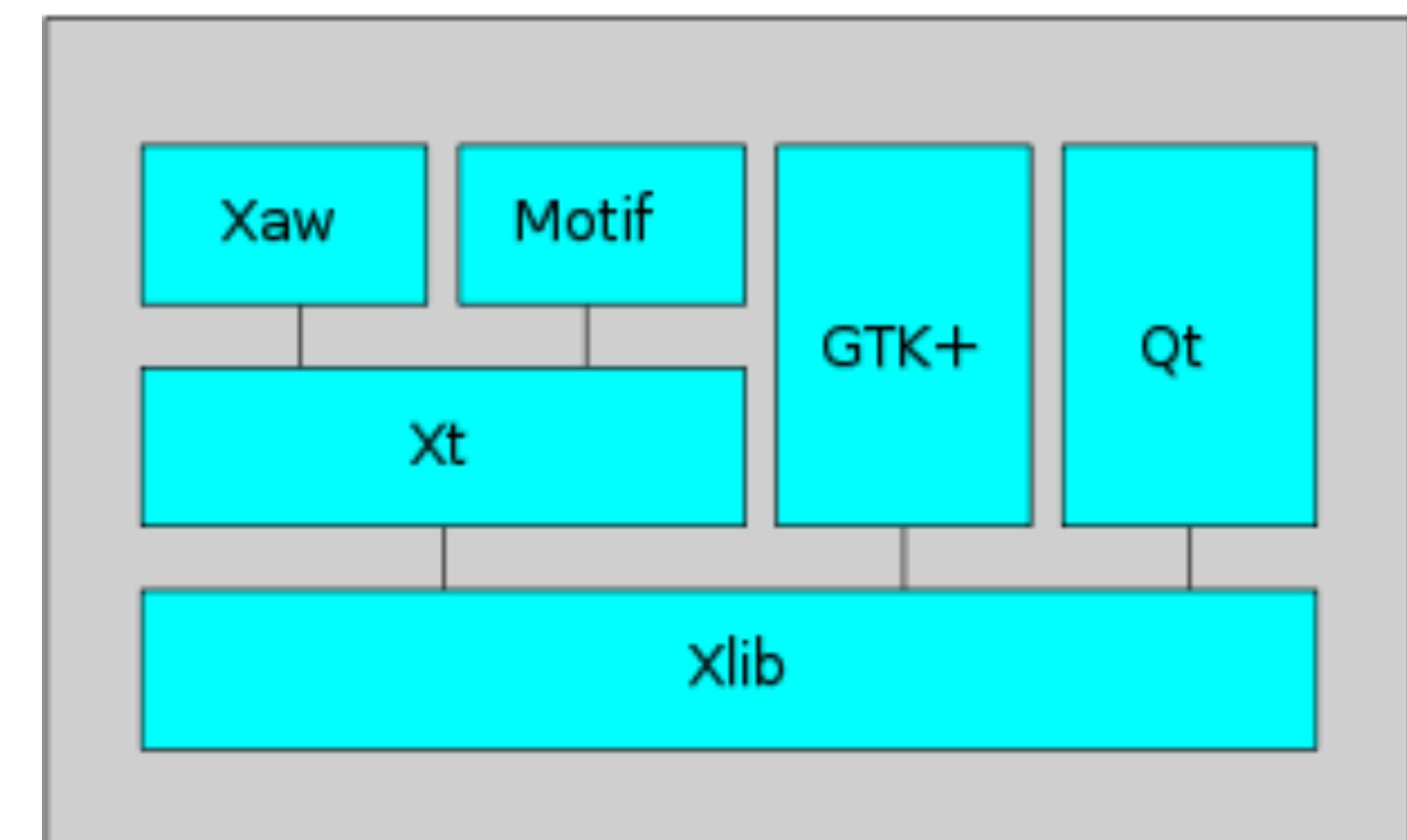


Event-Driven Programs: basic software loop

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 Intrinsics Programming Manual, vol. 4, 1990, p. 241.



Toolkits

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 tool

- Consistency across applications using same tool

Example: Web toolkits—from low to high level

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!
  }) ;
}) ;
```

Example: Web toolkits

One level up: JavaScript wrapper libraries like jQuery, which has predefined events for almost all DOM actions

```
$('.btn').click(function () {  
    //inside my click event!  
});
```

Example: Web toolkits

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

Examples: jQuery UI,
Bootstrap, Semantic UI

<https://jqueryui.com/demos/>

jQuery UI Demos

jQuery UI offers a combination of interaction, effects, widgets, utilities, and themes designed to work well together or on their own. Play with the demos, view the source, [build a theme](#), read the [API documentation](#) and start using jQuery UI today.

Interactions

Interactions add basic mouse-based behaviors to any element. You can create sortable lists, resizable elements, drag & drop behaviors and more with just a few lines of code. Interactions also make great building blocks for more complex widgets and applications.

- [Draggable](#)
- [Droppable](#)
- [Resizable](#)
- [Selectable](#)
- [Sortable](#)

Widgets

Widgets are full-featured UI controls that bring the richness of desktop applications to the Web. All widgets provide a solid core with plenty of extension points for customizing behavior, as well as full theming support.

- [Accordion](#)
- [Autocomplete](#)
- [Button](#)
- [Checkboxradio](#)

Example: Web toolkits

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

Examples: jQuery UI,
Bootstrap, Semantic UI

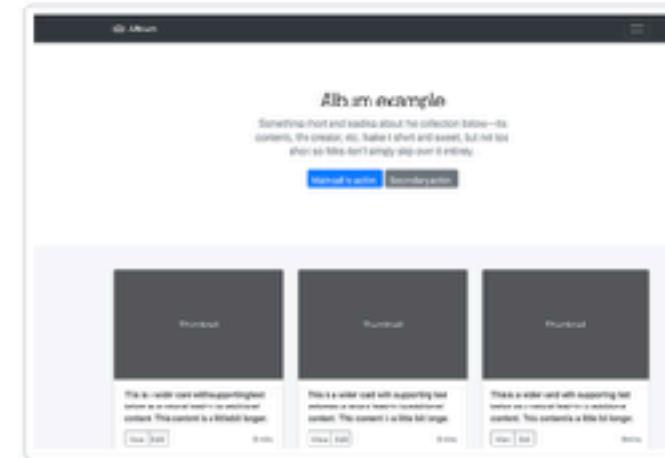
purpose, with a few extras thrown in for more control.

Primary Secondary Success Danger Warning

```
<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.



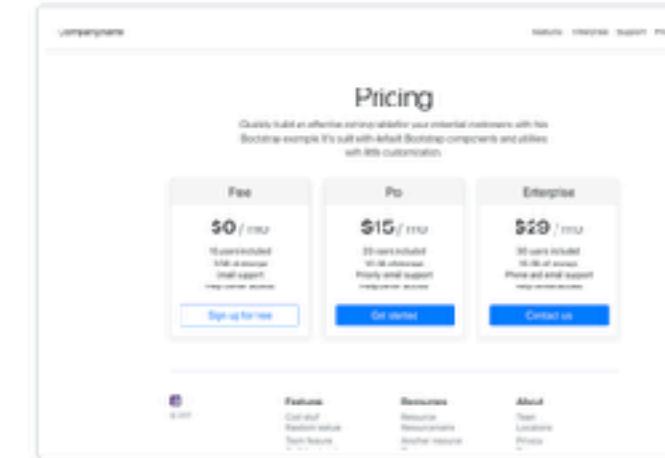
Album

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



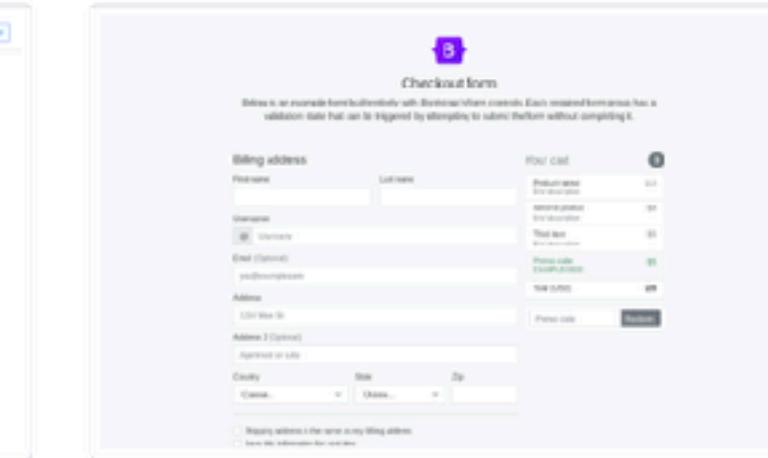
Cover

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



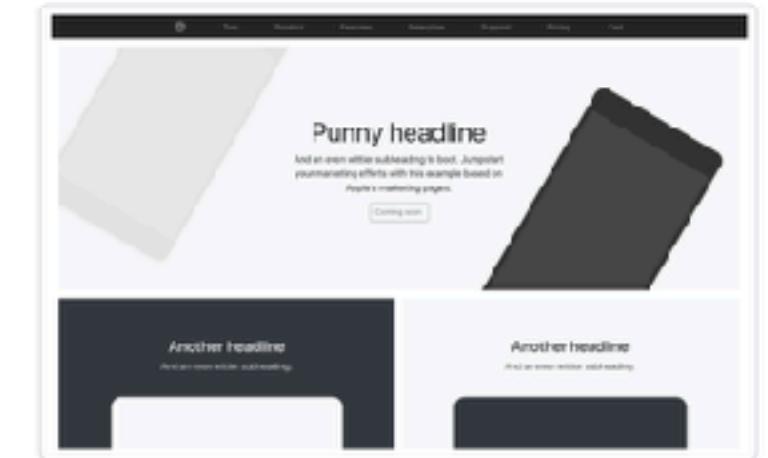
Pricing

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.



Blog

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

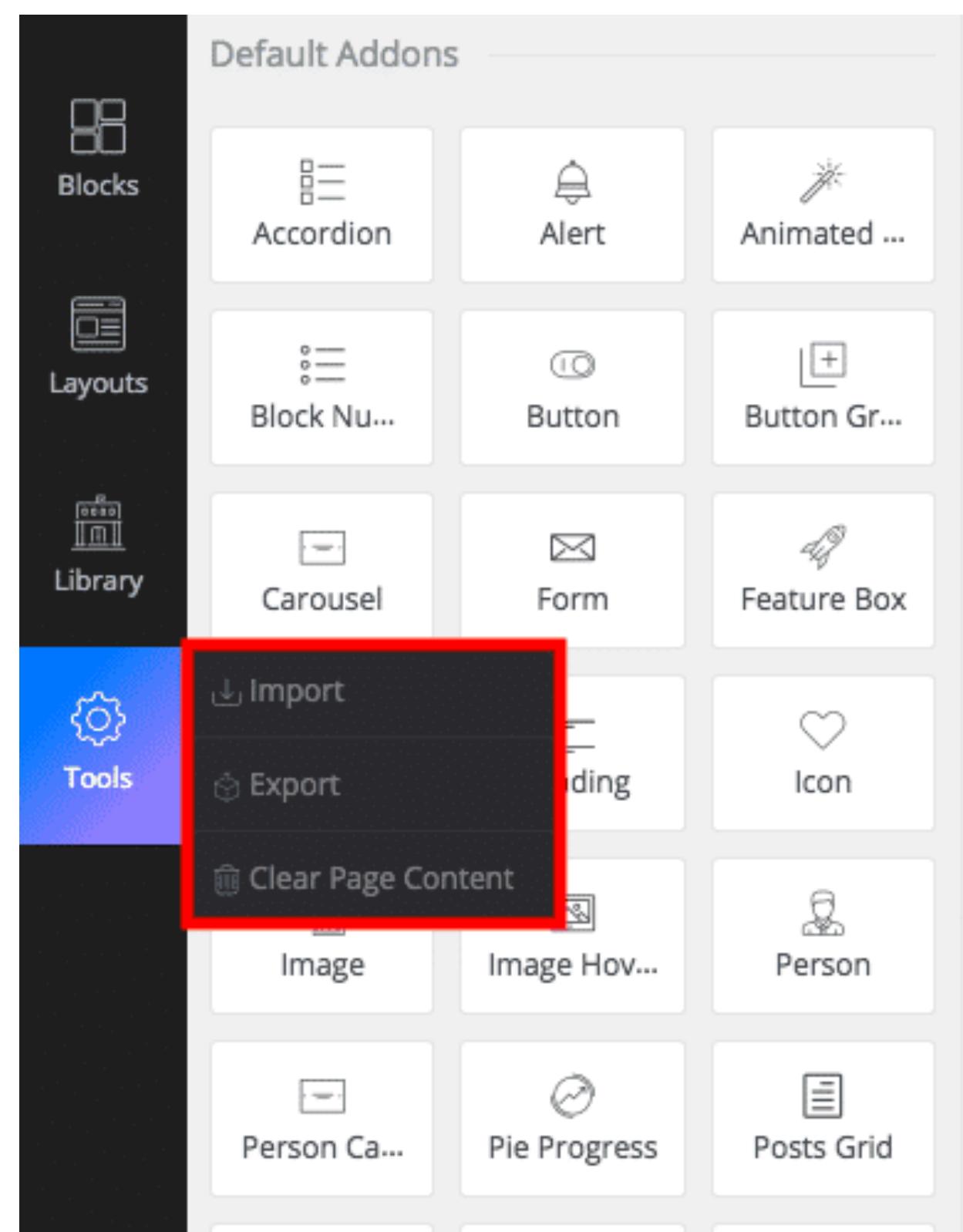


Dashboard

Basic admin dashboard shell with fixed sidebar and navbar.

Example: Web toolkits

GUI Builder:
Adobe
Dreamweaver,
Wix, Wordpress,
Squarespace,
Weebly



The image shows a screenshot of a web page builder interface. At the top, there are two logos: 'GoDECOR' and 'HandCraft'. Below the logos, there are three main sections: 1) 'Page Builder' which contains placeholder text: 'Reprehenderit enim eiusmod high life accusamus terry richardson ad squid. dolor brunch. Food truck quinoa nesciunt laborum eiusmod. Brunch 3 wolf r...'; 2) 'Drag and Drop' which has a close button 'X'; 3) 'WordPress Theme'.

Another example: interactive web visualization

Raw JavaScript

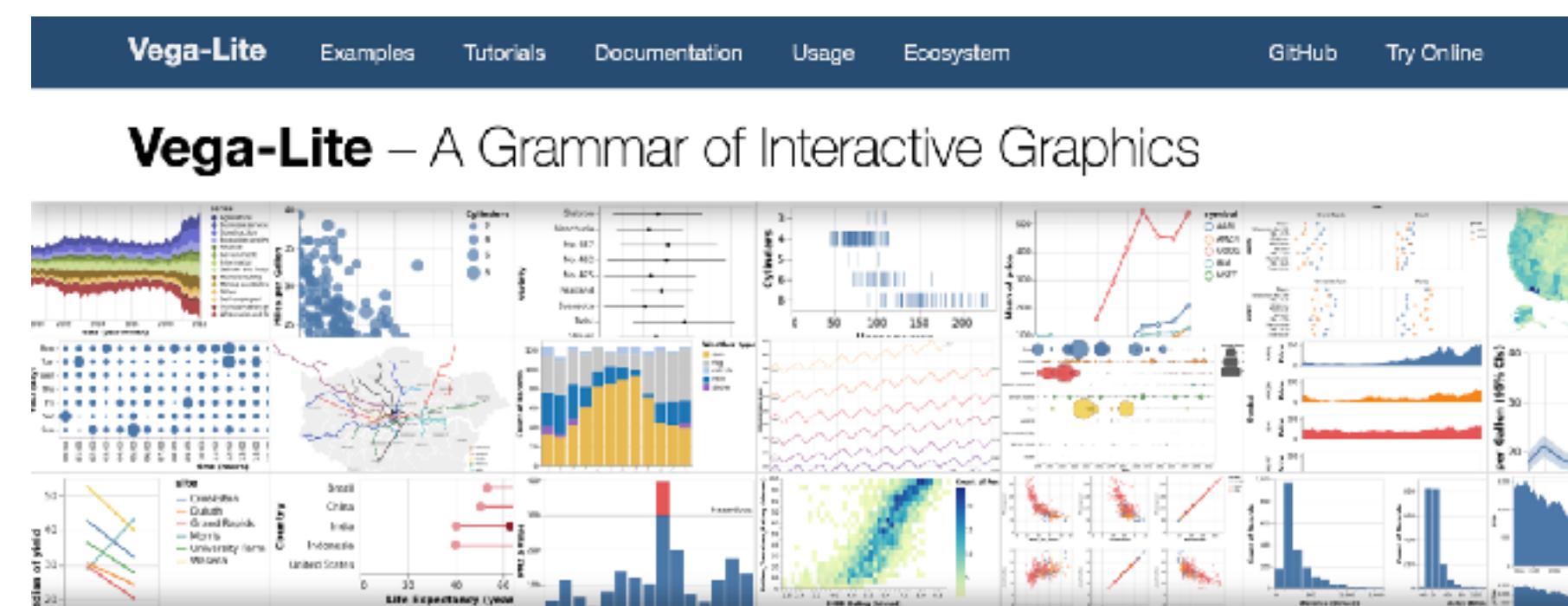
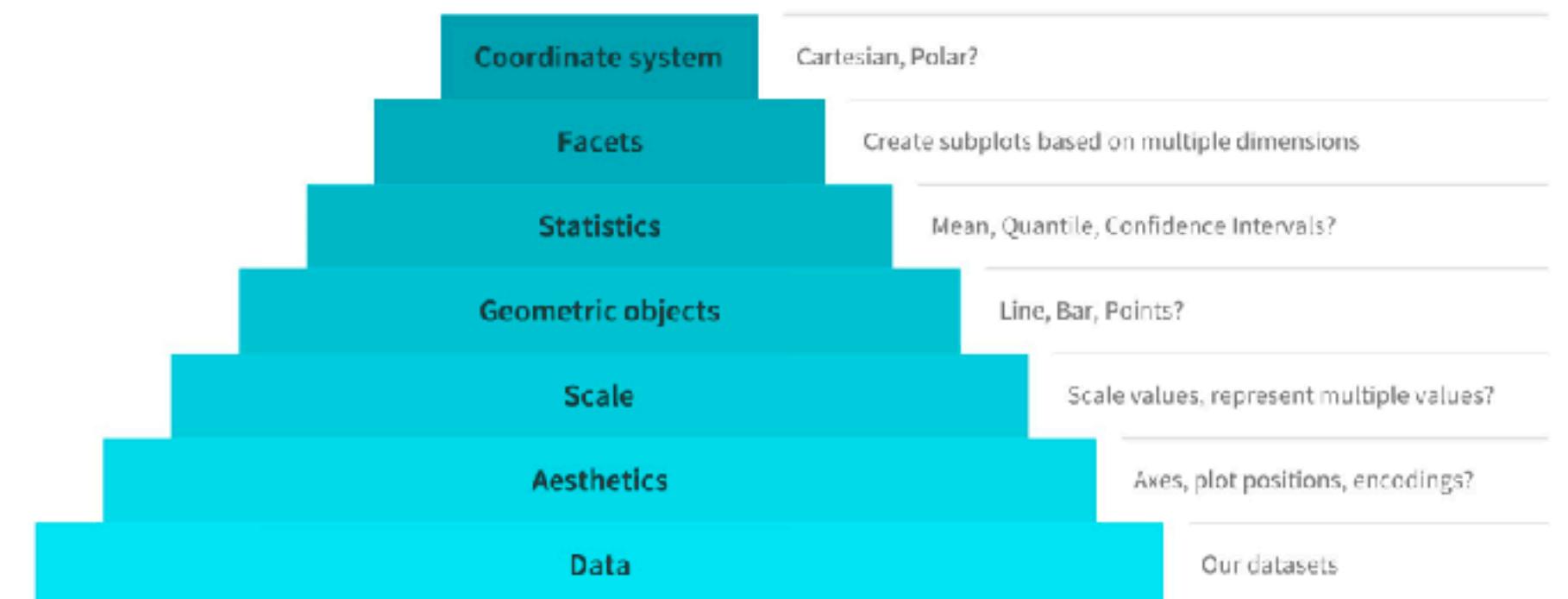
d3.js (JavaScript library)

Vega (visualization grammar)

Vega-Lite (simplified grammar)

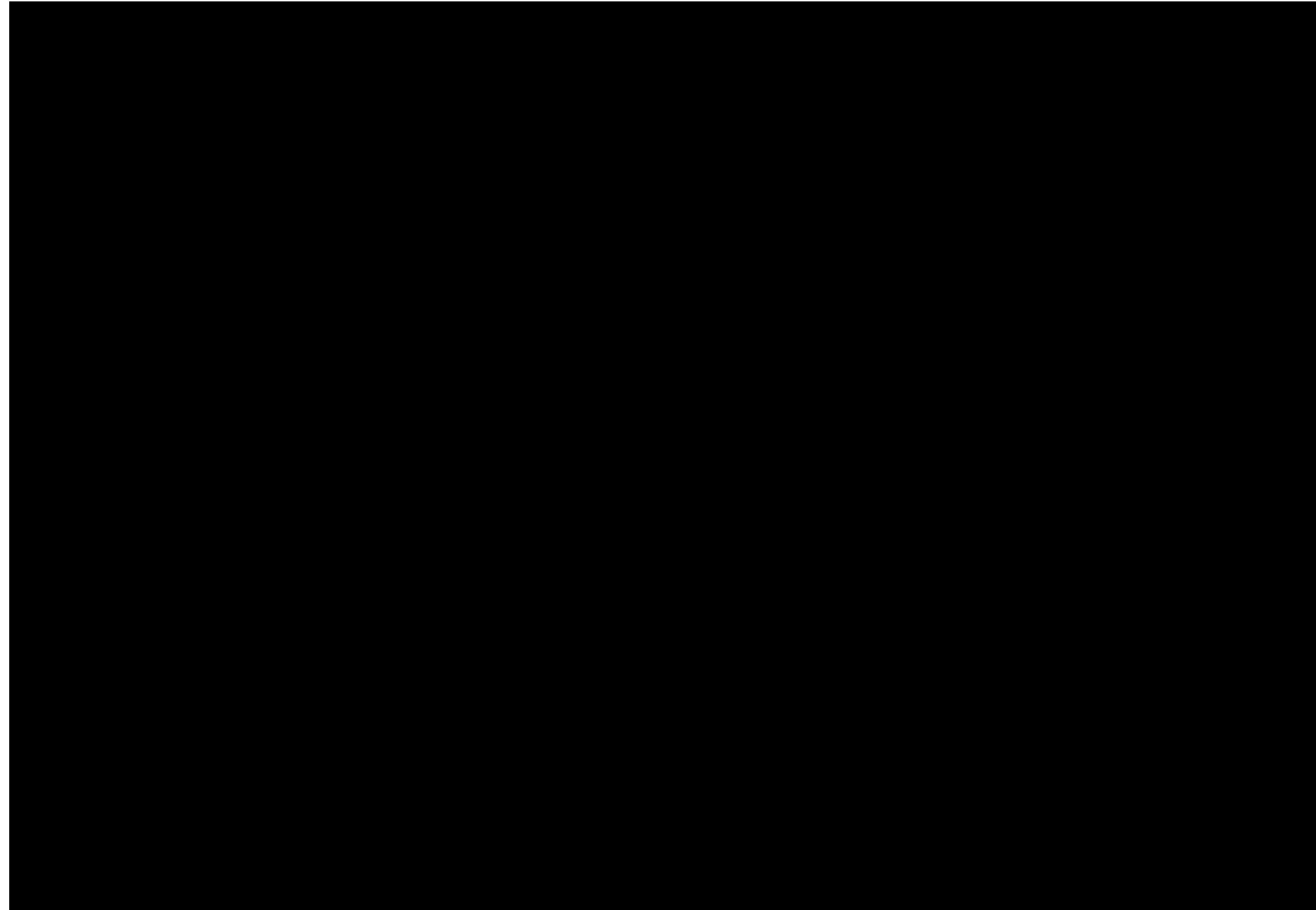
Voyager (web-based GUI builder)

Major Components of the Grammar of Graphics

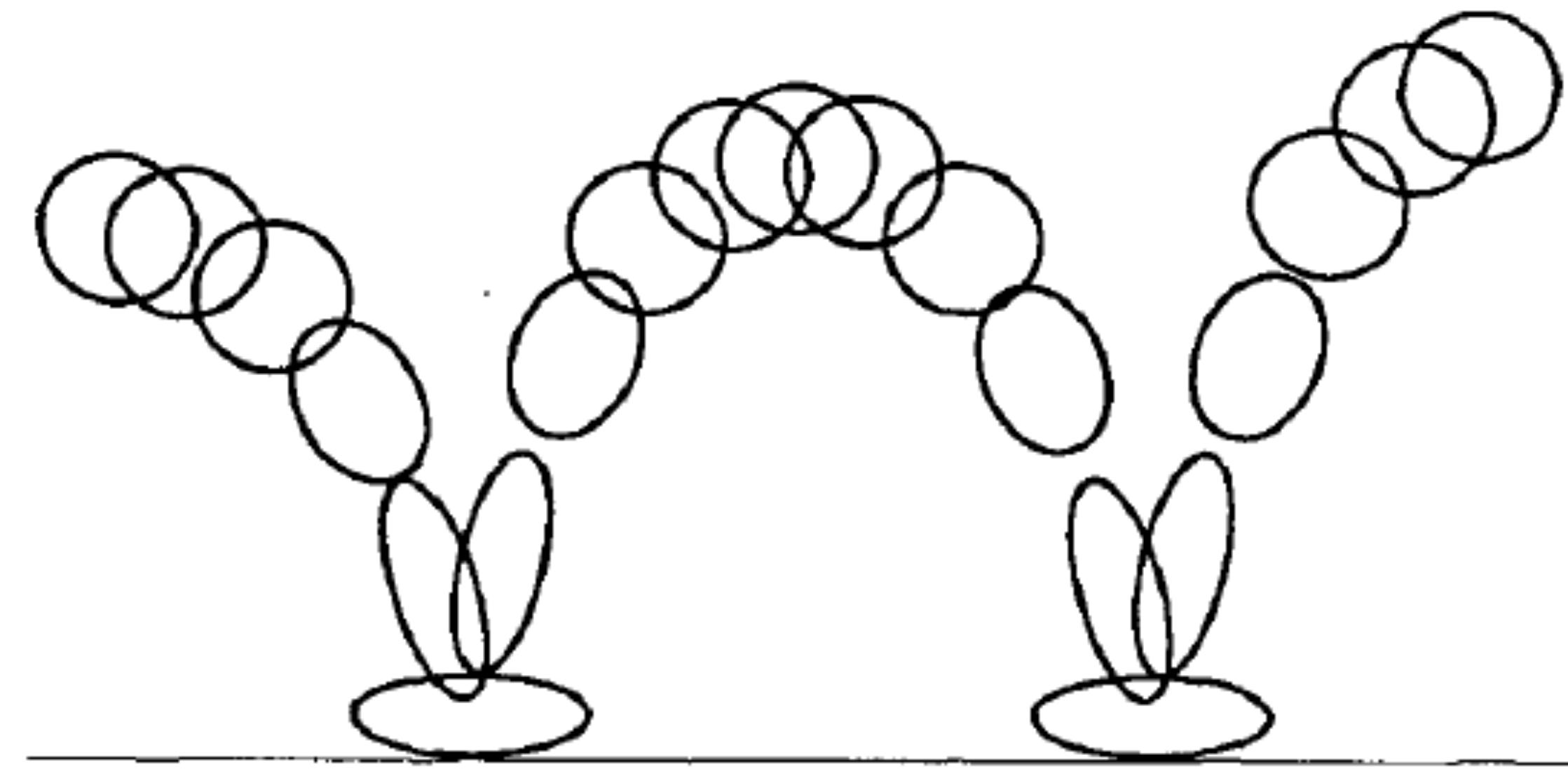


One more example: animation!

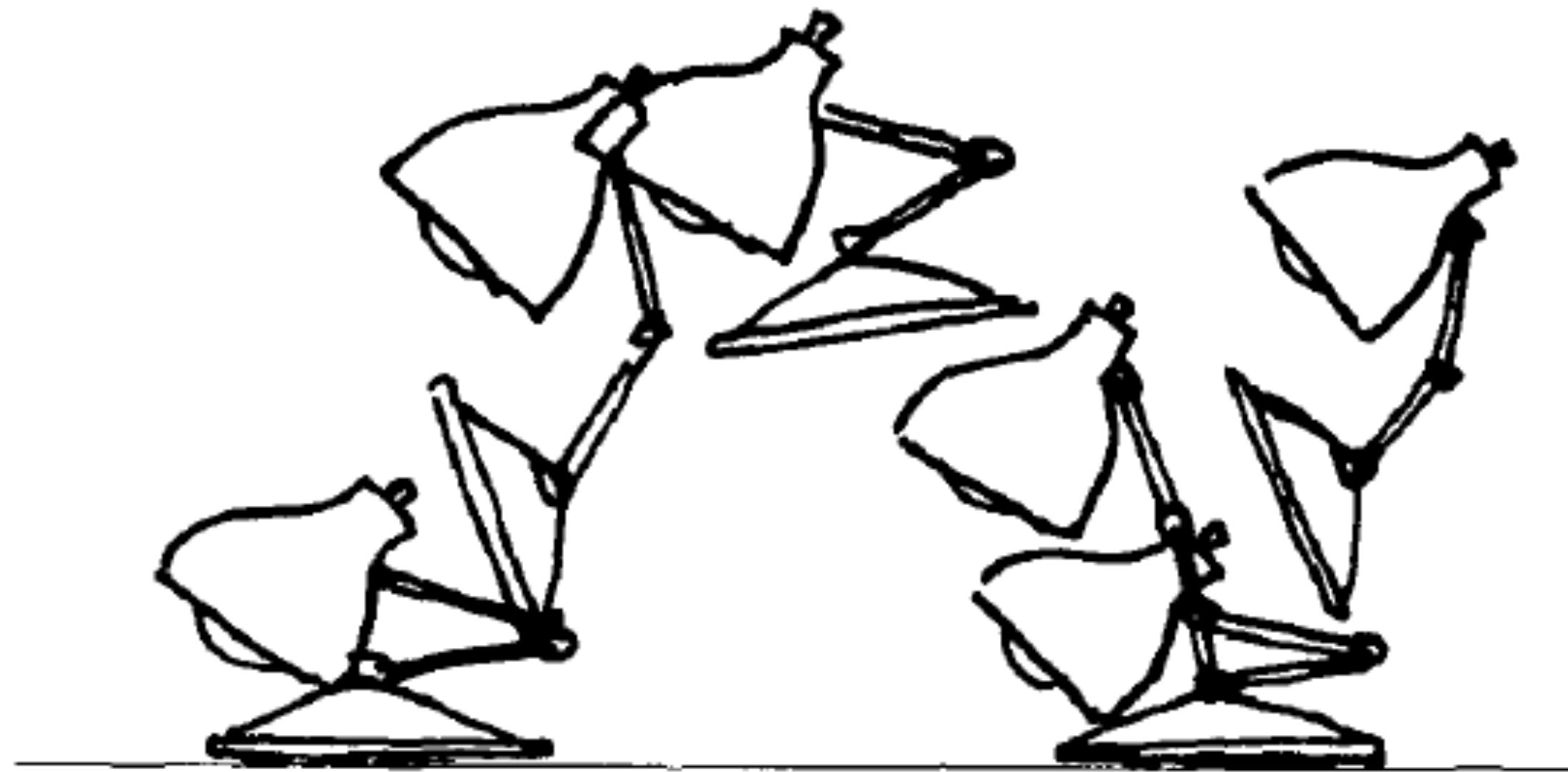
What are some common animation techniques you see here to convey something?



Squash and Stretch



Squash and Stretch



Squash and Stretch

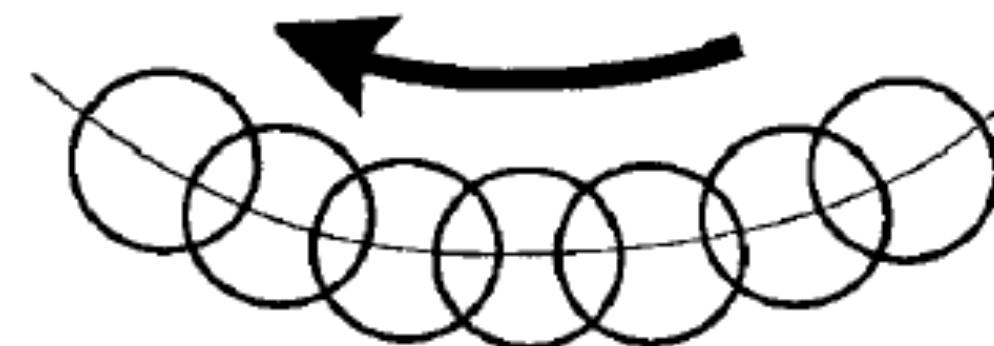


FIGURE 4a. In slow action, an object's position overlaps from frame to frame which gives the action a smooth appearance to the eye.

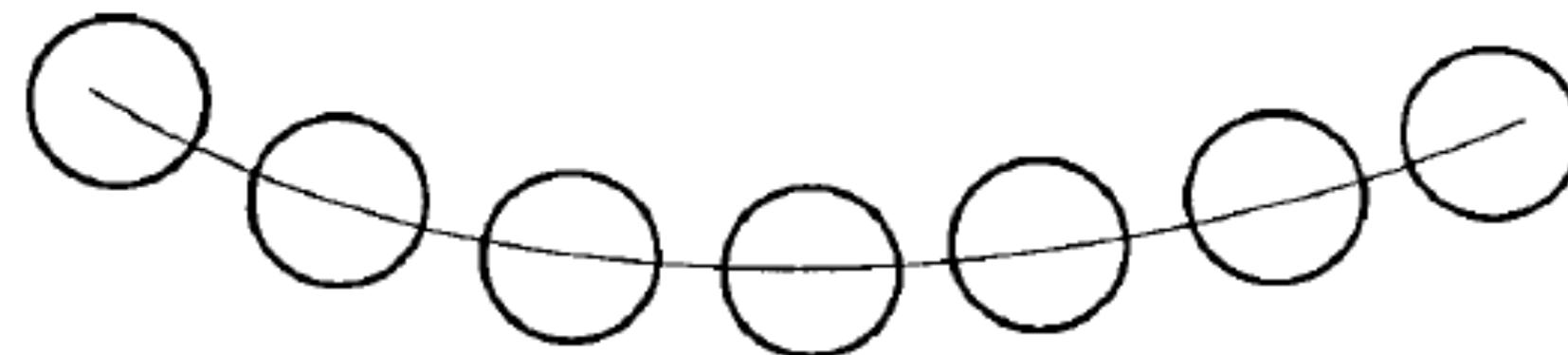


FIGURE 4b. Strobing occurs in a faster action when the object's positions do not overlap and the eye perceives separate images.

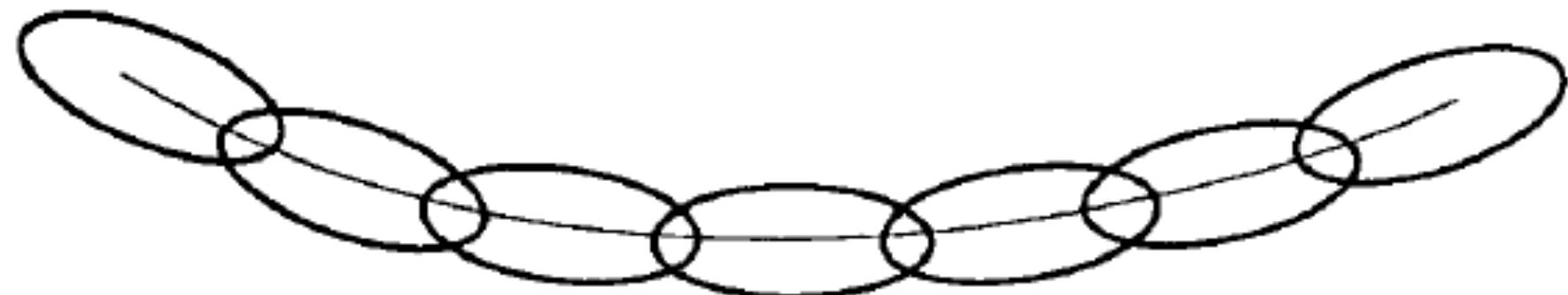
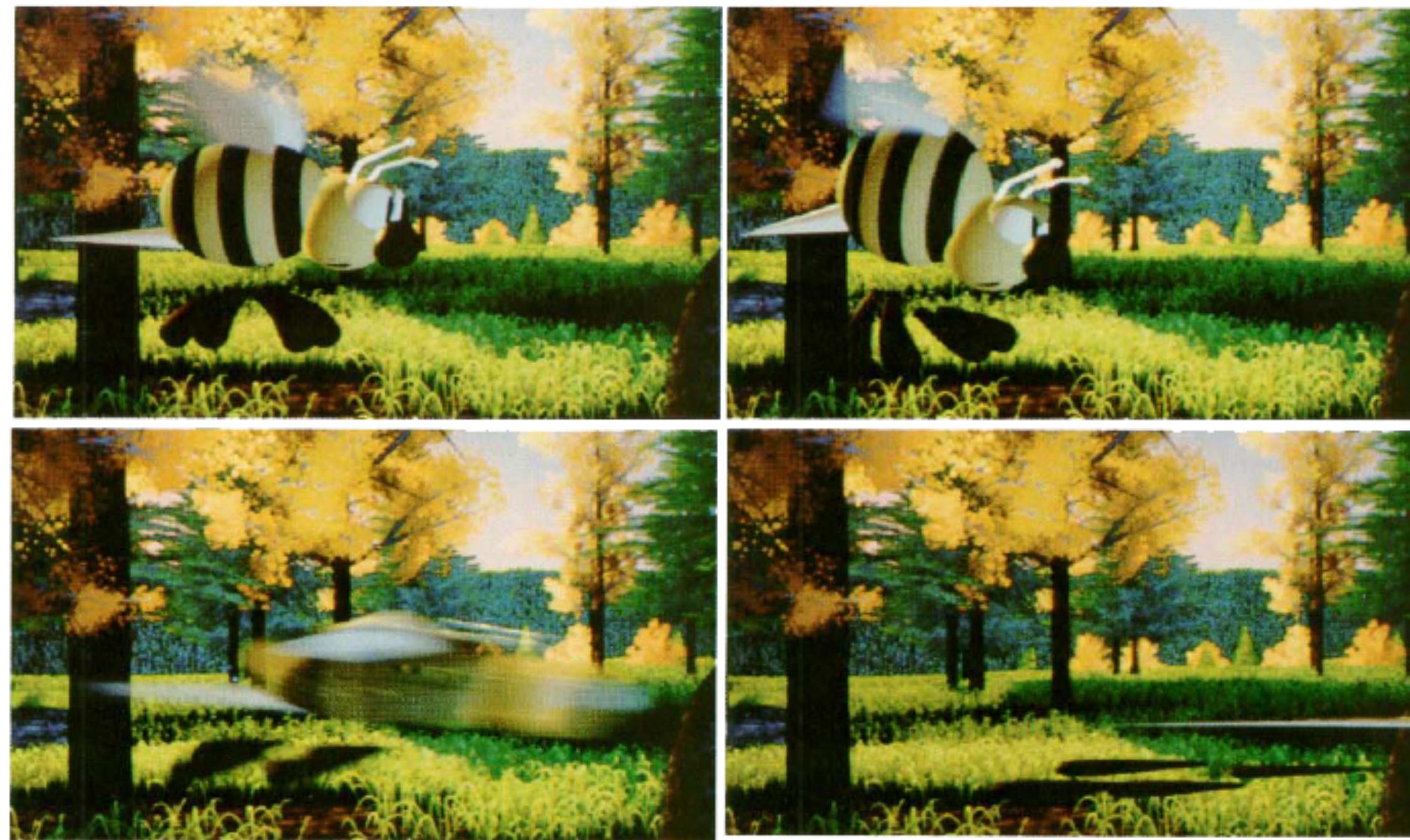


FIGURE 4c. Stretching the object so that it's positions overlap again will relieve the strobing effect.

Anticipation



Slow in, Slow out

Objects with mass must accelerate and decelerate

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

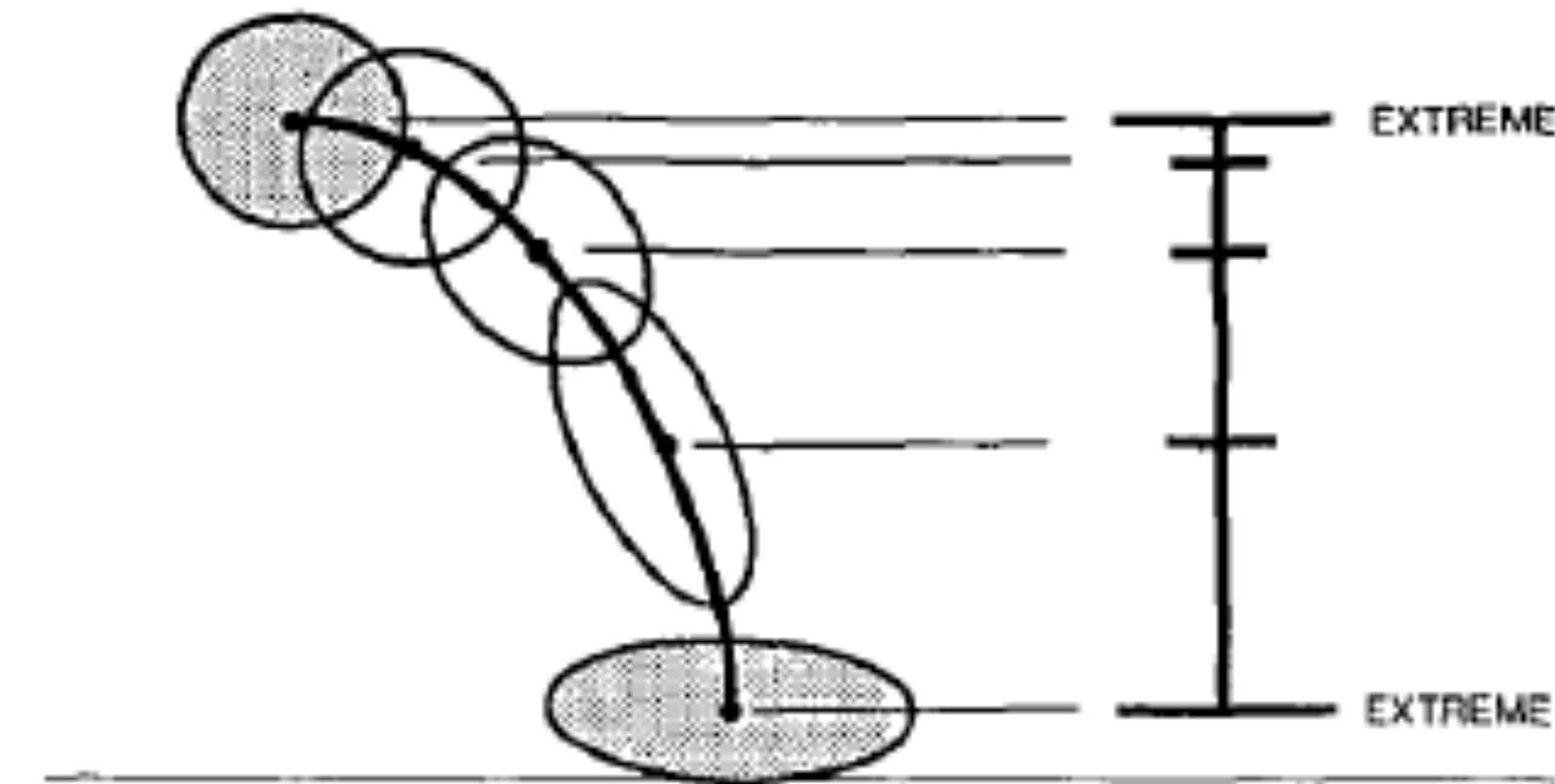


FIGURE 9. Timing chart for ball bounce.

Combine principles into an animation toolkit



What can UI 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.

Published in UIST'93: User Interface Software and Technology, Atlanta, GA, November 3-5, 1993, pp. 45-55

Animation: From Cartoons to the User Interface

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You must learn to respect that golden atom, that single frame of action, that 1/24th of a second, because the difference between lightning and the lightning bug may hinge on that single frame.
— Chuck Jones [10]

ABSTRACT

User interfaces are often based on static presentations, a model ill suited for conveying change. Consequently, events on the screen frequently startle and confuse users. Cartoon animation, in contrast, is exceedingly successful at engaging its audience; even the most bizarre events are easily comprehended. The Self user interface has served as a testbed for the application of cartoon animation techniques as a means of making the interface easier to understand and more pleasant to use. Attention to timing and transient detail allows Self objects to move solidly. Use of cartoon-style motion blur allows Self objects to move quickly and still maintain their comprehensibility. Self objects arrive and depart smoothly, without sudden materializations and disappearances, and they rise to the front of overlapping objects smoothly through the use of dissolve. Anticipating motion with a small contrary motion and pacing the middle of transitions faster than the endpoints results in smoother and clearer movements. Despite the differences between

these tableaux, but less thought is given to the transitions between them. Visual changes in the user interface are sudden and often unexpected, surprising users and forcing them to mentally step away from their task in order to grapple with understanding what is happening in the interface itself.

When the user cannot visually track the changes occurring in the interface, the causal connection between the old state of the screen and the new state of the screen is not immediately clear. How are the objects now on the screen related to the ones which were there a moment ago? Are they the same objects, or have they been replaced by different objects? What changes are directly related to the user's actions, and which are incidental? To be able to efficiently and reliably interpret what has happened when the screen changes state, the user must be prepared with an expectation of what the screen will look like after the action. In the case of most interactions in unanimated interfaces, this expectation can only come by experience; little in the interface or the action gives the user a clue about what will happen, what is happening, or what just happened.

For example, the Microsoft Windows interface [15] expands an icon to a window by eliminating the icon and drawing the window in the next instant. In this case the first static presentation is the screen with the icon; the next is the

What can UI toolkits also learn from animation?

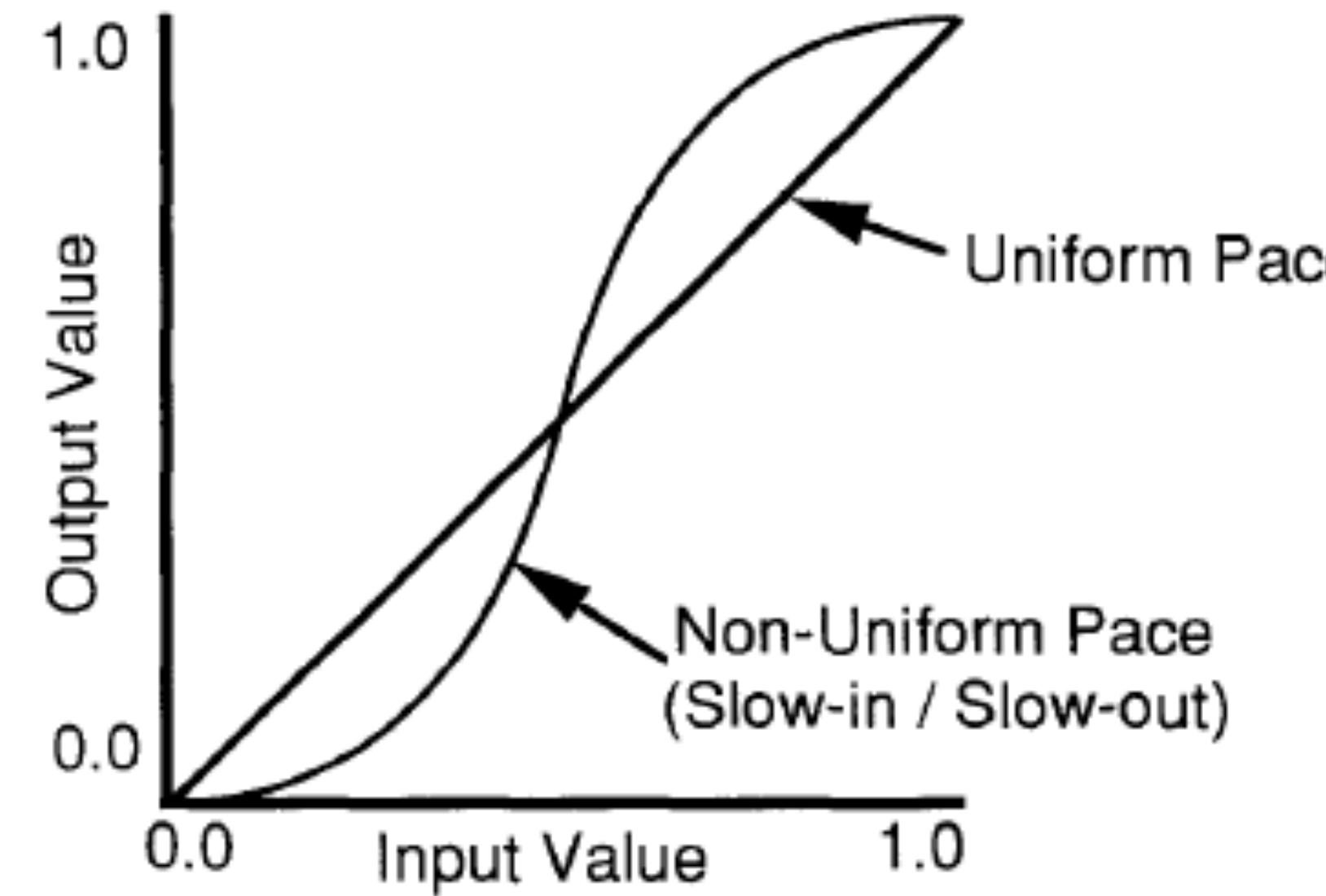


Figure 4. Two Example Pacing Functions

Animation Support in a User Interface Toolkit: Flexible, Robust, and Reusable Abstractions

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ABSTRACT

Animation can be a very effective mechanism to convey information in visualization and user interface settings. However, integrating animated presentations into user interfaces has typically been a difficult task since, to date, there has been little or no explicit support for animation in window systems or user interface toolkits. This paper describes how the Artkit user interface toolkit has been extended with new animation support abstractions designed to overcome this problem. These abstractions provide a powerful but convenient base for building a range of animations, supporting techniques such as simple motion-blur, "squash and stretch", use of arcing trajectories, anticipation and follow through, and "slow-in / slow-out" transitions. Because these abstractions are provided by the toolkit they are reusable and may be freely mixed with more conventional user interface techniques. In addition, the Artkit implementation of these abstractions is robust in the face of systems (such as the X Window System and Unix) which can be ill-behaved with respect to timing considerations.

Keywords: object-oriented user interface toolkits, window systems, animation techniques, dynamic interfaces, motion blur, real-time scheduling.

often be much more easily comprehended in a moving scene than in a single static image or even a sequence of static images. For example, the "cone tree" display described in [Rube93] provides a clear illustration that the use of continuous motion can allow much more information to be presented and understood more easily.

However, even though the potential benefits of animation in user interfaces have been recognized for some time ([Baec90] for example, surveys a number of uses for animation in the interface and cites their benefits and [Stask93] reviews principles for using animation in interfaces and describes a number of systems that make extensive use of animation in an interface), explicit support for animation is rarely, if ever, found in user interface support environments. The work described in this paper is designed to overcome this problem by showing how flexible, robust, and reusable support for animation can be incorporated into a full scale object-oriented user interface toolkit. Specifically, this paper describes how the extension mechanisms of Artkit — the Advanced Reusable Toolkit (supporting interfaces in C++) [Henr90] — have been employed to smoothly integrate animation support with other user interface capabilities.

Now in almost every major UI toolkit out there!
(e.g., Microsoft's WPF, JavaFX, jQuery)

~3 minute break!

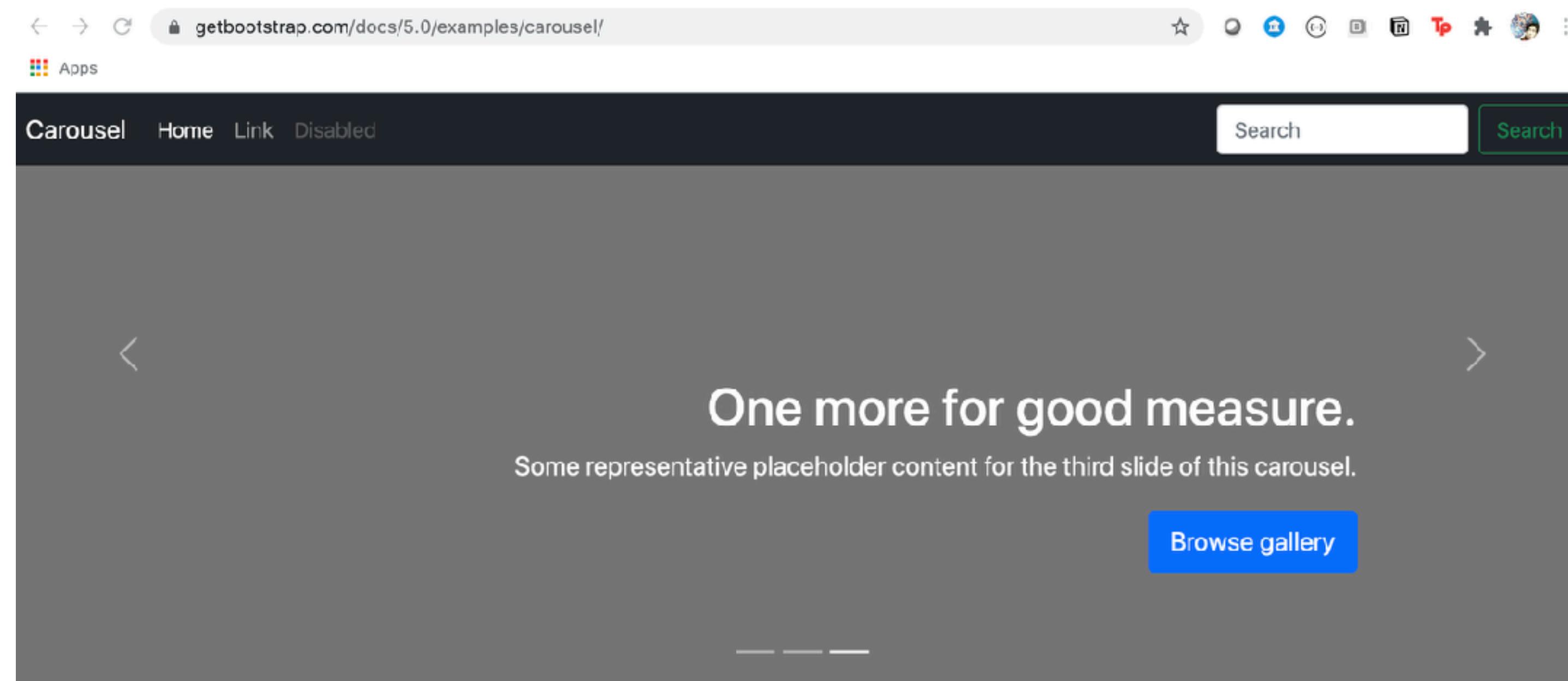
UI Patterns

What is a UI or interaction 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.

Example

- UI **Toolkit**: Bootstrap <https://getbootstrap.com/>
- ...includes the **design pattern**: picture carousel landing page
- ...can incorporate important **design principles** such as:
 - [Heuristic #7] Flexibility and efficiency of use (can wait for items to swipe OR click to speed ahead)



Activity

- Here's a really old website!
- But I bet you can still answer questions about this site, how it works, and what it's for.
- Why? Many UI patterns used on this page are still used today.
- Try to spot some patterns that you recognize as still in use today and note them here: <https://tinyurl.com/bdec5s9j>

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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".

	Our Price	List Price
Weezer, Weezer	\$6.99	\$18.97
Gutterflower, Goo Goo Dolls	\$9.00	\$18.98
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Echoes, Pink Floyd	\$11.54	\$24.97
18, Moby	\$10.99	\$18.98

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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.

	Our Price	List Price
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[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!

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".

	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.

	Our Price	List Price
Monster's Ball (DVD)	\$11.25	\$24.99

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...](#)

Navbars

navigation bar in the top of the page

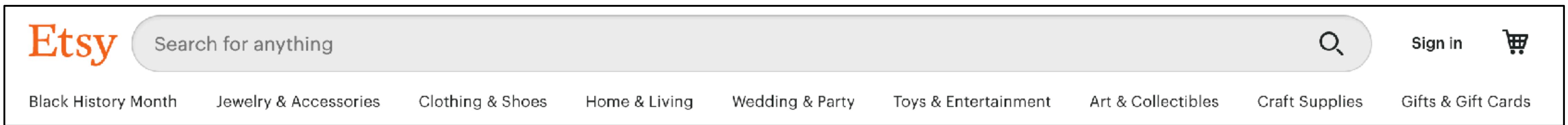
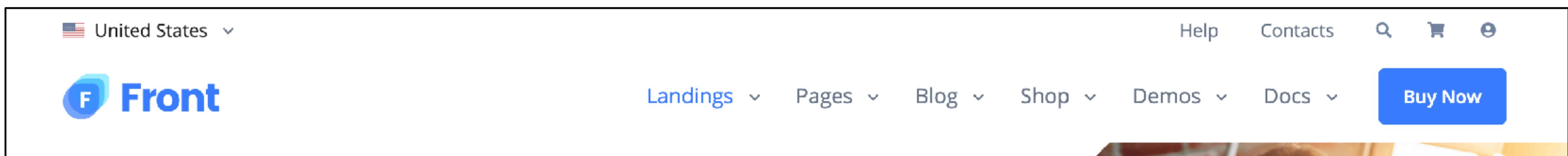
account settings, cart, login in top right



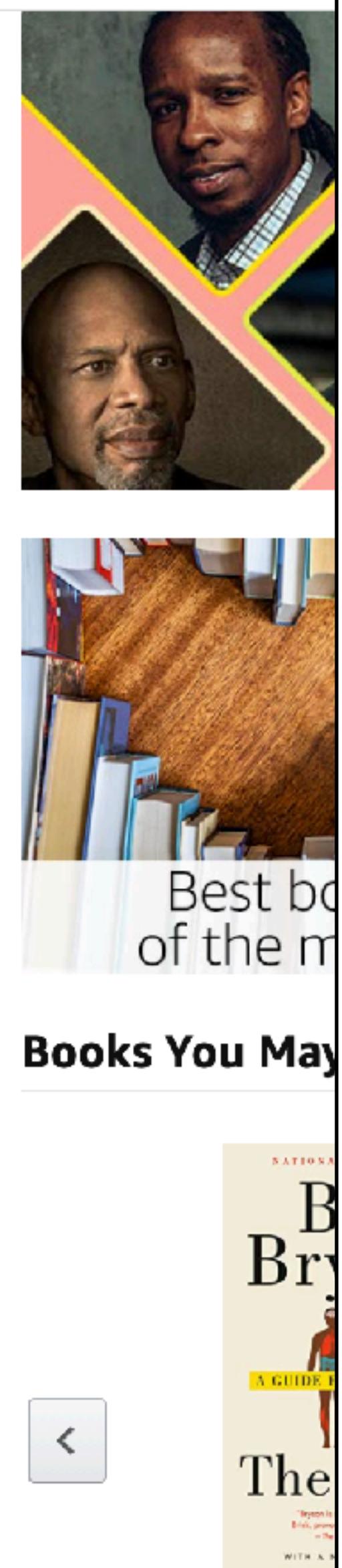
search at the top of the page

Below: Bootstrap templates and real websites today

Some visual cues are different and a different look and feel is in vogue but much of the design pattern of the navbar is the same.



Amazon website



Sidebars

Bootstrap template

A screenshot of a Bootstrap sidebar template titled 'Shopper.'. It includes a search bar, a navigation menu with items like 'Home', 'Default', 'Classic', etc., and a large image of a person's legs and a '50%' discount sign.

sidebar
faceted
browsing

A screenshot of a website sidebar with a red border. It contains sections for 'Welcome', 'DESKTOP LIQUIDATION CENTER', 'Categories' (Books, Music, Movies/DVDs, Games), and various promotional banners for new releases and deals.

The “L” shape navigation

The screenshot shows the half.com website interface. A large red box highlights the left sidebar, which contains a 'welcome' section with links to 'Learn about Buying', 'Learn about Selling', and 'Register Now!', and a 'Categories' section listing 'Books', 'Music', 'Movies/DVDs', and 'Games'. Another red box highlights the top navigation bar, which includes links for 'Home', 'Books', 'Music', 'DVDs/Movies', 'Video Games', 'Computers & Software', 'Electronics', 'Everything Else...', 'Gift Certificates', 'Wish List', 'Pre-Orders', 'Sell Your Stuff', and 'New Users'. Below the top bar is a search bar with the placeholder 'Search: All Categories' and a 'go' button.

The screenshot shows the 'Group for User Interface Research' website. A red box highlights the top navigation bar, which includes links for 'Home', 'Projects', 'People', 'Publications', and 'Links'. Another red box highlights a sidebar on the left labeled 'DENIM and SILK' containing links for 'Documentation', 'Support', 'Resources', and 'Publications'. The main content area displays a section titled 'DENIM and SILK' with a laptop image and text about buying and shipping.

Link to home

First-level navigation



Tables

Tabular view of data

Alternate colors of rows, gray and white

Column headers at the top, bolded

Left column is left aligned

Numerical columns are center-aligned (maybe should be right-aligned)

The screenshot shows a website layout with several sections. At the top left is an "Announcement Board" with the text "Updated Jun 13, 2002". Below it is a "DESKTOP LIQUIDATION CENTER" banner with the text "as low as \$249!" and an image of a computer monitor. To the right is a "Music" section featuring a CD icon and a thumbnail of a Chili Peppers album cover. A promotional message for the album says "Red Hot Price for the Chili Peppers' New CD: \$11.88!". Below this is a table titled "In-Stock Now!" with the following data:

		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

A red box highlights the first two rows of the table. At the bottom of the page, there's a "Movies" section with a thumbnail of the movie "The Royal Tenenbaums" and a promotional message: "Just Released: The Royal Tenenbaums for \$18.45".

Similar Bootstrap component

Striped rows

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

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

Grid Layout

Grid layout with header, 3 columns, and a main center column

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

Grid layouts are such a common pattern that they are now buildable using vanilla CSS and recognized in all major browsers as of 2017

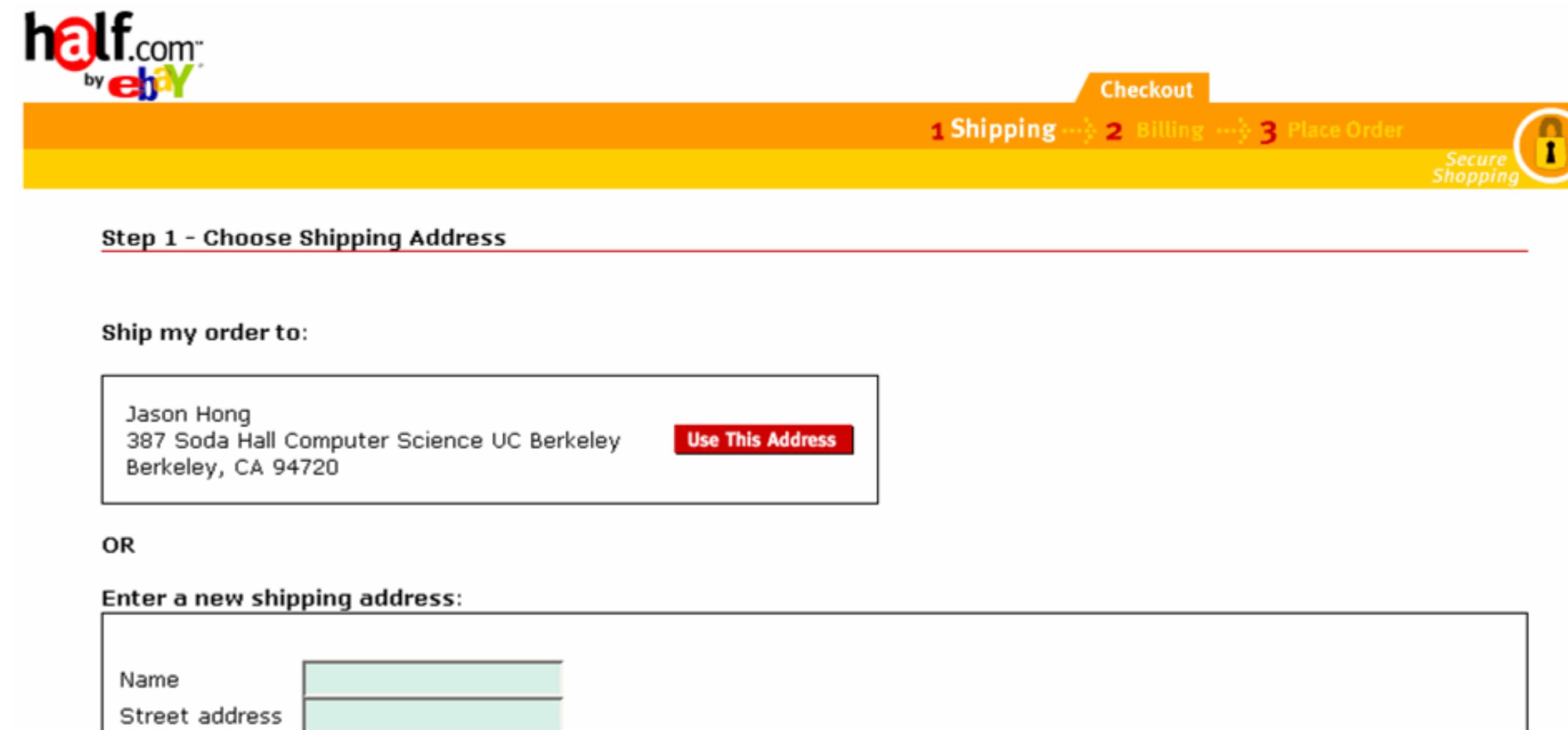


The screenshot shows the half.com website, which uses a grid layout with the following structure:

- Header**: Top navigation bar with links for my account, cart, help, eBay home, and sign in.
- Left Column**: Welcome section with links for Learning about Buying, Selling, and Registering, and an Announcement Board updated on Jun 13, 2002. It also features a "DESKTOP LIQUIDATION CENTER" offer.
- Center Column**: The main content area, highlighted with a red border. It includes:
 - A promotional banner for "New CD Releases!" at \$11.88.
 - A "Music" section showing a thumbnail for "Red Hot Chili Peppers' New CD" and a table of in-stock music titles with their prices.
 - A "Movies" section showing a thumbnail for "The Royal Tenenbaums" and a table of in-stock movie titles with their prices.
- Right Column**: Advance Orders section featuring deals like "The Simpsons: Complete 2nd Season" and "The Sopranos: Complete 3rd Season". It also includes sections for "In Computers" (Gateway Desktop Under \$400) and "More great deals...".

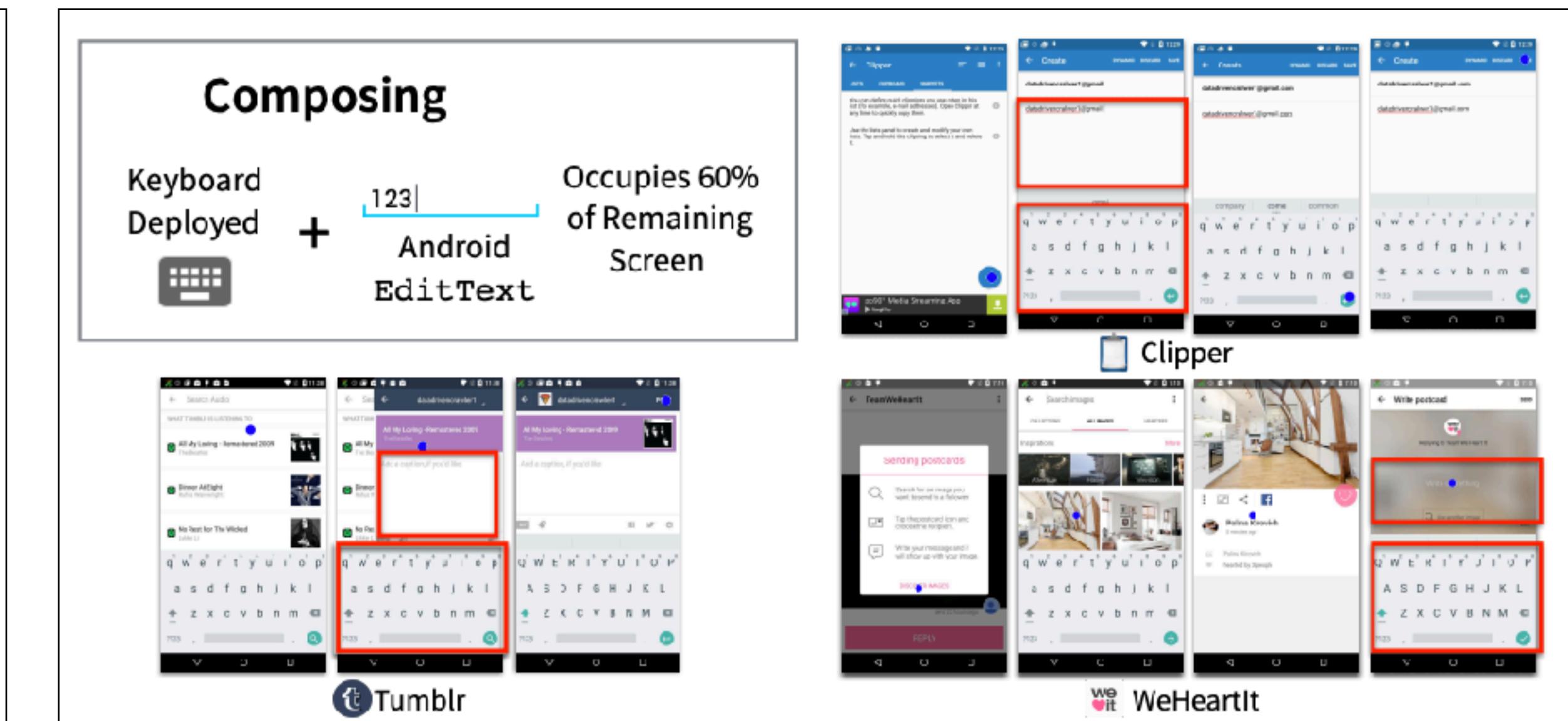
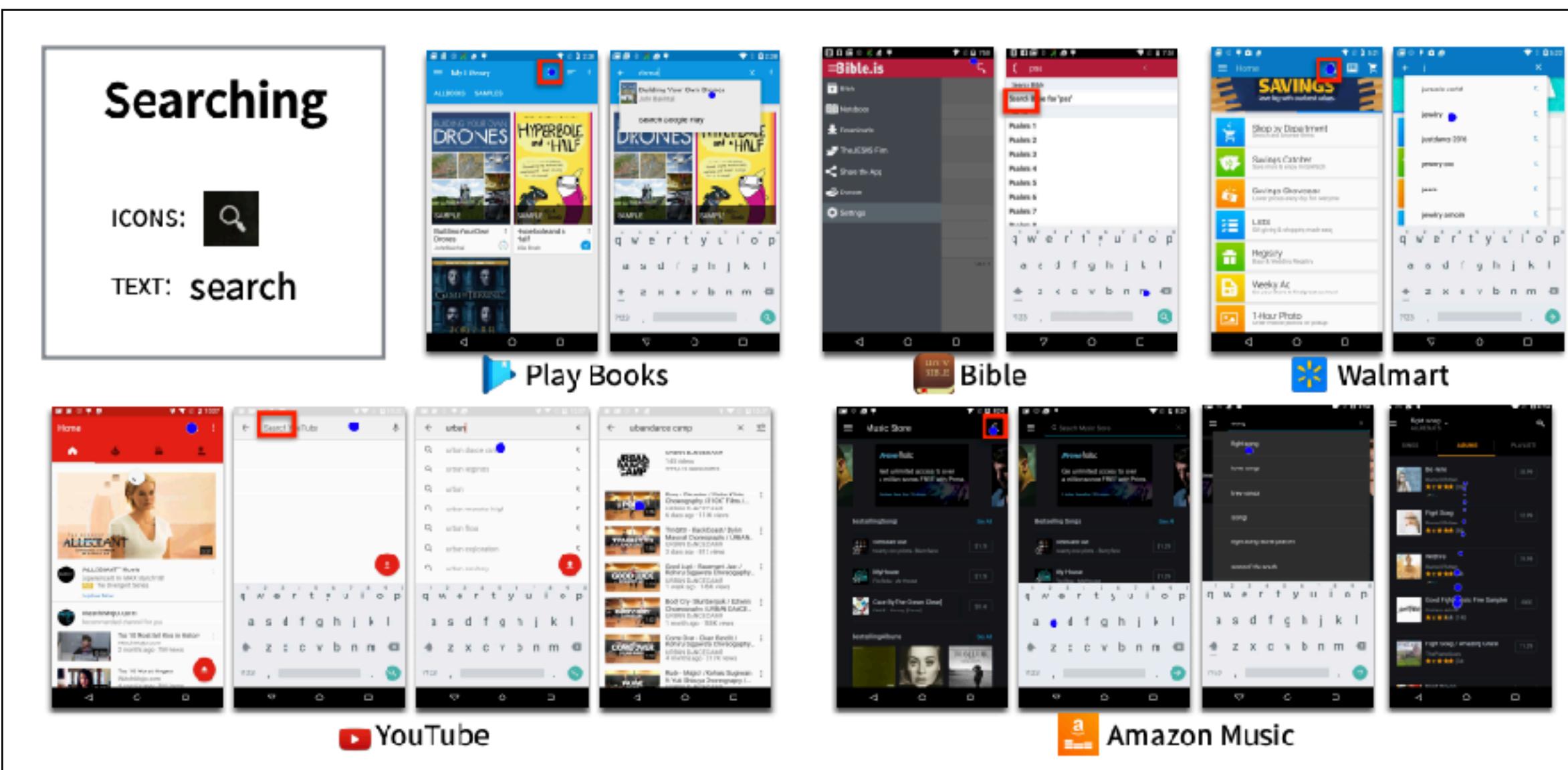
Patterns can also describe common user flows

- 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.



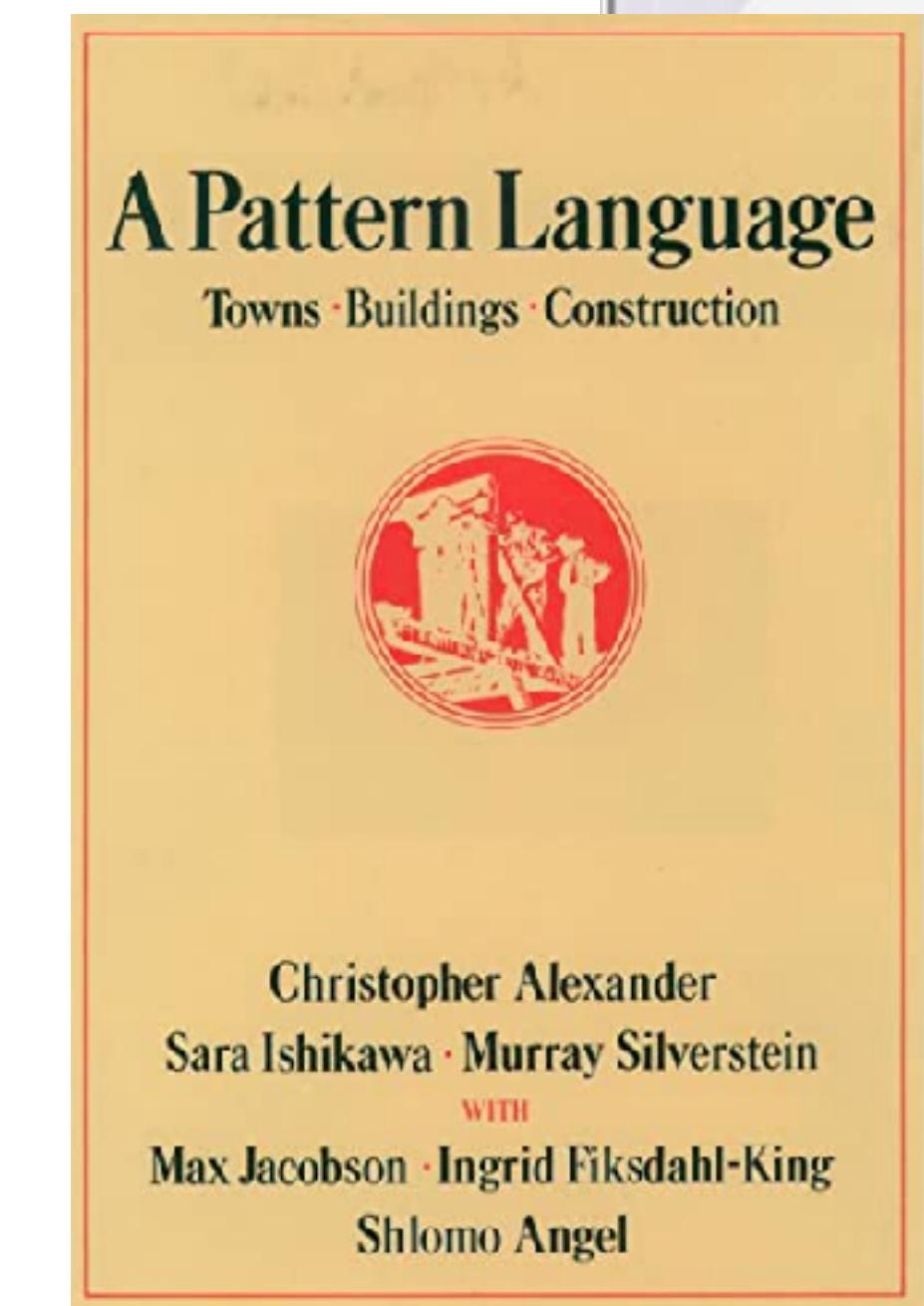
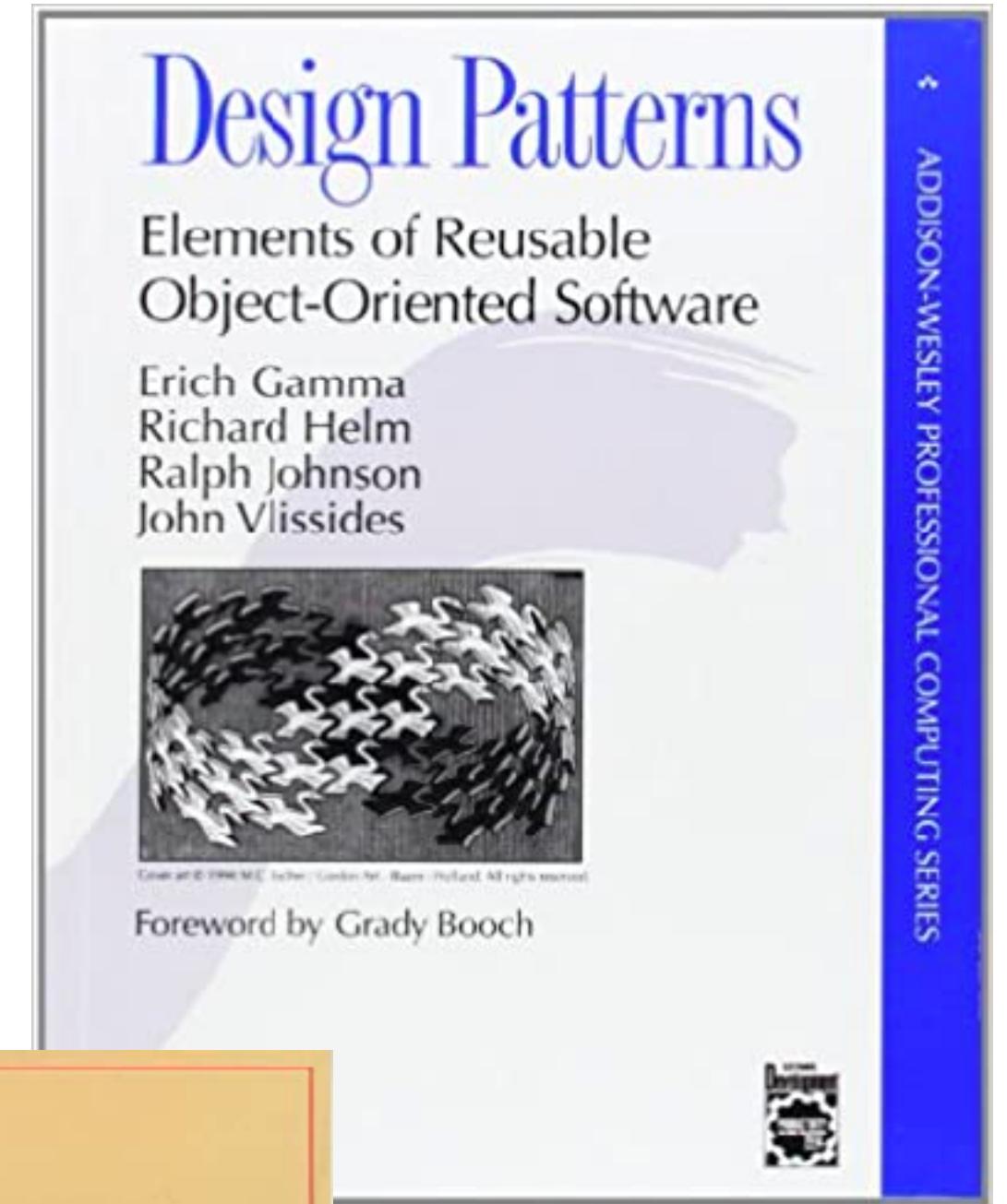
Patterns can also describe common user flows

- common mobile app UI flows



Design patterns aren't just for UIs

- 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 (the precursor to Wikipedia which was called WikiWikiWeb).



Why use design patterns?

- 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
- Design patterns are a tool for knowledge sharing

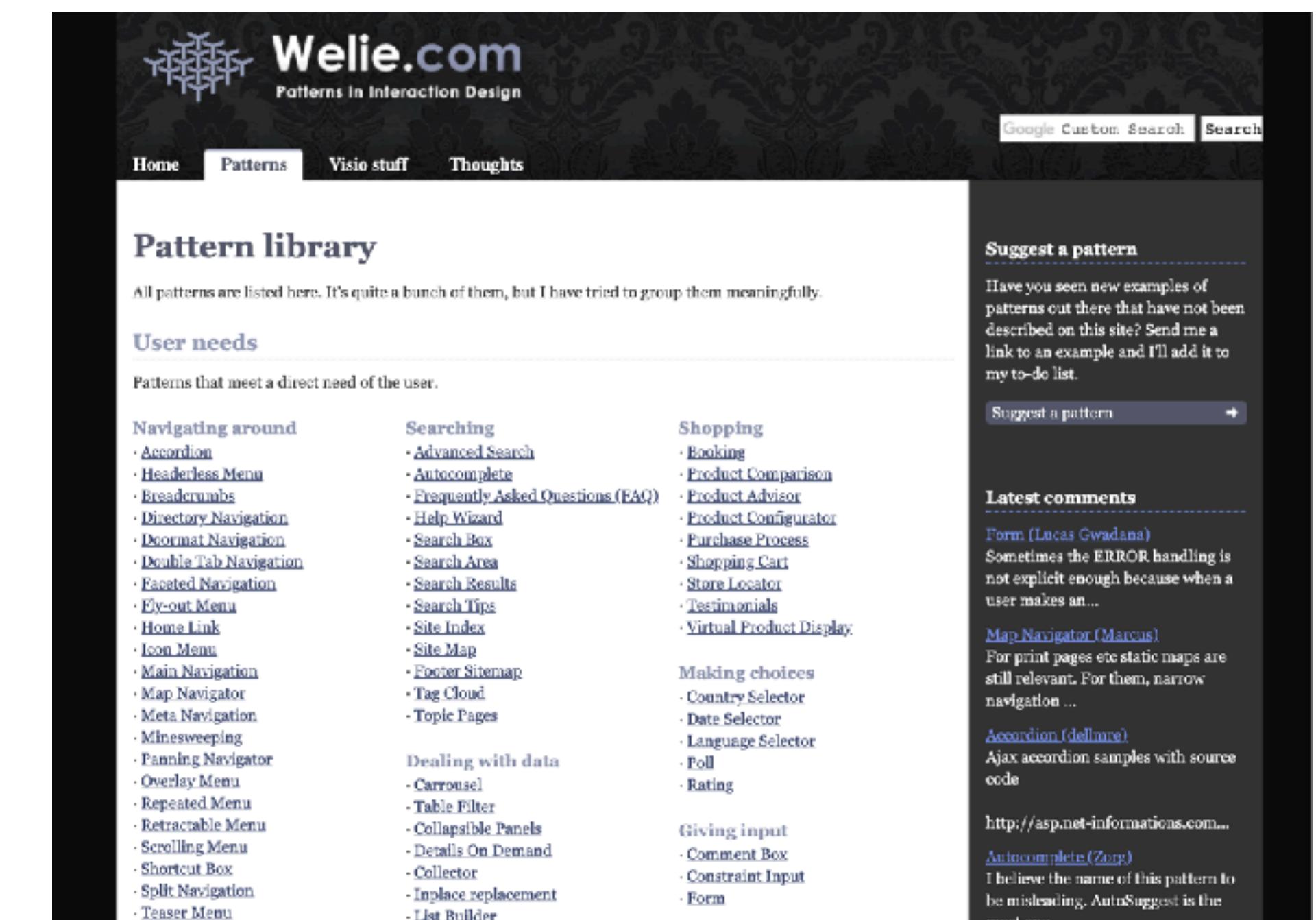
Patterns support creativity

- 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

UI Patterns for your Digital Mockup

- 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 digital mockup (3d):
 - <http://www.welie.com/patterns/index.php>
 - <http://ui-patterns.com/>
 - Bootstrap components: <https://getbootstrap.com/>
 - Many more out there!

User Interface Design Patterns	Persuasive Design Patterns
Getting input Getting the user to input data is a task that should be tailored to the context of use.	Cognition Patterns of psychological tendencies that cause the human brain to draw incorrect conclusions.
Dealing with data Data can be searched, formatted, overviewed, and browsed in a variety of ways.	Game mechanics Games engage, involve, and influence us through its playful nature.
Social Allow the user to associate, communicate, and interact with other people online.	Perception and memory Patterns in how we visually perceive, interpret, and remember meanings as we interact with systems.
Miscellaneous Patterns that haven't found their main category yet.	Feedback As the users interacts with your system feedback motivate them take the next step.
Onboarding The user needs to acquire the necessary knowledge, skills, and behaviors to become effective.	Social Allow the user to associate, communicate, and interact with other people online.



Looking forward in the course

Looking Forward

- Remainder of this course:
 - **Assignment 3d (Digital Mockup)** <- this is where we end w.r.t. the design process of your prototype. For a real product with a LOT more time, you'd do usability testing of the mockup, and then proceed to a Computer Prototype, then more user testing.
 - Due Monday at 11AM
 - **Exam**
 - This Thursday, after a review session in class, you'll have from the end of class to 10AM the next day to take the exam. We estimate it should take roughly 2-2.5 hours.
 - Open to lecture slides and notes, covering the topics from lectures. NOT open to the internet or your classmates.
 - **Poster session (Assignment 4)**
 - Next Thursday in class. We have a great roster of external judges! We'll start talking about this in Friday's section.
 - **Assignment 3e (Final Blog post)**
 - Will be due after the end of class, and is a public write-up of all of Assignment 3.

Group work time on 3d!