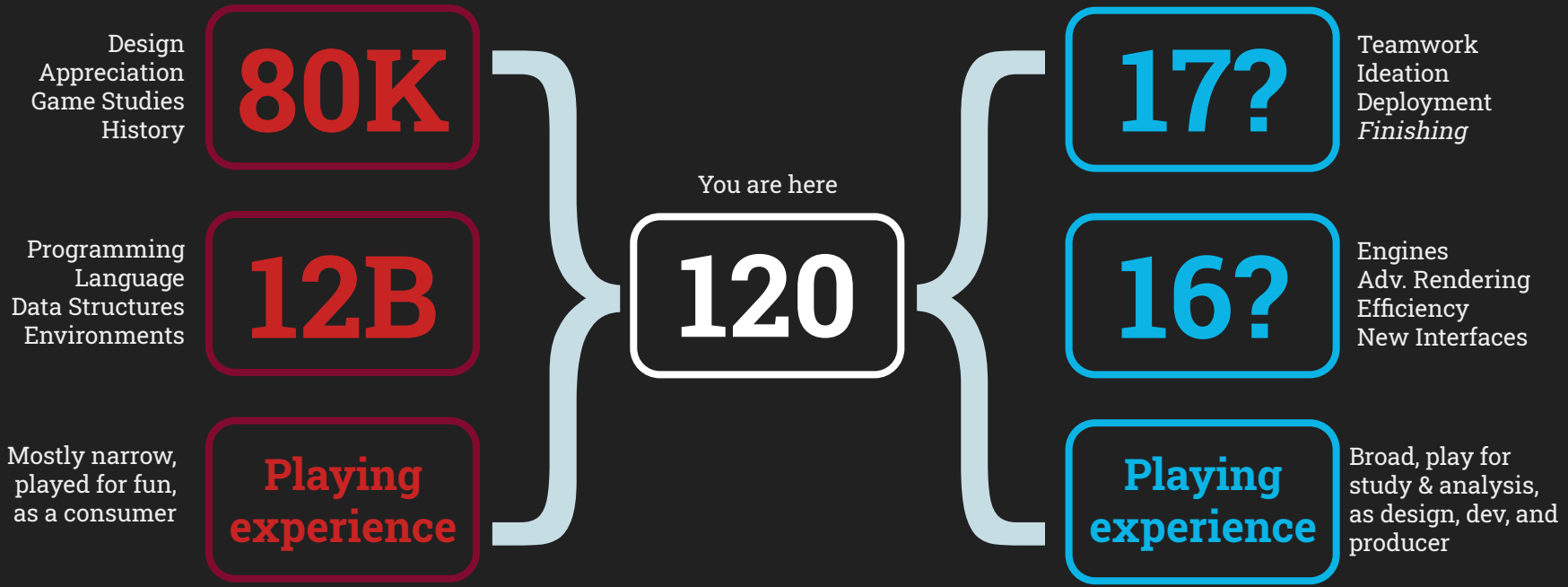
CMPM 120

Game Development Experience

CMPM 120

Be prepared to ask me a question about the class

Where you are



Why You Are Here

- Learn the basic principles of game programming and put them into practice
- Learn how to do the low-level implementation so we can turn ideas into working games
- Learn how technology *and* teamwork affect game design (PLO 7 & 8)

The Team

Isaac Karth

- ➔ he/him
- ➔ Teaching CMPM 120
- ➔ ikarth@ucsc.edu
- ➔ Computational Media PhD candidate (I do procedural generation stuff)

Dayna Diamond

- ➔ Teaching AGPM 120

Who are you?

If you think of yourself as a programmer:
What is one artwork that you like?

If you think of yourself as an artist:
What is one programming element that you like?

https://forms.gle/qRAqjxNeVN3mGNDD8

Who are you?

If you think of yourself as a programmer:

Albrecht Dürer, *Young Hare*

If you think of yourself as an artist:

```
[list_item for list_item in python_list_comprehension]
```

Who are you?

What is one thing about you or your interests that has nothing to do with games?

https://forms.gle/qRAqjxNeVN3mGNDD8

Who are you?

Some Bad News

Programming Videogames is Difficult

Especially in **5 weeks**,
in Summer,
and working in a team.

5 Weeks is Short

We're speedrunning 120

```
var Environment = {
    code: [ "HTML5", "CSS", "JavaScript"],
    framework: "Phaser",
    collaboration: [ "git", "GitHub" ],
    editor: ["VSCode"],
    server: "Python"
}
```

NEWS LEARN DOWNLOAD EXAMPLES COMMUNITY PLUGINS

Desktop and Mobile HTML5 game framework

A fast, free and fun open source framework for Canvas and WebGL powered browser games.

DOWNLOAD & GET STARTED
Download or Fork via Github

3.18.1

PHASER FEATURES

- WEBGL & CANVAS
- PRELOADER
- PHYSICS
- SPRITES
- GROUPS
- ANIMATION
- PARTICLES
- CAMERA

- INPUT
- SOUND
- TILEMAPS
- DEVICE SCALING
- PLUGIN SYSTEM
- MOBILE BROWSER
- DEVELOPER SUPPORT
- WEB FIRST

Why Phaser?

- **Free**! (vs freemium)
- **Fast**! (computational: running smoothly on almost any device with a modern browser)
- **Instructor choice**! (has worked for for CGD+AGPM students in the past)
- **2D**! (finish and deploy your games faster, learn sooner)
- Actively supported and documented for **public use**! (not a local teaching toy)
- Lots of stuff "**for free**" (versus made by you in CMPM 164)
  - Game loop
  - Scene management
  - Physics, etc.

Some of the Languages I've Used

- ActionScript 2
- ActionScript 3
- BASIC
- Bash
- C
- C#
- C++
- Clojure
- ClojureScript
- Common Lisp
- DOS batch files
- HTML
- Inform 6
- Inform 7
- JavaScript
- Lingo
- Logo
- PHP
- Processing
- Python 2
- Python 3

Some of the Game Engines/Platforms I've Used

DirectX

XNA

Unity

Unreal

Ogre

Phaser

Processing

Flash

P5.js

Quil

Flixel

Scratch

NeoAxis

...and probably a bunch of stuff I'm forgetting.

There is no perfect...

...no perfect language

...no perfect framework

...no perfect engine

The sooner you learn this, the better.

You should be grateful
I'm not forcing you to
learn ClojureScript.

Why VSCode?

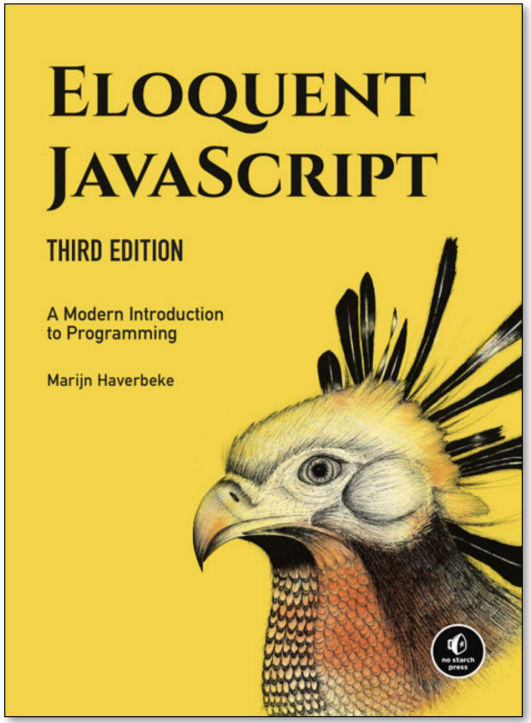
- Consistent experience across platforms (including Chromebooks)!
- Industrial-strength! (we'll use a tiny bit of it)
- Has features specific to the web platform (HTML/CSS/JS)
- Experimental Live Share feature (real-time collaboration like Google Docs)

Why git / GitHub?

- Industrial-strength! (we'll use a tiny bit of it)
- Publish playable versions of your games easily!
- This is how we'll grade your projects in this class!
- If you haven't already, sign up for their student benefits program (free Pro account plus free stuff from partner companies: e.g. domain name registration)

Note: You don't have to use your real name for GitHub

Do we need a textbook? Nah, just



ELOQUENT JAVASCRIPT
3RD EDITION (2018)

CONTENTS

If prefer to learn from video, many students have learned arts-relevant JavaScript skills from the videos on the YouTube channel The Coding Train.

This course is specific to 2021.

- Back in 2011:
  - C# / Microsoft XNA
  - PHP / ActionScript / Adobe Flash
- Today in 2021:
  - HTML/CSS/JavaScript focus
  - Phaser framework
- Someday in 2031:

The details change quickly:

- How do I draw a colored rectangle?
- How do I run code when someone presses a button?
- How do I made an end-of-level score summary screen?
- How does my game make noise?
- How do I share my game with a friend?

But the **concepts** and **development process** are quite stable.

Your game's scope:
small

Your game's scope:

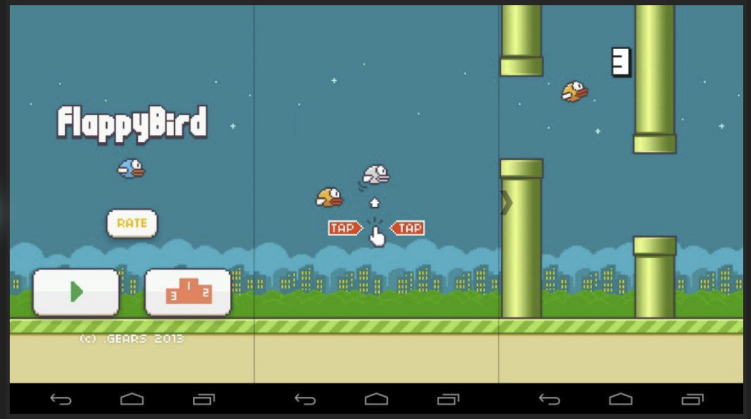
tiny

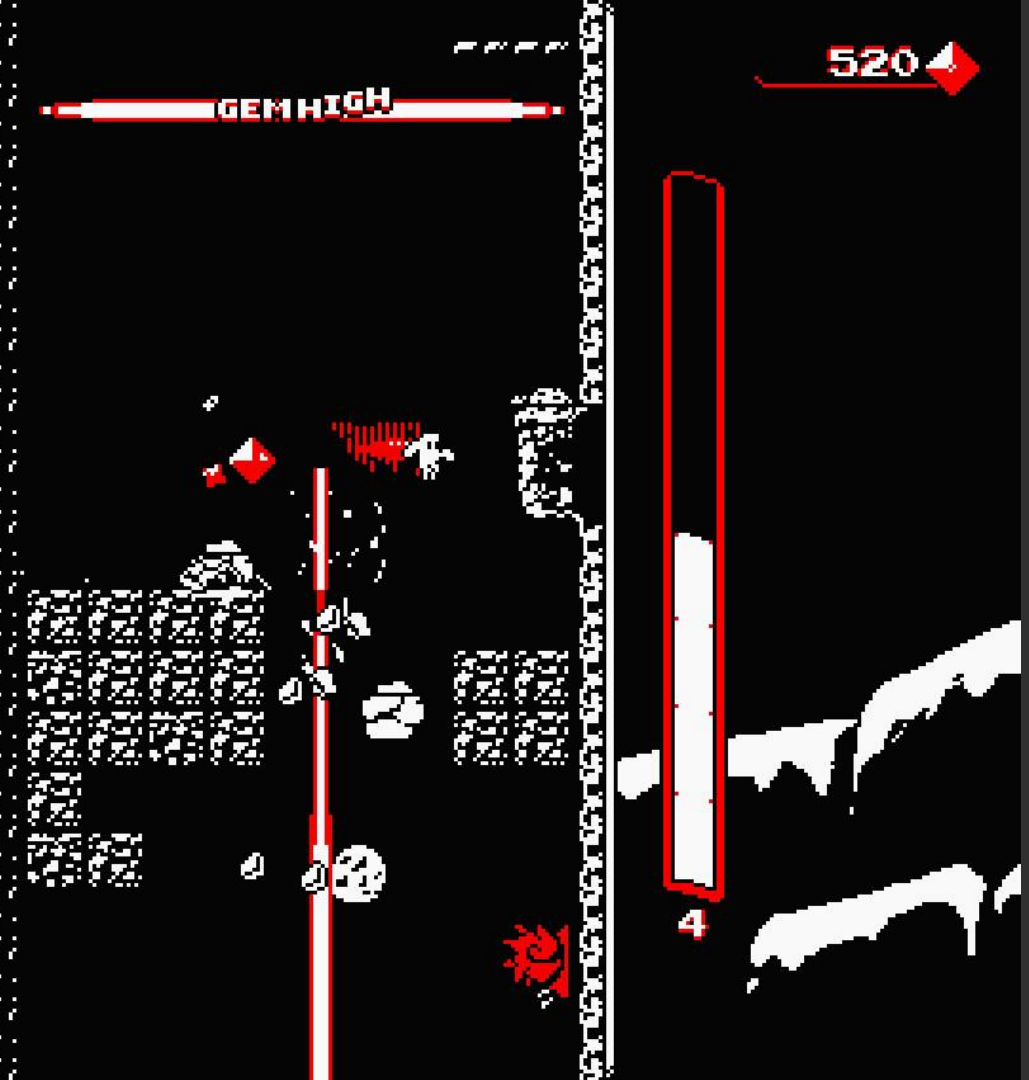
Finish your game.

https://makegames.tumblr.com/post/1136623767/finishing-a-game

No

Yes





Ambitiously small

Mechanic-centric

Well-structured

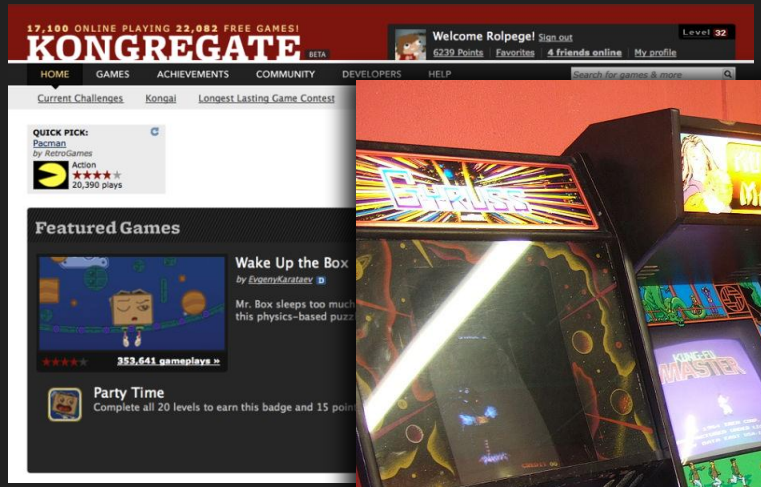
Expressive

Idea-driven

Achievable

2d :)

Think **arcade games** or **Flash games** from **2009**



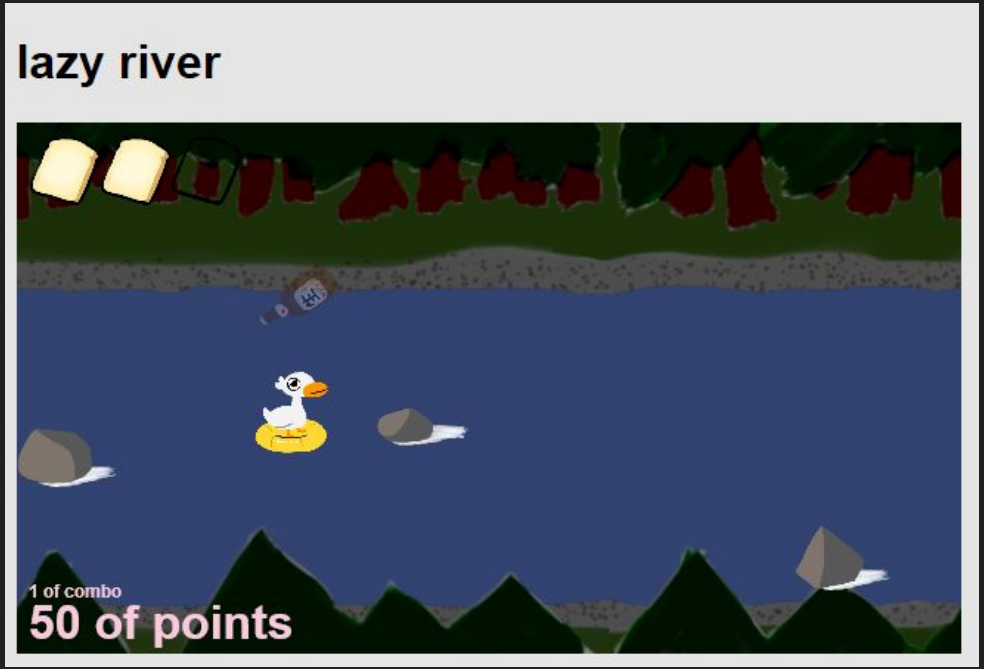
https://commons.wikimedia.org/wiki/File:Kongregate_Screenshot.png

https://commons.wikimedia.org/wiki/File:Flashbacksarcade-f-goodrob13.jpg

Some Good News

Every one of you can program a videogame

(And we have proof)



Lazy River: an endless drunker

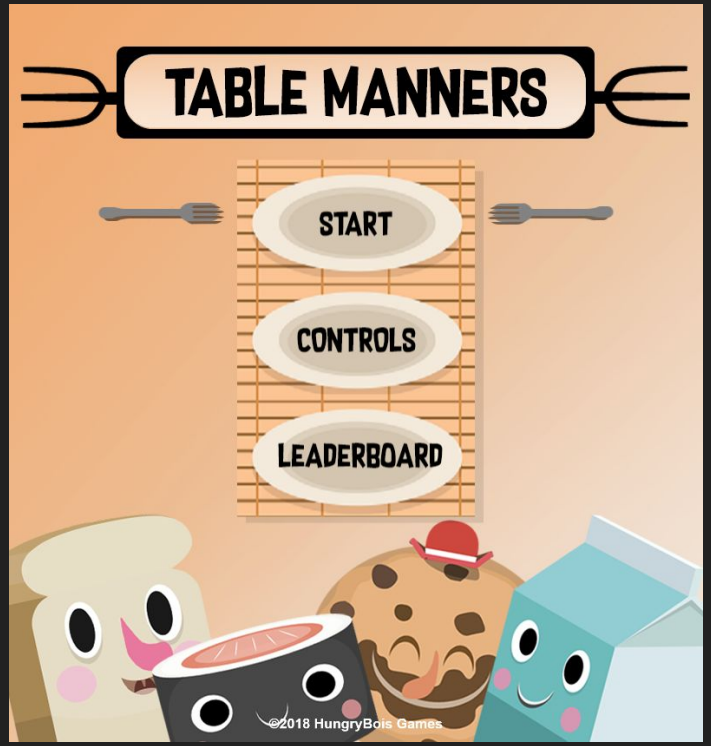
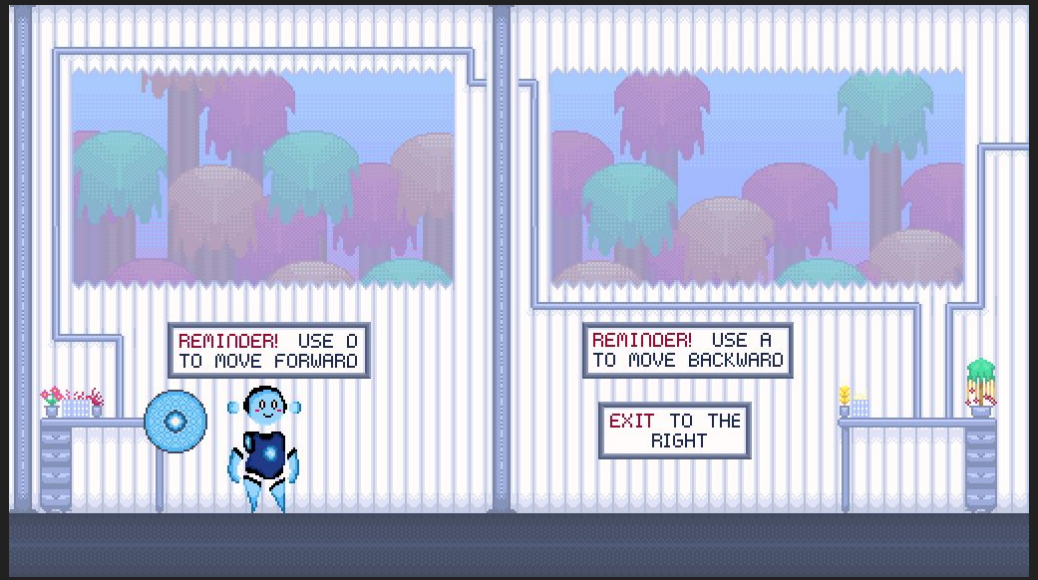
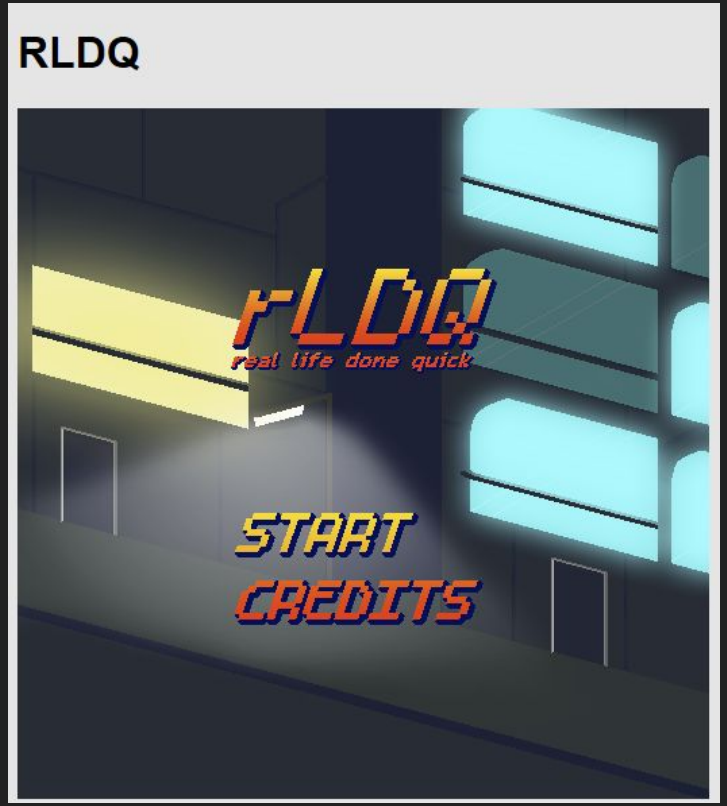


Table Manners: a game about stealing sushi



Gravobot: a 2D puzzle platformer with a gravity orb mechanic

Tiny Steps: a storybook game wherein you play as the CUTEST mouse



rLDQ: a minigame collection of mundane daily tasks

The Light: a survival typing game (!?)

Some More Good News

Any style or genre you choose is fine with us*

*As long as you do so with creativity, thoughtfulness, and professionalism

Simple 2D games

Celeste (2015; for PICO-8), a 4-day project by experience developers; later reimplemented and published for many different platforms.

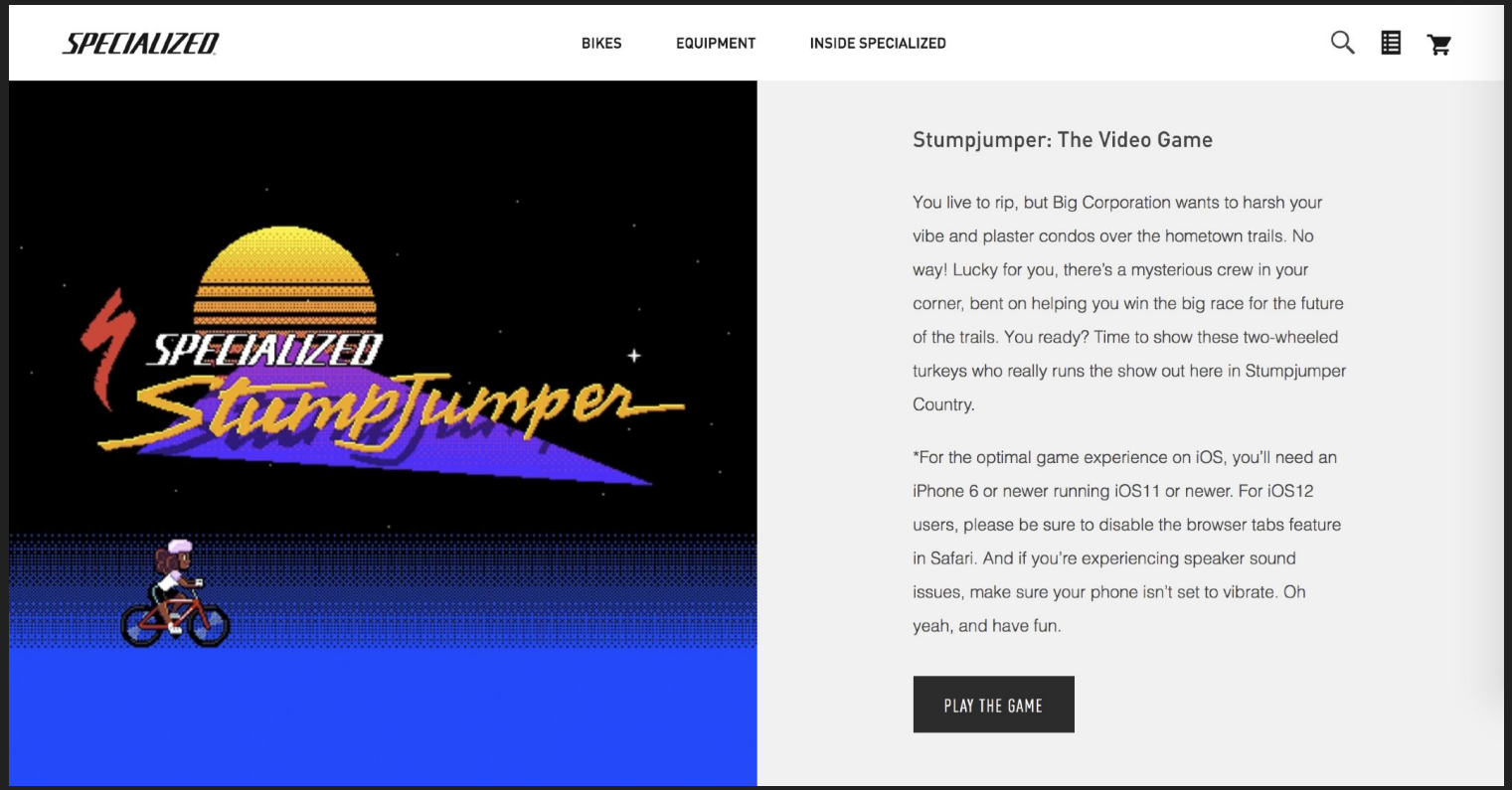
In this class, your team games can* be in any style or genre that you choose.

*as long as you make your game with creativity, thoughtfulness, and empathy

Make something you'd be proud to invite someone to play one year later.

The Runs: a very mature game

StumpJumper: a commercial UCSC game



Team of six, 10-minute game, 6 months, $25K Budget

Course Structure

Canvas Resources

Syllabus: https://canvas.ucsc.edu/courses/44176

Schedule Overview*

6/22	Introduction
6/24	Programming Our First Phaser Game
6/29	Version Control & Scenes
7/1	Input and Movement
7/6	Physics and Debugging
7/8	State Machines & Cameras
7/13	JSON, Tilemaps, Map Editors
7/15	Tweens & Particles
7/20	Special Topics
7/22	Final Presentations

*This will inevitably change a bit

Schedule Overview*

6/22	Introduction		
6/24	Programming Our First Phaser Game	Rocket Patrol Tutorial Due	6/26
6/29	Version Control & Scenes	Rocket Patrol Mods Due	6/29
7/1	Input and Movement		
7/6	Physics and Debugging	Endless Runner Due	7/6
7/8	State Machines & Cameras		
7/13	JSON, Tilemaps, Map Editors	Final Game: First Build	7/13
7/15	Tweens & Particles		
7/20	Special Topics		
7/22	Final Presentations	Final Game Due	7/22

*This will inevitably change a bit

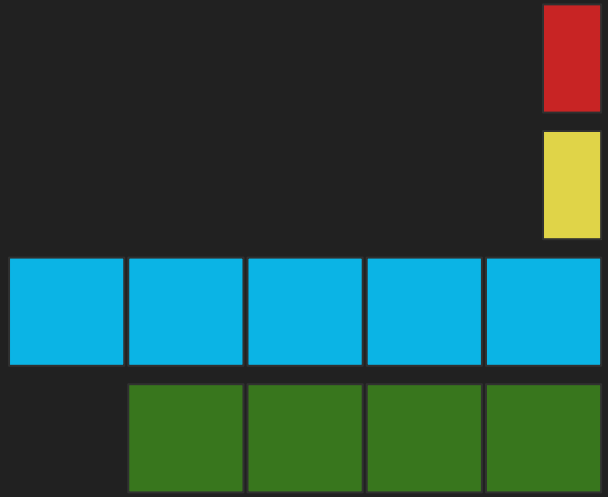
Policies & Expectations

There are no labs in the summer

However, I will have office hours:

- ➔ At a time that is partially determined by your answers in the First Day Survey
- ➔ This week, I will be available on Friday, 1pm - 3pm.

Grading



5% Readings

5% Surveys

50% Mini-Projects

40% Final Game

Readings (5%)

- Designed to introduce you to the concepts we'll be talking about
- Quizzes are there to provide extrinsic feedback
  - You can retake the quizzes as many times as you need to, only the last time counts
  - The quizzes are for assessment, not evaluation

Surveys (5%)

- Gives me feedback on what you need for the class
- Walks you through essential tasks to set up your programming environment
- You get the grade for answering the questions
- There are no right answers

Assessment vs. Grades

Mini-Programs (50%)

Three games:

- ➔ Follow the Rocket Patrol Tutorial
- ➔ Modify Rocket Patrol
- ➔ Make an Endless Runner (team project)

Due dates are mostly on Tuesday before AGPM 120, but check the time and dates on Canvas because with such a tight time span I couldn't make them all consistent.

Final Game (40%)

- Make a game
- Team project (3 - 4 team members)

Collaboration

- I won't run cheat-checking code scanners.
- I want you to read **and edit** each others code.
- Don't present someone else's work as your own.
- Imagine you were in a foreign language class.
    - Would you keep quiet in front of other students to make sure they weren't stealing your 中文? No! You'd practice together and help one another fix their mistakes. You'd develop taste for effective communication by seeing examples of less-than-perfect communication.

Easy way to credit sources and collaborators:

```
/* developed in collaboration
with ___@ucsc.edu */

/* based on example from
https://____ */
```

Attendance

- Attend when *you can* for maximum personal benefit and to provide an rich learning environment for others. (You are part of the show for others!)
- Catch up with Zoom recordings later when you can't.
- Zoom usage:
  - Use Zoom chat to ask questions. Okay for student's to help one another, but try not to be too distracting.
  - Consider turning on your camera. Seeing your face helps me and others see agreement and confusion.

My Attendance

?

First-day Survey (first assignment)

Let's find it on Canvas.

We're excited you're here!

Ask me a question

Break

Your first reading assignment

"Learning Web Design"

There's a quiz.

Modern Web Development

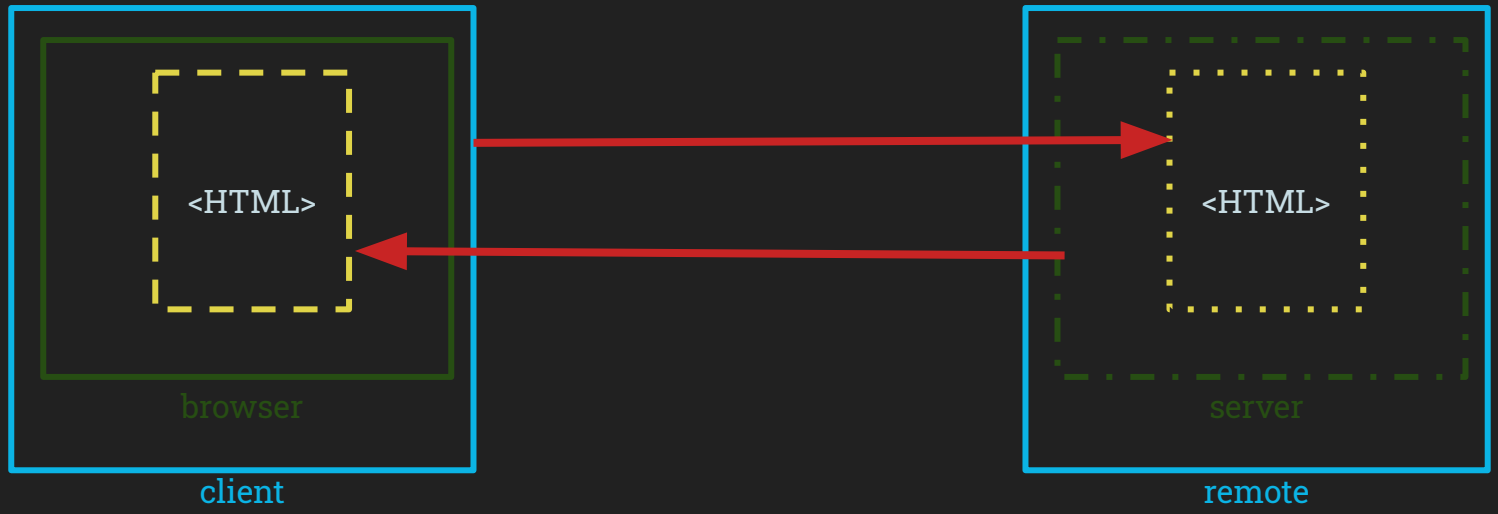
HTML + CSS + JS

HTML: semantic layer
(how a page is described)

CSS: presentation layer
(how a page looks)

JavaScript: interaction layer
(how a page behaves)

A basic model of how the web works



Learning Outcome

Be able to **explain** how HTML, CSS, and Javascript get turned into a web page that you can view.

Jigsaw

1. Divide into jigsaw groups
2. Each of you, pick one of the topics and read it.
3. Divide into expert groups, explain topic to your expert group
4. Return to jigsaw group
5. Explain the topic to your jigsaw group
6. Assessment Quiz

Jigsaw

Research:

https://docs.google.com/forms/d/e/1FAIpQLSfnFFmfKy_PHK__gDIpkBN_8CWhCSl0Tj_K_QVt0X9cGsTwhQ/viewform?usp=sf_link

Read the material assigned to your number and be prepared to teach others about it.

If you already are an expert on your assigned topic, great! Here's your opportunity to teach others about it.

Even if you think you know everything about it, try to look for a detail in the reading that you think would be surprising to someone who is new to the topic.

Jigsaw

Assessment:

https://docs.google.com/forms/d/e/1FAIpQLSf2VaXMgfltTla3pT9O1jECQVyJHe1UhJL8fAnesixBIURpLA/viewform?usp=sf_link

This is purely to give me (and you) a sense of what aspects you understand.

Break

Learning Outcome

Be able to implement HTML, CSS, and Javascript in a web page.

Let's make a web page

Let's make a simple page with HTML + CSS

HTML elements:

- <html>
- <head>
- <body>
- <h1>
- <p>
- and
- and
- <a>
- <img>

See also
https://developer.mozilla.org/en-US/docs/Learn/Getting_started_with_the_web/HTML_basics

CSS rules:

- Selectors:
  - [by tag name]
  - [by class]
  - ...
- Declarations:
  - Color
  - Font-family
  - ...

See also

https://developer.mozilla.org/en-US/docs/Learn/Getting_started_with_the_web/CSS_basics

JavaScript Essentials

Are you looking at these slides without access to the lecture video?
Try http://ex-artist.com/CMPM120/Resources/JavaScript%20ES6%20Essentials.html

JavaScript Overview

- First developed in 1995 at Netscape (for Navigator 2.0)
- Not really related to Java
- Actually a scripting language (domain-specific for web environment)
- Relies on host for input/output (e.g., browser)
- Multi-paradigm (e.g., procedural, functional, OOP, etc.)
- Dynamic (i.e., executes at runtime)
- Loosely typed
- Standardized as ECMAScript
- Historically maligned/praised for its flexibility

Activity plan

Environment setup

- Install VSCode.
- Create folder for today's demos
- Open folder in VSCode
- Create index.html in that folder
- Populate with basic html template
- Show inline documentation on mouseover
- Customize page title; refresh.
- Create src/main.js;
  console.log('#deface');

JavaScript demos:

- Babbling in the console window
- Printing messages with console.log
- Variables with let/const
- Template strings with `label: ${var}`
- Conditionals with if/else
- Loops with for/while
- Arrays
  - Literals with [...]
  - Indexing with [] and .length
  - for-of loops / a.forEach
- Objects
  - Literals with {...} (key: value)
- Functions
  - funciton(){}
  - =>
  - As values
- DOM interaction (addEventListener / getElementById)

Reading 1

First Day Survey

Reading 2

How is your programming environment set up?

Reading 1

Web Dev Basics

Assignment

Follow the Rocket Patrol Tutorial

Assignment: Rocket Patrol Tutorial

Complete the in-class Rocket Patrol tutorial.

Turn in two things to Canvas:

- ➔ a link to your public GitHub repository
- ➔ a link to your published, playable game (using GitHub Pages)

Please be sure to test your game in Chrome—that's the browser we use to grade.

Remember our contract of trust in this class. You could clone my finished game and turn it in as your own, but you won't learn anything that way, and it'd be an odd waste of your time. Choose the TRUE path: type in your own work 👍

Next Class:

Watch me make a game

Bonus Slides

indeed

What: front end developer
Where: Santa Cruz, CA
Find jobs | Advanced Job Search

front end developer jobs in Santa Cruz, CA

My recent searches
front end developer - Soquel, CA
» clear searches

Sort by:
relevance - date

Distance:
within 50 miles

Salary Estimate
$100,200+ (861)
$115,000+ (673)
$120,000+ (582)
$130,000+ (356)
$140,000+ (172)

Job Type
Full-time (962)
Contract (87)
Internship (24)
Part-time (13)
Temporary (9)
Commission (3)

Location
Sunnyvale, CA (161)
San Jose, CA (153)
Santa Clara, CA (116)
Palo Alto, CA (98)
Mountain View, CA (96)
+ more »

Company
Walmart eCommerce (35)
Apple (34)
Walmart (20)

Software Engineer, Front End
Google ★★★★☆ 3,009 reviews
Mountain View, CA
Experience with front end technologies and/or front end frameworks. As a Front End Software Engineer at Google, you will specialize in building responsive and...
save job

Front End Engineer
Amazon.com Services, Inc. ★★★½☆ 34,428 reviews
Cupertino, CA
You will design, build, and operate web services and web front end at scale, interface with front-end and back-end teams, and deliver the plumbing in-between....
save job

Front-End JavaScript Developer (Contract)
LG Electronics ★★★★☆ 2,069 reviews
Santa Clara, CA
Front-End JavaScript Developer. Advanced Platform Lab of LG ARC (America R&D Center) in Santa Clara, CA, is looking for passionate and talented JavaScript &...
3 days ago save job

Front End Developer
BlockRules
Fremont, CA
As a Front End Developer, you will work on development and implementation of features such as smart contracts, integration of crypto-exchanges, and registration...
Easy apply
save job

Sr Frontend Engineer (Remote)
Noom Inc. ★★★★½ 8 reviews
United States
$100,000 - $150,000 a year
At Noom, we use scientifically proven methods to help our users create healthier

Software Engineer, Front End

Google ★★★★½ 3,009 reviews - Mountain View, CA

Apply On Company Site

In school or graduated within last 9 months? We encourage you to apply to openings on the Student Jobs site

Our engineering teams bring the best of Google to our users around the world with high-impact, innovative work. Learn about career opportunities in Bangalore and Tokyo today.

Note: By applying to this position your application is automatically submitted to the following locations: **Mountain View, CA, USA; San Francisco, CA, USA; San Bruno, CA, USA; Sunnyvale, CA, USA**
Minimum qualifications:

- BA/BS degree in Computer Science or related technical field or equivalent practical experience.
- 1 year of work experience.
- Experience in JavaScript, and one or more programming languages including but not limited to: Java, C/C++, Python or Go.
- Experience with front end technologies and/or front end frameworks.

Preferred qualifications:

- Experience developing user-facing software.
- Experience with the latest and greatest web standards, including HTML5 and CSS3.
- Knowledge of web libraries and frameworks such as AngularJS, Polymer, Closure or Backbone.
- Strong sense of web design and attuned to the fundamentals of user experience.
- Familiarity with the whole web stack, including protocols and web server optimization techniques.
- An understanding of the principles of accessibility and can build products that are accessible to users with disabilities.

About the job

Google's software engineers develop the next-generation technologies that change how billions of users connect, explore, and interact with information and one another. Our products need to handle information at massive scale, and extend well beyond web search. We're looking for engineers who bring fresh ideas from all areas, including information retrieval, distributed computing, large-scale system design, networking and data storage, security, artificial intelligence, natural language processing, UI design and mobile; the list goes on and is growing every day. As a software engineer, you will work on a specific project critical to Google's needs with opportunities to switch teams and projects as you and our fast-paced business grow and evolve. We need our engineers to be versatile, display leadership qualities and be enthusiastic to take on new problems across the full-stack as we continue to push technology forward.

Do you want to help Google build next-generation web applications like Inbox, Gmail, Google Search, Google Maps and

Front End Developer

Apple ★★★★☆ 5,034 reviews - Santa Clara Valley, CA

Apply On Company Site

Apple is seeking a Front-End Developer to drive user experience innovations for apple.com. This developer will not only be responsible for defining the architectural strategy for front-end technologies, including HTML5, CSS3 & JavaScript, but for evangelizing that technology across the team and Apple as a whole.

Key Qualifications

- Comfortable with source version control software and package managers (SVN, Git, NPM)
- Well-versed in fundamental visual and interactive design discipline
- Strive to use web standards to build solutions using semantic markup, templates (Handlebars) and SASS
- Understanding of all major browsers and the special considerations required for all various quirks
- Competent JavaScript programmer who doesn't need to rely on libraries to accomplish innovative interactions
- Aware of the interplay between JavaScript and HTML & CSS, and can dynamically create, modify, and style elements on a page with ease
- Experience with WebGL is a plus.

Description

Lead development efforts on large scale web-based projects, ensuring robust and lasting solutions are implemented Awareness of Apple's mobile platform with the ability to build solution that take advantage of the latest iOS features while remaining performant on the latest iOS devices Maintain existing JavaScript libraries: making sure they support the engineering and creative needs of apple.com Mentor team members: Educate on software development best practices and new technologies, especially HTML5 & CSS3 Innovate: Build things that people will blog and Twitter about

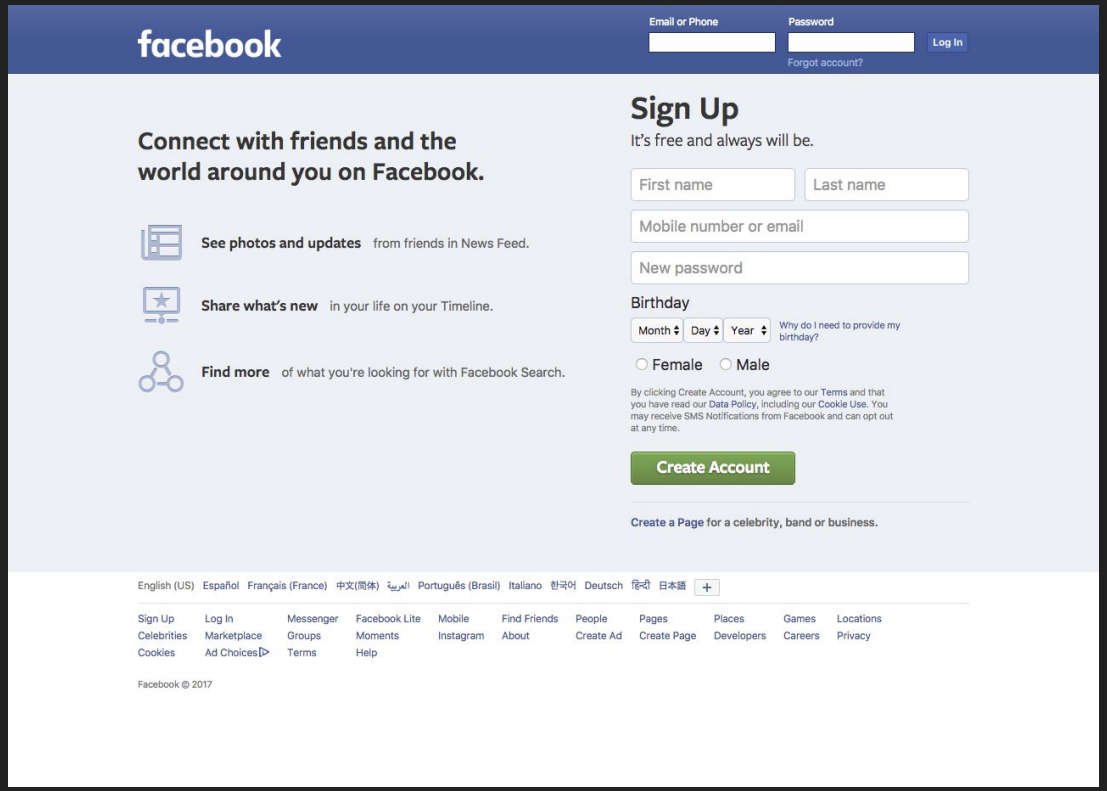
https://developer.mozilla.org/en-US/docs/Learn/Getting_started_with_the_web/HTML_basics

https://developer.mozilla.org/en-US/docs/Learn/Getting_started_with_the_web/CSS_basics

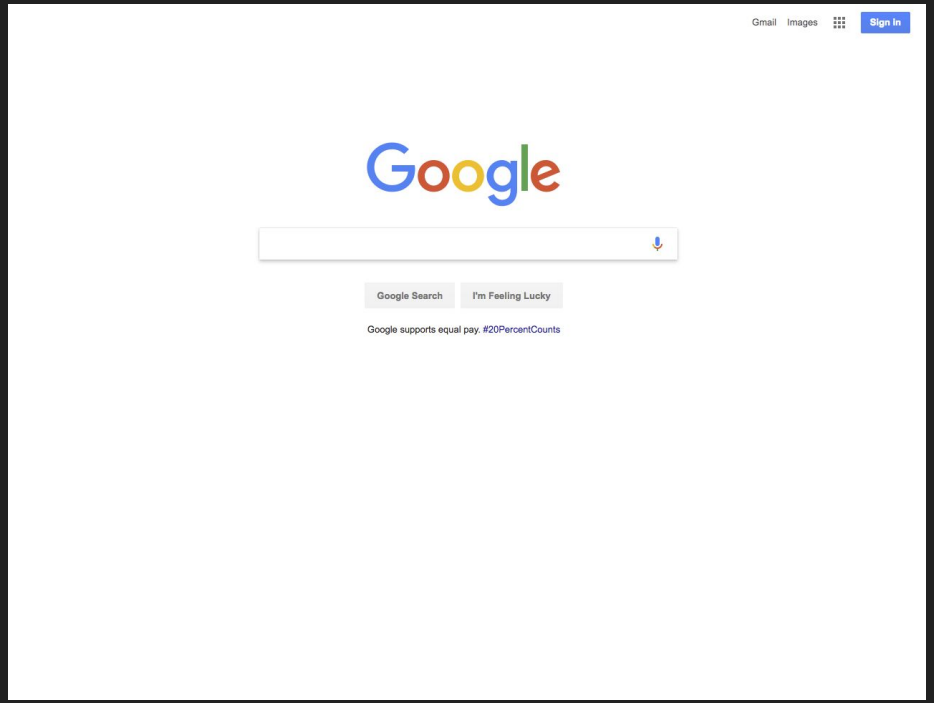
https://developer.mozilla.org/en-US/docs/Learn/Getting_started_with_the_web/How_the_Web_works

Before we start...

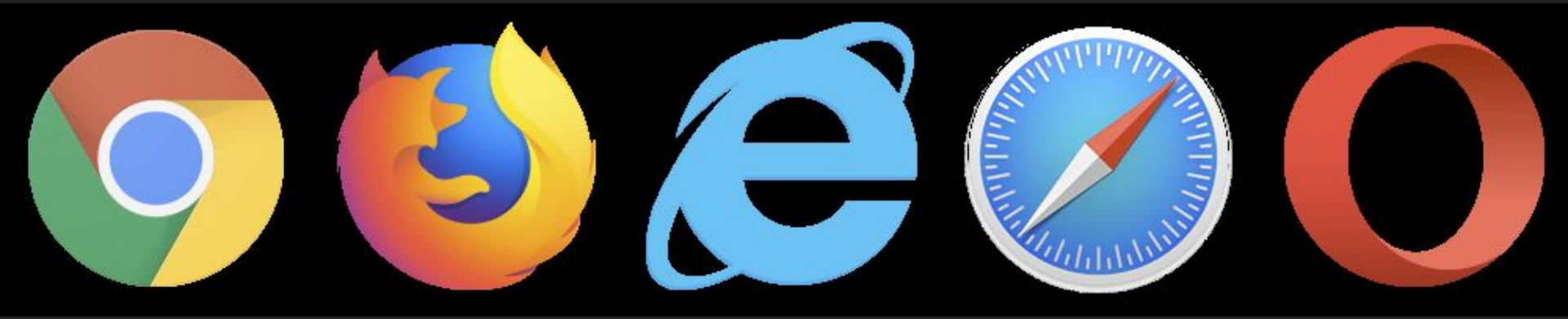
What the heck is the Internet?



On the Internet, but not actually *the* Internet...

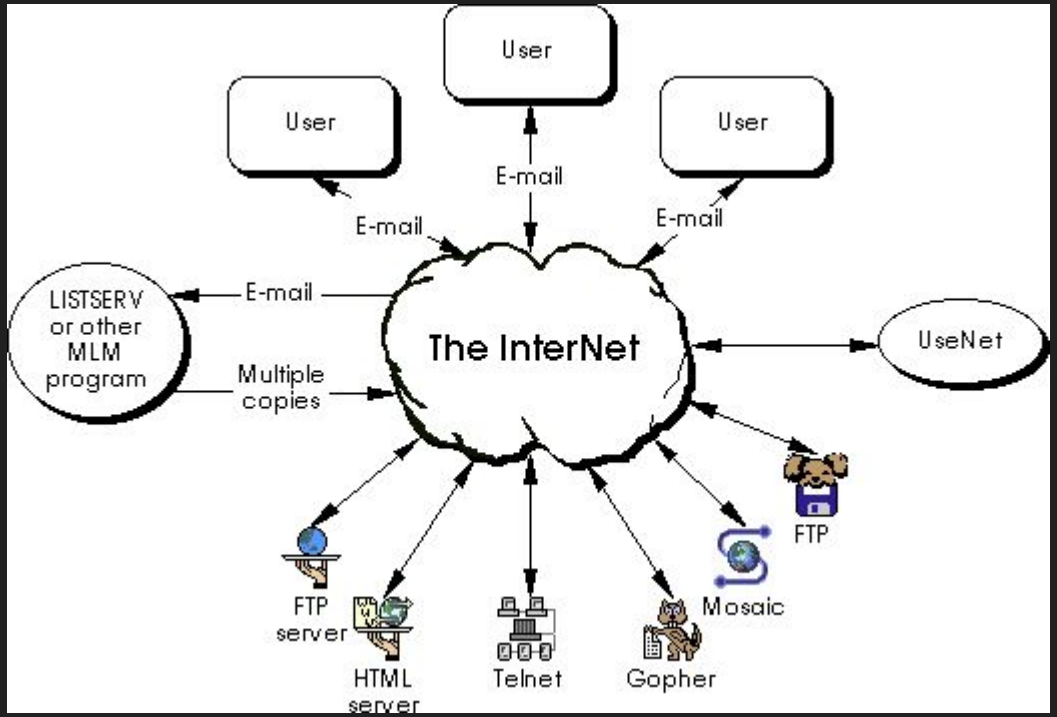


Also not the Internet...



Still not the Internet...

This *is* The Internet (but not the Internet we're talking about)

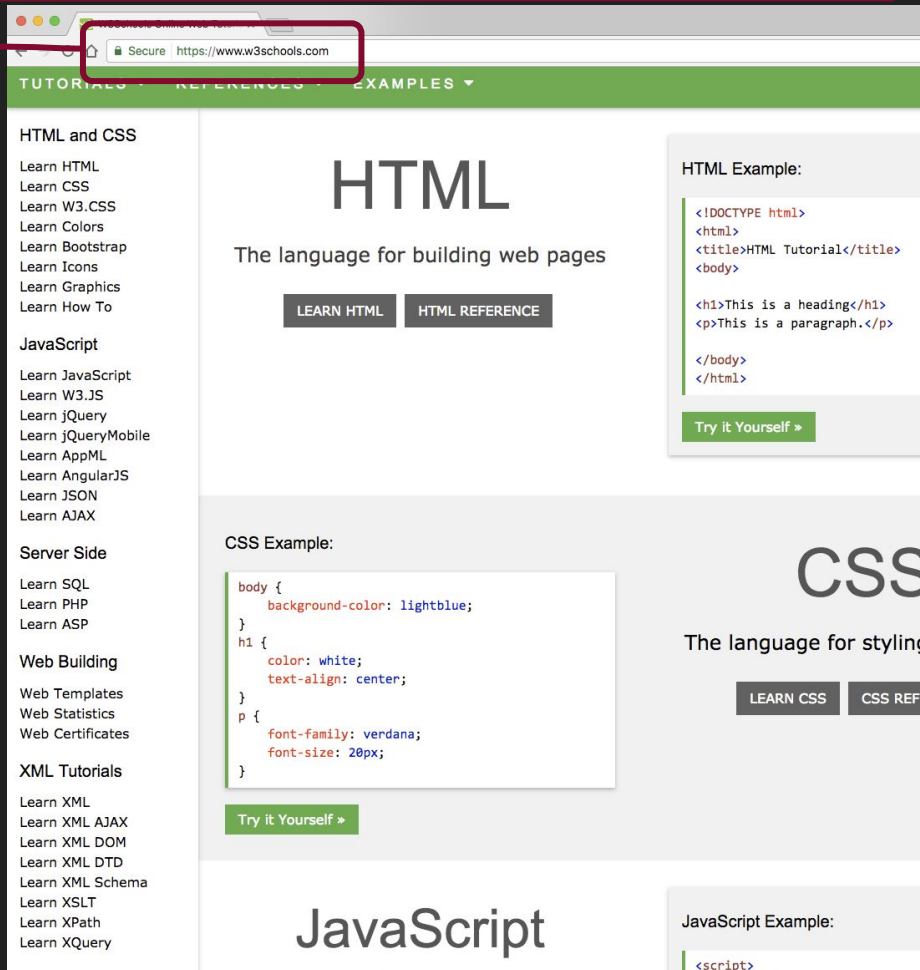


The Internet is a diverse network of connected computers that use a variety of standardized protocols to send and receive information

The World Wide Web is just one (of many) ways to send and receive information via the Internet.

It uses HTTP as its communication protocol, HTML as a language to describe and structure information, browsers to interpret HTML, and hypertext to link documents together

What's this stuff?



Uniform Resource Locator (URL)

User Agent (browser)

protocol

subdomain

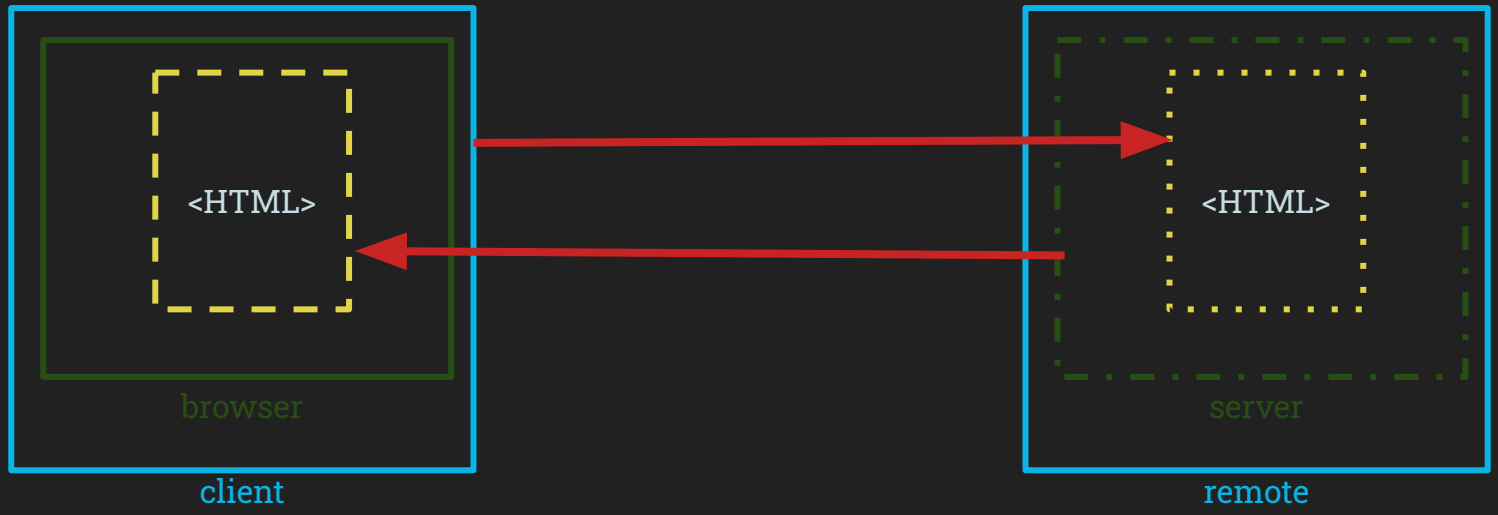
domain

top-level domain

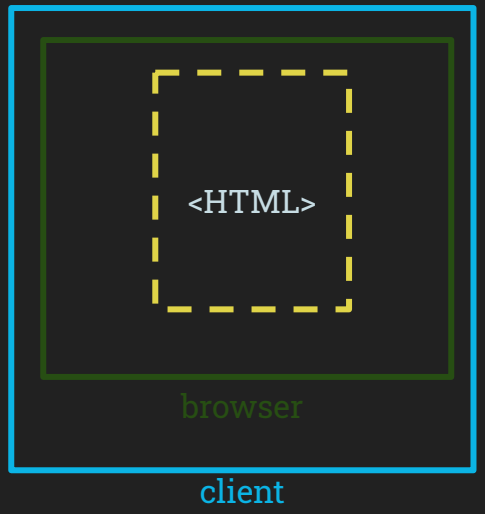
more stuff can go here

protocol://subdomain.domain.tld:port-number/path?parameters

A basic model of how the web works



Client



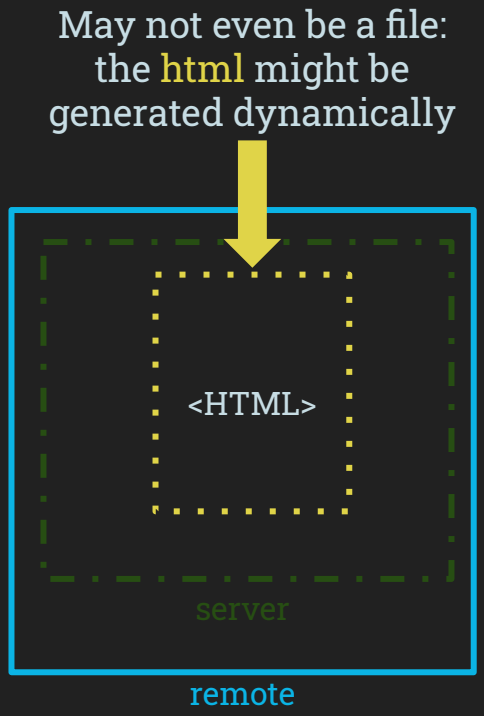
"Client-side" or "front end" applications run on our local machine

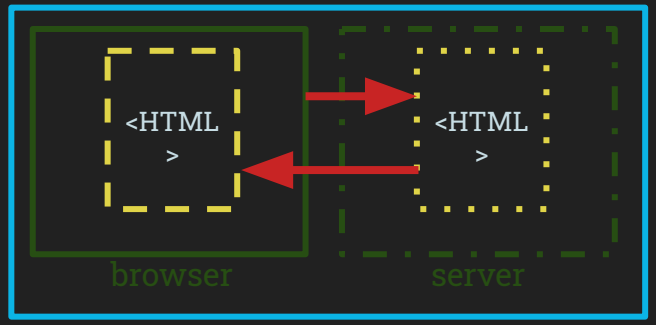
➔ Limited by the resources of the local machine

Server

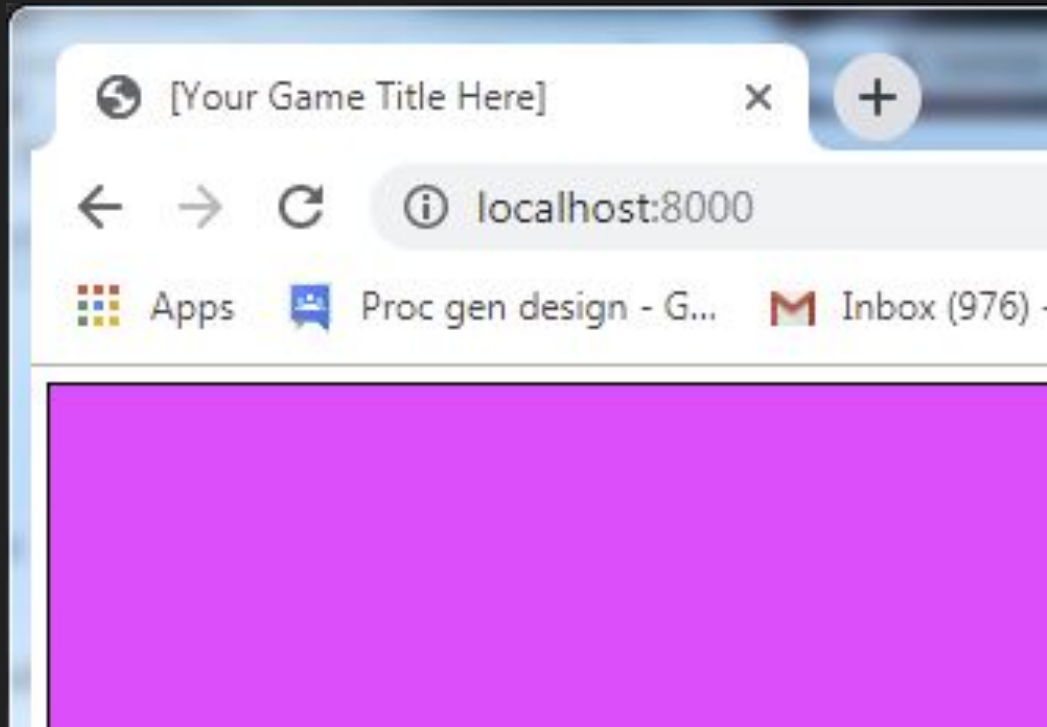
"server-side" or "back end" applications run on a remote machine

- ➔ Limited by the resources of the remote machine
- ➔ Are often virtual machines
  - Several can share a host machine
  - Or can be running on a cluster of host servers





You can serve websites locally



Python 2:

python -m SimpleHTTPServer

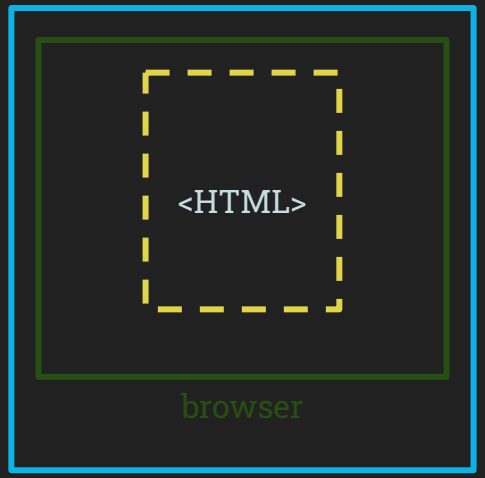
Python 3:

python -m http.server

If you don't have Python on your machine, install it.
https://www.python.org/downloads/
https://www.anaconda.com/distribution/

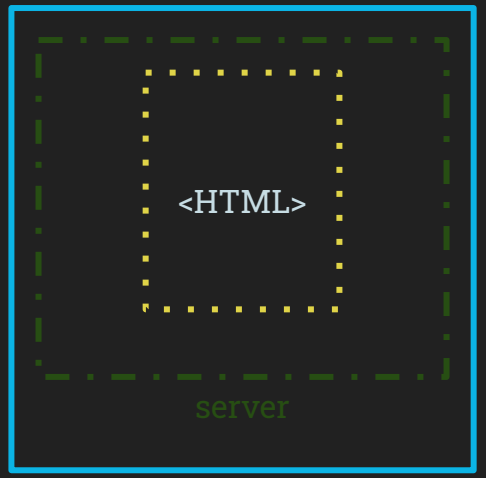
The easiest way to run a local server is with Python

Technologies



client

HTML
CSS
JavaScript



remote

PHP
Python
Ruby
Clojure
node.js

HTML = ???

HTML = Hypertext Markup Language

Nathan Altice
Santa Cruz, CA

Dear Mom,

I had a fun time at summer camp today. I stole a kid's swimsuit and set it on fire. He didn't mind because we are friends.

When you have the time, please send me a birthday cake in the mail. It isn't my birthday, but I like cakes with my name on them. Please do not send cake in a poster tube like last time.

OK, that's all for now. Please don't touch the things in my room.

Love,
Nathan

```
<address>
<name>
Nathan Altice
</name>
<location>
Santa Cruz, CA
</location>
</address>

<salutation>
Dear Mom,
</salutation>

<body>
I had a fun time at summer camp today. I stole a kid's swimsuit and set it on
fire. He didn't mind because we are friends.

When you have the time, please send me a <important>birthday cake</important>
in the mail. It isn't my birthday, but I like cakes with my name on them.
Please do not send cake in a poster tube like last time.

OK, that's all for now. Please don't touch the things in my room.
</body>

<closing>
Love,
</closing>
<signature>
Nathan
</signature>
```

Marking up text gives it structure and meaning

language

semantic

HTML uses standardized tags to markup text

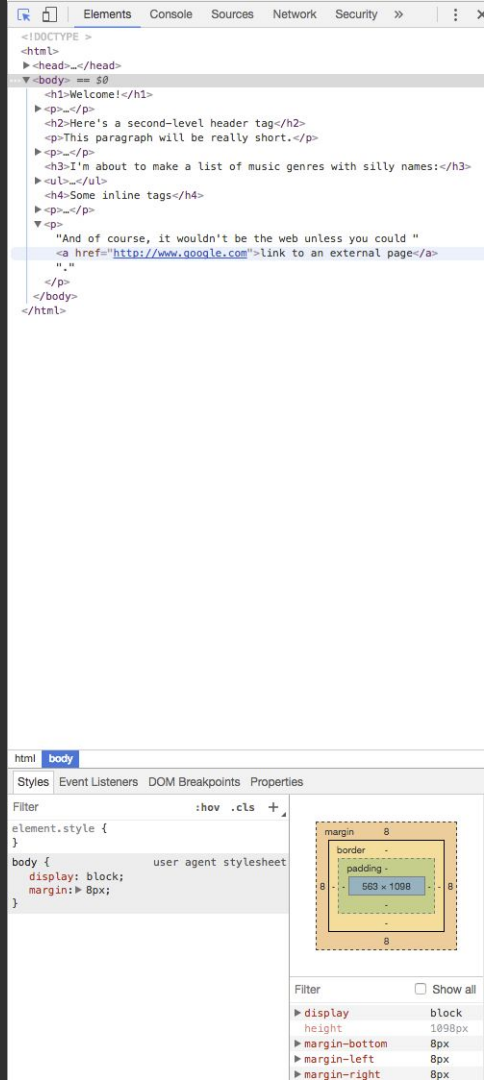
Tags provide semantic meaning to content

```
<!DOCTYPE>
<html>
</html>
```

All major browsers have developer tools

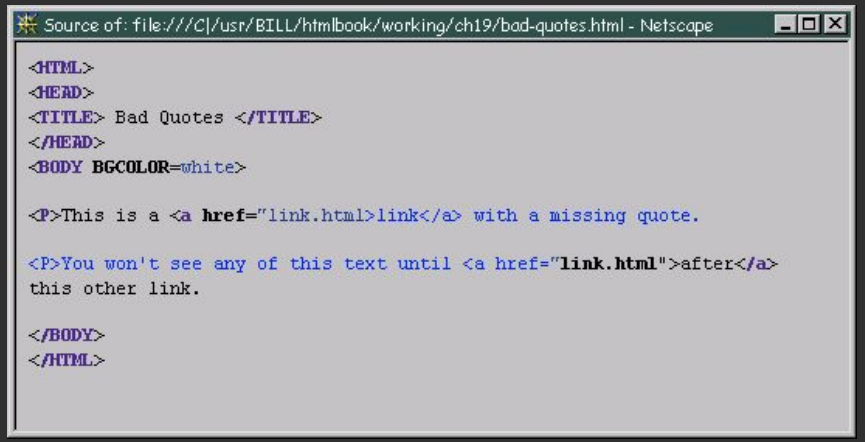
But every browser renders webpages slightly differently.

The BROWSER WARS! A period of civil war. Rebel open-source startups, striking from a hidden base, have won their first victory against the evil non-standards-compliant INTERNET EXPLORER...

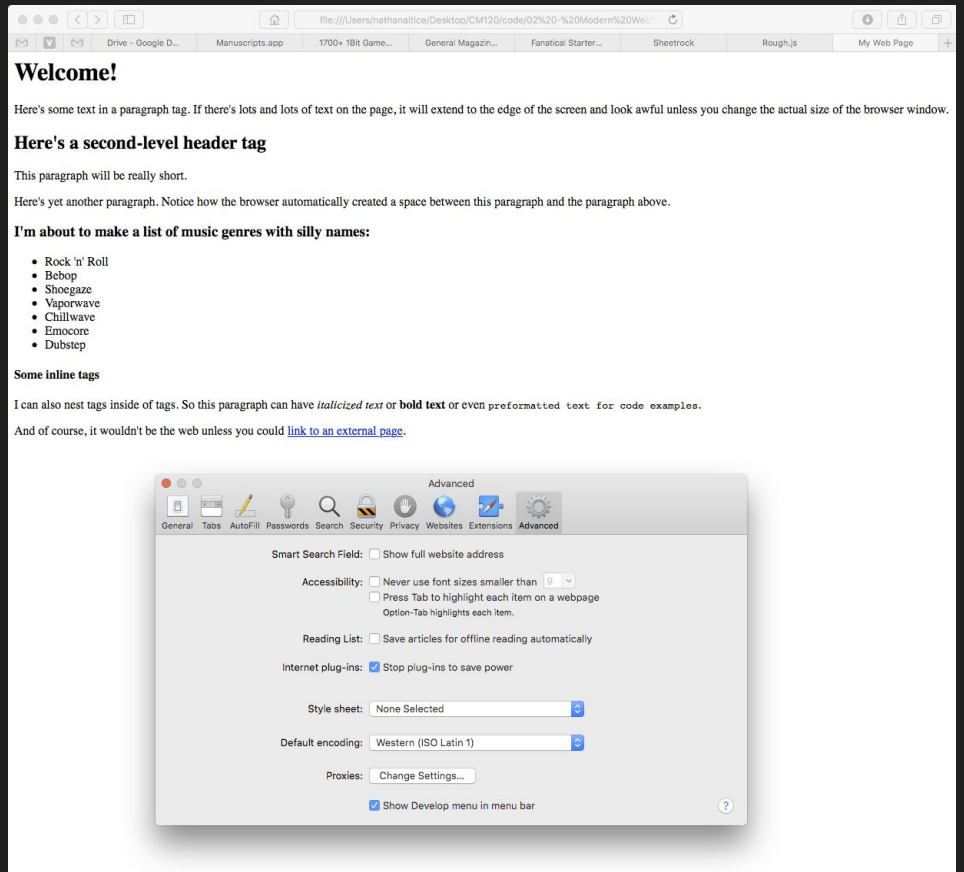


View Source

The 90s web designer's best friend



In Safari: Preferences > Advanced > Show Develop Menu...



Developer Tools Keyboard Shortcuts

Command+Option+I
OsX

F12 or Control+Shift+I
Windows

CSS = ???

CSS = Cascading Style Sheets

CSS: Let me sum up

- CSS separates presentation from structure
- CSS is a separate language with its own syntax
- CSS statements are called rules
- Rules contain a selector and a declaration
- Style rules "cascade" downward
- CSS definitions may live in a <style> tag (usually bad) or be linked externally (much better)

```css
body {
      font-family: "Arial";
      font-size: 14px;
      background-color: #facade;
}

h1 {
      border: 1px dotted red;
}

h2 {
      font-variant: small-caps;
}

.green {
      color: green;
}

/* h1 {
      font-family: serif;
      font-size: 5em;
} */
```

But what about...

What is HTML5?

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MDN › Web technology for developers › Web developer guides › HTML developer guide › HTML5

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HTML5

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HTML5 is the latest evolution of the standard that defines HTML. The term represents two different concepts:

- It is a new version of the *language* HTML, with new elements, attributes, and behaviors,
- and a larger set of **technologies** that allows more diverse and powerful Web sites and applications. This set is sometimes called *HTML5 & friends* and often shortened to just *HTML5*.

Designed to be usable by all Open Web developers, this reference page links to numerous resources about HTML5 technologies, classified into several groups based on their function.

- *Semantics*: allowing you to describe more precisely what your content is.
- *Connectivity*: allowing you to communicate with the server in new and innovative ways.
- *Offline and storage*: allowing webpages to store data on the client-side locally and operate offline more efficiently.
- *Multimedia*: making video and audio first-class citizens in the Open Web.
- *2D/3D graphics and effects*: allowing a much more diverse range of presentation options.
- *Performance and integration*: providing greater speed optimization and better usage of computer hardware.
- *Device access*: allowing for the usage of various input and output devices.
- *Styling*: letting authors write more sophisticated themes.

<canvas>The part we care about</canvas>

An HTML element that allows us to draw graphics using scripting (i.e. JavaScript).

plugin

native

HTML5 provides a

target container

for our games

02-03-important.html

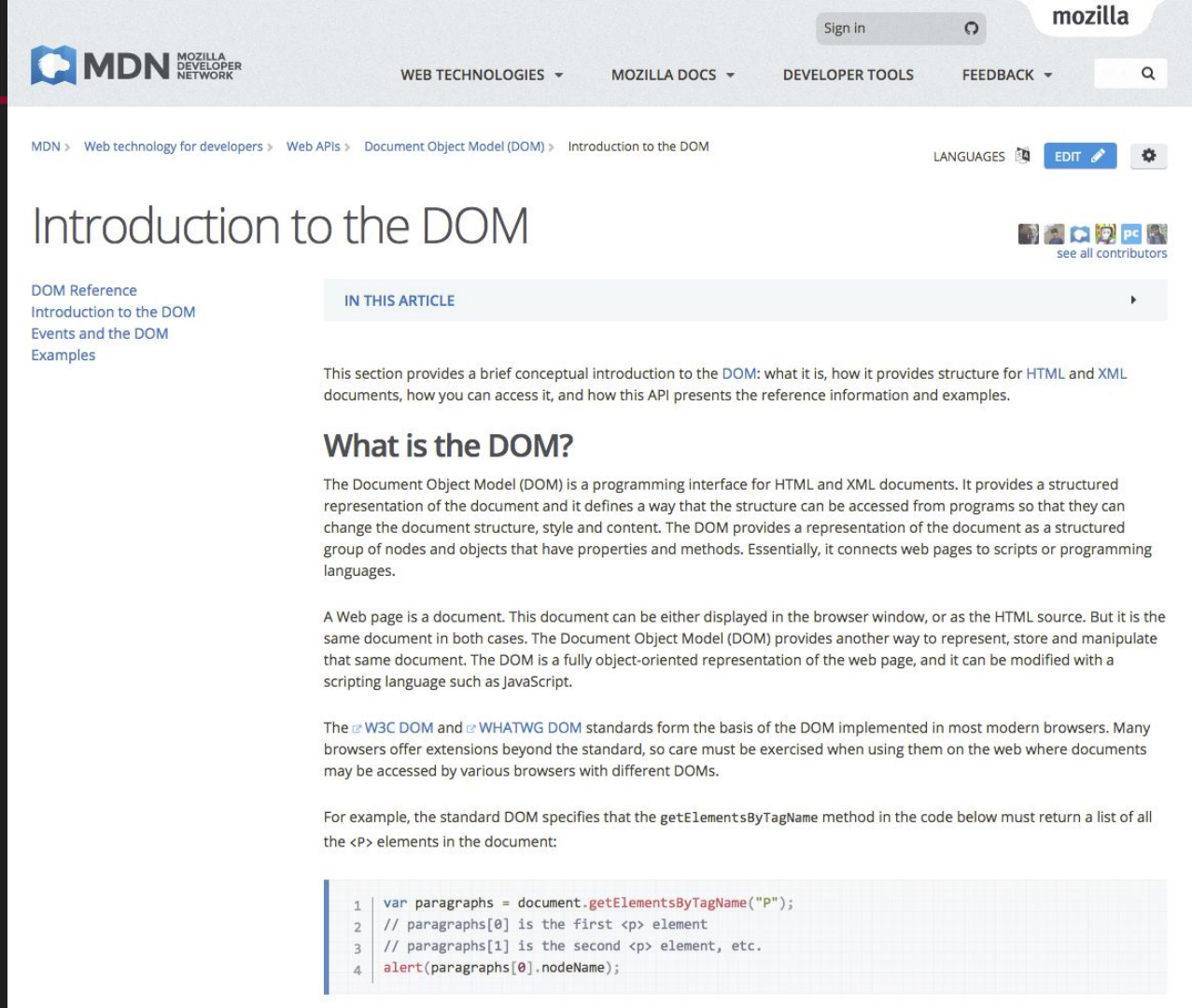
02-02-firstpage.html | 02-03-important.html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <title>Page Name</title>
    <meta charset="utf-8">
    <style type="text/css">
        /* CSS goes here */
    </style>
    <link rel="stylesheet" type="text/css" href="css/styles.css">
    <script type="text/javascript" src="js/game.js"></script>
</head>
<body>

    <!-- content goes here -->

    <script type="text/javascript">
        // code goes here
    </script>
</body>
</html>
```

Line 9, Column 66 | Tab Size: 4 | HTML

HTML, CSS, and JS combined

The Document Object Model



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MDN > Web technology for developers > Web APIs > Document Object Model (DOM) > Introduction to the DOM

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Introduction to the DOM

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DOM Reference
Introduction to the DOM
Events and the DOM
Examples

IN THIS ARTICLE

This section provides a brief conceptual introduction to the DOM: what it is, how it provides structure for HTML and XML documents, how you can access it, and how this API presents the reference information and examples.

What is the DOM?

The Document Object Model (DOM) is a programming interface for HTML and XML documents. It provides a structured representation of the document and it defines a way that the structure can be accessed from programs so that they can change the document structure, style and content. The DOM provides a representation of the document as a structured group of nodes and objects that have properties and methods. Essentially, it connects web pages to scripts or programming languages.

A Web page is a document. This document can be either displayed in the browser window, or as the HTML source. But it is the same document in both cases. The Document Object Model (DOM) provides another way to represent, store and manipulate that same document. The DOM is a fully object-oriented representation of the web page, and it can be modified with a scripting language such as JavaScript.

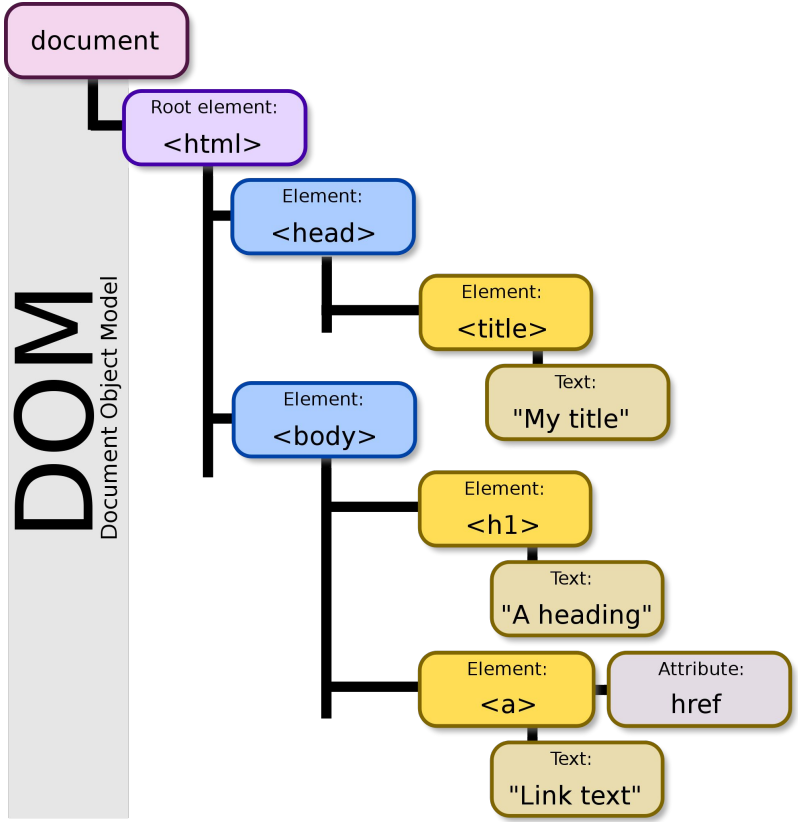
The W3C DOM and WHATWG DOM standards form the basis of the DOM implemented in most modern browsers. Many browsers offer extensions beyond the standard, so care must be exercised when using them on the web where documents may be accessed by various browsers with different DOMs.

For example, the standard DOM specifies that the `getElementsByTagName` method in the code below must return a list of all the `<P>` elements in the document:

```
var paragraphs = document.getElementsByTagName("P");
// paragraphs[0] is the first <p> element
// paragraphs[1] is the second <p> element, etc.
alert(paragraphs[0].nodeName);
```

“A Web page is a document. This document can be either displayed in the browser window, or as the HTML source. But it is the same document in both cases. The Document Object Model (DOM) provides another way to represent, store and manipulate that same document. The DOM is a fully object-oriented representation of the web page, and it can be modified with a scripting language such as JavaScript.”

MDN



https://commons.wikimedia.org/wiki/File:DOM-model.svg

JS = JavaScript

JavaScript Overview

- First developed in 1995 at Netscape (for Navigator 2.0)
- Not really related to Java
- Actually a scripting language (domain-specific for web environment)
- Relies on host for input/output (e.g., browser)
- Multi-paradigm (e.g., procedural, functional, OOP, etc.)
- Dynamic (i.e., executes at runtime)
- Loosely typed
- Standardized as ECMAScript
- Historically maligned/praised for its flexibility

JavaScript Types

number

string

Boolean

Object
- Function
- Array
- Date
- RegExp

null

undefined

JavaScript Types

Some examples

```
// number
var year = 2019;
var course_number = 120;

// string
var name = "Isaac Karth";

// Boolean
var ownsCar = false;

//Object (Function)
var addNumbers = function(a, b) {
        return a + b;
}
//Object (Array)
var = favGames = ['Thief: The Dark Project', 'SimCity 2000',
'Heaven's Vault', 'Crusader Kings 2', 'Pathologic 2' ]
//Object (Date)
var today = new Date(2019, 6, 25);
//Object (RegExp)
var re= new RegExp('\\w');

var the_abyss = null;

undefined // it's complicated
```