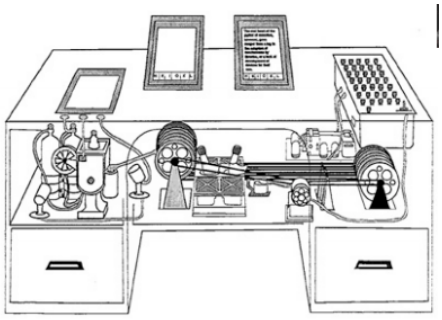
UI development for the Web

Intro to Web Development

- originally the **WWW** provided access to cross-referenced docs on the CERN comp. network
- **Hypertext** linking allows you to quickly open other Web pages, envisioned by Vannevar Bush



Divide and conquer

A webpage relies on three components:

- Content → HTML
  - text, images, animations, videos, etc
- Presentation → CSS
  - how it will appear through a web browser
- Behavior → JavaScript
  - real time interaction (validation, sorting, d&d)

HTML Documents

- Web pages are created using Hypertext Markup Language (HTML)
- A markup language is a set of characters or symbols that define a document's logical structure

Basic HTML Syntax

- HTML is a text format relying on tags
- Tags are enclosed in brackets (< >) and consist of an opening tag and a closing tag
- HTML tags
  - declare elements, e.g. image, canvas, svg, video, sound, button, checkbox, menu, textfield, etc…
  - describe the content, e.g. whether the text should be a title (h1), a paragraph (p), emphasized (em), a quote (quote), etc…
  - structure the content
- Tutorial for learning HTML

  http://www.htmldog.com/

  http://www.sitepoint.com/html/

```
<!DOCTYPE html>
<html>
  <head>
    <title>Hello HTML</title>
  </head>
  <body>
    <p>Hello World!</p>
  </body>
</html>
```


CSS

Cascading Style Sheets

- A single piece of CSS formatting information, (e.g. text alignment), is called style
- Cascading refers to the ability for Web pages to use CSS info from more than one source

CSS

Layers of a web page:

- Content
  - text, images, animations, videos, etc
- Presentation
  - how it will appear through a web browser
- Behavior
  - real time interaction (validation, sorting, d&d)

CSS separates the presentation from the content

CSS

- CSS properties:
  - CSS styles have two parts separated by a colon
    - The property refers to a specific CSS style
    - The value assigned to it determines the style's visual characteristics
    - `color:red`
  - Together, a CSS property and its value are a declaration or style declaration

Linking CSS and HTML

- Inline and internal Style Sheets embed css declarations in html files
- External Style Sheets
  - A separate text document containing style declarations used by multiple HTML documents

```
mywebpage.html
<head>
   < link type = "text/css" href="mycss.css" />
<head>

mycss.css
h1{font-family:Arial}  //all h1 tags
```

General syntax

- a selector (where to apply visual characteristics)
- and multiple pairs of **property:value**

```
body {font-family:Arial ; font-size:9pt}
```

- case insensitive, whitespace and line-breaks ignored
- selectors can be complex (unions, intersections, etc)
- comments: /* this is a comment */

- many online css tutorials

  e.g. http://developer.mozilla.org
  http://css-tricks.com/

Why CSS?

- Easy to maintain
  - change once apply everywhere
- CSS caching = less bandwidth + fast loading
- Flexible
  - can load different CSS under different situations
  - e.g. devices (more later)

css layout and fun

block vs inline

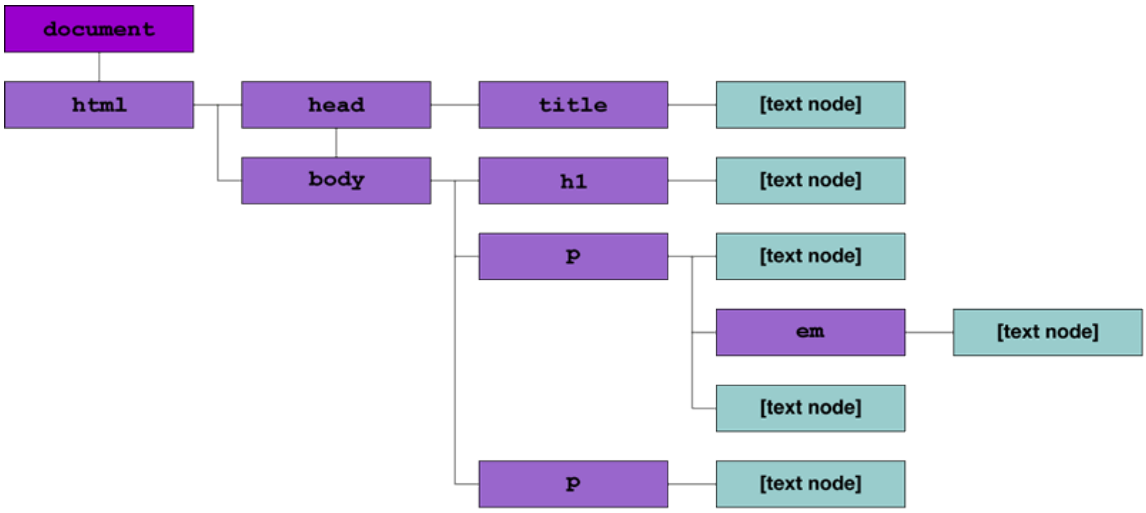
- HTML block-level elements
  - contain inline or other blocks and begin on new lines

    e.g. `<h1>...<h6>, <p>, <ul>, <ol>, <li>, <table>, <tr>, <td>, <div> ...`
- HTML inline (text) level elements
  - must be nested in blocks, may contain text or other inline elements, don't begin on new lines

    e.g. `<em>, <strong>, <a>, <img>, <abbr>, <span> ...`
- CSS helps define their visual properties

DOM

- The browser builds a document object model (DOM), or tree of nodes

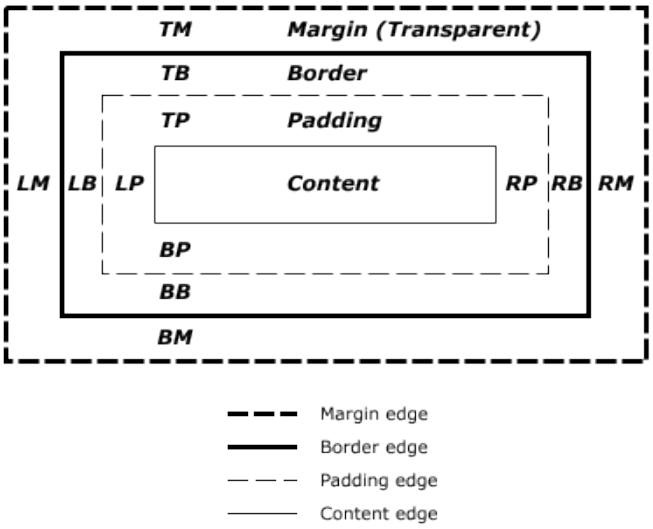


DOM

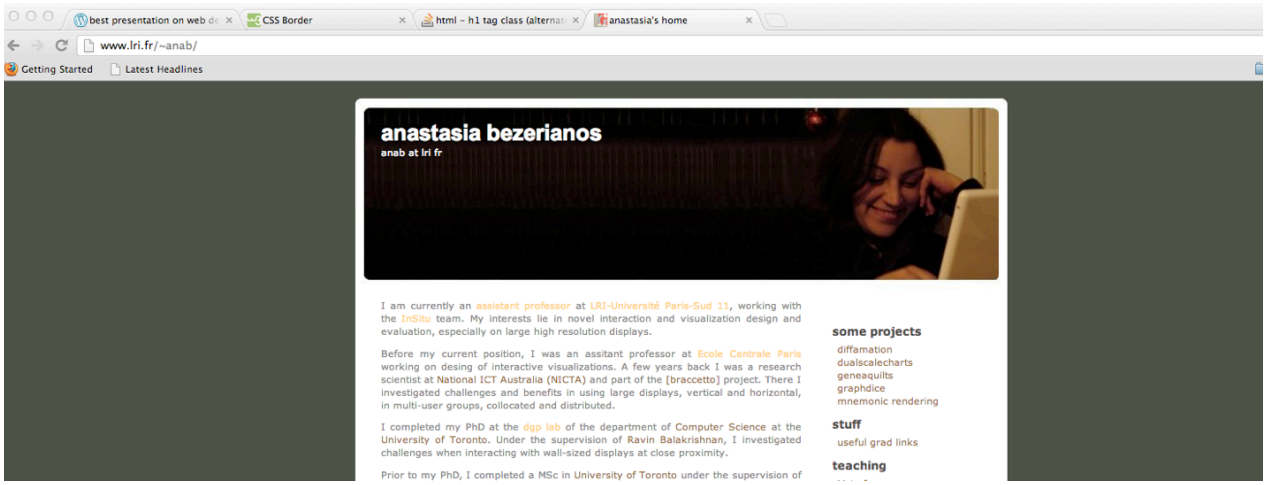
- The browser builds a document object model (DOM), or tree of nodes

- Each node is rendered as 0 or more boxes:
  - inline elements generate inline boxes
  - block elements block boxes
  - using css you can edit their visual properties
  - can fix the size of a box (`width, hight`)
  - and go crazy inside (or outside)...

Properties: the box model



Properties: the box model



fun with css
- css3 menus
- css3 animations
- css3 transforms

CSS and easy menus

- Easy navigation is important
- Navigation bar = a (pretty) list of links

```
<nav>
<ul>
  <li><a href="default.asp">Home</a></li>
      <ul>
        <li><a href="about.asp">About</a></li>
      </ul>
  <li><a href="news.asp">News</a></li>
  <li><a href="contact.asp">Contact</a></li>
</ul>
</nav>
```

CSS and easy menus

- in css remove the (default) bullets and padding

```
nav ul {
  list-style-type:none;
  margin:0;
  padding:0;
}
```

- hide submenus and on hover drop down menu

```
nav ul ul { display: none; }
nav ul li:hover > ul { display: block;}
```

- other “event” selectors: link, visited, hover, active, focus, selection, checked, etc.

CSS and easy menus

- a vertical bar

```
nav a {
  display:block;
  width:60px;
}
```

- a horizontal bar

```
nav li { float:left; }
nav a {
  display:block;
  width:60px;
}
```

CSS3 animations

- animations are transitions between style configurations
  - style describing the CSS animation
  - keyframes for start and end states of style (and possible intermediate points along the way)

```
h1 {
  animation-duration: 3s;
  animation-name: slidein;
  animation-iteration-count: infinite;
}
@keyframes slidein {
  from { margin-left: 100%; width: 300%}
  to   { margin-left: 0%; width: 100%; }
}
```

more at https://developer.mozilla.org/en-US/docs/CSS/Using_CSS_animations

CSS3 animations

- You can add listeners to animation events, such as
  - animation start, animation end, and begin of new iteration
  - they include info on time when the event took place, and the name of the animation that triggered it

CSS3 transforms

- With the **transform** we change the coordinate space of elements (translated, rotated, scaled, and skewed)
- stacking context (applied one after the other)

```
transform: none
transform: matrix(1.0, 2.0, 3.0, 4.0, 5.0, 6.0)
transform: translate(12px, 50%)  // translateX,translateY
transform: scaleX(2)             // scale, scaleY
transform: rotate(0.5turn)       // degrees/rad rotateX ...
transform: skewX(30deg)          // skewY
transform-origin ....
```

```
h1 {-webkit-transform:rotate(45deg)}
```

- seen these in Computer Graphics?
  - https://developer.mozilla.org/en-US/docs/CSS/transform

javascript

What is JavaScript (JS)?

- dynamic and functional language (like java, C#)
  - syntax influenced by C
  - names and naming conventions from Java, O-O
  - input treated with listeners
- can be interpreted by web browsers
- can be used for web client programming
- can be used for server programming (e.g. Node.js)

JavaScript (JS)

- importance to us
  - used to provide interactivity to Web sites and apps
- allows us to change
  - the document's list of stylesheets
  - the rules of a stylesheet
  - the individual elements of the DOM, independent of stylesheet used

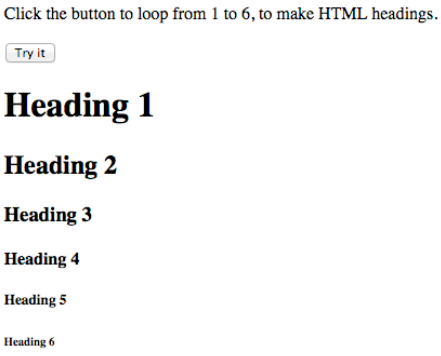
JavaScript (JS)

- classic programming structures
  - statements, functions, comments, `IF ... THEN, FOR, WHILE,...`
  - events (onmouseover, onclick, onkeyup, etc)
  - access to the html DOM

- Examples and tutorials
  https://developer.mozilla.org/

JavaScript (JS)

```
<!DOCTYPE html>
<html>
<body>

<p>Click the button to loop from 1 to 6, to make HTML headings.</p>
<button onclick="myFunction()">Try it</button>
<div id="demo"></div>

<script>
function myFunction()
{
  var x="",i;
  for (i=1; i<=6; i++)
  {
    x=x + "<h" + i + ">Heading " + i + "</h" + i + ">";
  }
 document.getElementById("demo").innerHTML=x;
}
</script>

</body>
</html>
```



JQuery library for JS

- JQuery is a library for JS

- It provides a cross-browser API for
  - HTML/DOM manipulation
  - DOM event handling
  - CSS manipulation
  - Effects and animations
  - AJAX (client server communication)
  - Other utilities

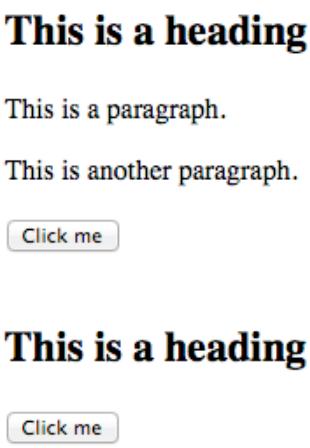
JQuery Syntax

- selecting HTML elements and perform action on them
- Basic syntax: **$(selector).action()**
  - A $ sign defines/accesses jQuery
  - A (selector) finds HTML elements
  - A jQuery action() is performed on the element(s)

- Examples:
  - $(this).hide() - hides the current element.
  - $("p").hide() - hides all <p> elements.

JQuery library for JS

```
<!DOCTYPE html>
<html>
<head>

<script src="http://ajax.googleapis.com/ajax/libs/jquery/1.10.2/jquery.min.js"></script>

<script>

$(document).ready( function(){
    $("button").click( function(){
      $("p").hide();
    });
});

</script>

</head>

<body>
<h2>This is a heading</h2>
<p>This is a paragraph.</p>
<p>This is another paragraph.</p>
<button>Click me</button>
</body>
</html>
```



Cooler stuff in the TA !!

more on JQuery

- Functions can have “callbacks” to order events

```
$("button").click(function(){
  $("p").hide("slow",function(){
    alert("The paragraph is now hidden");
  });
});
```

- and can be chained

```
$("#p1").css("color","red").slideUp(2000).slideDown(2000);
```

even more on JQuery

- Lots of JQuery extensions for
  - widget creation and manipulation
  - interaction extensions e.g. http://jqueryui.com/
  - Note: jQueryUI is a library for JavaScript in the same manner that Swing and SwingStates are libraries for Java

last on jQuery

- More and more functions of jQuery are now available in the HTML5 spec:
  - $(selector) → document.querySelector[All](selector)
  - $(...).addClass("...") → element.classList.add("...")

- Similarly, more and more jQueryUI widgets are now available in the HTML5 spec (see the <input> element)

How to draw/interact

- option 1: <canvas>
  - <canvas> is an HTML5 element
  - used to draw graphics using scripting (e.g. JS)
  - good for graphs, photo compositions or animations

```
<canvas id="canvas" width="300" height="300"></canvas>

//get a reference to the canvas
var ctx = $('#canvas')[0].getContext("2d");

var x,y;
//draw a circle at x, y
ctx.beginPath();
ctx.arc(x, y, 10, 0, Math.PI*2, true);
ctx.closePath();
ctx.fill();
```

```
$(document).mousemove(onMouseMove);

function onMouseMove(evt) {
  if (evt.pageX > x+10 && evt.pageX < x-10 &&
      evt.pageY > y+10 && evt.pageY < y-10) {
        alert (Little ball clicked);
  }
}
```


How to draw/interact

- option 2: <svg> (Scalable Vector Graphics)
  - XML-based language for creating graphics
  - used for static images, animations and UI
  - supports CSS stylesheets

```
<?xml version="1.0" standalone="no"?>
<!DOCTYPE svg PUBLIC "-//W3C//DTD SVG 1.1//EN"
"http://www.w3.org/Graphics/SVG/1.1/DTD/svg11.dtd">

<svg xmlns="http://www.w3.org/2000/svg" version="1.1">
  <circle cx="100" cy="50" r="40" stroke="black"
    stroke-width="2" fill="red" />
</svg>
```

How to draw/interact

- option 2: <svg> (cont'd)
  - interaction
    - linking (using <a xlink:href="…">)
    - events (mouseover, mouseout, etc)
    - scripting

```
<svg>
<a xlink:href="http://www.w3.org//Graphics//SVG//Overview.htm8">
   <rect x="10" y="10" width="140" height="140" rx="5" ry="5"
      style="fill:lightgrey">
   <set attributeName="fill" from="lightgrey" to="red"
        begin="mouseover" end="mouseout"/>
   </rect>
</a>
</svg>
```


How to draw/interact

- option 2: <svg> (cont'd 2)
  - linking (using <a xlink:href="…"> circle)
  - events (mouseover, mouseout, etc)
  - scripting

```
<svg>

<script type="text/javascript">
<![CDATA[
var red=0;
var green=0;
var blue=0;
function changeCol(evt)
{
   var targetshape = evt.getTarget();
   red = Math.round(Math.random()*255);
   green = Math.round(Math.random()*255);
   blue = Math.round(Math.random()*255);
   targetshape.setAttribute("fill",
         "rgb(" + red + "," + green + "," + blue + ")");
}
// ]]>
</script>

<circle cx="200" cy="200" r="100" fill="blue"
          onclick="changeCol(evt)" />
</svg>
```

How to draw/interact

- <canvas>
  - manipulates pixels (better for image manipulation)
  - can render 3D scenes (WebGL)
  - interaction/animation through scripting only
  - libraries to help you draw (Paper.js, Two.js, Three.js)
- <svg>
  - handles vector shapes (better for 2D interaction)
  - interaction/animation can be declared in CSS/SVG
  - libraries to help you manipulate shapes (Two.js) and create visualizations (D3.js)

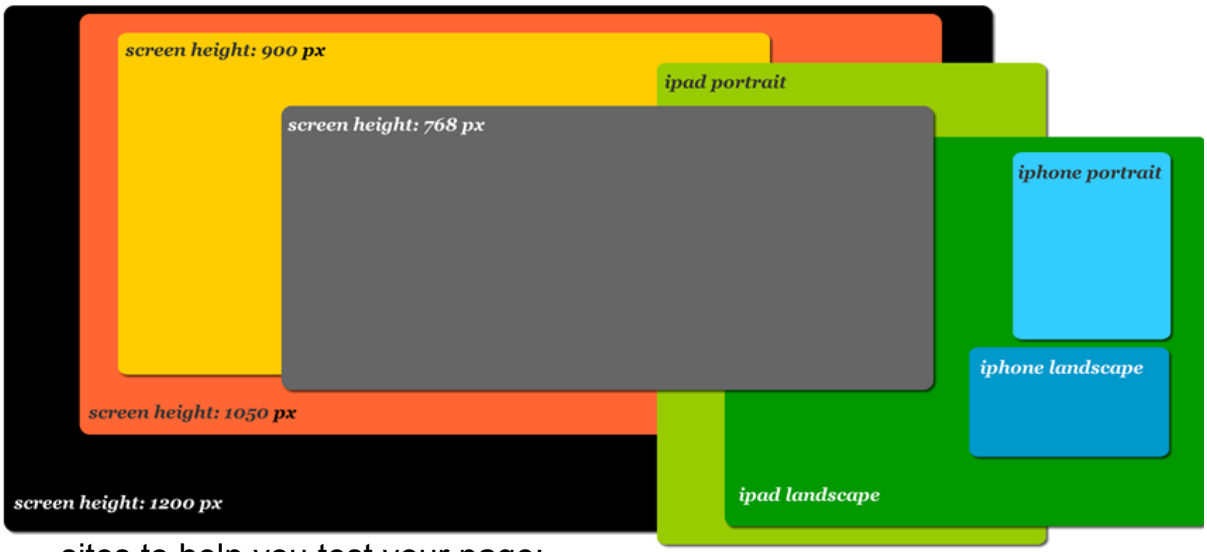
... media queries ...
(responsive web design)

Why CSS?

- Flexible (can load different CSS under different situations, e.g. devices)
  - How do we know what device/resolution?
  - But also, how do we design for it (more later ...)

resolutions

some display resolutions for iphones (http://www.websitedimensions.com/)



sites to help you test your page:

e.g. http://quirktools.com/screenfly/, http://www.viewlike.us/index.php

media queries

- Since CSS2 **media types** (device)

```
screen, braille, speech, ...
```

- In CSS3 added **media queries** (device capabilities)

```
width & height of browser window,
device-width, device-height or device-aspect-ration
orientation (landscape or portrait in phone)
resolution (dpi) ....
```

http://www.w3.org/TR/css3-mediaqueries/

media queries

- we query our media type and capabilities

```
@media screen and (min-device-width:481px) and ..
```

- and we
  - we create style blocks for this query
  - or call a different style sheet

http://www.w3.org/TR/css3-mediaqueries/
http://css-tricks.com/resolution-specific-stylesheets/

media queries

e.g. blocks for different media. On your CSS file

```
/* all screens */

#mypar{ font-size:12px;backround-color:#9F0;}


/* large screen (1440px or more)  */

@media screen and {min-width:1440px} {

      #mypar{ font-size:18px;backround-color:#F90;}

  }

...
```


media queries

e.g. of calling a different css file.

On your HTML, first link a default CSS sheet

```
< link type = “text/css” href=”my_default_css.css” />
```

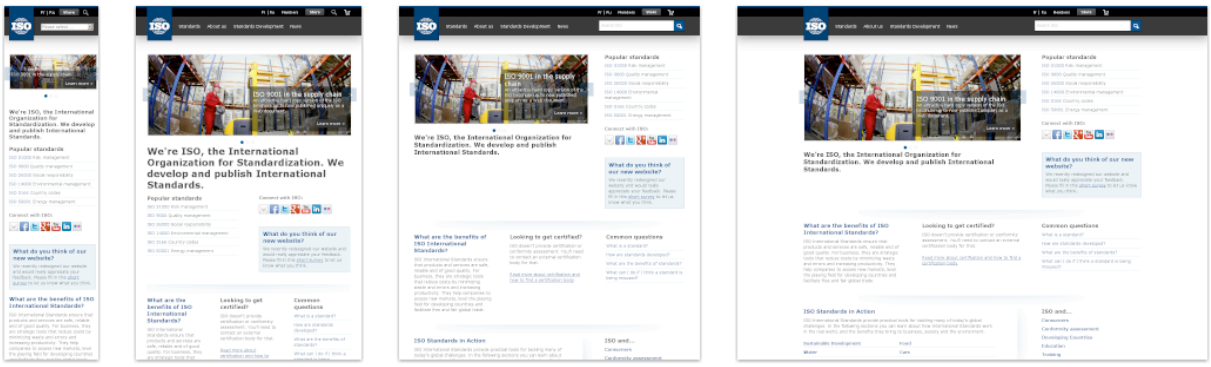
then override it under specific conditions

```
< link rel="stylesheet" type="text/css" media="only screen
and (max-device-width:480px)"href="small-device.css" />

...
```

media queries

ISO

6



from mediaqueri.es