



Department of Physics
Computer Science & Engineering

HTML and Javascript

Outline

- **HTML Basics**

- Document Formatting
- Hypertext and Multimedia
- Lists
- Tables

HTML Basics

- Html5 is current version
- HTML = HyperText Markup Language
 - describes formatting of web pages
 - uses tags, marked with `<...>` and `</...>`
 - typically: opening tags `<...>` followed by closing tags `</...>`
 - some single tags `<...>` e.g., `
`
- W3schools good source (<https://www.w3schools.com/html/>)

Simple Web Page

```
<!DOCTYPE html>
<!-- page1.html          Lynn Lambert-->
<!-- This is a simple html document -->
<!-- This comment does not show up -->

<html>
  <head>
    <title>My first Page</title>
  </head>

  <body>
    This is my first page!
  </body>
</html>
```

Outline

- ❑ HTML Basics
- ❑ Document Formatting
- ❑ Hypertext and Multimedia
- ❑ Lists
- ❑ Tables

Document Formatting

- formatting is done with tags and special symbols:
 - paragraph: `<p> your text </p>`
 - page division: `<div> here comes stuff </div>`
 - new line, break: `
`
 - horizontal line: `<hr>`
 - empty space (nonbreaking space): ` `
 - headings: `<h1>Heading 1</h1>`, `<h2>`, ..., `<h6>`
- attributes allow further style specifications
 - example: `<h2 style="text-align:center">`
 - or: `<p style="text-align:right">`

Font Formatting

- formatting of text passages:
 - bold: ` `
 - italics: `<i> </i>`
 - slightly larger: `<big> </big>`
 - slightly smaller: `<small> </small>`

- change color of text by enclosing it in SPAN (or div)
 - example: ` `
 - colors: red, green, blue, orange, ...

Hypertext and Multimedia

➤ link to other pages, i.e., *hyperlink*

- `Text of link`

- absolute address:

- `PCSE Department`

- relative address:

- `Local Page`

- open page in new browser window:

- `Local Page`

➤ images

- ``

- example : ``

Outline

- ❑ HTML Basics
- ❑ Document Formatting
- ❑ Hypertext and Multimedia
- ❑ Lists
- ❑ Tables
- ❑ Making Pages Publicly Viewable

Lists

- unordered list (bullets): ` ... `
- ordered list (numbers): ` ... `
- individual list item: ` ... `
- example of unordered list

```
<ul>  
  <li>Item 1</li>  
  <li>Item 2</li>  
</ul>
```

- example of ordered list
 - in example above, simply exchange `` with ``
and `` with ``

Outline

- ☐ HTML Basics
- ☐ Document Formatting
- ☐ Hypertext and Multimedia
- ☐ Lists
- ☐ **Tables**
- ☐ Making Pages Publicly Viewable

Tables

specify border width

- table tags: `<table border="1"> ... </table>`
- for each row: `<tr> ... </tr>`
- for each column per row: `<td> ... </td>`
- example of table

```
<table border="1">
  <tr>
    <td>Row 1,Col 1</td>
    <td>Row 1,Col 2</td>
  </tr>
  <tr>
    <td>Row 2,Col 1</td>
    <td>Row 2,Col 2</td>
  </tr>
</table>
```

Outline Javascript

- ❑ **Dynamic Web Pages**

- ❑ **Interaction via Buttons**

- ❑ **Dynamic Text within a Page**

Static vs. Dynamic Web Pages

➤ Static web pages

- pages do not change; always look the same
- format is specified with HTML

➤ Dynamic web pages

- web pages change and can be interactive
- JavaScript is used to create dynamic pages

HTML Event Handlers

- have seen "attributes" before, e.g., SRC or ALT for IMG element these were "static" attributes
- there are also dynamic attributes, known as *event handlers*
- two common ones:
 - ONMOUSEOVER : when user moves mouse over element, e.g., image
 - ONMOUSEOUT: when user moves mouse away from element
- actions are encoded in JavaScript
- example

```

```

Simple JavaScript

- simple action by an attribute (i.e., action handler) of an element:
→ change the value of one of the element's other attributes
- accomplished via JavaScript **assignment** statement of the form:

`this.ATTRIBUTE_NAME=NEW_ATTRIBUTE_VALUE;`

- **ATTRIBUTE_NAME** is an attribute (such as SRC)
- **NEW_ATTRIBUTE_VALUE** is new value being assigned to that attribute (such as the URL of an image)

Simple JavaScript Example (mystery1.html)

```
<!doctype html>
<!-- mystery1.html                                Dave Reed -->
<!-- This page changes an image source on mouseover. -->
<!-- ===== -->

<html>
  <head>
    <title> Mystery Image </title>
  </head>

  <body>
    <div style="text-align:center">
      
      <p>
        Move the mouse over the question mark to reveal the image.
      </p>
    </div>
  </body>
</html>
```

download from: <http://balance3e.com/source.html> or
<http://balance3e.com/Ch4/mystery1.html>

Simple JavaScript Example (mystery1.html)

```
<!doctype html>
<!-- mystery1.html                                Dave Reed -->
<!-- This page changes an image source on mouseover. -->
<!-- ===== -->

<html>
  <head>
    <title> Mystery Image </title>
  </head>

  <body>
    <div style="text-align:center">
      
      <p>
        Move the mouse over the question mark to reveal the image.
      </p>
    </div>
  </body>
</html>
```

this. refers to the current element

download from: <http://balance3e.com/source.html> or
<http://balance3e.com/Ch4/mystery1.html>

Simple JavaScript (2nd Version)

- IMG element has more attributes... e.g., HEIGHT and WIDTH
- can also be changed from within JavaScript statement

```

```

onclick Event Handler (mystery2.html)

```
<!doctype html>
<!-- mystery2.html                                Dave Reed -->
<!-- This page changes an image source on a click. -->
<!-- ===== -->

<html>
  <head>
    <title> Mystery Image </title>
  </head>

  <body>
    <div style="text-align:center">
      
      <p>
        Click on the question mark to reveal the image.
      </p>
    </div>
  </body>
</html>
```

download from: <http://balance3e.com/Ch4/mystery2.html>

Outline

- ❑ Dynamic Web Pages
- ❑ Interaction via Buttons
- ❑ Dynamic Text within a Page

Input Buttons

- `button` is an HTML input element
- can be embedded in web page just like image or table
- Format:

```
<input type="button" value="BUTTON_LABEL"  
      onclick="CODE_TO_EXECUTE_WHEN_MOUSE_CLICKS_ON_BUTTON">
```

- Use `document.getElementById('ELEMENT_ID')` to access other elements (`this` for the current element)

Example with Input Button (mystery3.html)

```
<!doctype html>
<!-- mystery3.html                                Dave Reed -->
<!-- This page changes an image source on button clicks. -->
<!-- ===== -->

<html>
  <head>
    <title> Mystery Image </title>
  </head>

  <body>
    <div style="text-align:center">
      
      <p>
        <input type="button" value="Show Image"
          onclick="document.getElementById('mysteryImg').src=
            'http://balance3e.com/Images/happy.gif';">
        <input type="button" value="Hide Image"
          onclick="document.getElementById('mysteryImg').src=
            'http://balance3e.com/Images/mystery.gif';">
      </p>
    </div>
  </body>
</html>
```

download from: <http://balance3e.com/source.html>

Example with Input Button (mystery3.html)

```
<!doctype html>
<!-- mystery3.html                                Dave Reed -->
<!-- This page changes an image source on button clicks. -->
<!-- =====>

<html>
  <head>
    <title> Mystery Image </title>
  </head>

  <body>
    <div style="text-align:center">
      
      <p>
        <input type="button" value="Show Image"
          onclick="document.getElementById('mysteryImg').src=
            'http://balance3e.com/Images/happy.gif';">
        <input type="button" value="Hide Image"
          onclick="document.getElementById('mysteryImg').src=
            'http://balance3e.com/Images/mystery.gif';">
      </p>
    </div>
  </body>
</html>
```

To make a button,
use input tag with
type="button"

download from: <http://balance3e.com/source.html>

Example with Input Button (mystery3.html)

```
<!doctype html>
<!-- mystery3.html                                Dave Reed -->
<!-- This page changes an image source on button clicks. -->
<!-- ===== -->

<html>
  <head>
    <title> Mystery Image </title>
  </head>

  <body>
    <div style="text-align:center">
      
      <p>
        <input type="button" value="Show Image"
          onclick="document.getElementById('mysteryImg').src=
            'http://balance3e.com/Images/happy.gif';">
        <input type="button" value="Hide Image"
          onclick="document.getElementById('mysteryImg').src=
            'http://balance3e.com/Images/mystery.gif';">
      </p>
    </div>
  </body>
</html>
```

document. for the
entire page

download from: <http://balance3e.com/source.html>

Example with Input Button (mystery3.html)

```
<!doctype html>
<!-- mystery3.html                                Dave Reed -->
<!-- This page changes an image source on button clicks. -->
<!-- ===== -->

<html>
<head>
  <title>Mystery Image </title>

<body>
  <div style="text-align:center">
    
    <p>
      <input type="button" value="Show Image"
        onclick="document.getElementById('mysteryImg').src=
          'http://balance3e.com/Images/happy.gif';">
      <input type="button" value="Hide Image"
        onclick="document.getElementById('mysteryImg').src=
          'http://balance3e.com/Images/mystery.gif';">
    </p>
  </div>
</body>
</html>
```

id attribute

Can be used by
other elements in
the document

download from: <http://balance3e.com/source.html>

Outline

- ❑ Dynamic Web Pages
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Alert Windows

- `alert` statement is JavaScript statement of form:

```
alert('ALERT MESSAGE');
```

- opens little window where user has to click "OK"
- Example:

```
<input type="button" value="Click for free money!"  
      onclick="alert('Did you really think it would work? ' +  
      'Nice try.');">
```

innerHTML Attribute (html5: use [node.textContent](#))

- often, alert window is not really good to show information, e.g., if there is a long text to be shown
- innerHTML is attribute of SPAN, P or DIV
- innerHTML allows to enter text into web page after page is already displayed

innerHTML Example (help.html)

```
<!doctype html>
<!-- help.html                                     Dave Reed -->
<!-- Web page that displays a help message when a button is clicked. -->
<!-- ===== -->

<html>
  <head>
    <title> Button Help </title>
  </head>

  <body>
    <p>
      Contents of the page.
    </p>
    <input type="button" value="Click for Help"
      onclick="document.getElementById('outputDiv').innerHTML=
        'If you have any trouble with this site, ' +
        'contact <i>admin@foo.bar</i>.'">

    <hr>
    <div id="outputDiv">
      Welcome to my site!
    </div>
  </body>
</html>
```

download from: <http://balance3e.com/Ch4/help.html> **Slide 30**

Functions in javascript

- ❑ **Predefined JavaScript Functions**
- ❑ **Simple User-Defined Functions**
- ❑ **Randomness in a Page**

Predefined JavaScript Functions

recall: in mathematics, a *function* is a mapping from inputs to a single output

- e.g., the absolute value function: $|-5| \rightarrow 5$, $|17.3| \rightarrow 17.3$

in JavaScript, a function is applied to inputs via a *function call*

- specify the function name, followed by inputs in parentheses

```
num = parseFloat(document.getElementById('numBox').value);
```

in addition to `parseFloat`, JavaScript has other Global Properties and Functions: https://www.w3schools.com/jsref/jsref_obj_global.asp

Math Functions

Math.sqrt determines the square root

`Math.sqrt(9)` → $\sqrt{9} = 3$

`Math.sqrt(12.25)` → $\sqrt{12.25} = 3.5$

Math.max determines the maximum of two values

`Math.max(12, 8.5)` → 12

`Math.max(-3, -8)` → -3

Math.pow raises a number to a power

`Math.pow(2, 10)` → $2^{10} = 1024$

`Math.pow(2, -1)` → $2^{-1} = 0.5$

`Math.pow(9, 0.5)` → $9^{0.5} = 3$

Math.min, Math.abs, Math.round, Math.ceil, Math.floor, ...

See https://www.w3schools.com/js/js_math.asp

Math.random Function

Math.random generates a *pseudo-random* number in the range [0...1)

- *pseudo-random* refers to the fact that the numbers appear randomly distributed, but are in fact generated by a complex algorithm
- note: this function has no inputs; it returns a different number each call

`Math.random()` → 0.33008525626748814

`Math.random()` → 0.213335955823927

`Math.random()` → 0.8975001737758223

a call to `Math.random` can be placed in an expression to affect the range

`2*Math.random()` → [0...2)

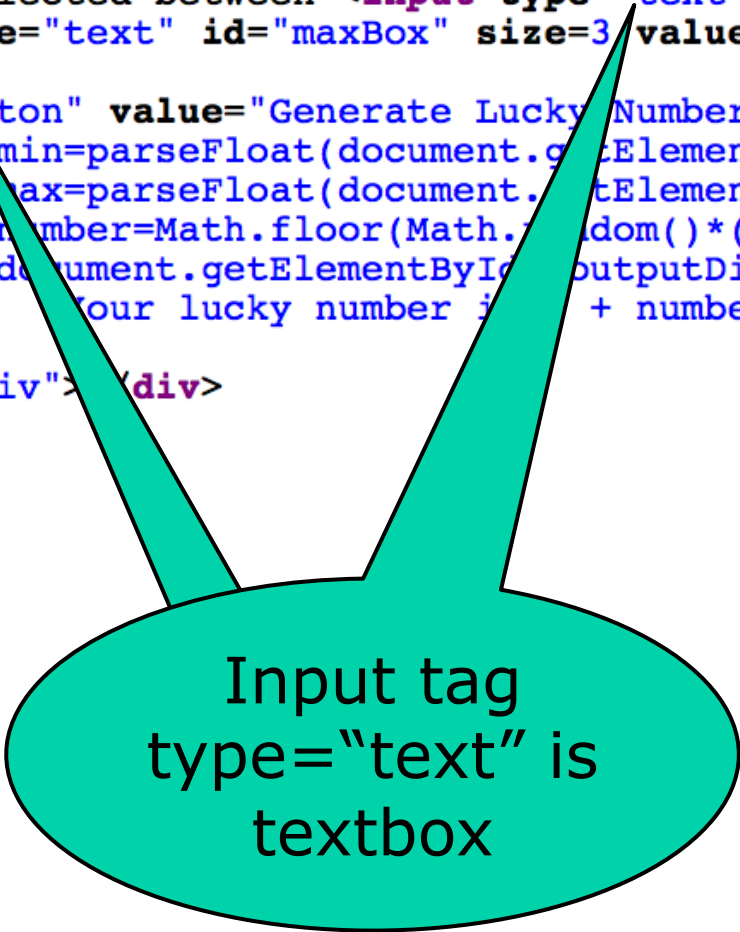
`Math.random() + 1` → [1...2)

`9*Math.random() + 1` → [1...10)

`Math.floor(9*Math.random() + 1)` → 1, 2, 3, ..., 9

Lucky Number Page (lucky1.html)

```
<h2>Lucky Number</h2>
<p>
  Numbers are selected between <input type="text" id="minBox" size=3 value=0>
  and <input type="text" id="maxBox" size=3 value=9>.
</p>
<input type="button" value="Generate Lucky Number"
  onclick="min=parseFloat(document.getElementById('minBox').value);
           max=parseFloat(document.getElementById('maxBox').value);
           number=Math.floor(Math.random()*(max-min+1)) + min;
           document.getElementById('outputDiv').innerHTML=
             'Your lucky number is ' + number;">
<hr>
<div id="outputDiv"></div>
```



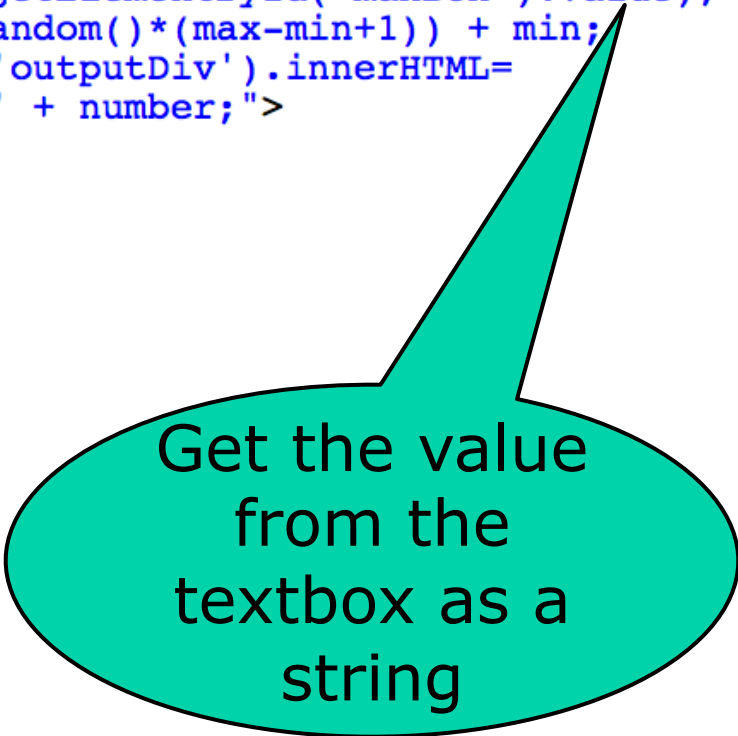
Input tag
type="text" is
textbox

Lucky Number Page (lucky1.html)

```
<h2>Lucky Number</h2>
<p>
  Numbers are selected between <input type="text" id="minBox" size=3 value=0>
  and <input type="text" id="maxBox" size=3 value=9>.
</p>
<input type="button" value="Generate Lucky Number"
  onclick="min=parseFloat(document.getElementById('minBox').value);
           max=parseFloat(document.getElementById('maxBox').value);
           number=Math.floor(Math.random()*(max-min+1)) + min;
           document.getElementById('outputDiv').innerHTML=
             'Your lucky number is ' + number;">
<hr>
<div id="outputDiv"></div>
```



Convert it
to a float



Get the value
from the
textbox as a
string

Lucky Number Page (lucky1.html)

```
<h2>Lucky Number</h2>
<p>
  Numbers are selected between <input type="text" id="minBox" size=3 value=0>
  and <input type="text" id="maxBox" size=3 value=9>.
</p>
<input type="button" value="Generate Lucky Number"
  onclick="min=parseFloat(document.getElementById('minBox').value);
           max=parseFloat(document.getElementById('maxBox').value);
           number=Math.floor(Math.random()*(max-min+1)) + min;
           document.getElementById('outputDiv').innerHTML=
             'Your lucky number is ' + number;">

<hr>
<div id="outputDiv"></div>
```

What does it do?

Outline

- ❑ Predefined JavaScript Functions
- ❑ Simple User-Defined Functions
- ❑ Randomness in a Page

Lucky Number Revisited

- the code from the button is moved to the user-defined GenerateNumber function
- SCRIPT tags enclose the function definition in the HEAD

```
<head>
  <title> Lucky Number </title>
  <script type="text/javascript">
    function GenerateNumber()
    // Assumes: minBox and maxBox define the range for the value
    // Results: picks a random number and displays it in outputDiv
    {
      min=parseFloat(document.getElementById( 'minBox' ).value);
      max=parseFloat(document.getElementById( 'maxBox' ).value);
      number=Math.floor(Math.random()*(max-min+1)) + min;
      document.getElementById( 'outputDiv' ).innerHTML=
        'Your lucky number is ' + number;
    }
  </script>
</head>
```

- as a result, the button is greatly simplified

```
<input type="button" value="Generate Lucky Number" onclick="GenerateNumber();">
```

Example: Simulated Dice

```
<head>
  <title> Die Rolls </title>
  <script type="text/javascript">
    function SelectImage()
      // Assumes: die images are in balance3e.com/Images
      // Results: displays a randomly selected image of a 6-sided die
      {
        roll=Math.floor(Math.random()*6) + 1;
        imgName='http://balance3e.com/Images/die' + roll + '.gif';
        document.getElementById('dieImg').src = imgName;
      }
  </script>
</head>

...

<p>
  
</p>
<input type="button" value="Click to Roll" onclick="SelectImage();">
```

From: <http://balance3e.com/Ch7/dice.html>

Example: Random Banner Ads

```
<head>
  <title> Random Banner Ads </title>
  <script type="text/javascript">
    function SelectAd()
      // Assumes: the banners ad0.gif, ad1.gif, ad2.gif, and ad3.gif are
      //           stored in http://balance3e.com/Images
      // Results: displays the next banner ad image in the page
    {
      adNum = Math.floor(4*Math.random());
      document.getElementById('adImg').src=
        'http://balance3e.com/Images/ad' + adNum + '.gif';
    }
  </script>
</head>
<body onload="setInterval('SelectAd()', 1000);">
  <div style="text-align:center">
    
  </div>
  <p>
    Contents of the page.
  </p>
</body>
```

Having functions in different files

- To include a function in the head, you can define it in the same file or a different one.
- Same file
- Different file:
 - In html file:

```
<script type="text/javascript" src="http://  
url.nameOfFile"> </script>
```

- In nameOfFile.js:

```
function abc( ) { /* stuff in here */ }  
function def(params) /* stuff in here, too */ }
```