

## Chapter 2: Introduction to HTML Part 1

CS 80: Internet Programming

Instructor: Mark Edmonds

### HTML

- What does it stand for?
  - Hypertext markup language
- What is a markup language?
  - Not a traditional programming language
  - Specifies the structure and content of documents

### Editing HTML

- All you need is a text editor and a web browser
- Text editors
  - Brackets (recommended), Visual Studio Code, Sublime Text, Notepad++, TextEdit, Vim (!), etc
  - Anything will do, but don't use Microsoft Word (technically you can do this but it will make for a painful semester and you will almost certainly get points off)

### Editing HTML

- Web browsers
  - Chrome, firefox, IE, etc
  - For this course, firefox seems to be the most agreeable
    - \* There is one assignment with Ajax that only works with firefox

### HTML Concepts

- Documents are composed of HTML5 *tags*
- These tags outline this structure and content of a webpage
- Tag format:
  - `<tag>` begins the tag
  - `</tag>` closes the tag

## HTML Concepts

- Most tags have a beginning and an end
  - Exceptions: `<meta>` (specifies document metadata, `<img>` tag (adds an image to the page), there are others we will come across
  - We call tags without an ending *void elements* because they do not markup text (text is not placed between a start and an end tag).

## HTML Concepts

- Tags can be *nested* e.g. there is a tag inside of another tag before the outer tag's closing tag
- Attributes: content inside of a tag that specifies information about this particular use of the tag
- We will see an example in a moment
- Elements: the portions of a HTML document
  - The beginning to closing of a tag form an element
  - e.g. `<tag> content </tag>` is an element

## Example: `hello_world.html`

```
1 <!DOCTYPE html>
2 <!-- document type declaration. required. must be on first line -->
3
4 <!-- starts the html document, the root of the document's structure.
   required. -->
5 <html>
6
7 <!-- starts the head section of the document, provides info but usually
   not content. required. -->
8 <head>
9   <!-- metadata tag, here we specify the character encoding of the
       document. required. -->
10  <meta charset="utf-8">
11  <!-- specify the title of the document (what is displayed in the
       browser tab). required. -->
12  <title>Hello world!</title>
13 <!-- end of head section. required. -->
14 </head>
15
16 <!-- document body. the content goes here! required. -->
17 <body>
```

```
18  <!-- simple paragraph (the p-tag) -->
19  <p>Welcome to HTML5!</p>
20  <!-- end of body section. required. -->
21  </body>
22
23  <!-- ends the html document. required. -->
24  </html>
```

## HTML5 Validation

- You can validate HTML online!
- Go to [https://validator.w3.org/#validate\\_by\\_upload](https://validator.w3.org/#validate_by_upload) to validate a file
- Go to [https://validator.w3.org/#validate\\_by\\_input](https://validator.w3.org/#validate_by_input) to validate input
- Upload `hello_world.html` example to validator

## Headings

- Heading elements designate a level of importance for a topic on a page
- Headings range from `<h1>` to `<h6>`
  - The lower the number, the greater importance
  - `<h1>` is the "most" important

## Example: `headings.html`

```
1  <!DOCTYPE html>
2  <html>
3
4  <head>
5    <meta charset="utf-8">
6    <title>Headings</title>
7  </head>
8
9  <body>
10   <h1>Level 1 Heading</h1>
11   <h2>Level 2 heading</h2>
12   <h3>Level 3 heading</h3>
13   <h4>Level 4 heading</h4>
14   <h5>Level 5 heading</h5>
15   <h6>Level 6 heading</h6>
```

```
16 </body>
17
18 </html>
```

## Hyperlinks

- Provides a link to another HTML document
- Can be on this host or on a different host
  - What does this mean?
  - You can link internally to your own content or to a new host's webpage.
  - In either case, a new HTTP request is triggered

## Hyperlinks

- Links are facilitated using the `<a>` tag with a corresponding attribute of `href`
  - `a` stands for 'anchor'
  - `href` stands for 'hypertext reference'
- We can href other protocols (e.g. `https://`, `ftp://`, `mailto:`, `file:`, etc) or even javascript!
  - If it's javascript the script will execute when clicked
  - This will make more sense once we get to javascript, hold on!

## Example: `linking.html`

```
1 <!DOCTYPE html>
2 <html>
3
4 <head>
5   <meta charset="utf-8">
6   <title>Linking</title>
7 </head>
8
9 <body>
10  <h1>Welcome to CS 80 at SMC</h1>
11
12  <p>Hope you enjoy; make sure to <strong>turn in assignments on time</strong></p>
13
14  <p><a href="http://www.smc.edu/">SMC</a></p>
```

```
15 <p><a href="http://smconline.org/index.real?action=Login">eCompanion
    </a></p>
16 <p><a href="mailto:edmonds_mark@smc.edu">Email me</a></p>
17 </body>
18
19 </html>
```

## Images

- Added to HTML using the `<img>` tag
- `<img>` tag is one of the tags without an ending `</img>`
- The `src` attribute specifies where the image is located
  - The location can be a relative path (e.g. stored on the same computer as the html document)
  - The location can be a remote path (e.g. an image stored on a different host)

## Images

- Must use an `alt` attribute, it allows for two important usages:
  - For those with poor or no eyesight to still understand the content on the page. A text-to-speech program can read the `alt` description to a visually impaired person.
  - If the image fails to load (maybe it's an external image), the `alt` can still describe what the image is
  - The `alt` description should be as brief as possible while still being descriptive

## Images

- Common attributes used: specifying height and width'
  - Height and width are both measured in pixels
  - If there are no height and width are specified, image will be rendered at it's own size (the original image size)
- Images can be nested inside of a link tag (`<a>`) to create an image that is also a hyperlink

## Example: images.html

```
1 <!DOCTYPE html>
2 <html>
3
```

```
4 <head>
5   <meta charset="utf-8">
6   <title>Images</title>
7 </head>
8
9 <body>
10  <h3>Every common image type is supported</h3>
11
12  <p><strong>Note: alt is a required attribute</strong></p>
13  <p>
14    <!-- relative path -->
15    
16    <!-- remote paths -->
17    
19    
22  </p>
23  <h3>We can control the width and height as well</h3>
24
25  
27
28  <h2>We can make our images links as well!</h2>
29
30  <a href="http://google.com">
31    
35  </a>
36 </body>
37 </html>
```

## Special Characters

- HTML itself uses certain characters to represent the structure of the document
  - These symbols have special meaning within the document itself

- What are some examples?
  - \* How are tags wrapped?
    - Around < and >

## Special Characters

- Clearly, we still want to be able to include these tags in an HTML document.
- Solution: We have to use a special convention to include these restricted characters
- These special conventions are called *character entity references*
  - The basic format: `&ref;`
    - \* Where `ref` is a reference to the character you wish to insert

## Special Characters

- E.g. `&lt;` inserts the less-than symbol (<)
- You can find a list of these symbols online
  - Do a quick google search go all of the symbols available
  - [http://www.w3schools.com/html/html\\_entities.asp](http://www.w3schools.com/html/html_entities.asp)
  - <https://www.w3.org/TR/REC-html40/sgml/entities.html>
  - <https://dev.w3.org/html5/html-author/charref>

## Example: char.html

```
1 <!DOCTYPE html>
2 <html>
3
4 <head>
5   <meta charset="utf-8">
6   <title>Special characters and horizontal rules</title>
7 </head>
8
9 <body>
10  <p>
11    <!-- use some special characters -->
12    We &amp;amp; can &lt; add &copy; symbols &trade; wherever &hellip;
        we &quot; want &gt; in &mdash; our &ndash; docment
13  </p>
14  <hr>
15  <p>
```

```
16     It's best practice to avoid the <hr> tag now because we can
      do styling with CSS, producing more professional looking and
      easier to maintain websites
17     We can also strike through <del>text</del>, subscript <sub>text</
      sub>, or superscript <sup>text</sup>.
18 </p>
19 </body>
20
21 </html>
```

### Lists

- Two types of lists:
  - Unordered list and ordered list
- Unordered list (bulleted list; like this list)
  - `ul` tag starts an unordered list (`ul` stands for unordered list)
  - Each list item is a nested `li` tag (`li` stands for list element)

### Lists

- Ordered list (numbered list)
  - `ol` tag starts an ordered list
  - each list item is a nested `li` tag
- We can also make lists inside of lists (nested lists)
  - Just like your word processor
  - Bullets of an unordered list will change based on the nesting level

### Example: `lists.html`

```
1 <!DOCTYPE html>
2 <html>
3
4 <head>
5   <meta charset="utf-8">
6   <title>Lists</title>
7 </head>
8
9 <body>
```



```
10  <h2>We can make unordered and ordered lists!</h2>
11
12  <p>
13    This is an unordered list
14  </p>
15  <ul>
16    <li>this item has no order</li>
17    <li>neither does this one</li>
18    <li>this is not an exciting list</li>
19  </ul>
20
21  <p>
22    This is an ordered list with reasons why this course is good
23  </p>
24  <ol>
25    <li>Computer science is a great field</li>
26    <li>The course is fun!</li>
27    <li>The tests are take home</li>
28  </ol>
29
30  <p>
31    We can nest lists too
32  </p>
33  <ol>
34    <li>Computer science is a great field
35      <ul>
36        <li>It's fun</li>
37        <li>There are a lot of jobs</li>
38        <li>It makes you think</li>
39      </ul>
40    </li>
41    <li>The course is fun!
42      <ol>
43        <li>You get to explore an entire subfield in one semester
44          <ul>
45            <li>Can be the starting point for a career</li>
46          </ul>
47        </li>
48      </ol>
49    </li>
50    <li>The tests are take home
51      <ul>
52        <li>
```

```
53     A nest
54     <ul>
55         <li>
56             Another nest
57             <ul>
58                 <li>Nests on nests</li>
59             </ul>
60         </li>
61     </ul>
62 </li>
63 </ul>
64 </ol>
65
66
67 </body>
68
69 </html>
```

### Line Breaks

- `<br>` tag - a line break

### Tables

- Similar to a textbook table or excel spreadsheet (except without math functions)
- Started with the `table` tag
- The nested `caption` tag gives the table a title and summarizes the table's content

### Tables

Table Bodies, Headers, and Footers

- `<thead>` and `<tfoot>` specify the header and footer of the table, respectively
  - Maybe you want different styling for the header and footer using CSS
  - Again, we'll cover that later

### Tables

Table Bodies, Headers, and Footers

- `<tbody>` specifies the main body portion of the table
- `<thead>` and `<tfoot>` have the same internal structure

### Tables

#### Table Rows

- `<tbody>`, `<thead>`, and `<tfoot>` is comprised of at least one `<tr>` element, which is a table row
  - Note that no table requires all three, but you should use them appropriately
- If your table has a header, put the header, etc.
- Makes table maintenance easier later

### Tables

#### Table Rows

- Each `<tr>` tag is comprised of `<th>` tags, which is a *header cell*. It is different from the normal cell!
  - It is different to allow easier styling using CSS
  - The table fills left to right along the columns
- Repeat this `<tr>` and `<th>` pattern for each row, and each column you want to specify
- `<tfoot>` can be below or above

### Tables

#### Table Rows

- `<tbody>` follows the same convention, but uses a `<td>` element instead of `<th>`
- `td` stands for 'table data'

### Tables

#### Table Sizing

- By default, each table column is only as wide as its largest cell.
- `rowspan` and `colspan`
- These attributes allows a cell to span multiple rows or columns
  - This is like merging rows/columns in a document

## Tables

### Table Sizing

- `rowspan` allows a single table cell to span the width of more than one cell or row
- `colspan` allows a single table cell to span the width of more than one cell or column
- These attributes can be applied in `<th>` and `<td>` elements

### Example: `tables.html`

```
1 <!DOCTYPE html>
2 <html>
3 <!-- Fig. 2.12: table1.html -->
4 <!-- Creating a basic table. -->
5
6 <head>
7   <meta charset="utf-8">
8   <title>Tables</title>
9 </head>
10
11 <body>
12
13   <h2>Here's a simple table example</h2>
14
15   <h3>Notice the table scales to the widest cell's content (and not the
16     caption's)</h3>
17
18   <!-- the <table> tag opens a table -->
19   <!-- Reminder: the border element should not be used. We are using it
20     here before we learn CSS -->
21   <table border="1">
22     <!-- the <caption> tag summarizes the table's -->
23     <!-- contents (this helps visually impaired people) -->
24     <caption><strong>Table of Fruits (1st column) and Their Prices (2nd
25       column)</strong></caption>
26     <!-- the <thead> section appears first in the table -->
27     <!-- it formats the table header area -->
28     <thead>
29       <tr>
30         <!-- <tr> inserts a table row -->
31         <th>Fruit</th>
32         <!-- insert a heading cell -->
```

```
30     <th>Price</th>
31   </tr>
32 </thead>
33 <!-- the <tfoot> section appears last in the table -->
34 <!-- it formats the table footer -->
35 <tfoot>
36   <tr>
37     <th>Total</th>
38     <th>$3.75</th>
39   </tr>
40 </tfoot>
41 <!-- within the <tbody> -->
42 <tbody>
43   <tr>
44     <td>Apple</td>
45     <!-- insert a data cell -->
46     <td>$0.25</td>
47   </tr>
48   <tr>
49     <td>Orange</td>
50     <td>$0.50</td>
51   </tr>
52   <tr>
53     <td>Banana</td>
54     <td>$1.00</td>
55   </tr>
56   <tr>
57     <td>Pineapple</td>
58     <td>$2.00</td>
59   </tr>
60 </tbody>
61 </table>
62
63 <!-- <br> is a line break -->
64 <br>
65
66 <h2>We can make more complicated tables using rowspan and colspan</h2>
67 >
68 <!-- Reminder: the border element should not be used. We are using it
69 here before we learn CSS -->
69 <table border="1">
70   <caption>A more complex sample table</caption>
```

```
71     <thead>
72         <!-- rowspans and colspans merge the specified -->
73         <!-- number of cells vertically or horizontally -->
74         <tr>
75             <!-- merge two rows -->
76             <th rowspan="2">
77                 
79             </th>
80             <!-- merge four columns -->
81             <th colspan="4">
82                 <strong>Camelid comparison</strong><br> Approximate as of
83                 10/2011
84             </th>
85         </tr>
86         <tr>
87             <th># of humps</th>
88             <th>Indigenous region</th>
89             <th>Spits?</th>
90             <th>Produces wool?</th>
91         </tr>
92     </thead>
93     <tbody>
94         <tr>
95             <td>Camels (bactrian)</td>
96             <td>2</td>
97             <td>Africa/Asia</td>
98             <td>Yes</td>
99             <td>Yes</td>
100         </tr>
101         <tr>
102             <th>Llamas</th>
103             <td>1</td>
104             <td>Andes Mountains</td>
105             <td>Yes</td>
106             <td>Yes</td>
107         </tr>
108     </tbody>
109 </table>
110 </body>
111 </html>
```

## Forms

- Mechanism for the user to send data to the server from the client
- The user types in the data, then hits 'submit' the submit triggers a
- HTTP request to the server to accept the form
  - The receiving end will be covered in Chapter 17
- Forms use the `<form>` tag

## Forms

Important `<form>` attributes

- These setup the form and specify how and where to send data to the server
- `method` attribute can be two values:
  - `get`
  - `post`

## Forms

Important `<form>` attributes

- `get`
  - Appends form data to url in name/value pairs
  - Length of URL is limited (~3000 characters limit)
  - Never use this to send sensitive data
  - Best suited for things like a query or other non-secure data (you can bookmark the url to effectively save the form submission)

## Forms

Important `<form>` attributes

- `post`
  - Appends form data to HTTP request
  - Has no size limitations
  - Cannot be bookmarked (since it does not modify the URL)

## Forms

Important `<form>` attributes

- `action`
  - Specifies where to send the form data (e.g. what site should process the form)
  - Must be a valid URL
  - The server **should** know how to respond to the form submission

## Forms

Inputs

- Once we have the form setup, we can add inputs
- Inputs are added using the `<input>` tag

## Forms

Important `<input>` attributes

- `type`
  - Controls the type of the input; a lot of options available
  - Options include: `text`, `button`, `color`, `password`, `radio`, `range`, `reset`, `submit`, etc. with more available online

## Forms

Important `<input>` attributes

- `type`
  - `hidden` is a special type
    - \* It submits data to the server that is predetermined in the HTML page
    - \* The user cannot control this input
    - \* Might be used for sending information to another server to identify where the form is coming from

## Forms

Important `<input>` attributes



- `type`
  - `text` has a couple of special attributes: `size` - specifies the size of the text box and `maxLength` which specifies the maximum length of the input

## Forms

Important `<input>` attributes

- `name`
  - Gives the input a name that can be referenced once the server receives the submission
  - This is part of the glue between the client and the server that processes the form

## Forms

Important `<input>` attributes

- `value`
  - Gives the input an initial value

## Forms

- Please lookup these elements in your book or online:
  - `textarea` - multiline text input, has `rows` and `cols` attributes
  - `password` - provides a password-protected field. this is only visually enforced (displays a \* instead of the text), the password still should be encrypted when sent over HTTP
  - `color` - allows color input
  - `number` - allows user to input a number, similar to a text but for numbers

## Forms

- Please lookup these elements in your book or online:
  - `range` - allows user to pick between a range of values
  - `checkbox` - allows user to tick multiple options
  - `radio` - allows user to pick one option from a list
  - They all follow a similar pattern, but familiarize yourself!
- `<select>` tag presents a dropdown menu with a preselected list of options

**Example: forms.html**

```
1 <!DOCTYPE html>
2 <html>
3
4 <!-- Fig. 2.14: form.html -->
5 <!-- Form with a text field and hidden fields. -->
6
7 <head>
8   <meta charset="utf-8">
9   <title>Feedback Form</title>
10 </head>
11
12 <body>
13   <h1>Feedback Form</h1>
14   <p>Please fill out this form to help us improve our site.</p>
15   <!-- this tag starts the the form, gives the -->
16   <!-- method of sending information and the -->
17   <!-- location of the form-processing script -->
18   <form method="post" action="http://www.deitel.com">
19     <!-- hidden inputs contain non-visual -->
20     <!-- information that will also be submitted -->
21     <input type="hidden" name="recipient" value="deitel@deitel.com">
22     <input type="hidden" name="subject" value="Feedback Form">
23     <input type="hidden" name="redirect" value="main.html">
24     <!-- <input type = "text"> inserts a text field -->
25     <p>
26       <label>Name:
27         <input name = "name" type = "text" size = "25" maxlength = "30"
28         >
29       </label>
30     </p>
31     <p>
32       <label>Comments:<br>
33       <textarea name = "comments" rows = "4" cols = "36">Enter
34       comments here.</textarea>
35     </label>
36   </p>
37   <p>
38     <!-- input types "submit" and "reset" insert -->
39     <!-- buttons for submitting and clearing the -->
```

```
39     <!-- form's contents, respectively -->
40     <input type="submit" value="Submit">
41     <input type="reset" value="Clear">
42 </p>
43 </form>
44
45 </body>
46
47 </html>
```

### Internal Linking

- Mechanism to jump between locations in a single document without reloading the HTML page
- Basic idea: we uniquely mark elements in the document using the `id` attribute, then we refer to the corresponding id in an anchor (a link, the `a` tag)
- The link tag can reference a specific tag in a different HTML document, even on a different host

### Example: `internal_linking.html`

```
1 <!DOCTYPE html>
2 <html>
3 <!-- Fig. 2.16: internal.html -->
4 <!-- Internal Linking -->
5 <head>
6   <meta charset="utf-8">
7   <title>Internal Linking</title>
8 </head>
9
10 <body>
11   <!-- id attribute creates an internal hyperlink destination -->
12   <h1 id="features">The Best Features of the Internet</h1>
13   <!-- an internal link's address is "#id" -->
14   <p><a href="#bugs">Go to <em>Favorite Bugs</em></a></p>
15   <ul>
16     <li>You can meet people from countries around the world.</li>
17     <li>You have access to new media as it becomes public:
18       <ul>
19         <li>New games</li>
20         <li>New applications
21       </ul>
```

```
22         <li>For Business</li>
23         <li>For Pleasure</li>
24     </ul>
25 </li>
26 <li>Around the clock news</li>
27 <li>Search Engines</li>
28 <li>Shopping</li>
29 <li>Programming
30     <ul>
31         <li>HTML5</li>
32         <li>Java</li>
33         <li>Dynamic HTML</li>
34         <li>Scripts</li>
35         <li>New languages</li>
36     </ul>
37 </li>
38 </ul>
39 </li>
40 <li>Links</li>
41 <li>Keeping in touch with old friends</li>
42 <li>It is the technology of the future!</li>
43 </ul>
44
45 <br><br><br><br><p>Skipping a whole bunch of space where you would
    put amazing web content</p><br><br><br><br>
46 <p>Skipping a whole bunch of space where you would put amazing web
    content</p><br><br><br><br>
47 <p>Skipping a whole bunch of space where you would put amazing web
    content</p><br><br><br><br>
48 <p>Skipping a whole bunch of space where you would put amazing web
    content</p><br><br><br><br>
49 <p>Skipping a whole bunch of space where you would put amazing web
    content</p><br><br><br><br>
50
51 <!-- id attribute creates an internal hyperlink destination -->
52 <h1 id="bugs">My 3 Favorite Bugs</h1>
53 <p>
54     <!-- internal hyperlink to features -->
55     <a href="#features">Go to <em>Favorite Features</em></a>
56 </p>
57 <ol>
58     <li>Fire Fly</li>
59     <li>Gal Ant</li>
```

```
60     <li>Roman Tic</li>
61 </ol>
62
63 <h1>We can even reference an id in a different HTML document on a
    different host</h1>
64 <p>
65     <a href="https://en.wikipedia.org/wiki/HTML#Attributes">https://en.
        wikipedia.org/wiki/HTML#Attributes</a>
66 </p>
67 <p>
68     <a href="#">Top</a>
69 </p>
70
71 </body>
72
73 </html>
```