

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, `` 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`

- Tip: try clicking the link above! This will load the example in your browser.

```
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 to validate a file
- Go to 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 `` tag
- `` tag is one of the tags without an ending ``
- 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 
18 
19 </p>
20
21 <h3>We can control the width and height as well</h3>
22
23 
24
25 <h2>We can make our images links as well!</h2>
26
27 <a href="http://google.com">
28 
29 </a>
30 </body>
31
32 </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. `<` 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
 - <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; can &lt; add &copy; symbols &trade; wherever &hellip;
13    we &quot; want &gt; in &mdash; our &ndash; docment
14  </p>
15  <hr>
16  <p>
17    It's best practice to avoid the &lt;hr&gt; tag now because we can
18    do styling with CSS, producing more professional looking and
19    easier to maintain websites
20    We can also strike through <del>text</del>, subscript <sub>text</
21    sub>, or superscript <sup>text</sup>.
22  </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

- `
` 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
      caption's)</h3>
16
17   <!-- the <table> tag opens a table -->
18   <!-- Reminder: the border element should not be used. We are using it
      here before we learn CSS -->
19   <table border="1">
20     <!-- the <caption> tag summarizes the table's -->
21     <!-- contents (this helps visually impaired people) -->
22     <caption><strong>Table of Fruits (1st column) and Their Prices (2nd
      column)</strong></caption>
23     <!-- the <thead> section appears first in the table -->
24     <!-- it formats the table header area -->
25     <thead>
26       <tr>
27         <!-- <tr> inserts a table row -->
28         <th>Fruit</th>
29         <!-- 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 -->
70 <table border="1">
71     <caption>A more complex sample table</caption>
72     <thead>
73         <!-- rowspans and colspans merge the specified -->
74         <!-- number of cells vertically or horizontally -->
75         <tr>
76             <!-- merge two rows -->
77             <th rowspan="2">
78                 
80             </th>
```

```
79      <!-- merge four columns -->
80      <th colspan="4">
81          <strong>Camelid comparison</strong><br> Approximate as of
            10/2011
82      </th>
83  </tr>
84  <tr>
85      <th># of humps</th>
86      <th>Indigenous region</th>
87      <th>Spits?</th>
88      <th>Produces wool?</th>
89  </tr>
90 </thead>
91 <tbody>
92  <tr>
93      <td>Camels (bactrian)</td>
94      <td>2</td>
95      <td>Africa/Asia</td>
96      <td>Yes</td>
97      <td>Yes</td>
98  </tr>
99  <tr>
100     <th>Llamas</th>
101     <td>1</td>
102     <td>Andes Mountains</td>
103     <td>Yes</td>
104     <td>Yes</td>
105  </tr>
106 </tbody>
107 </table>
108 </body>
109
110 </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      <!-- input types "submit" and "reset" insert -->
38      <!-- 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   </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>
```