Programming 1 Team Solo

The basics of web programming: Lecture #1: Making sense of HTML

The story so far

- Hopefully, you should have picked up at least some skills from what I've taught you so far:
 - being able to break problems down into their constituent parts
 - understand the discrete "blocks" of code that exist within a larger program
 - combine these "blocks" of code to create an original program that solves a problem

About the coming unit...

- In this unit, we'll look at how you can write (small) programs for the web using HTML and PHP
- Many of the skills you've learned so far will cross over
- You'll also learn more about the structure of web content and the PHP programming language

How the web works

Here you can see what happens when a web user in Cambridge, England views the website of the Louvre art gallery in France which is located at the address http://www.louvre.fr

(Images labelled Duckett are from HTML & CSS: design and build websites by Jon Duckett. Excellent book is excellent.) When you connect to the web, you do so via an Internet Service Provider (ISP). You type a domain name or web address into your browser to visit a site; for example: google.com, bbc.co.uk, microsoft.com.

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The unique number that the DNS server returns to your computer allows your browser to contact the web server that hosts the website you requested. A web server is a computer that is constantly connected to the web, and is set up especially to send web pages to users.

Duckett

Your computer contacts a network of servers called Domain Name System (DNS) servers. These act like phone books; they tell your computer the IP address associated with the requested domain name. An IP address is a number of up to 12 digits separated by periods / full stops. Every device connected to the web has a unique IP address; it is like the phone number for that computer.

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PARIS

The web server then sends the page you requested back to your web browser.

How the web works

 The server in France sends back (among other things) a stream of HTML to the computer in Cambridge:



What is HTML?

- HTML stands for Hyper-Text Markup Language (catchy)
- The first rule of HTML is:
 - HTML is NOT a programming language.
- The second rule of HTML is:
 - HTML IS NOT A PROGRAMMING LANGUAGE!
- HTML cannot make decisions, cannot do repetition, cannot store data and cannot (directly) get input from an end-user
- When you write HTML you are NOT programming!
 - ...you are simply describing the overall structure of a web page

HTML yersys "the web"

- The earlier slide gave you an idea of how the web works always HTML is just a part of the web
- We will concentrate on HTML in the early stages of the unit your NoobLab activities will abstract a lot of "the web" away from you:
 - You won't have to worry about publishing your work on a server, or uploading your HTML files
 - Other modules might cover this; we may touch on it later
- For now, we want you get gain proficiency and understanding of how HTML is constructed and the "rules" which govern it

HTML is about structure

- HTML describes the structure of static, unchanging web pages
 - e.g. this bit of content goes here, these items go inside this other, surrounding item
- Consider a newpaper article
 - There may be a headline
 - There may be sub headings
 - There may be pictures and quotes
- Structure helps readers make sense of the story in the paper

About structure

- When you view a newspaper story online, the structure doesn't change
 - It still has the same headlines
 - It still has the same sub headings
 - The pictures, quotes and other text are the same
- The presentation may differ but the structure remains the same

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Vevo revolutionary

Universal's former mobile chief is leading the music industry's fight to shake up online video. He reveals his frustration with MTV, and says why no one need own music if his site succeeds. Interview by Mark Sweney

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Free access

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An HTML page

<html>

<body>

<h1>This is the Main Heading</h1>

This text might be an introduction to the rest of

the page. And if the page is a long one it might

be split up into several sub-headings.

<h2>This is a Sub-Heading</h2>

Many long articles have sub-headings so to help you follow the structure of what is being written. There may even be sub-sub-headings (or lower-level headings).

<h2>Another Sub-Heading</h2>

Here you can see another sub-heading.

</body>

</html>

Parts of the page in blue are HTML *elements*

HTML elements

- Elements (usually) have two tags, an opening tag and a closing tag
- Each type of element has a unique name; in our example we have html, body, h1, h2 and p
- The name in our tags are enclosed by < >
- The closing tag has a / before the name

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<h2>Another Su</h2>	b-Heading
Here you ca	n see another sub-heading.

HTML elements are blocks too

- Think of your elements as being exactly like the blocks in our Banana programs
 - Some blocks can contain other blocks
 - Each block has a start and end point
 - Between the start and end point is the *content* of the element
 - The content of an element can include other elements

<h1>This is t</h1>	he Main Heading
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<h2>Another S</h2>	ub-Heading
Here you c	an see another sub-heading.

HTML elements are blocks too

<html> fur <body> <h1>This is a Heading</h1> Some text </body> </html>

```
function myFunction
for i = 1 to 10
if i == 5
display "We got to 5!"
endif
endfor
endfunction
```

- Think back to programming in Banana
- Some constructs had a beginning statement and an end statement
- Between these statements were other statements sometimes, these themselves contained inner statements
- These mapped onto our blocks we used initially and there we had blocks within blocks
- HTML elements work in a very similar way

A closer look at tags



Document level tags

- All HTML documents have the <html> element as their top level (or "root") tag
 - All other elements are inside the <html> element -
 - we say they are child elements of the <html> element
 - Think of the <html> element as being the "boss block" all other blocks go inside it
- The <body> and <head> elements go inside the <html> element

The sheads element

- The <head> goes above the body
- It does NOT mean "header" it means what it says: "head", i.e. it is the top of the document
- Nothing in the <head> is displayed in the browser - it simply contains information about the page
- DO NOT MAKE THE MISTAKE OF THINKING <head> MEANS "header" or "heading" - it does not!
- There are resources out there that refer to this element as the "header element" - this is incorrect and misleading terminology!

<	(html>
	<head></head>
	<pre><title>Awesome page</title></pre>
	<body></body>
	<h1>This is a Heading</h1>
	Some text
<	

The <title< element

- The <title> element goes in the <head>
- As with all things in the <head>, this is not displayed in the browser page
- The <title> is the title of the page (surprisingly enough)
- To be a valid HTML page, all pages should contain a title
- There is no "official" way that browser use this element, although many use it as the title bar of their window and/or to label the tab that displays the web page

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<hea< th=""><th>4></th></hea<>	4>
<t< b=""></t<>	itle>Awesome page
<th>ad></th>	ad>
<body< td=""><th>y></th></body<>	y>
<h< b=""></h<>	1>This is a Heading
<p2< td=""><th>>Some text</th></p2<>	>Some text
<th>dy></th>	dy>
<th>></th>	>

The <body < element

- The <body> element follows the <head>
 - ...because you wouldn't want the head and body the wrong way round, would you?! ©
- Everything in the <body> is shown inside the main browser window
- The <body> contains all the elements that describe the *structure* of the page
 - e.g. a heading here, a paragraph there...
- Within the elements in the <body> is the content of the page
 - e.g. this heading contains the text *KU student wins lottery*, this paragraph contains the story for that, etc...

<	html>
	<head></head>
	<pre><title>Awesome page</title></pre>
	<body></body>
	<h1>This is a Heading</h1>
	Some text
Ś	/html>

Text elements: headings

- HTML has six levels of headings
- Use <h1> for main headings
- Use <h2> for sub-headings
- You can go further down if needed
- Usually, browsers will display the headings larger and/or bolder than other text

```
<html>
<head>
<title>Awesome page 2</title>
</head>
<body>
<h1>This is a Heading</h1>
<h2>This is a sub heading</h2>
<h3>sub-sub heading</h3>
<h4>sub-sub-sub heading!</h4>
<h5>sub-sub-sub heading!</h5>
<h6>More subs than the navy</h2>
</body>
</html>
```

- However, don't be fooled into thinking that this is just a way of making text bigger and/or bolder
- You should use heading elements as a *semantic* tool not as a way of changing the *style* of text
- If a piece of content is intended to summarise or highlight the section that follows, this would be a good semantic use for a heading

Text elements: paragraphs

- The element is used to create a paragraph
- Surround the words and sentences that make up the paragraph with an opening tag and closing tag.

<html> <head> <title>Awesome page 2</title> </head> <body> <h1>About paragraphs</h1> A paragraph contains one or more sentences that form a self-contained unit of discourse. The start of a new paragraph goes on a new line. Text is easier to understand when it is split up into semantic units of text. This page has a heading and two paragraphs. </body> </html>

Other text elements: bold and italic

- The <i> element is used to make text appear in *italics*
- The element makes text appear in **bold**
- So, our first paragraph would appear in the browser page as

A paragraph contains one or more sentences that form a self-contained unit of discourse. The start of a new paragraph goes on a new line. <html> <head> <title>Awesome page 2</title> </head> <body> <h1>About paragraphs</h1> A <i>paragraph</i> contains one or more sentences that form a self-contained unit of discourse. The start of a new paragraph goes on a new line.Text is easier to understand when it is split up into semantic units of text. This page has a heading and two paragraphs.

</body>

Other text elements: superscript and subscript

- The <sup> element is used on text that should be superscript, such as the suffixes of dates or raising a number to a power such as 2⁴
- The <sub> element is used for subscript text. This is commonly used in chemical formulas:

On the 4^{th} September you will learn about $E=MC^2$.

On the 11^{th} September you will learn about global warming. In 2009 the amount of CO_2 in the atmosphere grew by 2ppm.

<html> <head> <title>Awesome page 2</title> </head><body> <h1>Agenda</h1> On the 4th September you will learn about E=MC². On the 11th of September you will learn about global warming. In 2009 the amount of CO₂ in the atmosphere grew by 2ppm.</body> </html>

Breaking up text

- Most browsers will display paragraphs and headings with a blank line between them
- There are also two other elements, <hr/> and
 which allow you to inject one-off breaks in your text without having to start a new paragraph
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 Sou
- <hr/> immediately breaks the current line, inserts a horizontal line across the page, and then resumes the text underneath the line

Self-closing tags

- Note that <hr/> and
 don't have any content for example, there is no text *inside* a horizontal rule...
- We refer to such tags as *self-closing tags*.
- As the name suggests, such tags close themselves so you don't need a discrete start tag and end tag
- A self-closing tag has a slash before the closing bracket
- You can think of a self-closing tag as being a shorter way of writing something like

<hr></hr>

(although that wouldn't actually be valid HTML!)

Breaking up text: an example

<html> <head> <title>Awesome page 3</title> </head> <body> <h1>The Solar System</h1> The Earth
gets one hundred tons heavier
 every day due to falling space dust. <hr/>Jupiter is bigger than<hr/> all the other planets combined. </body> </html>

The Solar System

The Earth gets one hundred tons heavier every day due to falling space dust.

Jupiter is bigger than

all the other planets combined.



- HTML gives us three types of list elements:
 - Ordered list: when each item in the list is numbered
 - Unordered list: when each item in the list is not numbered; usually browsers will show these with bullet points
 - Definition list: a set of terms shown with the definition for the terms
 - ...but definition lists are a bit rubbish and we won't worry about looking at them for now... ^(C)



- Regardless of whether you are using an ordered or unordered list, the principle is the same
 - You open a list element
 - You have item elements within your list element
 - You close your list element
- The unordered list element is
- The ordered list element is
- The list item element is <1i>

Lists example

<html> <head> <title>Awesome recipe</title> </head> <body> This is gorgeous: <111> 1kg potatoes 100ml milk 50g butter Nutmeg Salt and pepper $\langle 01 \rangle$ Chop potatoes Simmer for 15-20 mins Mix and heat milk, butter and nutmeg Drain potatoes & mash Stir in the mix </body>

</html>

This is gorgeous:

- 1kg potatoes
- 100ml milk
- 50g butter
- Nutmeg
- · Salt and pepper
- 1. Chop potatoes
- 2. Simmer for 15-20 mins
- 3. Mix and heat milk, butter and nutmeg
- 4. Drain potatoes & mash
- 5. Stir in the mix

Remember to think in blocks

- Remember that the HTML elements are just like our NoobLab blocks in *Thinking Like A Programmer*.
- You can have elements inside of elements just as we had blocks within blocks
- In fact, some elements *need* to have other elements inside them in order to be useful
 - e.g. lists
- So, don't forget that you can do things like

This text will be in bold but <i>this will be in bold AND italic</i>, isn't that brilliant?

Remember to think in blocks

 What would be in bold, what would be in italics, what would be in both, and what would be in neither in the following example?

I'm not a pheasant <i>plucker</i>, I'm the pheasant plucker's son, and I'm only plucking <i>pheasants</i> till the pheasant plucker comes

Remember to think in blocks

 What would be in bold, what would be in italics, what would be in both, and what would be in neither in the following example?



I'm not a **pheasant** *plucker*, I'm the pheasant plucker's son, and I'm only plucking *pheasants* till the **pheasant plucker** comes

So, with that in mind, what would the output be of that code?

I'm not a pheasant <i>plucker</i>, I'm the pheasant plucker's son, and I'm only plucking i>pheasants</i> till the pheasant plucker comes

1.

2.

4.

1 I'm not a **pheasant** *plucker*, I'm the pheasant plucker's son, and I'm only plucking *pheasants* till the **pheasant plucker** comes

2 I'm not a pheasant plucker, I'm the pheasant plucker's son, and I'm only plucking pheasants till the pheasant plucker comes

3 I'm not a **pheasant plucker**, I'm the pheasant plucker's son, and I'm only plucking pheasants till the **pheasant plucker** comes

I'm not a pheasant plucker, I'm the pheasant plucker's son, and I'm only plucking pheasants till the pheasant plucker comes

What's wrong with this picture?

I'm not a pheasant <i>plucker</i>, I'm the pheasant plucker's son, and I'm only plucking <i>pheasants till the pheasant</i> plucker comes

What's wrong with this picture?

I'm not a pheasant <i>plucker</i>, I'm the pheasant plucker's son, and I'm only plucking <i>pheasants till the pheasant</i> plucker comes

- 1. You can't have an <i> within a
- 2. There are missing end tags
- 3. There are missing start tags
- 4. There are overlapping elements



What's wrong with this picture?

I'm not a pheasant <i>plucker</i>, I'm the

pheasant plucker's son, and I'm only plucking

<i>pheasants till the pheasant</i> plucker

comes

- Overlapping elements are ILLEGAL
- Elements be placed next to each other, they can go inside each other, but they cannot overlap!

What's wrong with this picture?

I'm not a pheasant <i>plucker</i>/b>, I'm the pheasant plucker's son, and I'm only plucking <i>pheasants till the pheasant plucker comes

- You can't have an <i> within a
- 2. There are missing end tags
- 3. There are missing start tags
- 4. There are overlapping elements



What's wrong with this picture?

I'm not a pheasant <i>plucker</i>, I'm the pheasant plucker's son, and I'm only plucking <i>pheasants till the pheasant plucker pmes

- This starting <i> has no corresponding end tag </i>
- This is illegal too!
- Browsers will try to make sense of illegal HTML, but what you'll usually find is that your whole page suddenly becomes bold, italic, or whatever element it was you forgot to "turn off"!

Summary

- HTML is not the entirety of the web it simply describes the structure of a web page
- HTML is divided into elements which have a start and an end tag
 - (although self-closing elements combine the two)
- HTML elements are like the blocks we've used previously, in that elements fit inside elements just as our blocks fitted inside other blocks, but...
 - overlapping elements are illegal!
 - forgetting to close an element is also illegal!
- Each element has a unique name
- The name is enclosed by < >
- The closing tag is signified by a slash
- There is a <head> element which contains information /about/ a page
- The <body> element contains the actual content that the user sees on the page
- There are a variety of elements that signify different parts of a page; we've looked at paragraphs, headers, bold, italic, super and subscript, and two different types of list