A Brief Introduction to Web Technologies

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Outline

- HTML
- CSS
- SVG
- JavaScript

HTML

HTML
(Hypertext Markup Language)

- Used to mark up the content of a web page by adding a structure to the elements in the web page

- Elements
  - Paragraph, division, ordered and unordered list, headings, links, body, head, title, etc., and the root html
  - Elements are created by tags, for example,
    - defines the beginning of a paragraph
    - closes the paragraph

A Simple HTML

```
<!DOCTYPE html>
<html>
    <head>
        <title>Page Title</title>
    </head>
    <body>
        <h1>Page Title</h1>
        <p>This is a really interesting paragraph.</p>
    </body>
</html>
```

A List of Common Elements

`<!DOCTYPE html>`

The standard document type declaration. Must be the first thing in the document.

`html`

Surrounds all HTML content in a document.

`head`

The document `head` contains all metadata about the document, such as its `title` and any references to external stylesheets and scripts.

`title`

The title of the document. Browsers typically display this at the top of the browser window and use this title when bookmarking a page.

`body`

Everything not in the `head` should go in the `body`. This is the primary visible content of the page.

`h1`, `h2`, `h3`, `h4`

These let you specify headings of different levels. `h1` is a top-level heading, `h2` is

`p`

A paragraph!

`ul`, `ol`, `li`

Unordered lists are specified with `ul`, most often used for bulleted lists. Ordered lists (`ol`) are often numbered. Both `ul` and `ol` should include `li` elements to specify list items.

`em`

Indicates emphasis. Typically rendered in *italics*.

`strong`

Indicates additional emphasis. Typically rendered in **boldface**.

`a`

A link. Typically rendered as underlined, blue text, unless otherwise specified.

`span`

An arbitrary `span` of text, typically within a larger containing element like `p`.

`div`

An arbitrary *division* within the document. Used for grouping and containing related elements.

Comments, Classes, and IDs

- You can add comments to your html document with *<!– this is a comment -->*
- Elements can be identified by their classes or IDs (important for CSS and Javascript)
- Classes:

```
<p class="uplifting">Brilliant paragraph</p>
<p class="uplifting">Insightful paragraph</p>
<p class="uplifting awesome">Awe-inspiring paragraph</p>
```

- IDs: (only used for one element and only once in a page)

```
<div id="content">
    <div id="visualization"></div>
    <div id="button"></div>
</div>
```

Document Object Model (DOM)

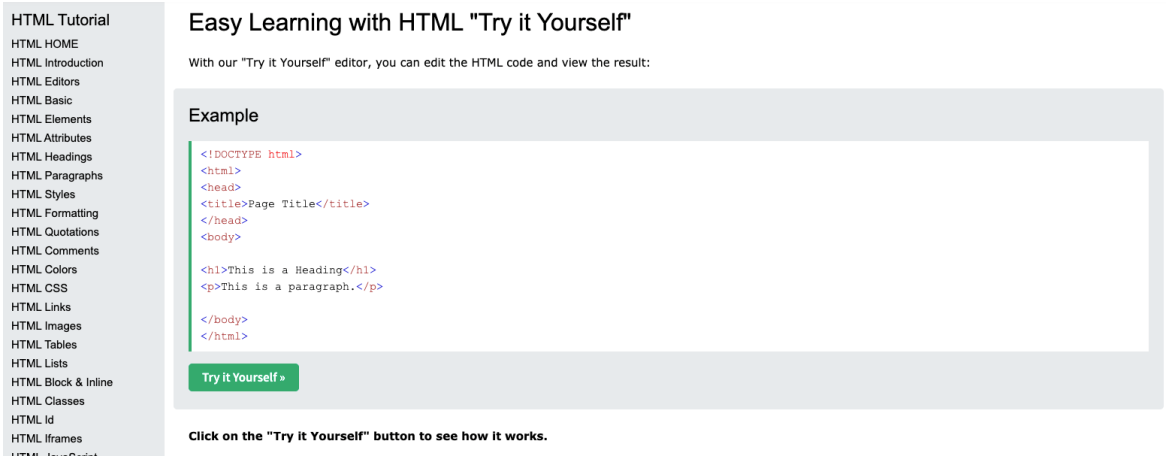
- Describes the hierarchical structure of HTML
  - The parent, child, sibling, ancestor, descendant relationships among the HTML elements, which is also called *DOM Tree*

- Open the development tool of your browser to check the DOM of any webpage

By right-clicking a webpage, you can select "Inspect" and then you will be able to see the DOM of the webpage.

Try and Learn More about HTML

- HTML tutorial on W3Schools
  https://www.w3schools.com/html/default.asp



- You are highly recommended to try some of those online examples by clicking “*Try it Yourself*”

Demo: How to Run/Render a HTML File?

- Directly open the HTML file in a browser

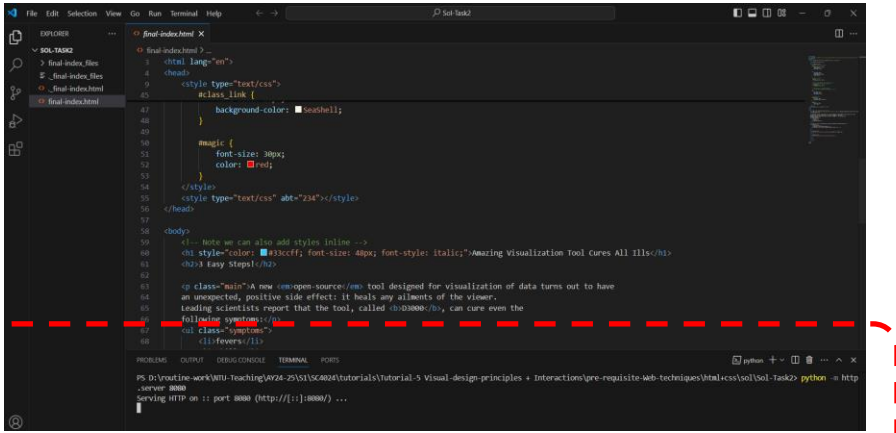
- Run a server on your local computer:

  - For Python3 users:

  # python3 -m http.server 8080

  - For Python2 users:

  # python -m SimpleHTTPServer 8080



*You are recommended to use **VS code** to run all the demo code, which provides **the terminal** for you to type in the python command to run a web server.*

Task 1: Create Your First HTML Page

```
<!DOCTYPE html>
<html>
    <head>
        <title>Page Title</title>
    </head>
    <body>
        <h1>Page Title</h1>
        <p>This is a really interesting paragraph.</p>
    </body>
</html>
```

Following the template above, you are asked to create the following HTML page by using “Task1-starting-code”:

Amazing Visualization Tool Cures All Ills *(h1)*

A new open-source tool designed for visualization of data turns out to have positive an unexpected side effect: it heals any ailments of the viewer. Leading scientists report that the tool, called D3000, can cure even the following symptoms:

- fevers
- chills
- general malaise

(ul)

It achieves this end with a patented, three-step process.

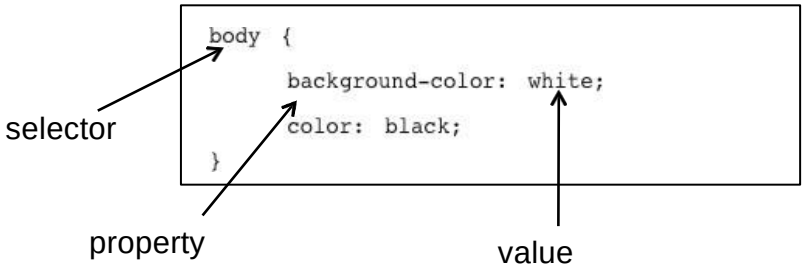
1. Load in data.
2. Generate a visual representation.
3. Activate magic healing function.

(ol)

CSS

Cascading Style Sheets (CSS)

- To style the visual presentation of DOM elements



- Selectors:
  - DOM elements : body, h1, p, div, em, etc.
  - Descendant selectors: div p *(p elements contained in a div)*
  - Class selectors: example: .caption, .label, .axis *(caption, label, and axis are class names)*
  - You can string the classes together: .main.steps *(select one element that has the class names of both "main" and "steps")*
  - ID selectors: e.g. #nav #export

Properties

- There are tons of properties in CSS
- Common properties: font-family, font-size, background-color, background-image, border, etc.
- An exhaustive list of CSS properties: https://developer.mozilla.org/en-US/docs/Web/CSS/Reference

It is not necessary to remember all of them! You can always google CSS properties when you need to use them!

Apply CSS rules

- Embed CSS in HTML

```
<html>
    <head>
        <style type="text/css">

            p {
                font-size: 24px;
                font-weight: bold;
                background-color: red;
                color: white;
            }

        </style>
    </head>
    <body>
        <p>If I were to ask you, as a mere
paragraph, would you say that I
        have style?</p>
    </body>
</html>
```

Apply CSS rules

- Reference an external file

```
<html>
    <head>
        <link rel="stylesheet" href="style.css">
    </head>
    <body>
        <p>If I were to ask you, as a mere
paragraph, would you say that
        I have style?</p>
    </body>
</html>
```

Apply CSS rules

- Attach inline styles

```
<p style="color: blue; font-size: 48px; font-style: italic;">Inline
styles
are kind of a hassle</p>
```

Inline styles are kind of a hassle

Try and Learn More about CSS

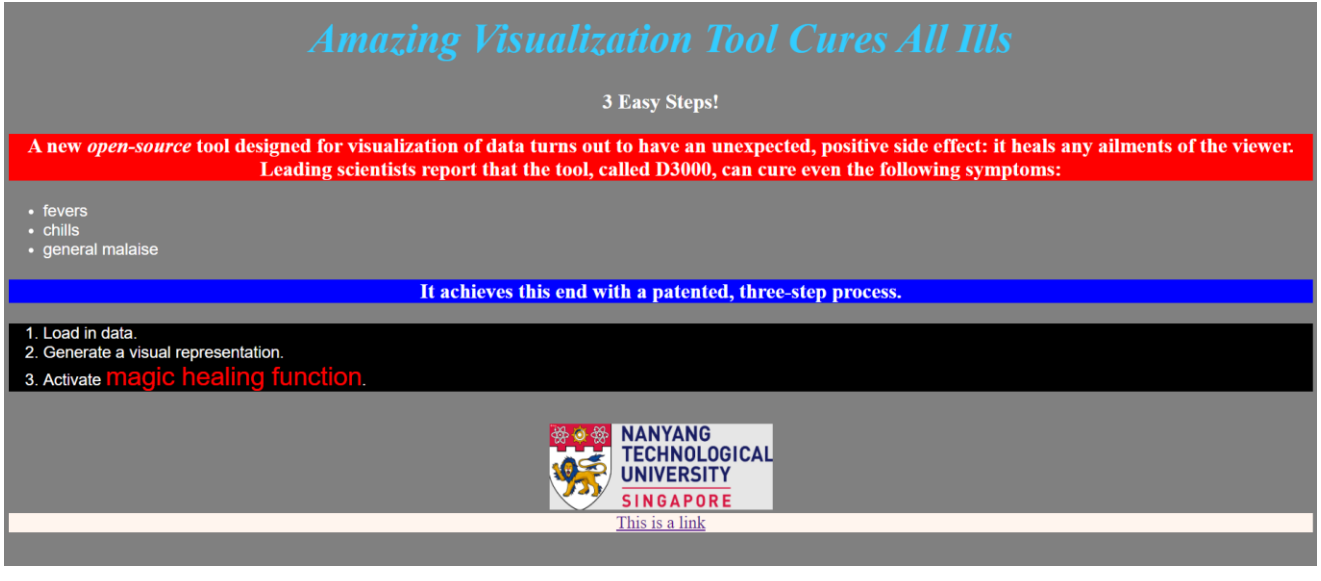
- CSS tutorial on W3Schools

  https://www.w3schools.com/html/html_css.asp

- You are highly recommended to try some of those online examples by clicking "*Try it Yourself*"

Task 2: CSS Practices

- Add CSS to the “index.html” file of “Task2-starting-code” folder and change its styles as follows：



SVG

Scalable Vector Graphics (SVG)

- We can use D3 to produce SVG
- SVG can be directly included in a HTML document
- How to write SVG?
  - Create a SVG element
  - Between the svg tags, include your visual elements
    - rect,circle, elliopse, line, text, and path
  - (0,0) is the top left corner
  - rect `<rect x="0" y="0" width="500" height="50"/>`
  - circle `<circle cx="250" cy="25" r="25"/>`
  - ellipse `<ellipse cx="250" cy="25" rx="100" ry="25"/>`
  - text `<text x="250" y="25">Easy-peasy</text>`
  - path anything more complex then the preceding shapes

```
<svg width="500" height="50">
</svg>
```

Styling SVG

`fill`
: A color value. Just as with CSS, colors can be specified as named colors, hex values, or RGB or RGBA values.

`stroke`
: A color value.

`stroke-width`
: A numeric measurement (typically in pixels).

`opacity`
: A numeric value between 0.0 (completely transparent) and 1.0 (completely opaque).

With `text`, you can also use these properties, which work just like in CSS:

- `font-family`
- `font-size`

Try and Learn More about SVG

- SVG tutorial on W3Schools

  https://www.w3schools.com/graphics/svg_intro.asp

- SVG Tutorial by Mozilla Developer Network

  https://developer.mozilla.org/en-US/docs/Web/SVG/Tutorial

Task 3: SVG

- Run “svg-index.html” and you will see the following yellow circle within an SVG

- Do the following changes and see the final visualization effect
  - Change the SVG width and height to 400
  - Move the center of the circle to (200,200)
  - Change the fill color to green
  - Change the radius to 150
  - Change the border color to red

Javascript

Javascript

- Created in 10 days in May 1995 by Brendan Eich
- Originally developed as a prototype language for web browser (Client-side)
- Now used in server-side (Node.js) as well
- Not related to Java, just named similarly for marketing purpose
- C style syntax but got inspiration from Functional programming
  - *for, while, continue, break, if/else, switch* are similar to C or Python
  - operators (+,-,*,/,%) are also similar (except ==,!=,||)
  - include function operations such as *map, reduce, forEach*.

Quick Review of JS syntax

- Print message to the console (in the development window)
  - console.log(“hello world!”);
- Declare a variable
  - var number = 5;
  - You can later change the variable content to a value of different type
    - number = “hello”;
  - JS is a losely typed language
- Declare an array (useful for you to try some visualization)
  - var numbers = [1,2,3,4,5];
- Objects

```
var fruit = {
    kind: "grape",
    color: "red",
    quantity: 12,
    tasty: true
};
```

```
fruit.kind      //Returns "grape"
fruit.color     //Returns "red
fruit.quantity  //Returns 12
fruit.tasty     //Returns true
```

Objects

Quick Review of JS syntax

- Mathematical Operators

```
==  //Equal to
!=  //Not equal to
<   //Less than
>   //Greater than
<=  //Less than or equal to
>=  //Greater than or equal to
```

```
+   //Add
-   //Subtract
*   //Multiply
/   //Divide
```

- Control structures

```
if (3 < 5) {
    console.log("Eureka! Three is less than five!");
}
for (var i = 0; i < 5; i++) {
    console.log(i);  //Prints value to console
}
```

- Functions (a chunk of reusable code)
- Comments

```
var calculateGratuity = function(bill) {
    return bill * 0.2;
};
/* JavaScript supports CSS-style comments like this. */

// But double-slashes can be used as well.
```

Javascript

- Putting javascript code in your HTML
  - External source file:

```
<!-- below is how you are going to load your javascript file -->

<script type="text/javascript" src="myExample.js"></script>
```

  - Direct put in your HTML:

```
<script type="text/javascript">

        //Width and height
        var w = 600;
        var h = 250;

</script>
```

Javascript Tutorials

- W3School Tutorial
  - https://www.w3schools.com/js/js_operators.asp

Task 4: Use JavaScript to Change SVG styles

- Run “js-index.html” and follow the example code to update the circle styles
  - Change the fill color to red
  - Change the radius to 150
  - Change the border color to yellow
  - Change the stroke width to 10
  - Move the circle center to (150,150)

Optional Practices on JavaScript!

Link: https://observablehq.com/d/4e3a3396fcd56802

Notes on Writing JS Code on Observable Workbook

- You need to duplicate the give observable workbook by “forking” it
- Save your code before refreshing the webpage!