

CM1040 Web Development Week 1 Lecture Note

Notebook: Web Development

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Cornell Notes	Topic: Introduction to the web	Course: BSc Computer Science Class: Web Development CM1040[Lecture] Date: October 13, 2020
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Essential Question:

What are some of the foundational technologies involved in making the web what it is?

Questions/Cues:

- What is a web?
- What is "The Web"
- What is a simple understanding of how the Internet functions on the same network?
- What is the World Wide Web?
- What is the Architecture of the World Wide Web?
- How many Web Users are there?
- How many Web Sites are there?
- Who are the Users?
- What is the difference between browsing and navigating?
- How do we use the Web?
- What is Web Architecture?
- What is a Web Server?
- What is a Web Client?
- What are the Interconnections of the Web?
- What are HTTP Responses?
- What do we mean by media?
- What are images?
- What are the two methods of compression when trying to reduce file size for the web?
- What are the various qualities of audio available?
- What are the different page semantic sections present on a webpage?
- What are the various kinds of semantic spaces found typically on a webpage?
- What are Divisional Blocks?
- What are the benefits of Semantic Tags?

Notes

- Web = A complex system of interconnected elements
- "The Web" = If a web is a complex system of interconnected elements, then in the case of "The Web"--the elements are computers or other tech devices. The interconnections pass data between them using the Internet. Given this setup of infrastructure, many different "services" can be provided

Internet

- ▲ On the same network:
 - ▲ Information delivered: Books, brochures, newspapers, music, films: Repositories of information around the world
 - ▲ Asynchronous conversations take place: Letters, bills: Using mail services delivered as email
 - ▲ Synchronous conversations take place: Text messaging, videoconferencing, audio telephony
- ▲ The whole network works because of a set of rules or protocols
- ▲ Each service governed by its own rules or protocols: Using mail service or a videoconference service.

World Wide Web

- ▲ Information delivered: Books, brochures, newspapers, pictures, music, films: Repositories of information around the world
- ▲ Each service governed by its own rules or protocols: So need a protocol for information sharing
- ▲ Information itself is understood better when it is connected to other relevant information
- ▲ So ... we need a service that connects information from around the world with a common protocol
- ▲ This is the World Wide Web

World Wide “Architecture”

- ▲ Uses the concept of pages of information
 - ▲ A collection of web pages is a web site
 - ▲ Web sites can connect or reference other web sites
- ▲ Enabling
 - ▲ Information sources (e.g. Wikipedia)
 - ▲ Entertainment services, streaming media
 - ▲ Shared information creation and editing, including diaries
 - ▲ Shopping, including reviews, price comparison, store locators
 - ▲ Community building services

How Many Web Users?

- ▲ As of April 2018, around 52% of the world's population of 7.6 billion online

(Source: Nathan McDonald, We Are Social, www.wearesocial.com/us/blog/2018/01/global-digital-report-2018, published: 30/01/2018, updated: 30/01/2018)
- ▲ Many use internet through mobile devices
- ▲ Highest proportion of users in N. America and Europe
- ▲ Fastest growing proportions in Asia and S. America

How Many Web Sites?

- ▲ April 2018, around 1.9 billion web sites registered
(Source: Daniel S. Fowler, Tek Eye, www.tekeye.uk/computing/how-many-websites-are-there, published: 07/01/2014, updated: 20/02/2018)
- ▲ About 75% of registered web sites at any time are inactive, giving around 500 million active web sites
- ▲ Range from small personal web sites to large corporate or government web presences

Who Are the Users?

- ▲ All around the world
- ▲ Of all ages, so with different life experiences
- ▲ With mixed educational levels and intellectual levels
- ▲ With mixed abilities or disabilities
- ▲ With many different interests:
 - ▲ Buying, selling, education, entertainment, information, applying for/booking services

Browsing vs Navigation

- ▲ Imagine reading a newspaper
 - ▲ We could read from cover to cover: Browsing
 - ▲ We could jump straight to the back, sports pages: Navigation
- ▲ Imagine using a library
 - ▲ Browse along shelves looking for any interesting book: Browsing
 - ▲ Look for a book by its topic number (Dewey number): Navigation

Using the Web

- ▲ Find a page with the information needed:
 - ▲ Each web site has a domain name so it can be found
 - ▲ E.g. www.thetimes.co.uk
 - ▲ Know the URL
 - ▲ Search for information by topic: Google, Bing, DuckDuckGo
 - ▲ Follow a link on a page: Hypermedia
 - ▲ Follow a button on a page: Process or procedure

Web Architecture

- ▲ Remember our definition:
 - ▲ A web is: a complex system of interconnected elements
- ▲ Elements: A computer holding web pages that can be found and delivered (e.g. a computer, a security camera, a central heating controller): A server
- ▲ Elements: A computer being used by somebody that wants to view the information held on another computer: A client
- ▲ Interconnections that allow the clients to find the right server and get the information that is required

Web Server

- ▲ Web server
 - ▲ Server software, listening for requests for web pages and delivering them
 - ▲ File store for web pages and any additional material such as pictures, audio and video clips and other instructions concerning presentation on different devices

Web Client

▲ Web client

- ▲ Some software running on a device being used by a person to receive the information being held somewhere else
- ▲ The software is able to present some or all of text, pictures, graphics, sound, video or even games or other applications
- ▲ This software is known as a browser

Interconnections

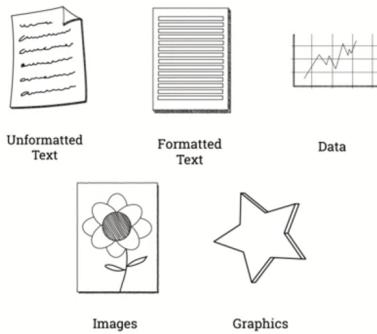
- ▲ Using the infrastructure of the internet, different client devices can connect and ask for information from different servers
- ▲ This conversation between clients and servers is according to a set of rules, a protocol
 - ▲ This is the Hypertext Transfer Protocol (HTTP)
 - ▲ The client requests information (a page, an image etc.) from a specific server, using a Request Method, usually "get"
 - ▲ The request is sent to that server across the internet
 - ▲ The server responds with a message, and the information if it is available

HTTP Responses

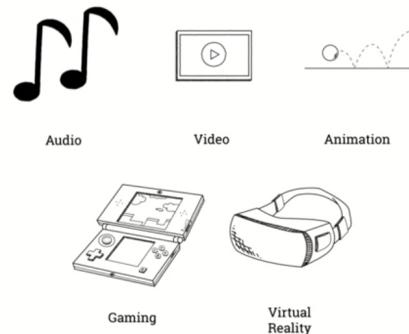
- ▲ Response is a number with an agreed standardised meaning
- ▲ Common examples
 - ▲ 200 OK: The request has succeeded
 - ▲ 400 Bad Request: This response means that server could not understand the request due to invalid syntax
 - ▲ 404 Not Found: The server cannot find requested resource

What do we Mean by Media?

Time Independent Media



Time Dependent Media



- When handling text, it is much easier to use the Web page as a container for the text content and do formatting right in the webpage rather than inserting or linking a text doc like a .docx file
- Images = collection of dots which can be shown on a display, where the color of every dot is defined as being a mix of shades of red, green, and blue

Compression

Lossless: Reduce file content with no loss of information

Reduce the number of pixels or the detail used but keep a description of how the information was transformed into the new size and form. This way the original image can be recovered if necessary.

Required for medical images

Lossy: Reduce file content by removing detail in the hope that it is not visible
e.g. Approximate colour of pixels based on adjacent or nearby pixels in the hope that the "guesses" are not visible
e.g. JPEG

Audio Quality Matters

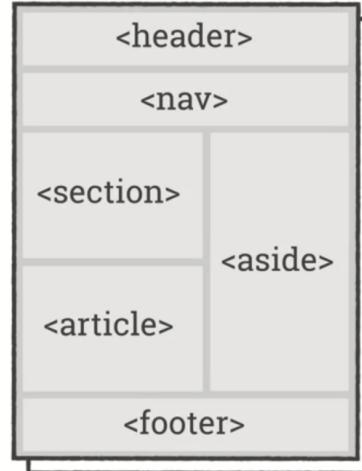
- ▲ Human hearing range 20-20,000 Hz
- ▲ Digitally, that means sample rate of at least 40,000 samples per second
- ▲ CD quality = 44100 Hz sampled at 16 bit (65,536 levels), so is capturing audio up to 22,050 Hz, so should be high enough to capture all that we can hear
 - ▲ $44,100 \times 16 \times 2$ (stereo) = 1,411,200 bps = 1.4 million bits per second Mbps
- ▲ HD quality = 96 kHz or 192 kHz at 24 bit (16,777,216 levels), capturing easily more than we can hear
 - ▲ $96,000 \times 24 \times 2$ = 4.6 Mbps or $192,000 \times 24 \times 2$ = 9.2 Mbps
- ▲ Reduced by compressing, e.g. mp3

Conclusion

- ▲ Media is part of how web pages communicate information
- ▲ The richer the media, the larger the data file and the more bandwidth required to move the data from server to client
- ▲ Depending on the capabilities of the client and the number of clients trying to access the server, the web pages may load slowly, reducing the quality of the user experience

Page Semantic Sections

For example



Semantic spaces communicate what they mean:

- ▲ The main article
- ▲ Content aside from the page content
- ▲ Additional details that the user can view or hide
- ▲ A caption for a <figure> element
- ▲ Specifies Self-contained content, like illustrations, diagrams, photos, code listings, etc
- ▲ A footer for a document or section
- ▲ A header for a document or section
- ▲ The main content of a document
- ▲ Marked/highlighted text
- ▲ Navigation links, effectively behaving as contents lists
- ▲ A specified section in a document
- ▲ A visible heading for a specified section within the page
- ▲ A date/time

Divisional Blocks

- ▲ Web developers can define parts of a web page to have a purpose beyond the regular expected sections defined in the HTML language
- ▲ So the developer can group everything related to that part into a block, a sub-division of the whole page

The Benefit of Semantic Tags

- ▶ Search engines can find better. Search engines can:
 - ▲ look for contents lists or images (for example)
 - ▲ eliminate irrelevant content
 - ▲ focus on the place where the content is.

Summary

In this week, we learned about what the web is, how to use the web, what the various interconnections of the web are, what a server/client is, what HTTP responses are, the two different methods of compressing a file, page semantic sections and tags, divisional blocks and finally the benefits of semantic tags.