

Semantic Web and Microformats

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Contents

• Abstract	2
• HTML vs. XML	3
• Plain HTML	4
• Good HTML	5
• Excellent HTML	6
• XML → HTML Stylesheet	7
• Graceful Degradation	8
• Excellent HTML	9
• From Information, Knowledge	10
• The Semantic Web Hype	11
• Semantic Web Layers	12
• Conclusions	13

Abstract (2)

HTML pages are for human users and describe a resource in structural terms (headings, lists, tables, ...). For machine-based interaction, it is often useful to have more information about the application concepts. The Web reflects the various ways in which the issue of *semantics* has been addressed in other disciplines, with the *Semantic Web* having the strongest commitment to highly formalized semantics. On the syntax side, the *Extensible Markup Language (XML)* is a popular language for representing application structures, but it is representing only syntax and no semantics

HTML vs. XML (3)

- HTML describes structures in a very general way
 - HTML elements describe logical page structures such as headings, lists, tables, ...
 - useful for dynamic and adaptive page rendering, but not for understanding contents
- Good HTML may have more information available
 - classes in HTML elements may represent underlying concepts (CSS may use this)
 - [HTML containers](#) [Advanced HTML; All-Purpose Elements (1)] may represent aggregation of some basic information items
- Very good HTML
 - some guidelines/rules/methods for *understanding* class names
 - some model for the underlying schema (what may appear in which combination)
- Excellent HTML is dynamically generated from XML
 - the model is exposed as structured XML data that is available to the client
 - there is a stylesheet for producing the HTML version of the XML
 - but even XML does not provide semantics (it is just a structured syntax)

Plain HTML

(4)

```

<html>
  <head>
    <title>Cannondale 2007 System Six 2</title>
  </head>
  <body>
    <h1>Cannondale 2007 System Six 2</h1>
    <ul>
      <li>Mavic Ksyrium ES wheelset</li>
      <li>Maxxis Xenith Hors Categorïe tires</li>
      <li>Fi'zi:k Arione Titanium saddle</li>
      <li>SRAM Force components</li>
    </ul>
    <p>Sizes: 48cm, 50cm, 52cm, 54cm, 56cm, 58cm, 60cm, 63cm</p>
    <p>Dealers: </p>
    <ul>
      <li>Mike's Bikes of Berkeley, 2161 University Avenue, Berkeley, CA
        94704; +1-510-8452453</li>
    </ul>
  </body>
</html>

```

Good HTML

(5)

```

<html>
  <head>
    <title>Cannondale 2007 System Six 2</title>
  </head>
  <body>
    <h1 class="bike"><span class="manufacturer">Cannondale</span> <span
      class="year">2007</span> <span class="model">System Six</span> <span
      class="type">2</span></h1>
    <ul class="components">
      <li class="component"><span class="manufacturer">Mavic</span> <span
        class="type">Ksyrium ES</span> wheelset</li>
      <li class="component"><span class="manufacturer">Maxxis</span> <span
        class="type">Xenith Hors Categorïe</span> tires</li>
      <li class="component"><span class="manufacturer">Fi'zi:k</span>
        <span class="type">Arione Titanium</span> saddle</li>
      <li class="component"><span class="manufacturer">SRAM</span> <span
        class="type">Force</span> components</li>
    </ul>
    <p>Sizes: <span class="size">48cm</span>, <span
      class="size">50cm</span>, <span class="size">52cm</span>, <span
      class="size">54cm</span>, <span class="size">56cm</span>, <span
      class="size">58cm</span>, <span class="size">60cm</span>, <span
      class="size">63cm</span></p>
    <p>Dealers: </p>
    <ul>
      <li class="dealer"><span class="name">Mike's Bikes of
        Berkeley</span>, <span class="adr"><span class="street-address">2161
          University Avenue</span>, <span class="locality">Berkeley</span>, <span
          class="region">CA</span> <span class="postal-code">94704</span></span>; <a
          href="tel:+1-510-8452453">+1-510-8452453</a></li>
    </ul>
  </body>
</html>

```

Excellent HTML

(6)

```
<?xml version="1.0" encoding="UTF-8"?>
<?xml-stylesheet href="bike2html.xsl" type="text/xsl"?>
<bike manufacturer="Cannondale" year="2007">
  <model>System Six</model>
  <type>2</type>
  <sizes>
    <size unit="cm">48</size>
    <size unit="cm">50</size>
    <size unit="cm">52</size>
    <size unit="cm">54</size>
    <size unit="cm">56</size>
    <size unit="cm">58</size>
    <size unit="cm">60</size>
    <size unit="cm">63</size>
  </sizes>
  <parts>
    <wheelset manufacturer="Mavic">Ksyrium ES</wheelset>
    <tires manufacturer="Maxxis">Xenith Hors Categoric</tires>
    <saddle manufacturer="Fi'zi:k">Arione Titanium</saddle>
    <components manufacturer="SRAM">Force</components>
  </parts>
  <dealers>
    <dealer>
      <name>Mike's Bikes of Berkeley</name>
      <address>2161 University Avenue</address>
      <city>Berkeley</city>
      <zip>94704</zip>
      <state>CA</state>
      <phone>+1-510-8452453</phone>
    </dealer>
  </dealers>
</bike>
```

XML → HTML Stylesheet

(7)

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL
/Transform">
  <xsl:template match="/">
    <html>
      <head>
        <title>
          <xsl:value-of select="bike/@manufacturer"/>
          <xsl:text> </xsl:text>
          <xsl:value-of select="bike/@year"/>
          <xsl:text> </xsl:text>
          <xsl:value-of select="bike/model"/>
          <xsl:text> </xsl:text>
          <xsl:value-of select="bike/type"/>
        </title>
      </head>
      <body>
        <h1 class="bike">
          <span class="manufacturer">
            <xsl:value-of select="bike/@manufacturer"/>
          </span>
          <xsl:text> </xsl:text>
          <span class="year">
            <xsl:value-of select="bike/@year"/>
          </span>
          <xsl:text> </xsl:text>
          <span class="model">
            <xsl:value-of select="bike/model"/>
          </span>
          <xsl:text> </xsl:text>
          <span class="type">
            <xsl:value-of select="bike/type"/>
          </span>
        </h1>
        <ul class="components">
          <xsl:for-each select="//parts/*">
            <li class="component">
              <span class="manufacturer">
                <xsl:value-of select="@manufacturer"/>
              </span>
              <xsl:text> </xsl:text>
              <span class="type">
                <xsl:value-of select="text()"/>
              </span>
            </li>
          </xsl:for-each>
        </ul>
      </body>
    </html>
  </template>
</xsl:stylesheet>
```

Graceful Degradation

(8)

- XML was designed as a language for Web content
 - the idea was that XML documents would be delivered to the browser
 - stylesheets (CSS/XSL) would take care of the client-side rendering
- [CSS](#) [Cascading Style Sheets (CSS)] is good at supporting graceful degradation
 - viewing an HTML page with CSS turned off most of the time works fine
- XSL is not good at supporting graceful degradation
 - the browser just displays the raw XML when XSL is not supported
- Serving XML on the Web is not a good idea
 - in closed scenarios (intranet applications) this might be a viable solution
 - in open scenarios, HTML should be served as the default representation
 - alternate versions can be provided by supporting *HTTP content Negotiation*

Excellent HTML

(9)

```

<html>
  <head>
    <title>Cannondale 2007 System Six 2</title>
    <link title="XML version" rel="alternate" type="application/xml"
href="systemsix.xml"/>
  </head>
  <body>
    <h1 class="bike"><span class="manufacturer">Cannondale</span> <span
class="year">2007</span> <span class="model">System Six</span> <span
class="type">2</span></h1>
    <ul class="components">
      <li class="component"><span class="manufacturer">Mavic</span> <span
class="type">Ksyrium ES</span> wheelset</li>
      <li class="component"><span class="manufacturer">Maxxis</span> <span
class="type">Xenith Hors Categorie</span> tires</li>
      <li class="component"><span class="manufacturer">Fi'zi:k</span>
<span class="type">Arione Titanium</span> saddle</li>
      <li class="component"><span class="manufacturer">SRAM</span> <span
class="type">Force</span> components</li>
    </ul>
    <p>Sizes: <span class="size">48cm</span>, <span
class="size">50cm</span>, <span class="size">52cm</span>, <span
class="size">54cm</span>, <span class="size">56cm</span>, <span
class="size">58cm</span>, <span class="size">60cm</span>, <span
class="size">63cm</span></p>
    <p>Dealers: </p>
    <ul>
      <li class="dealer"><span class="name">Mike's Bikes of
Berkeley</span>, <span class="adr"><span class="street-address">2161
University Avenue</span>, <span class="locality">Berkeley</span>, <span
class="region">CA</span> <span class="postal-code">94704</span></span>; <a
href="tel:+1-510-8452453">+1-510-8452453</a></li>
    </ul>
  </body>
</html>

```

From Information, Knowledge (10)

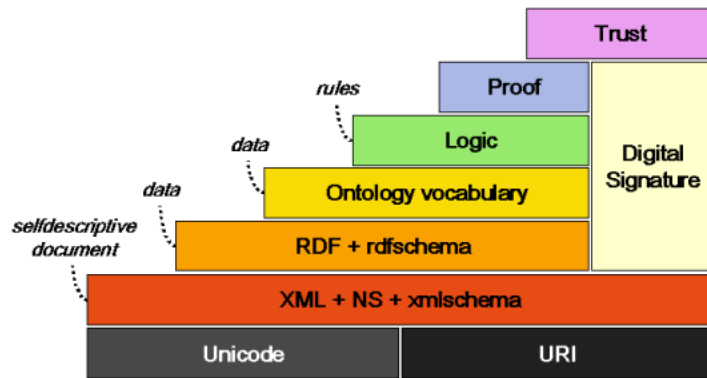
- XML is often said to be “self-describing”
 - many people think this is the same as “self-explanatory”
 - the catch is what exactly it is you refer to by “describing”
- Database data cannot live without a database
 - database data is simply content, the structure is provided by a DBMS
 - XML documents have their structure encoded within them
 - compared to database data, XML in fact is “self-describing”
- What is the gap between “self-describing” and “self-explanatory”?
 - it is impossible to find out how the document could be modified
 - there are no semantics associated with structure or content
 - so “self-describing” means, you can guess a lot, but you maybe wrong

The Semantic Web Hype (11)

1965, H. A. Simon: “[machines will be capable, within twenty years, of doing any work a man can do](http://en.wikipedia.org/wiki/Artificial_intelligence#_note-11)” [http://en.wikipedia.org/wiki/Artificial_intelligence#_note-11]
1967, Marvin Minsky: “[Within a generation \[... \] the problem of creating 'artificial intelligence' will substantially be solved.](http://en.wikipedia.org/wiki/Artificial_intelligence#_note-12)” [http://en.wikipedia.org/wiki/Artificial_intelligence#_note-12]

- How to get past the limitations of HTML?
 - a machine-friendly Web must make Web resources machine-processable
 - XML solved the problem on the syntax level
 - how could the problem be solved on the level of semantics?
- As in the 1970's, *description logic* was declared as being the solution
 - there was a need for the Web to move towards semantics
 - there was a community of AI researchers with a long history
 - the *Semantic Web* was born and is currently repeating AI history

Semantic Web Layers (12)



Conclusions (13)

- Formal semantics allow machines to “understand” Web content
- Semantics can be “deep” or “shallow”
- Philosophy has discussed these question for a log time
- The Web has two major approaches for expressing semantics:
 - *Semantic Web* as an attempt to completely formalize semantics
 - *Microformats* as a pragmatic way of agreeing on useful bits and pieces