

Comp 336/436 - Markup Languages

Fall Semester 2019 - Week 11

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XML - XPath details - functions - mathematics

- also include simple arithmetic operations with our expressions
- allow us to test for more complicated conditions
 - *or to output calculated values...*
- e.g to multiply, divide, add, or subtract,
 - *add first operand*
 - e.g. numerical constant 12 or a node set
 - *add mathematical operator*
 - * (for multiplication)
 - `div` (for division, since / is reserved)
 - + (for addition)
 - - (for subtraction)
 - add second operand
- multiplication and division are performed before addition and subtraction
 - e.g. $4+5*3 = 19$ and not 27
 - use parentheses to override the default, e.g. $(4+5)*3 = 27$
- modulus operator may also be used
 - e.g. $20 \bmod 4 = 0$ (since 4 divides evenly into 20)
 - but $20 \bmod 3 = 2$ since 20/3 is 6 with a remainder of 2

XML - working example - ancient sites - mathematics

XML

```
<history>
  <period>New Kingdom</period>
  <dynasty>18</dynasty>
  <year range="start" era="BC">1346</year>
  <year range="end" era="BC">1332</year>
</history>
```

XSL

```
<xsl:choose>
  <xsl:when test="year[@range='end']">
    <xsl:value-of select="year[@range='start'] - year[@range='end']"/>
  </xsl:when>
  <xsl:otherwise>
    <xsl:value-of select="year[@range='start'] + 2017"/>
  </xsl:otherwise>
</xsl:choose>
```

■ Demo - Ancient Sites 8

XML - XPath & XSLT tests - functions - mathematics

Exercise - part 9

- update your XSL stylesheet
 - *add an option to calculate a given value from the data in your XML*
 - add new values to XML, if necessary, to perform calculations
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath details - functions - count nodes

- `count ()` function
 - *count total nodes in a given node set*
 - *e.g. count images in an image set...*
- use the `count ()` function as follows,
 - *add count (*
 - *add the path to the node set count*
 - *add) to complete the function*

XML - working example - ancient sites - count

XSL

```
<xsl:template match="images">
  <td><xsl:value-of select="count(./image)"/></td>
  <td>
    <a href=""><xsl:value-of select="image[@type='jpg'][position() = last()]" />
  </td>
</xsl:template>
```

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XML - XPath & XSLT tests - functions - count

Exercise - part 10

- update your XSL stylesheet
 - *add an option to count nodes in a given node set*
 - add new values to XML, if necessary, to perform count
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath details - functions - format numbers

- standard arithmetic is performed using *floating point* mathematics
- may return very long numbers for certain calculations
- use `format-number ()` function
 - *easily control required output of numbers*
- use the `format-number ()` function as follows,
 - *add ``format-number(``*
 - *add expression or number to format*
 - *add `, ' (a comma, a space, and a single quote)`*
 - *add `0` for each digit that should always appear*
 - *add `#` for each digit that should only appear when **not zero***
 - *if necessary, add `.` (a period) to separate integer from fraction parts...*
 - *add `')` to complete function*

n.b. there are many ways to add further formatting to output numbers...

XML - working example - ancient sites - format numbers

XML

```
<dimensions>
  <width type="average" unit="metre">230.360</width>
  <height type="original" unit="metre">146.59</height>
  <height type="current" unit="metre">138.75</height>
</dimensions>
```

XSL - part 1

```
<xsl:choose>
  <xsl:when test="dimensions">
    <xsl:apply-templates select="dimensions"/>
  </xsl:when>
  <xsl:otherwise>
    <td>N/A</td>
  </xsl:otherwise>
</xsl:choose>
```

XSL - part 2

```
<xsl:template match="dimensions">
  <td>
    <xsl:value-of select="format-number(./width * ./width, '0.#')"/> m<sup>2</sup>
  </td>
</xsl:template>
```

- Demo - Ancient Sites 10

XML - XPath & XSLT tests - functions - format numbers

Exercise - part II

- update your XSL stylesheet
 - *add an option to format some numbers in your XML*
 - add new values to XML, if necessary
 - or format the result of a calculation...
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath details - functions - round numbers

- three XPath functions for rounding numbers
 - *follows similar usage pattern to `format-number()`*
- round to the nearest integer using the `round()` function
- always round up with the `ceiling()` function
- always round down using the `floor()` function
- use the round functions as follows,
 - *add `ceiling()`, `floor()`, or `round()` depending on requirements*
 - *add expression or number to format*
 - *add `)` to complete function*

XML - working example - ancient sites - round numbers

XSL

```
<xsl:template match="dimensions">
  <td>
    approx. <xsl:value-of select="ceiling(./width * ./width)"/> m<sup>2</sup>
  </td>
</xsl:template>
```

- Demo - Ancient Sites I I

XML - XPath & XSLT tests - functions - round numbers

Exercise - part I I

- update your XSL stylesheet
 - *add an option to format some numbers in your XML*
 - add new values to XML, perform calculation, round result...
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath details - functions - extract substrings

- useful option to extract substrings from XML content
- extract substrings for processing, rendering, computed values...
- extract substrings before or after a particular character
 - use *substring-before()* or *substring-after()*
- to use substring functions before and after,
 - add either *substring-before()* or *substring-after()*
 - choice of function depends on required part of source string
 - add expression containing the source string
 - add *)* to close the function
- also possible to extract specific substring within source string
 - e.g. start at character 3 in the source string, extract 5 characters
- to use specific substring function, `substring(s,f,n)`
 - add *substring()*
 - add expression for source string, *s*
 - add position of the first character for the substring, *f*
 - add total number of characters to extract, *n*

XML - working example - ancient sites - extract substrings

XML

```
<notes>
  <note type="intro">
    ... add lots of text ...
  </note>
</notes>
```

XSL

```
<xsl:template match="notes/note[@type='intro']">
  <td>
    <xsl:value-of select="substring(.,1,75)"/>
    ...
  </td>
</xsl:template>
```

- Demo - Ancient Sites I2

XML - XPath & XSLT tests - functions - extract substrings

Exercise - part 12

- update your XSL stylesheet
 - *add an option to extract a substring from a string value in your XML*
 - add new values to XML, if necessary
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath details - functions - modify case

- whilst processing and rendering text
 - *useful to change letters from upper-case to lower-case*
 - *and vice-versa...*
- use the following pattern to capitalise characters
 - *add `translate(`*
 - *add expression containing source string*
 - *Next, add `, abcdefghijklmnopqrstuvwxyz`*
 - *(a comma, a space, and string containing letters to change)*
 - *add `, ABCDEFGHIJKLMNOPQRSTUVWXYZ`*
 - *(a comma, a space, and string containing letters to replace)*
 - *add `)` to complete the function*
- process function will also work either way

XML - working example - ancient sites - modify case

XML

```
...  
<overview type="general" url="...">wikipedia</overview>  
...
```

XSL

```
...  
<xsl:value-of select="translate(., 'w', 'W')"/>  
...
```

- Demo - Ancient Sites I 3

XML - XPath & XSLT tests - functions - modify case

Exercise - part 13

- update your XSL stylesheet
 - *add an option to modify the case of a string value in your XML*
 - add new values to XML, if necessary
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath details - functions - total values

- additional mathematical functions
 - e.g. *sum()*
- use *sum()* to total all values in a selected node set
- use the following pattern to *sum()* values
 - *add sum(*
 - *add path to required node set with values*
 - *add)*
- use *sum()* with division to get initial average
 - use *count()* for total in node set
 - use *format-number()* to structure output for rendering

XML - working example - ancient sites - total values

XML

```
<dimensions>
  <width type="average" unit="metre">230.360</width>
  <height type="original" unit="metre">146.59</height>
  <height type="current" unit="metre">138.75</height>
</dimensions>
```

XSL

```
...
<xsl:value-of select="sum(./height) div count(./height)"/>
...
```

- Demo - Ancient Sites 14

XML - XPath & XSLT tests - functions - total values

Exercise - part 14

- update your XSL stylesheet
 - *add an option to total some values, and then output the average, in your XML*
 - add new values to XML, if necessary
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath details - functions - extras - node functions

- many useful extra node functions
- `name (node-set)`
 - *returns name of first node in specified node set*
- `name ()`
 - *returns name of current node*
- `id (id-str)`
 - *use with unique IDs specified in DTD &c.*
 - *returns all elements with an ID equal to `id-str`*
 - *get only certain elements with a given ID...*
 - *e.g. all first pages from each chapter...*
- full list of the functions in XPath Version 1.0
 - *XPath Version 1.0 functions*

XML - XPath details - functions - extras - string functions

- many useful extra string functions
- `contains(str1, str2)`
 - *returns True if str1 contains str2*
 - *otherwise returns False*
- `string-length(str1)`
 - *returns the number of characters in str1*
- `string-length()`
 - *returns the number of characters in the current node*
- `normalize-space(str1)`
 - *returns str1 with all leading and trailing white space removed*
 - *sequences of white space replaced with a single space*
- `normalize-space()`
 - *performs same action on current node*

XML - XPath details - functions - extras - boolean functions

- boolean functions as well, e.g.
- `not(expression)`
 - *returns `True` if expression evaluates to `False`*
 - *returns `False` if expression evaluates to `True`*
- further details on functions for XPath 2
 - *XPath 2 functions*

XML - working example - ancient sites - add some images

XSL

```
...  
<img>  
  <xsl:attribute name="src">  
    <xsl:value-of select="image[@type='jpg' and @size='thumb']/@url"/>  
  </xsl:attribute>  
</img>  
...
```

- Demo - Ancient Sites I5

XML - XPath & XSLT tests - functions - add some images

Exercise - part 15

- update your XSL stylesheet
 - *output some thumbnail images*
 - *wrap a link (anchor element) around at least one thumbnail image*
 - *add output to rendered document*
- test stylesheet with XML file

~ 10 minutes

XML - XPath & XSLT tests - conclusion

Exercise - Working Demo

- tidy up the code
- add some headings and structure to HTML output
- add some CSS styling
- test rendering and output

~ 10 to 15 minutes if necessary

Demos

XML & XSLT - Part 2 - Functions

- Ancient Sites - comparison - part 7
- Ancient Sites - mathematics - 8
- Ancient Sites - count - part 9
- Ancient Sites - format numbers - 10
- Ancient Sites - round numbers -part 11
- Ancient Sites - substrings - part 12
- Ancient Sites - modify case - part 13
- Ancient Sites - total values - part 14
- Ancient Sites - node functions - part 15

References

- XPath Version 1.0 functions
- XPath Version 2 functions