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 mod 4 = 0` (since 4 divides evenly into 20)*
  - *but `20 mod 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>
```

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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
  </td>
</xsl:template>
```

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XML - XPath & XSLT tests - functions - format numbers

Exercise - part 11

- 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 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</s
  </td>
</xsl:template>
```

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XML - XPath & XSLT tests - functions - round numbers

Exercise - part 11

- 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>
```

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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')"/>
...
```

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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)"/>
...
```

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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>
...
```

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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