PyXDiff
Model Differences

How to specify and detect changes in graph-like models

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Outline

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- Challenges

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- XML-Differences Computation

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XML Differences

X-Diff

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book1-book2.diff

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4  ---
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6  >   <Price>$29.00</Price>
7  7,8c7,8
8  <     <Title>The adventures of Tom Sawyer</Title>
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GNU Diff upgrade script

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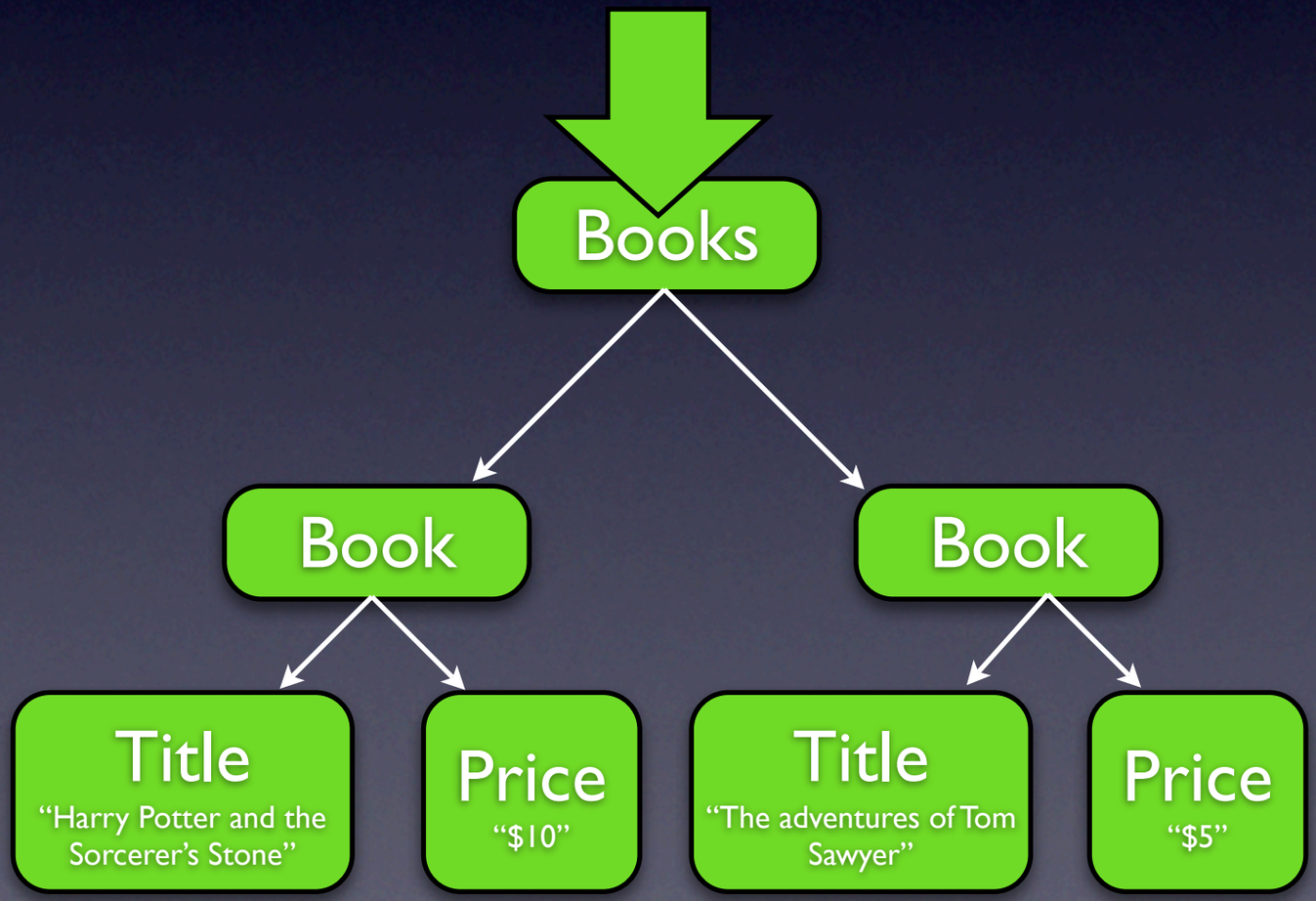

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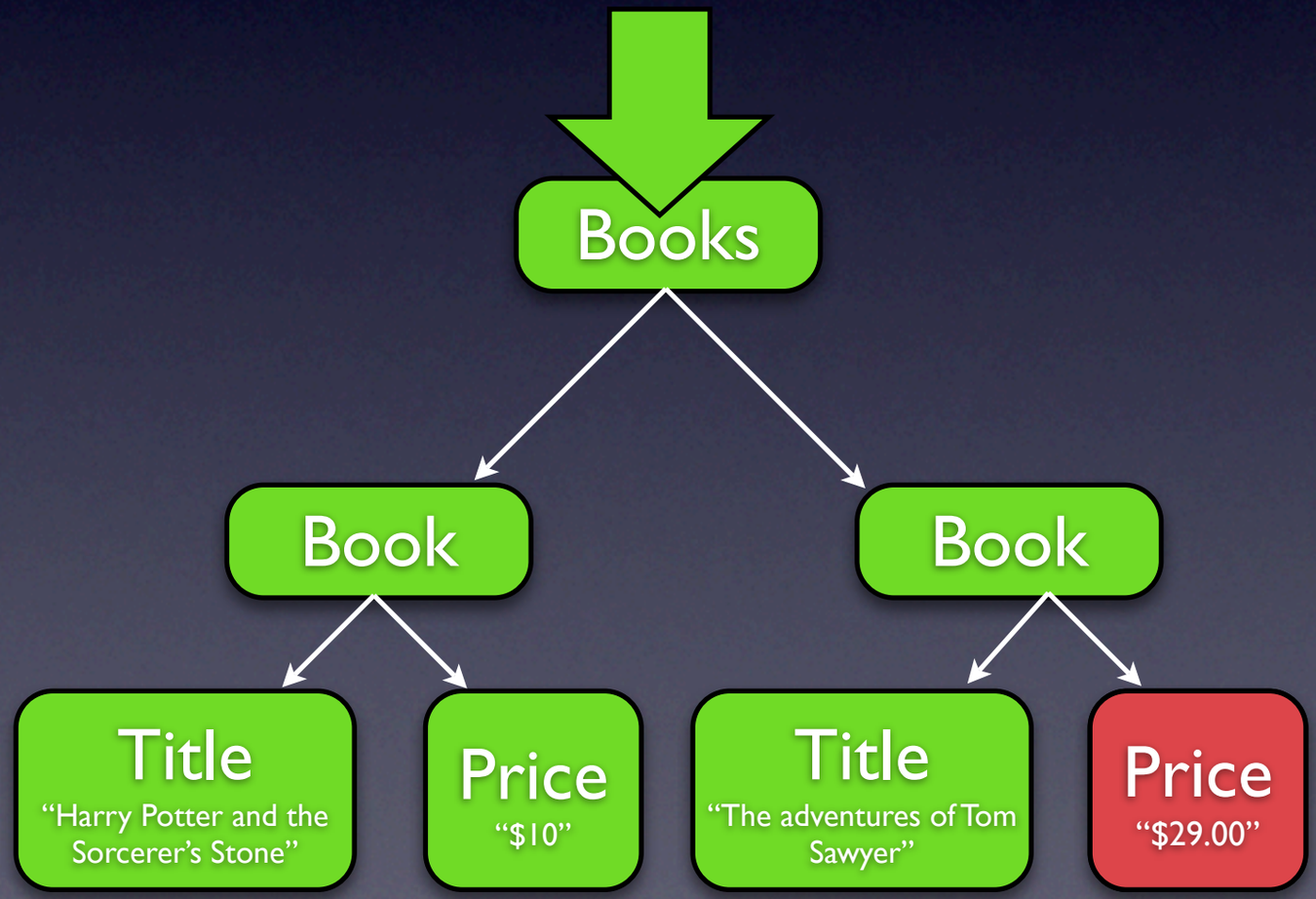


X-Diff

Y. Wang, D.J. DeWitt and J. Cai

"An Effective Change Detection Algorithm for XML Documents"

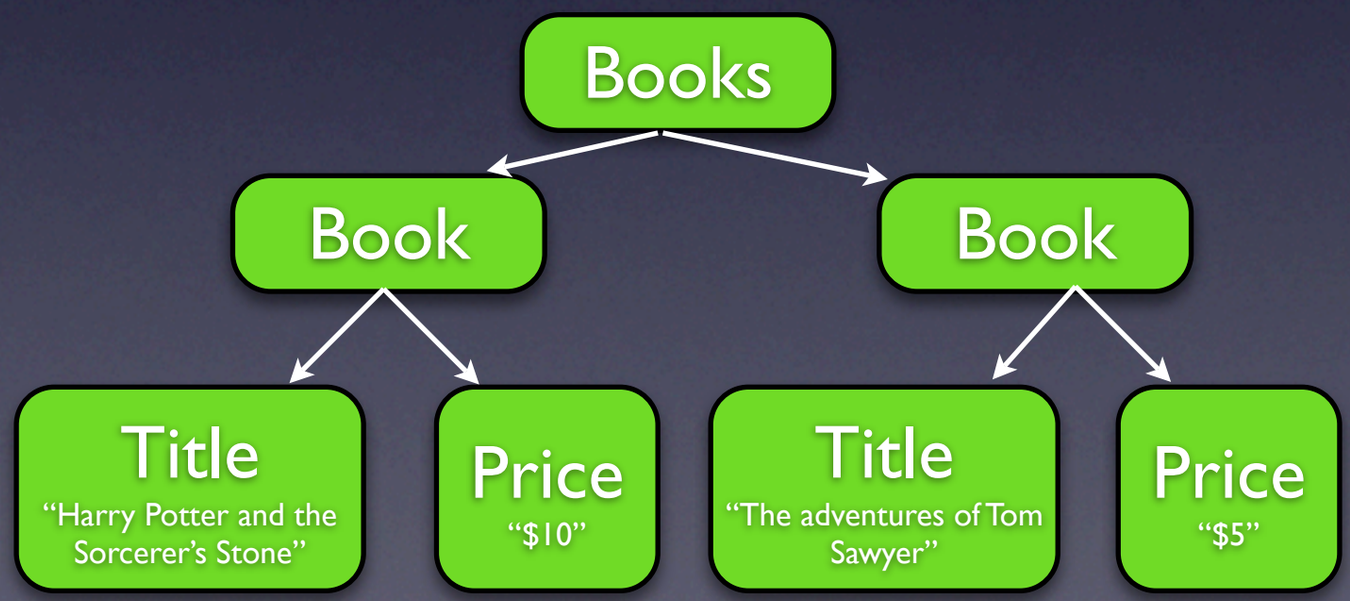
University of Wisconsin (2003)

- XML structure is hierarchical and can be represented as a tree
- Unordered trees
  - only ancestor relationship is important
  - optimal change detection of unordered trees is NP complete[1]
- Algorithm generates near optimal edit scripts
- Two trees are *isomorphic* if they are identical except for the ordering of siblings. X-Diff considers two trees as equivalent if they are *isomorphic*.

[1] K. Zhang, R. Statman, D. Shasha, "On the Editing Distance betweem Unordered Labeled Trees", *Information Processing Letters*, 42: 133-139, 1992

Tree Definition

- A tree has three kinds of nodes:
  - **Element** nodes - non-leaf nodes with one label, *name*
  - **Text** nodes - leaf nodes with one label, *value*
  - **Attribute** nodes - leaf nodes with two labels, *name* and *value*



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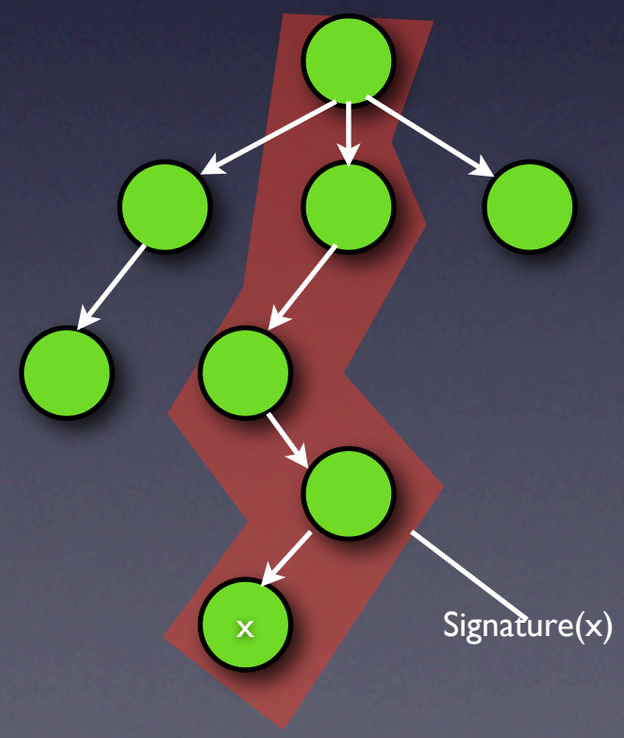

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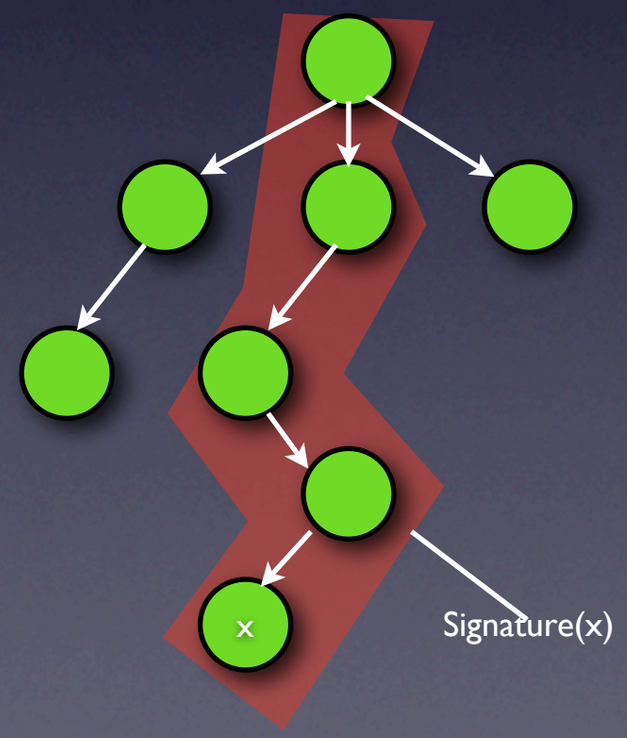

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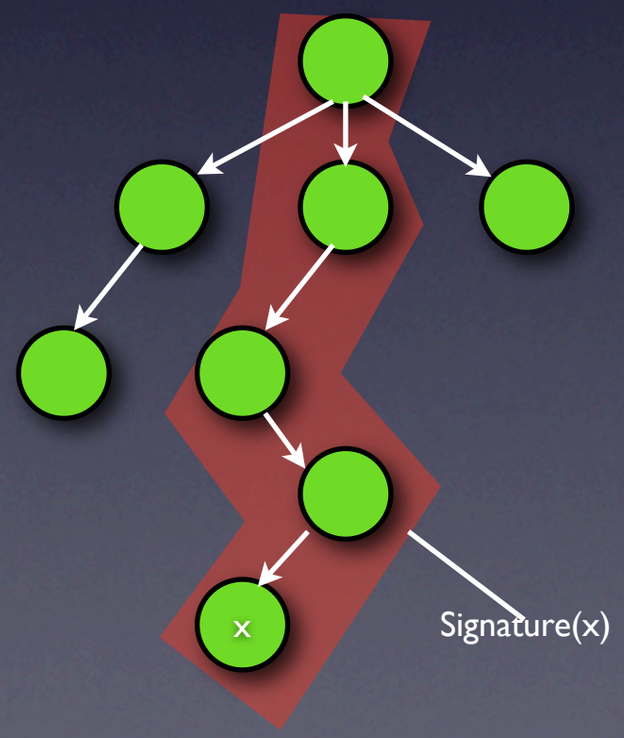

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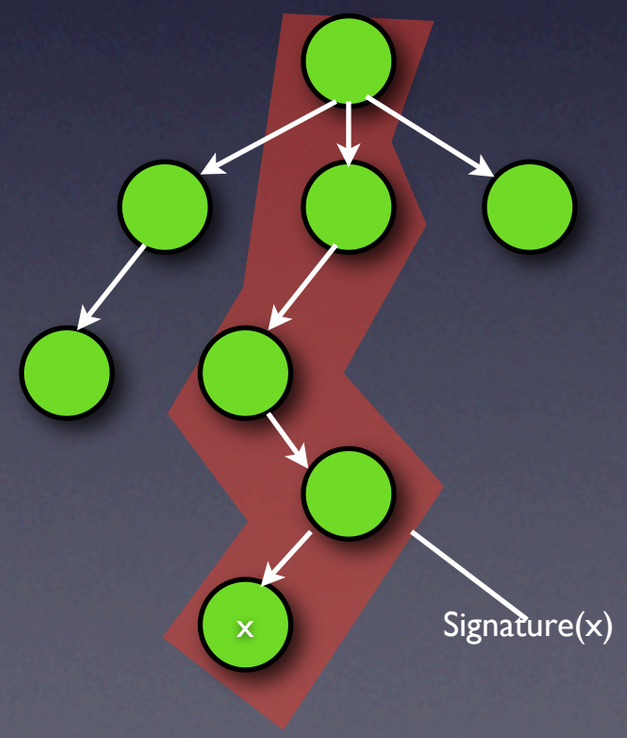
- Algorithm only computes editing distances between nodes that have the same signature
  - Important to archive polynomial time complexity



Project Implementation

Implementing X-Diff in Python

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- In my project I implemented the base, the XML difference computation algorithm
- Algorithm is released under GPL3 and will be in future maintained and extended as a private project

Implementation - Input

XDiff.py

```
274 class XDiff(object):
275     """
276     This class is a wrapper for the XDIFF methods.
277     It takes two xml files and creates the editscript in I{self.editscript}.
278     """
279
280     def __init__(self, xmlfile1, xmlfile2):
281         # create Reader object
282         reader = Sax2.Reader()
283         doc1 = reader.fromStream(xmlfile1)
284         doc2 = reader.fromStream(xmlfile2)
285
286         root1 = doc1.documentElement
287         root2 = doc2.documentElement
288
289         matching = findMatching(root1, root2)
290         #: The computed editscript
291         self.editscript = editScript(root1, root2, matching, set([]))
```

Line: 274 Column: 1 Python Tab Size: 4 XDiff(object)

- The input for the X-Diff algorithm are two Strings linking to XML files
- After that two DOM-trees are parsed using the libraries:
  `xml.dom.ext.reader`
  `xml.dom`

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    - contains a action type: *ADD*, *REMOVE* or *UPGRADE*

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  - **findMatching(t1, t2)**
    This method returns from two tree nodes, that are treated as root nodes a minimum cost matching set.
  - **editScript(t1, t2, M_min, script)**
    This method creates an edit script. It takes two root nodes from two DOM trees, the previous computed minimum cost matching set and returns a valid edit script consisting of Action objects.

Demo

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  - Note: It has to kept track of backlinks.

Questions?