# Data Extraction and Label Assignment for Web Databases

PS WIE – Paper #19

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# The Twelfth International World Wide Web Conference

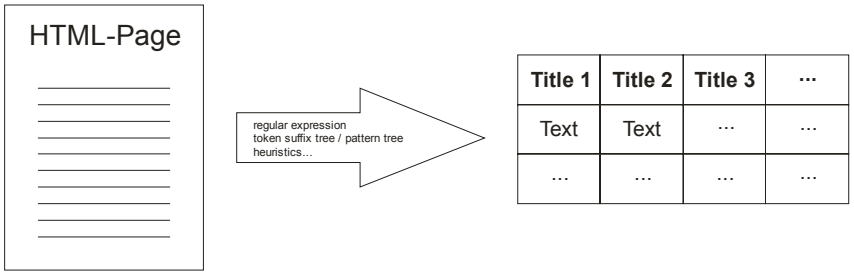
- Hungary, 2003
- organized by the international World Wide Web Conference Committee (IW3C2)
- representatives of economy and research debate about new internet technologies and trends

# Hidden Web

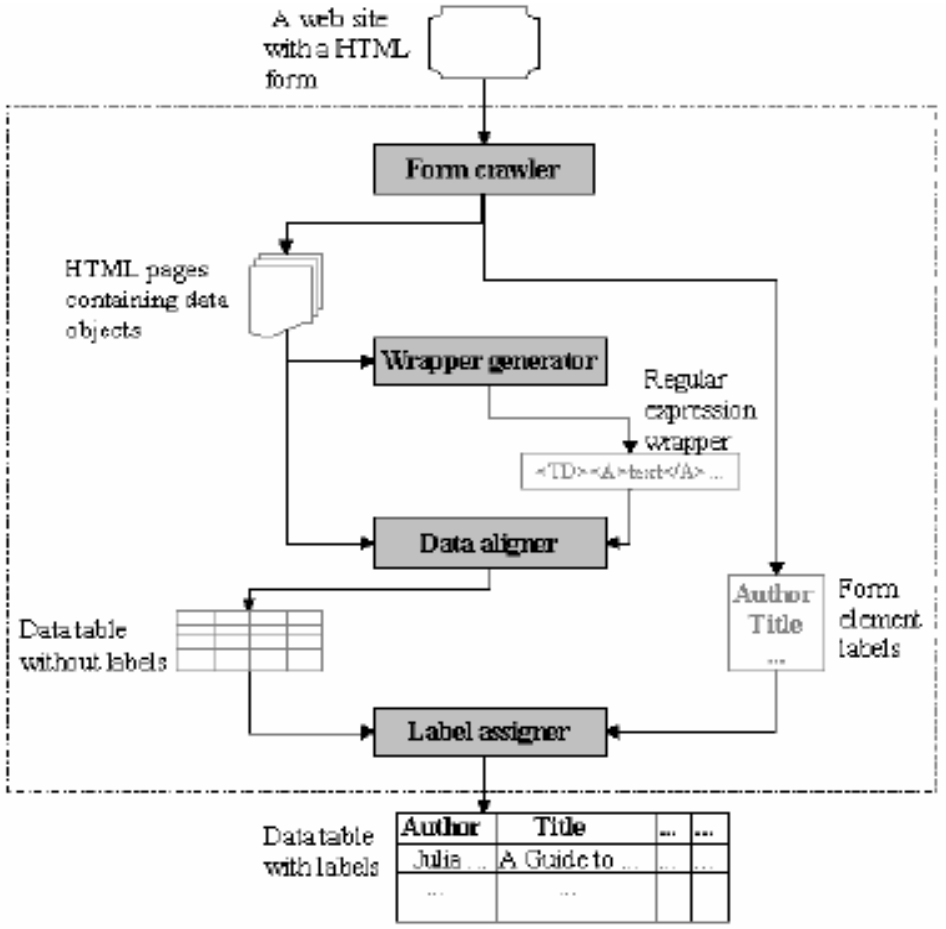
- created dynamically with the use of db
- 400 to 550 times bigger than the surface Web
- impossible to index for search engines
- Organisations are placing their content online, by building Web query front-ends to their databases.

# Dela

- to build a System that
  - extracts (automatically) text froma web-page into a table
  - assignes labels in a table



# DeLa Architecture



- **Form Crawler**
- Wrapper Generator
- Data Aligner
- Label Assigner

# Form Crawler

- sends queries though the form elements
- HiWe is supported with a db storing task-specific concepts → label annotating
- our system: DeLa

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# Wrapper Generator

- find data-rich section → DSE-algorithm
  - DOM-tree
  - compare web pages
- build a token suffix tree
  - data structure
  - built on the alphabet composed of HTML tags, a terminal token “$” and a token “text”
  - be built optimally in O(n) time

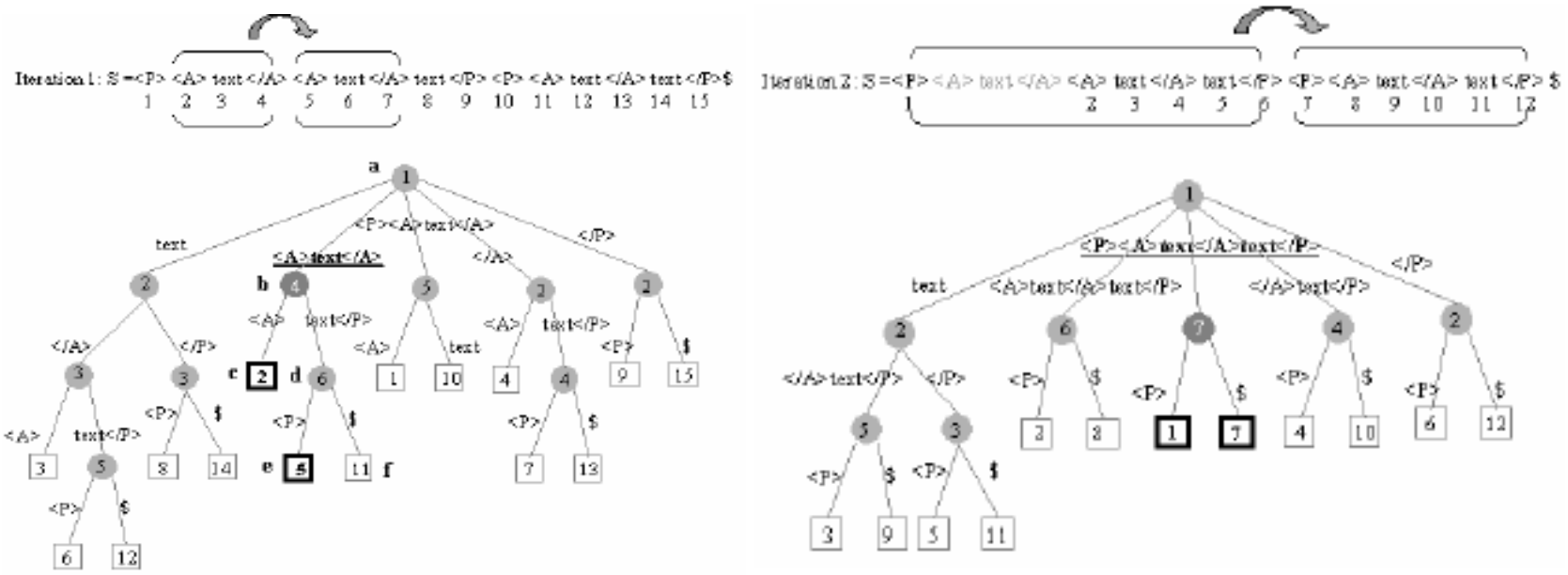
# Token suffix tree (1/2)

- Each leaf is represented by a square with a number that indicates the starting token position of a suffix.
- A solid circle represents each internal node with a number that indicates the token position where its children nodes differ.
- Sibling nodes sharing the same parent are put in alphabetical order.

# Token suffix tree (2/2)

- Each edge between two internal nodes has a label, which is the substring between two token positions of the two nodes.
- Each edge between one internal node and one leaf node has a label, which is the token at the position of the internal node in the suffix starting from the leaf node.

# Iteratively discovering C-repeated patterns

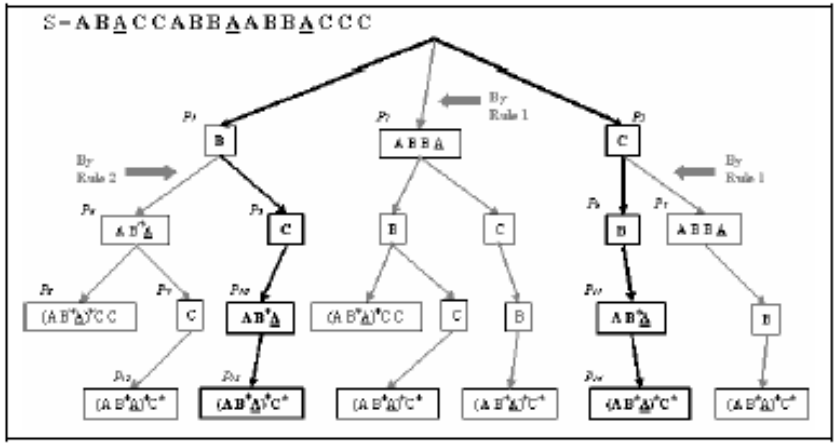


# C-Repeated Pattern

- Definition:
  - Given an input string S, a C-repeated substring (pattern) of S is a repeated substring of S having at least one pair of its occurrences that are adjacent.

# Pattern Tree

- a heuristic (with 3 rules) is applied to the pattern tree, to filter out patterns that cross pairs of HTML-tags → regular expression



# Optional attributes

- P1="ABCDXF" and P2="BCEXF"

- P1: A B C D X F
- P2: – B C E X F

can be done in O(nm) time where n and m are the size of S1 and S2

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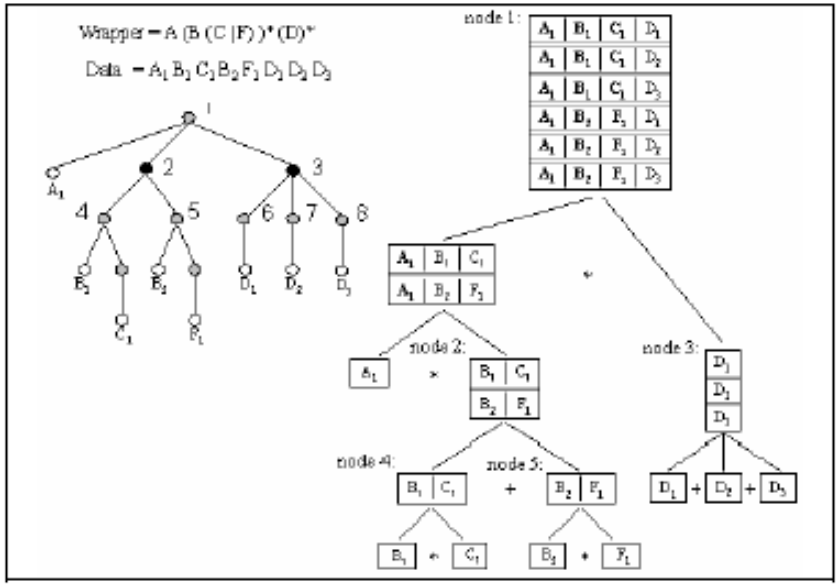
# Data Aligner

- there are different nodes (star type, cat type) which are handled differently
- the data-tree is traversed deep-first order
- attribute separation



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# Label Assigner

- Heuristic 1 uses the idea of matching form labels to data attributes. This can be done when the database is good designed.
- Heuristic 2 uses the <TH> tag in a table for assigning labels in a table
- Heuristic 3 uses the idea that the prefix or suffix of data elements can be the correct assignment
- Heuristic 4 takes use of conventional (data) formats, e.g. date is usually organised as dd-mm-yy or dd/mm/yy etc.