



Theoretical Computer Science in the XML World

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Databases



A short story of databases:

- 1970's Relational Database [Codd]
- 1980's Datalog
- 1990's Data mining, data warehousing, new models: temporal databases, OO, OR databases
- 2000's: **XML**, P2P, Data integration on the web



Data Exchange



A short story of Data Exchange:

- HTML5
- XHTML (2000)
- XML (eXtensible Markup Language, 1996)
- HTML (1990)
- XML \subset SGML (Standard Generalized Markup Language, 1986)



XML



```
<paperDB>
  <paper>
    <author>
      <chandra />
      <merlin />
    </author>
    <title title="Conjunctive Queries" />
  </paper>
  . . . . .
</paperDB>
```



XML Technologies



- representing and interacting with XML data - **DOM, SAX**
- markup declarations - **DTD, XML Schema, Relax NG**
- query languages - **XPath, XQuery**
- update languages - **XQuery Update, XQuery!, XQueryP**
- transform languages - **XSLT**



Universal TM



```
<xsl:text>Tape          = </xsl:text>
  <xsl:value-of select="$tape"/>
  <xsl:text>&#x0D;&#x0A;</xsl:text>
  <xsl:text>Tape head    </xsl:text>
  <xsl:call-template name="display_tape_head">
    <xsl:with-param name="tape_position" select="$tape_position"/>
  </xsl:call-template>

<xsl:text>State          = </xsl:text>
  <xsl:value-of select="$state"/>
  <xsl:text>&#x0D;&#x0A;</xsl:text>

<xsl:variable name="current_symbol" select="substring( $tape,
                                                         $tape_position,
                                                         1 )" />

<!-- Get the mapping for the current state and current symbol. -->
<xsl:variable name="mapping"
               select="key( 'mapping',
```

XML stream firewalling



- The XML stream filtering
- The XML stream firewalling
 - efficiently streamable XPath
 - runtime space - linear in the size
 - runtime space - independent in the stream
 - Transducer Networks
 - identity, composition, product, generators



Independence of XML Updates



- View maintenance
 - DB
 - Update
 - Query - View
- Destabilizers and intersection analysis
- Statically independent

