A rule-based methodology for the adaptation of Web based Information System

Roberto De Virgilio

Dipartimento di Informatica e Automazione
Università degli studi Roma Tre
Overview

- **Scenario**
  - An ever increasing number of mobile devices can provide *everywhere* and *any time* access to the Web: they offer limited computing capabilities

- **Problem**
  - content delivery adaptation of Web information to the context of the client

- **Goal**
  - general approach to adapt a Web Information System according to different and possibly heterogeneous contexts
design of WIS data-intensive

- we focus our attention on the large category of *data intensive* Web Information Systems

- a *Web access* to large amounts of structured data

- *model-driven* methodologies to design a WIS
An Example: content layer

<table>
<thead>
<tr>
<th>J</th>
<th>Name</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>Roma</td>
<td>Rome</td>
</tr>
<tr>
<td>J2</td>
<td>Oggi</td>
<td>Naples</td>
</tr>
</tbody>
</table>

**News**

<table>
<thead>
<tr>
<th>Title</th>
<th>Summary</th>
<th>Content</th>
<th>Picture</th>
<th>Date</th>
<th>Gn</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>S1</td>
<td>1</td>
<td>P1</td>
<td>1/02/05</td>
<td>x</td>
<td>J1</td>
</tr>
<tr>
<td>b</td>
<td>S2</td>
<td>2</td>
<td>P2</td>
<td>2/02/05</td>
<td>x</td>
<td>J2</td>
</tr>
<tr>
<td>c</td>
<td>S3</td>
<td>3</td>
<td>P3</td>
<td>3/02/05</td>
<td>y</td>
<td>J1</td>
</tr>
<tr>
<td>d</td>
<td>S4</td>
<td>4</td>
<td>P4</td>
<td>1/02/05</td>
<td>z</td>
<td>J2</td>
</tr>
</tbody>
</table>

**Genre**

<table>
<thead>
<tr>
<th>Gn</th>
<th>Pict</th>
<th>Descr</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>Pg1</td>
<td>aa</td>
</tr>
<tr>
<td>y</td>
<td>Pg2</td>
<td>bb</td>
</tr>
<tr>
<td>z</td>
<td>Pg3</td>
<td>cc</td>
</tr>
</tbody>
</table>
An Example: navigation layer

**Genre**
- Name
- Picture
- Descr

**News**
- Title
- Picture
- Summary
- Content

**Journal**
- Name
- City

- **News**
  - a P1 1/02/05
  - b P2 2/02/05
  - c P3 3/02/05
  - d P4 1/02/05

- **Genre**
  - x Pg1 a

- **Journal**
  - J1 Rome
An Example: presentation layer

body {
    background-color: yellow;
    font-family: georgia;
    font-size: 16pt;
    color: black;
}

h1 {
    font-size: 24pt;  font-weight: navy;
    color: purple;
}

#picture span {
    width: 100px;  height: 100px;
    float: center;
}
Adaptation on WIS (several aspects)

- a WIS is **adaptive** if it is able to modify and personalize delivery of contents and services according to the **context** of the client (human being or application).
definition of context

“a set of attributes that characterizes the capabilities of the access mechanism, the preferences of the user and other aspects of the context into which a Web page is to be delivered”

W3C Working Group on Device Independence
an example of context

“a user having a preference of summaries for genre x and z with his/her mobile phone with a black and white display of limited size and without graphical capabilities”
The “adapted” example

<table>
<thead>
<tr>
<th>Journal</th>
<th>Name</th>
<th>City</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1</td>
<td>Roma</td>
<td>Rome</td>
</tr>
<tr>
<td>J2</td>
<td>Oggi</td>
<td>Naples</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>News</th>
<th>Title</th>
<th>Summary</th>
<th>Content</th>
<th>Picture</th>
<th>Date</th>
<th>Gn</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>S1</td>
<td>1</td>
<td>P1</td>
<td>1/02/05</td>
<td>x</td>
<td>J1</td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>S2</td>
<td>2</td>
<td>P2</td>
<td>2/02/05</td>
<td>x</td>
<td>J2</td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>S3</td>
<td>3</td>
<td>P3</td>
<td>3/02/05</td>
<td>y</td>
<td>J1</td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>S4</td>
<td>4</td>
<td>P4</td>
<td>1/02/05</td>
<td>z</td>
<td>J2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Genre</th>
<th>Gn</th>
<th>Pict</th>
<th>Descr</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
<td>Pg1</td>
<td>aa</td>
</tr>
<tr>
<td></td>
<td>y</td>
<td>Pg2</td>
<td>bb</td>
</tr>
<tr>
<td></td>
<td>z</td>
<td>Pg3</td>
<td>cc</td>
</tr>
</tbody>
</table>

De Virgilio – A rule-based methodology for the adaptation of Web based Information System
### The “adapted” example

#### News

<table>
<thead>
<tr>
<th>Title</th>
<th>Summary</th>
<th>Content</th>
<th>Picture</th>
<th>Date</th>
<th>Gn</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>S1</td>
<td>1</td>
<td>P1</td>
<td>1/02/05</td>
<td>x</td>
<td>J1</td>
</tr>
<tr>
<td>b</td>
<td>S2</td>
<td>2</td>
<td>P2</td>
<td>2/02/05</td>
<td>x</td>
<td>J2</td>
</tr>
<tr>
<td>c</td>
<td>S3</td>
<td>3</td>
<td>P3</td>
<td>3/02/05</td>
<td>y</td>
<td>J1</td>
</tr>
<tr>
<td>d</td>
<td>S4</td>
<td>4</td>
<td>P4</td>
<td>1/02/05</td>
<td>z</td>
<td>J2</td>
</tr>
</tbody>
</table>

#### Genre

<table>
<thead>
<tr>
<th>Gn</th>
<th>Pict</th>
<th>Descr</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>Pg1</td>
<td>aa</td>
</tr>
<tr>
<td>y</td>
<td>Pg2</td>
<td>bb</td>
</tr>
<tr>
<td>z</td>
<td>Pg3</td>
<td>cc</td>
</tr>
</tbody>
</table>
The “adapted” example

Genre
- Name
News
- Title
- Picture
- Date

News
- Title
- Picture
- Summary
- Content

Journal
- Name

Genre
- Name
News
- Title
- Date

News
- Name
- Date

Journal
- Name

Genre
- Name
- Picture
- Descr

Journal
- Name
- City

Genre
- Name
- Description

Journal
- Name
- City

News
- Content
De Virgilio – A rule-based methodology for the adaptation of Web based Information System
Several approaches

- many approaches provide a solution for the **whole** development process: design, implementation, configuration and deployment

- they are often **specific solutions**, suited only for predefined coordinates of adaptation and **hardly reusable** for adding new adaptation capabilities to existing systems
Profiles

• profile: a description of an autonomous aspect of the context in which the Web site is accessed.

device  user preference  temporal aspects  location  network
Configurations

- **configuration**: abstract description that specifies how information has to be delivered by taking into account the requirements of adaptation for a profile.
De Virgilio – A rule-based methodology for the adaptation of Web based Information System

from profiles to configuration

n profiles  

Context Manager

configuration

Adaptation

Existing WIS

Adaptation Engine

Adaptation Engine
An architecture of reference

- Contents
- Context repository
- Response Generator
- Request Interpreter
- Context Manager
- Request
- Response
- Profile

De Virgilio – A rule-based methodology for the adaptation of Web based Information System
Context Manager

- Profile Interpreter
- Dimension A Adapter
- Dimension B Adapter
- Dimension C Adapter
- Adaptation Coordinator
  - content adaptation
  - navigation adaptation
  - presentation adaptation

Profiles flow through the system, starting from the Context repository.
The adaptation process: context analysis

De Virgilio – A rule-based methodology for the adaptation of Web based Information System
Different Formats to express a profile

- text files in ad-hoc format
- HTTP headers
- DTDs
- XML
- RDF
- CC/PP

... and their dialects.
Abstraction Levels

- **Profile Models**
  - Profile Schemes
    - Profile Instances
  
- Set of constructs to build a schema
- Description of data
- data
Headers HTTP

La versione del protocollo http che si intende adottare

Contiene una serie di informazioni sul presente collegamento che il client invia al server

Il metodo di richiesta

Il nome del file oggetto della richiesta

Informazioni opzionali

Una riga vuota

Dati

Una riga vuota separa l’header dal body

Sono i dati effettivamente inviati dal client al server

Alcuni metodi non prevedono body
Headers HTTP

\[ \text{Request} = \text{Request-Line} \]

\[ *((\text{general-header} \mid \text{request-header} \mid \text{entity-header}) \ CRLF) \]

\[ \text{CRLF} \]

\[ [ \text{message-body} ] \]

http://www.w3.org/Protocols/rfc2616/rfc2616-sec5.html#sec5
POST register.jsp HTTP/1.1
Host: hi.iq
User-Agent: Mozilla/5.0 (X11; U; Linux i686; en-US; rv:1.7)
    Gecko/20040616 MultiZilla/1.6.4.0b
Accept: text/xml,application/xml,application/xhtml+xml,text/html;q=0.9,
    text/plain;q=0.8,video/x-mng,image/png,image/jpeg,image/gif;q=0.2,
    text/css,/*;q=0.1
Accept-Language: en-us, en;q=0.50
Accept-Encoding: gzip, deflate, compress;q=0.9
Accept-Charset: ISO-8859-1, utf-8;q=0.66, *;q=0.66
From: rde79@yahoo.com
Content-Type: application/x-www-form-urlencoded
Content-Length: 36
### Log File

<table>
<thead>
<tr>
<th>Elemento</th>
<th>Descrizione</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1) Indirizzo utente</strong></td>
<td>Indirizzo IP o nome del dominio dell’utente che accede al sito</td>
</tr>
<tr>
<td><strong>2) Rfc931</strong></td>
<td>Campo utilizzato per registrare il dominio nel caso di un web server con più homepage</td>
</tr>
<tr>
<td><strong>3) Autenticazione utente</strong></td>
<td>Identificativo (user name) dell’utente se richiesto dal documento consultato</td>
</tr>
<tr>
<td><strong>4) Data e orario</strong></td>
<td>Data e orario di accesso al documento</td>
</tr>
<tr>
<td><strong>5) GMT</strong></td>
<td>Differenza di jet lag dal fuso orario utilizzato</td>
</tr>
<tr>
<td><strong>6) Action</strong></td>
<td>GET o POST e documento richiesto</td>
</tr>
<tr>
<td><strong>7) Codice di risposta</strong></td>
<td>Codice di risposta (eventualmente per mostrare condizioni di errore)</td>
</tr>
<tr>
<td><strong>8) Dimensioni</strong></td>
<td>Dimensioni del documento trasferito</td>
</tr>
<tr>
<td><strong>9) Referrer</strong></td>
<td>URL di origine dell’utente</td>
</tr>
<tr>
<td><strong>10) Browser/system</strong></td>
<td>Browser e sistema da cui l’utente accede</td>
</tr>
</tbody>
</table>
Log File

host144-98.pool80117.interbusiness.it 1)
- 2)
- 3)
[01/Apr/2003:08:18:49 +0200] 4) + 5)
"GET /~coppola/didactics/twm/aa2002-2003 HTTP/1.1" 6)
302 7)
284 8)
“http://www.google.it/” 9)
“Mozilla/2.0b5 (WinNT; I)” 10)
**XML**: client is able to send structured information

```xml
<context>
  <coordinate 1>… </coordinate1>
  <coordinate 2>… </coordinate2>
  <coordinate 3>… </coordinate3>
  …
</context>
```
<!DOCTYPE TVSCHEDULE>
[<!ELEMENT TVSCHEDULE (CHANNEL+)>
  <!ELEMENT CHANNEL (BANNER, DAY+)>
  <!ELEMENT BANNER (#PCDATA)>
  <!ELEMENT DAY (DATE, (HOLIDAY | PROGRAMSLOT)+)>
  <!ELEMENT HOLIDAY (#PCDATA)>
  <!ELEMENT DATE (#PCDATA)>
  <!ELEMENT PROGRAMSLOT (TIME, TITLE, DESCRIPTION?)>
  <!ELEMENT TIME (#PCDATA)>
  <!ELEMENT TITLE (#PCDATA)>
  <!ELEMENT DESCRIPTION (#PCDATA)>
  <!ATTLIST TVSCHEDULE NAME CDATA #REQUIRED>
  <!ATTLIST CHANNEL CHAN CDATA #REQUIRED>
  <!ATTLIST PROGRAMSLOT VTR CDATA #IMPLIED>
  <!ATTLIST TITLE RATING CDATA #IMPLIED>
  <!ATTLIST TITLE LANGUAGE CDATA #IMPLIED> ]>
```xml
<xs:element name="shipto">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="name" type="xs:string"/>
      <xs:element name="address" type="xs:string"/>
      <xs:element name="city" type="xs:string"/>
      <xs:element name="country" type="xs:string"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
```
Relational schema

- Common model to store data: Relational Model

**Table** \( (\text{Field1}, \text{Field2}, \ldots) \)

**tuple**

\[
\begin{array}{cccccccc}
\text{News} \\
\text{Title} & \text{Summary} & \text{Content} & \text{Picture} & \text{Date} & \text{Gn} & \text{Jn} \\
\text{Genre} \\
\text{Name} & \text{Pict} & \text{Descr} \\
\text{Journal} \\
\text{Name} & \text{City}
\end{array}
\]
RDF: Resource Description Framework

- Resource (Web)
- Property (subclass of Resource)

(subject) \(\rightarrow\) (predicate) \(\rightarrow\) (object)

statement
General Profile Model

De Virgilio – A rule-based methodology for the adaptation of Web based Information System
“Generic” profile

- **a profile** is a **description** of an autonomous aspect of the context (device, user, network…)

- **a dimension** is a property that characterizes a profile

- each dimension can present a set of **attributes**
  - **simple**: a value associated
  - **complex**: a set of (simple or complex) attributes associated
General Profile Model

Client A

Device
- Hardware
  - CPU
  - display
- Software
  - OS

Network
- Connection
  - delay
  - bandwidth

User
- Account
  - E-mail

profile  dimension  attribute
Instance of a profile

- The *instance* $I_A$ of an attribute $A$ is
  - pair $(A, v)$, where $v$ is a value (if $A$ is *simple*)
  - a set of pairs $(A, I_{A_k})$, for each attribute $A_k$ that composes $A$, where $I_{A_k}$ is an instance of $A_k$ (if $A$ is *complex*)

- The *instance* $I_D$ of a dimension $D$ is
  - a set of pairs $(D, I_A)$, where $I_A$ is an attribute instance, for each attribute $A$ of $D$.

- The *instance* of a profile $P$ is a set of dimension instances, for each dimension of $P$. 

De Virgilio – A rule-based methodology for the adaptation of Web based Information System
Subsumption relation between profiles

- $P_1$
  - Hardware
    - CPU
    - display
    - width
    - height
  - Software
    - Memory
    - OS
    - Version
    - type
    - family
    - Model
  - Category

- $P_2$
  - Hardware
    - display
    - width
    - height
  - Software
    - OS
  - Category
    - type

- $P_3$
  - Category
    - type

$P_3 \land P_2 \land P_2 \land P_1$
**Interpretation of Profiles**

- $PM_s$ to $GPM$ (translation)
- $PS_s$ to $PS'_s$ (transformation)
- $PS'_s$ to $PS_t$
- $PI_s$ to $PI'_s$ (translation)
- $PI'_s$ to $PI_t$ (transformation)
Translation of Profiles

POST register.jsp HTTP/1.1
Host: hi.iq
User-Agent: Mozilla/5.0
Accept: text/xml, application/xml, application/xhtml+xml,
text/html, text/plain, video/xmng, image/png,
image/jpeg, image/gif, text/css, */*
From: w3c@yahoo.com
ScreenSize: 15x10
Translation of Profiles

HttpRequest

request-line
- method
- URI
- HTTPvr

headers
- ScreenSize
- User-Agent
- From
- Accept

$\text{PS}_s$
De Virgilio & Torlone - Management of Heterogeneous Profiles in Adaptive Context-Aware Information Systems
Translation step

- Given a context expressed in a model, we want to serialize it in RDF.
Then we want to build a “rule” to translate primitives of source model in metaprimitives of our General Profile Model.
Jena: a Java Framework to manage RDF files
http://jena.sourceforge.net/
Jena: a Java Framework to manage RDF files
http://jena.sourceforge.net/

Rule := bare-rule.
  or [ bare-rule ]
  or [ ruleName : bare-rule ]

bare-rule := term, ... term -> hterm, ... hterm   // forward rule
  or term, ... term <= term, ... term   // backward rule

hterm := term
  or [ bare-rule ]

term := (node, node, node)   // triple pattern
  or (node, node, functor)   // extended triple pattern
  or builtin(node, ... node)   // invoke procedural primitive

functor := functorName(node, ... node)   // structured literal

node := uri-ref   // e.g. http://foo.com/eg
  or prefix:localname   // e.g. rdf:type
  or ?varname   // variable
  or 'a literal'   // a plain string literal
  or 'lex'"typeURI   // a typed literal, xsd:* type names supported
  or number   // e.g. 42 or 25.5
Es.


->

(?A ?P ?C) ]
A tool for translation

- RDF Serialization rules
- Wrapper
- RDF Instances
- RDF Schemes
- GPM Model
- OWL Models
- Translator
- Translation rules
- GPM Instances
- GPM Schemes
- Rule Definer
- Context information
A tool for translation

Model A

GPM

Model B
Seminario

- Documentazione sul modello RDF, OWL, Jena e Inference Rules
- Scelta di due modelli: individuazione di primitive
- Costruzione del Parser RDF per i due modelli scelti (definizione della grammatica)
- Costruzione delle regole (Jena Rule) per tradurre i costrutti dei due modelli nei costrutti del GPM
Transformation step

The second step is more involved and is based on a *mapping* between *profiles* that drives the profile instance $PI_t$.

**Definition (Mapping of profiles)** Given two profiles $P1$ and $P2$ in GPM model, a *mapping* $M$ is a set of pairs $(S, t)$ where $S$ is a set of one or more *components* (dimension or attribute) of $P1$ and $t$ is a *component* of $P2$. 
De Virgilio & Torlone - Management of Heterogeneous Profiles in Adaptive Context-Aware Information Systems
Transformation step

- Input: $P_I_s$, $PS_s$, $PS_t$, $M$
- Output: $P_I_t$
- We have to calculate the instance of $t$ for each $(S,t)$ in $M$
- $Instance(t) = f((S,t),costr)$
- $f$ is an operator to calculate the instance of $t$ from $S$
Transformation step

Algorithm 1
Input: $PI_s$, $PS_s$, M, $PS_t$
Output: $PI_t$
(1) begin
(2) $\forall$ dimension $D \in PS_t$
(3) if $\exists m \in M / m = (D',D)$
(4) $\forall$ attribute $A$ of $D \in PS_t$
(5) if $\exists m' \in M / m' = (A',A)$
(6) $PI_t \cup (D, VALUE(A,m'))$
(7) end

Procedure 1
(1a) $I_A VALUE(\text{attribute } A, \text{pair } m)$ {
(2a) if (A is simple) return (A, value of m.s);
(3a) else {
(4a) $I_A vA = \emptyset$;
(5a) $\forall$ attribute $A'$ of $A$ {
(6a) if $\exists m' \in M / m' = (A'',A')$
(7a) $vA \cup (A', VALUE(A',m'))$;
(8a) }
(9a) return $vA$;
(11a) }
(12a) }
A tool for transformation

Diagram:
- Translator
- Transformer
- Mapping definer

Data structures:
- GPM Instances
- GPM Schemes
- Internal Schemes
- mapping
 Seminario

- Documentazione sul modello RDF, OWL, SPARQL, Jena e Inference Rules
- Studio di tecniche per il mapping semi-automatico tra schemi
- Scelta di uno schema sorgente
- Scrittura dei mapping (Jena Rule o SPARQL) tra lo schema sorgente e lo schema target (fornito)
Automatic Generation of Adaptation

- **Context repository**
- **Profile Interpreter**
- **Adaptation Coordinator**
- **Dimension A Adapter**
- **Dimension B Adapter**
- **Dimension C Adapter**

**Profiles**
- Content adaptation
- Navigation adaptation
- Presentation adaptation
Configuration

\[ C = \{q, h, p\} \]

- \( q \) is a query expressed in standard relational calculus
- \( h \) is an abstract hypertext expressed in WebML model
- \( p \) is presentation specification expressed in terms of Logical style sheet
Content layer

<table>
<thead>
<tr>
<th>News</th>
<th>Genre</th>
<th>Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>Summary</td>
<td>Content</td>
</tr>
<tr>
<td>Name</td>
<td>Pict</td>
<td>Descr</td>
</tr>
<tr>
<td>Name</td>
<td>City</td>
<td></td>
</tr>
</tbody>
</table>

Gn = ‘Sport’
Content layer

\{Title: x_1, \text{Summary}: x_2, \text{Picture}: x_3, \text{Date}: x_4, \text{Gn}: x_5, \text{Jn}: x_6 \mid \\
\text{News}(T: x_1, S: x_2, C: y_1, P: x_3, D: x_4, G: x_5, J: x_6), \\
\text{Genre}(\text{Name}: x_5, \text{Pict}: y_2, \text{Descr}: y_3) \\
\text{Journal}(\text{Name}: x_6, \text{City}: y_4), x_5 = 'Sport'\}
Navigation layer

Genres Page
Genres Index
Genre NEST News [Gn]

NewsPage
News Data
News [Title = NewsTitle]

NewsTitle: Title
Navigation layer

IndexUnit GenresIndex hierarchical

(source Genre; attributes Name;

orderby Name; NEST News selector GN=Name;

attributes Title, Picture, Date; orderby Title;)

DataUnit NewsData

(source News; selector NewsTitle=Title;

attributes Title, Content, Date)

link GenreToNews

(from GenresIndex to NewsData;

parameters NewsTitle = Title)
Presentation Layer

<table>
<thead>
<tr>
<th>Text</th>
<th>Link</th>
<th>Image</th>
<th>Video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Font: Arial</td>
<td>Note: FALSE</td>
<td>Resolution: jpeg</td>
<td>Resolution: mpeg</td>
</tr>
<tr>
<td>Size: 10pt</td>
<td>Font: 10pt</td>
<td>Size: 176 x 208</td>
<td>Size: 240 x 320</td>
</tr>
<tr>
<td>Style: Normal</td>
<td>Size: Normal</td>
<td>Border: 0pt</td>
<td>Border: 2pt</td>
</tr>
<tr>
<td>Color: Black</td>
<td>Style: Underline</td>
<td>Color: TRUE</td>
<td>Color: FALSE</td>
</tr>
<tr>
<td>Border: 0pt</td>
<td>Color: Blue</td>
<td>Alignment: left</td>
<td>Alignment: center</td>
</tr>
</tbody>
</table>

```javascript
{
    Text {Font: Arial; Size: 10pt; ... ; Border: 0pt},
    Link {Note: FALSE; ... ; Color: Blue},
    ...,
    Video {Resolution: mpeg; ... }
}
```
Configuration is an abstract entity

- a configuration can be implemented in several ways and with different syntaxes
  - SQL (on content layer)
  - XHTML (on navigation layer)
  - CSS or XSL (on presentation layer)
A rule looks as

\[ P_r : C_d \rightarrow C_f \]

- \( P_r \) is a parametric profile, that is, a profile in which parameters can appear in place of values,

- \( C_d \) is a condition, made of a conjunction of atoms of the form \( A = c \) or \( A = B \) where \( A \) and \( B \) are parameters occurring in \( P_r \) and \( c \) is a constant value, and

- \( C_f \) is a parametric configuration in which parameters occurring in \( P_r \) can appear in place of values.
x = ‘No’
y < 1500
z = ‘No’
News

<table>
<thead>
<tr>
<th>Title</th>
<th>Summary</th>
<th>Content</th>
<th>Picture</th>
<th>Date</th>
<th>Gn</th>
<th>Jn</th>
</tr>
</thead>
</table>

Genre

<table>
<thead>
<tr>
<th>Name</th>
<th>Pict</th>
<th>Descr</th>
</tr>
</thead>
</table>

\[ Gn = x \]

<table>
<thead>
<tr>
<th>Text</th>
<th>Link</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Font: z</td>
<td>Note: FALSE</td>
<td>Resolution: jpeg</td>
</tr>
<tr>
<td>Size: 10pt</td>
<td>Font: z</td>
<td>Size: 176 x 208</td>
</tr>
<tr>
<td>Style: Normal</td>
<td></td>
<td>Border: 0pt</td>
</tr>
<tr>
<td>Color: blue</td>
<td>Style: Underline</td>
<td>Color: true</td>
</tr>
<tr>
<td>Border: 0pt</td>
<td></td>
<td>Alignment: left</td>
</tr>
</tbody>
</table>

Preference

- content
- path
- Font: z

Genre: x

From: j

To: k

Font: z

Size: Normal

Style: Normal

Color: true

Alignment: left

Resolution: jpeg

Size: 176 x 208

Border: 0pt

Color: true

Alignment: left

Note: FALSE

Font: z

Size: 10pt

Style: Normal

Color: blue

Border: 0pt

Color: true

Alignment: left
Activation of a rule

- A profile $P$ activates a rule $P_r : C_d \rightarrow C_f$ if $P_r \prec P$.
- Hence, a profile $P$ can activate a rule for a profile that is more general than $P$. 
Seminario

- Documentazione sul modello RDF, OWL, SPARQL, Jena e Inference Rules
- Studio sull’adattamento dei vari livelli di un WIS
- Scrittura delle regole di adattamento
- Parser per serializzare le regole (RDF model)
Seminario

- Documentazione sul modello RDF, OWL, SPARQL, Jena e Inference Rules
- Scrittura di regole di adattamento sui tre livelli
- Studio di un processo di attivazione delle regole che sfrutti la relazione di sussunzione
Coordination of adaptation

- Profile Interpreter
- Dimension A Adapter
- Dimension B Adapter
- Dimension C Adapter
- Adaptation Coordinator

Profiles

Content adaptation
Navigation adaptation
Presentation adaptation

Context repository
Composition of configurations (⊕)

Given a pair configurations $C_1(q_1, h_1, p_1)$ and $C_2(q_2, h_2, p_2)$:

$C_1 \oplus C_2$ is a configuration $C(q, h, p)$ is defined as follows:

- $q = q_1 \circ q_2$, that is, $q$ is obtained as the composition of $q_1$ followed by $q_2$;

- $h$ is obtained by merging $h_1$ and $h_2$: if some conflict arises, the choices of $h_1$ are preferred to those of $h_2$; and

- $p(w_i) = p_1(w_i)$ if $w_i$ is a WOT occurring in $p_1$ and $p(w_i) = p_2(w_i)$ otherwise (that is, if $w_i$ is a WOT occurring only in $p_2$).
Content layer

News
Title Summary Content Picture Date Gn jn

Genre
Name Pict Descr

Gn = ‘Sport’

Navigation layer

Genres Page
Genre
Name: Gn

News Index Page
News Name:

News Index
News [News.Gn = Genre.Name]

News Page
News Data
News Title:

News Detail
News [Title = NewsTitle]

News Detail
News [Title = Tlink]

Presentation layer

Text | Link
---|---
Font: Arial | Note: FALSE
Size: 10pt | Font: 10pt
Style: Normal | Size: Normal
Color: black | Style: Underline
Border: 0pt | Color: black
Seminario

- Documentazione sul modello RDF, OWL, SPARQL, Jena e Inference Rules
- Studio dell’operatore di composizione
- Studio di una relazione formale per stabilire conflitti tra configurazioni
- Definizione di un algoritmo per la composizione di configurazioni
De Virgilio – A rule-based methodology for the adaptation of Web based Information System

FAWIS: a prototype application

Contents

Query Builder

Query Processor

Hypertext Builder

Hypertext Processor

Presentation Builder

Presentation Processor

Request Interpreter

Context Manager

Request

Profile

Response
Several responses
Thanks for the attention

rde79@yahoo.com

http://mais.dia.uniroma3.it/rodevirg