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Adapting Generic Web Structures with Semantic Web Technologies: A Cognitive Approach

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SCRAT Group Semantic and Cognitive Research Adaptivity Technologies





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Agenda

Introduction

The Web Today Web Personalization and Semantic Web technologies

User Profiling

Definition Profile Extraction Using Cognitive Factors in Web Environments Implications in Generic Web Content

The smarTag Framework

How?.. Technical Objectives Architecture Web Transformations Smart Web Objects smartTag Plugin Extension Sample Adaptive Environment Sample Preliminary Evaluation

Current / Future Work

People's lives today are more turbulent and diversified.

The "one size fits all" model could be considered, for many researchers and domains, out of date.

Problems of the Web today:

- Inability to be all things to all people, especially when the user population is relatively diverse,
- Users often lose sight of the goal of their inquiry,
- Users look for stimulating rather than informative material, or even use the navigational features unwisely...

Introduction (2 / 2)

- Web Adaptation and Personalization...aiming: to address the comprehension and orientation difficulties presented in such systems; to alleviate such navigational difficulties and instead, satisfy the heterogeneous needs of the user population.
- Semantic Web Technologies...aiming: to allow machines to understand the meaning - or "semantics" - of information on the World Wide Web
- A big challenge: to design structure of meta-data (provider's side)...aiming: to construct a Web-based personalization mechanism that will serve as an automatic filter adapting the received hyperetext/hypermedia content based on a comprehensive user profile.

Research Scope:

...whether we could develop a smart Web authoring framework that will dynamically alter a section of a Web-site by personalizing the content presentation and structure to specific users' cognitive preferences.

Techniques and methods for the collection of user characteristics; and the adaptation of the Web-based content based on the collected characteristics.

User profiling can either be *static* or *dynamic*. Information is obtained either *explicitly* or *implicitly*.

The data used for constructing a user profile could be distinguished into:

(a) Data Model

- demographic model (who the user is)
- transactional model (what the user does)
- (b) Profile Model
 - factual profile (contains specific facts of the user)
 - *behavioural* profile (modeling the behaviour of the user)

However...

Which kind of profile can be considered complete? Which parameters are significant enough as to be incorporated in user modelling?

User Profiling (2/6)

Comprehensive User Profile



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User Profiling (3/6)

User Perceptual Preference Characteristics Model



(Germanakos et al., 2008, 2007, 2005)

User Profiling (4/6)

Implications into the Information Space



User Profiling (5/6)

Data – Implications Correlation Diagram



User Profiling (6/6)

Profile Construction: Psychometric Tests for Creating the Profile



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How?.. Technical objectives

- 1. Mapping the User's Profile Characteristics with the Provider's Content
- 2. Extend the html model with custom rdf tags
 - a) The provider is able to enhance specific divisions of his content with dynamic objects that are altered based on the user's cognitive characteristics

<div xmlns:v="http://www4.cs.ucy.ac.cy/adaptiveWeb/rdf/#" typeof="v:SmartObject"> <div about="/sonyvaio/sz/info"> Sony Vaio SZ791 Notebook
Ultra Portable </div> </div>

1. Firefox Browser extension in order for the browser to understand these rdf tags and adapt the content inside the tag

The smarTag Architecture



Adaptation Mechanism



Web Transformations



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Smart Web Objects (1/3)

Proposed rdf tag

Code sample inside a Web-site

```
<div xmlns:v="http://www4.cs.ucy.ac.cy/adaptiveWeb/rdf/#"
typeof="v:SmartObject">
<div about="/sonyvaio/sz/info">
  <span property="v:title">General Information</span>
  <span property="v:content">Sony Vaio SZ791<br
/>Notebook<br />Ultra Portable</span>
</div>
<div about="/sonyvaio/sz/cpu">
  <span property="v:title">CPU Information</span>
  <span property="v:content">Intel Core 2 Duo<br />
2.5GHz</span>
</div>
<div about="/sonyvaio/sz/memory">
  <span property="v:title">Memory Information</span>
  <span property="v:content">4GB Memory<br />250GB
Hard Disk (7200 rpm)</span>
</div>
```

</div>

Output

General Information Sony Vaio SZ791 Notebook Ultra Portable **CPU Information** Intel Core 2 Duo 2.5GHz **Memory Information** 4GB Ram Memory 250 GB Hard Disk (7200 rpm)

Smart Web Objects (2/3)

Output: Wholist / Imager instance



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Output: Analyst / Verbalizer instance



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smartTag Extension Sample (1/2)

😻 Automatic Profile Extraction - Mozilla Firefox						
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Google Analytics 🚎 10th International	Downloads Add-ons	Ctrl+3				
VAIO® VGN-S2640N/B Features	Sothink SWF Gatcher	Alt+C	8			
Learn the B	žava Console Error ⊆onsole Page [nfo	Ctrl+Shift+J	Get Music and Vid	eo on Your Computer	Take Music and	Video Anywhere
Get around in the player			Rip (copy) songs	Rip (copy) songs	Burn CDs	Burn CDs
Play CDs and DVDs	Clear Brivate Data	Ctrl+Shift+Delete	Organize	Organize	Sync files to (MP3 player)	Sync files to (MP3 player)
	Options				office meet to (an o product)	elite meete far a brahart
Media Player as default player	smarTag Options		ind and listen to eRadio	Find and listen to eRadio	Share your media	Share your media

Switch to a Tab to Simplify a Task

The tabs on the Player taskbar allow you to focus on a specific task, as shown in the following screen shot.



You can switch to a tab to see a view that targets the task you want to complete. The arrow that appears below each tab provides you with quick access to options and settings for that task. For example, the arrow below the Burn tab gives you the ability to burn the currently playing playlist to a CD in just a few clicks, as shown in the following screen shot.



As you switch between various tabs and views in the Player, use the Back and Forward buttons to retrace your steps, as shown in the following screen shot.

Done

smartTag Extension Sample (2/2)





eCommerce Environment (1)

Personalized and adapted environment based on user's comprehensive profile

"myNotepad" tool; temporary memory buffer for storing sections' summaries (low working memory)





eCommerce Environment (2)

Personalized and adapted environment based on user's comprehensive profile

Wholist -> Floating Menu



Verbalizer -> Textual content presentation

Evaluation of the eCommerce Paradigm (1/2)

- Sample: 89 students; 40% of the participants were male and 60% were female, and their age varied from 19 to 23 with a mean age of 21;
- □ <u>The environment:</u> An e-Commerce content on a series of laptop computers.

Dependent Variables:

- 1. Task accuracy (number of correct answers)
- 2. Task completion time
- 3. User Satisfaction (questionnaire)
- The most robust and interesting finding was the fact that users in the personalized condition were more accurate in providing the correct answer for each task. The same user in the raw condition had a mean of 0.6 / 3 correct answer, while in the personalized condition the mean rose to 2.3 / 3.
- Equally interesting is the fact that users in the personalized condition were significantly faster at task completion. The mean aggregated time of answering all three questions was 541 seconds in the raw condition, and 412 in the personalized (see diagram).



Evaluation of the eCommerce Paradigm (2/2)

- ➢ As it concerns the satisfaction questionnaire, 23 users leaned towards the personalized environment, 17 had no preference while 13 preferred the raw.
- > All the results are demonstrating significance at zero level of confidence.



Current / Future Work

- Further testing of the system / model and investigation of the constraints and challenges arise from the implementation of such issues;
- Apply the abovementioned model into more advanced computermediated entities and wireless platforms / environments in order to further evaluate the validity of their impact;
- Establishing the proposed cognitive characteristics and content transformations as an effective set of Intelligent User Interfaces design guidelines for providing efficient personalized content of any type;
- To further investigate metadata structures and semantics for upgrading smarTag into a system that will automatically extract users' cognitive and emotional state through the identification of their navigational patterns and reconstruct / adapt any digital content to their current perceptual state;
- Measuring users' emotional state with the automatic extraction of brain and body signals (blood pressure, galvanic skin etc.) in relation to users' performance.

Questions?

Thank you for your attention!

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AdaptiveWeb: www4.cs.ucy.ac.cy/adaptiveweb smartTag framework: www4.cs.ucy.ac.cy/adaptivewebplus/smartag/index.aspx

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