End User Development of Web Augmentation applications

Towards its application in agriculture

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**Who am I?**

- Assistant Professor at **UNLP** (National University of La Plata)
- PhD candidate at **LIFIA**, UNLP

- **Topic**
  ➤ An End User Development Approach for Mobile Web Augmentation

- **Advisors:**
  ➤ Gustavo **Rossi**
  ➤ Sergio **Firmenich**

- **Co-advisor:**
  ➤ Marco **Winckler**
First, some background
Main topics

Web Augmentation
A technique for improving the user experience according to his requirements, by manipulating the style/structure/behaviour of existing Web pages

El gaucho Martín Fierro (Edición de la Biblioteca Virtual Miguel de Cervantes) (Spanish Edition)
El gaucho Martín Fierro (Edición de la Biblioteca Virtual Miguel de Cervantes) (Spanish Edition)
Format Kindle
de José Hernández (Auteur)

4.5 stars based on 343 ratings

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**Web Augmentation**

[Diagram showing the process of web augmentation with proxy-based transcoding, user profile, and HTTP requests to web app server, resulting in original and adapted web pages and client-side web augmentation.]
**Main Topics**

- Web Augmentation
- End User Development
End User Development

“A set of methods, techniques, and tools that allow users of software systems, who are acting as non-professional software developers, at some point to create, modify or extend a software artefact”

By their own means

There is a need of users to quickly build their own solutions

End users started to create, modify or extend their own software artefacts by using programming environments that abstract the complexity of the development


End-User Development (EUD) can be applied to adapt the Web.

End users started to –unofficially– manipulate Web applications when some of their requirements were not contemplated originally.

Big communities of userscripts and browser extensions support this claim. E.g.

<table>
<thead>
<tr>
<th></th>
<th>USERSCRIPTS MIRROR</th>
<th>GREASYFORK&lt;sup&gt;6&lt;/sup&gt;</th>
<th>OPENUSERJS&lt;sup&gt;7&lt;/sup&gt;</th>
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<td>130956</td>
<td>13603</td>
<td>3919</td>
</tr>
<tr>
<td>Installations</td>
<td>1203605530</td>
<td>1259866</td>
<td>13305857</td>
</tr>
</tbody>
</table>
EUD + The Adaptive Web

Number of «last updates» by scripts
In relation to...

- Mobile & context aware
- Web searches
- Crowdsourcing
- Recommender systems
- Decision support systems
- Personal web
- Semantic web
- Mashups

Web augmentation

End user development
Web Objects Ambient

https://sites.google.com/site/webobjectambient/
Web Augmentation

End User Development

- Mobile & context aware
- Web searches
- Crowdsourcing
- Recommender systems
- Decision support systems
- Mashups
- Personal web
- Semantic web

Many Web sites are tailored according to the user preferences, habits, requirements, etc.

But there is a need of a Personal Web, for improving the full experience of the user in the whole Web, as a common space of information.
Personal Web Apps

- Personal Information Management (PIM) systems
  
  To collect **Information Objects (IOs)** into a common **Space of Information**, where the user can perform operations with them

- Mashups
  
  To integrate **IOs from different Web sources** in a specialized application

- Web Augmentation
  
  To improve the user experience according to his **requirements**, by manipulating the **style, structure, behaviour** of existing Web pages
THE PROBLEM

◊ Much of the information we need **already exists** on the Web

◊ Personal Web
  
  • Existing apps provides **dissociated experiences** (contents, tasks)
  
  • The user needs to **integrate** and coordinate the tools

  - user with technical skills?
  - Structured/unstructured data
  - Reusable information objects?
  - Web content enhancement?
  - Content integration from multiple sources?

...
1st Scenario: PIM + WA

- get related trailers
- get casting
- get user’s reviews
Our approach

What? an approach for materializing Web content and supporting Personal Web experiences

Who? end-users, developers

When? on-demand, opportunistic

How? A PIM system with Web Augmentation and Mashup capabilities

Where? in-situ, the browser context
Materializing info objects

1. Object Identification
   - Identification: identification of searching process
   - Via DOM elements identification

2. Object Abstraction and Structuring
   - Define conceptual layer for the object and its properties

End-User tasks

OMS (Objects Model Specification)
Materializing info objects

Objects are:
- extracted, by parsing the DOM, from their web pages asynchronously
- materialized in a Web Object Ambient from where users may interact with objects
Interaction with objects

Behavior vary depending on the underlying concept


Keep informed on

See related News

See related multimedia

Configurate...
A DEMO
END-USER MADE APP
Augmented Search Services

https://sites.google.com/site/webancillarysearches/
In relation to...

- Mobile & context-aware
- Web searches
- Crowdsourcing
- Recommender systems
- Decision support systems
- Mashups
- Personal web
- Semantic web
Primary Search

Google

ICWE

To

Wikipedia

Toulouse's Article

Toulouse

Commune française du département de la Haute-Garonne (chef-lieu)

Vous lisez un « article de qualité ».

Pour les articles homonymes, voir
Ancillary search
How users are supported?

1. Manual interaction with Web apps and Browser

2. Web Browser support for new search engines
E.g. in Firefox

<table>
<thead>
<tr>
<th>Default Search Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose your default search engine. Firefox uses it in the location bar.</td>
</tr>
<tr>
<td>Google ✓</td>
</tr>
<tr>
<td>Provide search suggestions ✓</td>
</tr>
<tr>
<td>Show search suggestions in location bar results</td>
</tr>
</tbody>
</table>

One-click search engines

<table>
<thead>
<tr>
<th>Search Engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Google ✓</td>
</tr>
<tr>
<td>Yahoo ✓</td>
</tr>
<tr>
<td>Bing ✓</td>
</tr>
<tr>
<td>Amazon.com ✓</td>
</tr>
<tr>
<td>DuckDuckGo ✓</td>
</tr>
<tr>
<td>Twitter ✓</td>
</tr>
<tr>
<td>Wikipedia (en) ✓</td>
</tr>
</tbody>
</table>

- **supported**
- **not supported**
The Underlying Problem

Not all search engines in the Web are directly available from the browser’s ancillary search mechanisms

1. Disadvantage for «not popular» Web sites
2. End users have to wait for an extension to be implemented
Results are presented in another context
The Underlying Problems

1. Not all search engines in the Web are directly available from the browser’s ancillary search mechanisms
   a. Disadvantage for «not popular» Web sites
   b. You have to wait for an extension to be implemented

2. Results are presented in a second context (a new tab)
   a. Extra interactions for comparing
   b. Time consuming
The approach

An inside-in approach empowering users to customize their searches, by

→ defining **Augmented Services** matching the existing search engines’ UI components
  - by means of **DOM annotation and automation of interaction with the DOM**

→ performing **ancillary searches** without leaving their current Web context
  - by means of **Web Augmentation**
Defining Augmented Search Services
EXECUTING ANCILLARY SEARCHES

Transparent search for the user
**How, when, where, who?**

- A Firefox extension
- On-demand
- In-situ, almost any Web site
- End-users

**Benefits**

- reuses existing search mechanisms & content
- transforms search results into domain objects
- reduces the user’s efforts for searching
  - time
  - interactions
- Integrates the resulting **domain instances** in the current Web context
Executing searches
**Preliminary results**

A quantitative Assessment based on GOMS-KLM

→ without the tool
  - 46.6 sec.

→ with the tool
  - 18 sec. → search
  - 39.2 sec. → definition of search services

Validation by construction

→ Success definition in 18/20 sites of the top 500 by Alexa

→ with different **UI controls & loading strategies**. E.g.
  - 17 of the full list of sites have a trigger element
    - 10 buttons, 6 inputs and 1 anchor

→ In average, the execution of the query took **7 sec.**
Mobile Web Augmentation

https://sites.google.com/site/mobilewebaugmentation/
Web Augmentation

Mobile & Context Aware

End User Development

Crowdsourcing

Web searches

Recommender systems

Decision support systems

Mashups

Personal web

Semantic web

Semantic Web

Crowdsourcing web searches

Web Augmentation

End User Development


Motivation

What happens when a Web application does not fulfill a particular user's need, missing a required information or feature?

Mobile devices allow creating more comprehensive experiences by taking advantage of the devices’ capability of sensing the context.
**Native counterparts**

Many Web sites already use such features or provide a native mobile counterpart...

E.g. Took the 10 first sites in the top 500 by Alexa + Google Play
- There is a native counterpart by each popular Web site
... but many other still provide a poor –or no– support for a mobile Web counterpart.

E.g. take the sites specialized in news in AR from the Alexa

❖ just 36/52 sites have a native counterpart
❖ Users may access them through a Web browser
Adapting the Web

Although there are approaches for adapting Web apps from/to:

**Development**
- Mobile native app
- Mobile Web app
- Desktop environments

**Execution**
- Mobile native app
- Mobile Web app

they are aimed and limited to producers with programming skills (from now on, developers).
Mobile WA & EUD techniques can help to add such features when required and on-the-fly by the users themselves.

Our approach is supported by MoWA Authoring, an EUD tool that allows the improvement of existing –usually third party– Web applications with mobile features.

It is a Firefox for Android extension that assists the user in the construction of applications by easily selecting the components that fit his needs.

We conducted an experiment with 21 real end users...
Demo
FUTURE DIRECTIONS

Concerning the support-making process
Web Augmentation

End User Development

Mobile & Context aware

Web searches

Crowdsourcing

Recommender systems

Decision support systems

Mashups

Personal web

Semantic web
Logikós

A decision support system integrated to the Web
1. How people take decisions? Do they use the Web for comparing alternatives?
   a. e.g. [http://www.gsmarena.com/search.php3](http://www.gsmarena.com/search.php3)
But what about:

- **other alternatives** not considered by the app?
  - e.g. Ubuntu phone
- **other properties** not considered by the application?
  - e.g. the real price (not an average one)
- products or services of a **different domain**?
  - e.g. seeds, insurances, etc.
- you cannot pick certain items and compare them under **different criteria**.

Can we reuse the existing data over the Web?

- Web Scrapping + PIM + Web Augmentation
SCENARIO:
INSECTICIDE FOR TOMATOES

PROCLAIM FORTE

INSECTICA
PROTECCIÓN DE CULTIVOS
Authorization Number: 37316

Product «A»

SOLVIGO

INSECTICA-NEMATICIDA
PROTECCIÓN DE CULTIVOS
Authorization Number: 38790

Product «B»

CIPERMETRINA ACA

Bidón x 5 litros - botella x 1 litro

Insecticida Cipermetrina 25%
$290

Product «C»

MERCADO LIBRE

Product «D»
Logikós

Formulas → Decision Making analysts

Criteria: rules & weights → Domain experts

Alternatives → End users
Logikós

Formula

\( \Box (p_i \times w_i) \)

Rules & weights

<table>
<thead>
<tr>
<th>p</th>
<th>w</th>
</tr>
</thead>
<tbody>
<tr>
<td>cam &gt;= 10px</td>
<td>0.6</td>
</tr>
<tr>
<td>mem &gt;= 32GB</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Alternatives

Samsung Galaxy S8

Xiaomi Redmi Note 4

Huawei P10
Questions?

ET MERCI POUR VOTRE ATTENTION!
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