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Intelligent Web System and its Life Essence: the AJAX

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Abstract

In the age of WEB 2.0, web development is not only about distributing information on web sites, but about creating web applications where users share informations directly or indirectly via web systems. On the other hand for nowadays the World Wide Web has become the first information resource and it is still growing exponentially. Because of these reasons the standard web sites are the things of the past, the new generation is here, it is called: Intelligent Web System (IWS).

IWS collects and provides the exact information what you need, by transforming the web site you are visiting on the fly. For example on a news portal, if the opinion of the IWS is that you like political news, next time you visit this site the main news will be "China rejects Iran UN sanctions" instead of "Arsenal v. Inter Final". You do not have to give exact information by answering the question "Do you prefer political news? Yes or No?". This is the past. The IWS analyzes your visiting behavior, your blog comments and automatically gives you relevant information. In this paper we will walk through these intelligent techniques, and get closer to the most popular WEB 2.0 tool, the AJAX.

It's a very new and interesting area not only in research fields but in the real business life also.

Keywords: web, ajax, intelligence, computer programming, web mining

1. Introduction

With the explosive growth of information available on the World Wide Web, it has become more difficult to access relevant information from the Web. The continuous growth of the size and use of the World Wide Web imposes new design and development methods of online Web Systems. Most Web structures are large and complicated and users often miss the goal of their inquiry, or receive ambiguous results when they try to navigate through them. [2]

One of the ways to improve the user's experience is using intelligent web techniques. These techniques are based on several IT fields like web mining, artifical intelligence or AJAX technology.

2. Web 2.0

First of all we have to talk about Web 2.0. To tell the truth Web 2.0 is a marketing phrase, it has become popular by Tim O'Reilly and Dale Dougherty in 2005 on a Web 2.0 conference. Nowadays this phrase is definitely more than a combination of a marketing phrase and a set of new technologies.

Web 2.0 is a web development method which main objective is to harness the resources of the users via web applications like community sites, blogs, RSS, wikis and many other kind of social web applications.

Based on but refreshing O'Reilly's conception there are four principles to describe the Web 2.0.

2.1. The Web as platform

The web 2.0 application developers aren't develope for operation system versions or specified hardware they develope for the web. Because of this reason these sotftwares are easily reachable by anyone, with some exaggeration we can say that these applications are idependent from any platform and hardware. It is not suprising that in the age of Web 2.0 we mention web services instead of talking about web softwares. Compared to the desktop softwares we don't have to install or update these applications. The only thing that we realize if a new version of a browser has been released and the developers optimize the web application for the new version.

2.2. Lightweight programming models

As a web developer we don't have to develope huge, complex systems, the receipt has been changed. The innovation came from - just in many other cases - the Google. Google has developed and still developing many applications that can be easily connected to a web portal via universal interfaces. Just to mention Google Search, Google Maps or one of the best Web usage mining tool, Google Analytics. The short name we are talking about: APIs (Application Programming Interface). With this tool we can integrate not only third party applications to our web portal but API developer toolkits give possibility to develope own applications also.

2.3. Rich user experience

One of the most important element is the user and user experience. The main objective is to grab the feeling that the web is not a collection of websites but a collection of web services. For this purpose one of the best technology is AJAX. AJAX (Asynchronous JavaScript + XML) isn't a new technology. It's a collection

of several technologies, each flourishing in its own right, coming together in powerful new ways.

2.4. Harnessing collective intelligence

Web services don't exist without input datas, just as pure datas are also useless without web applications that process and analyze them. One of the most important element why we describe the Web as Web 2.0 is derived from the previous three property: collective intelligence. The question is what makes the web intelligence, why we use the word 'intelligence' in this case?

On the one hand, users give intelligence to the web, users who use the web, who share information via web applications. On the other hand, the services that convert existing informations to knowledge make the web intelligence. [3]

3. Intelligent Web

However the World Wide Web is rich in information, collecting and organizing the exponentially growing data is a serious task for the user provider systems. That's why there are several research and development projects which objectives are to provide relevant information to the users. The name of these new technologies is Intelligent Web.

The phrase Intelligent Web is a combination of three technologies: web mining, semantic web and web personalization. [4]

3.1. Web personalization

The most interesting part of the Intelligent Web is the web personalization. Personalizing a web site means providing content that is relevant specifically to the user. Each person gets a customized view of the web site. Through personalization technology, web servers modify the pages that are viewed by a specific user with the goal of providing a unique and personal web viewing experience. The perfect technology for this is AJAX. With this 'tool', you can change the content of the web site dynamically, on the fly, in most cases the users do not even notice this manipulation.

The intelligent Web can personalize interactions by remembering a particular user's recent encounters and relating the topics and sites that a user accesses during different online sessions. It may further identify other goals and courses of action as a user's interactions broaden and deepen, providing ever more data upon which to base its recommendations. As part of its personalized approach to user services, the intelligent Web will interact with the user when executing various tasks. [1]

To personalize a web site, information about each visitor must be gathered and stored. To accomplish this, many web sites create individual visitor or group profiles. Below are the primary methods used:

- Content-based filtering

- Collaborative filtering
- Rule-based filtering

3.1.1. Content-based filtering

Content-based filtering systems are solely based on individual users' preferences. The system tracks each user's behaviour and recommends them items that are similar to items the user liked in the past.

3.1.2. Collaborative filtering

Collaborative filtering technology enables companies to deliver personalized content based on the preferences of "like-minded" individuals. The system "learns" more about the user's individual preferences and adjusts content accordingly. Collaborative filtering is accomplished through the following steps:

- web site visitors are asked to complete a questionnaire designed to identify special interests;
- the accumulated results are tabulated and analyzed respondents are segmented into groups of "like minded" individuals;
- the system then delivers content to individuals based on the preferences of their "like minded" group.

For collaborative filtering to work, users must continuously rate new products by completing online questionnaires. This can become tedious, over time, and visitors may loose interest.

3.1.3. Rule-based filtering

In rule-based filtering the users are asked to answer to a set of questions. These questions are derived from a decision tree, so as the user proceeds on answering them, what she/he finally receives as a result (for example a list of products) is tailored to their needs.

Content-based, rule-based and collaborative filtering may also be used in combination, for deducing more accurate conclusions.

I usually use another grouping method based on the active or passive interaction of the user. In this case there are

- Active profiling
- Passive profiling

3.1.4. Active profiling

Web site users are asked to complete online registration forms that request basic personal information and details about special interests. There is a problem, however, with registration forms. According to a recent study from Jupiter Communications, about 40% of individuals surveyed provide incorrect information, while

more than 30% refuse to complete the form. Other profiling methods are therefore necessary. [4]

3.1.5. Passive profiling

One of my favorite profiling technology is passive profiling. In general, this approach develops a profile based on how an anonymous user interacts with the web site. Passive profiling can collect the following information without requesting any additional information from the user:

- The website the user came from (good for tracking advertising effectiveness)
- What the user clicked on while visiting the site (for determining most popular website features)
- Purchases made (determining how demographics, psychographics, clickstream behavior etc. relate to categories of goods purchased)
- Content of the web pages viewed (providing greater info about user interests)

The information gathered about the anonymous website user is stored in a database. Complex data analysis techniques are then employed to sort the data into user profiles. Data analysis techniques include: data mining, online analytical processing, pattern-matching algorithms and concept extraction, and user modelling agents. [4] As mentioned above there is a very good and new tool to support passive profiling. This is Google Analytics.

4. AJAX

For the best user experience and perfect content providing - based on the result of user profiling algorithms - we use AJAX.

First of all let's examine the word AJAX. Ajax incorporates

- XHTML and CSS for standard-based presentation
- dynamic display and interaction using the DOM (Document Object Model)
- data interchange and manipulation using XML
- XMLHttpRequest object for the asynchronous data communication - we will turn back here, this is the heart of the AJAX.
- and JavaScript for client-side data processing, and binding everything together

Alltogether they create a poweful team, so the name is **A**synchronous **J**avaScript **A**nd **X**ML

Let's see how does it work and what is the difference between the classic and AJAX web application model:

The classic web application model works like this: Most user actions in the interface trigger an HTTP request back to a web server. The server does some processing - retrieving data, crunching numbers, talking to various legacy systems - and then returns an HTML page to the client.

This approach makes a lot of technical sense, but it doesn't make for a great user experience. While the server is doing its thing, what's the user doing? Waiting. And at every step in a task, the user waits some more.

Obviously, if we were designing the Web from scratch for applications, we wouldn't make users wait around. Once an interface is loaded, why should the user interaction come to halt every time the application needs something from the server? In fact, why should the user see the application connects to the server at all?

An Ajax application eliminates the start-stop-start-stop nature of interaction on the Web by introducing an intermediary - an Ajax engine - between the user and the server. The Ajax engine allows the user's interaction with the application to happen asynchronously - independent of communication with the server. So the user is never staring at a blank browser window and an hourglass icon, waiting around for the server to do something. That is the -desktop software like - application feeling. (Figure 1.) [5]

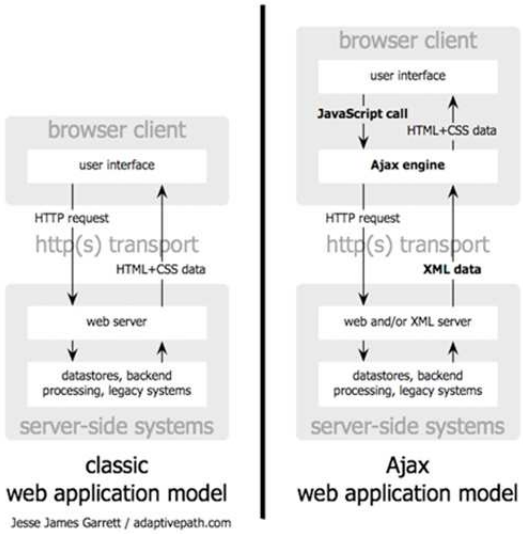

Figure 1: Source: `www.adaptivepath.com`

5. Overview

Web site personalization has many benefits. For the web site visitor, personalization provides a more interesting, useful and relevant web experience. For the web site provider, personalization allows one-to-one relationship building and mass customization. If we simplify and formalize our experience we get the following rules:

1. Get all the benefits of Web 2.0 and collect all informations about users
2. Organize the information

3. Make user profiles
4. Give the exact information (products, news, etc.) to the user

We can also learn something from the Ajax philosophy: You don't have to invent everything. It's 'enough' to use existing, modern technologies, combine them in a new way and give your own knowledge to this.

References

[1] Fawaz Ghali: Web 2.0 for the Adaptive Web, The University of Warwick, 2006

[2] Magdalini Eirinaki, Michalis Vazirgiannis: Web Mining for Web Personalization, ACM, 2003

[3] Tim O'Reilly: What Is Web 2.0, http://oreilly.com/pub/a/web2/archive/what-is-web-20.html, 2005

[4] Vagan Terziyan: Intelligent Web Applications, University of Jyvaskyla, 2002

[5] Zsolt Nagy: Intelligent Web Systems, III. International PhD Conference, 2009

[6] Jesse James Garett: Ajax: A New Approach to Web Applications, 2005