Personalized Search Results in B2C E-Commerce Applications using the Google Web Services

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Abstract: In this work, we focus on personalizing user’s interface for Web search: user might make a search via the well-known search engine ‘Google’, exploiting the privilege of using company’s Web Services. Users have the possibility, to create personal accounts selecting some of the available characteristics and then to make personalized and guided searches depending on the profiles that they have formed. This is achieved through simple manipulation and automation of the existing Google functionalities. Personalizing Web search pages can bring beneficial results for the user, as well as for the companies that are trying to promote their products and services to the appropriate customers.

Key-words: Personalization, search technology, e-commerce, Web Services, Google API.

1. Introduction
Search is a remarkable field of study: it presents unlimited options for how we might locate and make information available to users. Thus, search technology is one of the main issues which unleash the infinite prospective of the Web today. Modern search engines are continuously adapting their algorithms to deal with the dynamic development, and changing character of the Web. Among the others, Google holds a leading position and is considered as a true reflection of the Web, because maintains one of the largest collection of Web documents in the world.

A significant aspect of search engines is their importance for achieving customer-oriented e-commerce and e-business successful activities. The use of Internet for business purposes is growing rapidly. A major growth in the e-commerce area is by the organizations that wish to interact with their customers directly (business-to-customers - B2C). Online shopping and e-stores offer the vendors not only the opportunity to gain new customers but also to improve customer loyalty. Search engines are considered as a valuable customer-facing e-commerce technology because they play a crucial role in customer satisfaction.

Additional benefits can be provided when an environment capable to serve users in a somewhat personal way, is established. Personalization technology is mostly used for customer relationship management and several studies confirm that personalization approaches have provided benefits for both online vendors and customers [1].

In our case study, we adopt a personalization approach for web pages searching via keywords. In particular, the user’s searches are at some way guided: the application, as it is interacting with the user, collects information and thus creates a profile. So, the final search results are depended on this particular profile (e.g. the interests that he has already declared).

The rest of the paper is organized as follows: In sections 2 below, we outline background concepts related to search engines, e-commerce and personalization technology. In section 3 we discuss about Google Web Services. In section 4 we present our case study for personalizing search results. Our conclusions together with future work directions are given in section 5.

2. Search Engines and E-commerce Applications
2.1 Search Engines
Trying to think of the Internet as a library can be confusing: information on the Web is not all formatted the same way, nor is it up to date. In addition, information on the web is not spellchecked and it is not necessarily on the whole precise. On the other side, the term ‘library’ presupposes a lot of different conditions, such as a central source for resource information and a paid stuff devotedly indexing new material as it comes in. However, search engines are trying to make sense of the escalating index of information online [2]. In a broad view, we may distinguish the
following two kinds of search engines on the Internet:

- The searchable subject index: only the titles and descriptions of sites are searched, and not the individual pages (e.g. Yahoo!).
- The full-text search engine: it uses computerized ‘spiders’ to index billions of pages. These pages can be searched by title or content, allowing for more fine-grained searches than those of the previous type (e.g. Google).

The leading search engine at present is Google [3] and it offers an application programming interface (API) which enables web sites developers to use Google as a resource in their web-based applications.

2.2 Searching and Usability in E-commerce

E-commerce is one of the amazing and value creating results of Internet revolution. It has created a promising market in the virtual world, providing equal opportunity to all to take part in this new business paradigm. One aspect of e-commerce activity that is acknowledged is their use of websites. Websites are a critical component of the rapidly growing phenomenon of e-commerce and their successful design and use can alter the effectiveness of an organization’s venture into e-commerce [4].

A method for assessing the quality of a firm’s e-commerce offerings through its website is not easy to be established, but generally speaking website quality can be judged through three dimensions: information quality, usability and service interaction quality. It has proved very helpful to many people to find data that is relevant to products or services they are interested to purchase from an e-store and that it is important to them. So, supporting a flexible way to exploit the Google search engine is certainly a competitive advantage for every e-store.

2.3 Personalizing Search Results

Personalization is the ability to treat people based on their personal qualities and on their prior behaviour. It is considered as a key technology of e-commerce, which potentially can make it nearly as powerful as a traditional face-to-face marketplace. Speaking directly to the customer on a one-to-one basis means that vendors can target their marketing messages to specific individuals by adjusting the message to a person’s name interests, and past purchases [5].

There are a number of methods for achieving personalization, and personalizing Web content and Web search results are typical examples of such methods. Undoubtedly, delivering personalized information on the Web is a critical factor concerning the effectiveness of a Web site. Google (as well other modern search engines), allows sophisticated searches, with required and forbidden words, and the ability to restrict results based on a particular language or encoding. However, only a small number of web users actually know how to utilize the true power of these search engines. Most average web users make searches based on imprecise query keywords or sentences, which returns unnecessary and even inaccurate results [6]. Personalization technology may help and guide user’s searching sessions toward their desired objectives. Indeed, one solution to ambiguity is to aid users in better specifying their interests and intents [7]. In this context, an indicative example is given by Google Personal [8], which is asking users to build their profile by specifying their interests.

3. Google Web Services

3.1 Web Services

According to organism W3C, with the term ‘Web Service’ more generally we mean a software system which was designed in order to support the interoperability between two computers through a network. For this kind of communication, an interface is used that is described in language comprehensible by the computer. The interface is named WSDL (Web Services Description Language) and is based on the XML-schema. Substantially, WSDL interface, describes the form that the Web Service can communicate with other clients. WSDL creates the messages for the right communication of activities. Each message contains information in abstractive form, which means that it contains only the basic information that is necessary for the communication between two computers. Each client is connected with the server of the Web Service and it reads the WSDL file that is dispatched in order to determine both the methods that are available and potentially the special structures of data (the form of which is described completely in this file in XML-schema).

SOAP is the protocol which allows the exchange of messages and information via HTTP. This is what allows the substantial communication between Web Services. Based on XML-schema either it encodes messages in the suitable form and dispatches them or it decodes them in the side of recipient and it gives them in the higher levels to get processed. It is constituted by three basic parts:
• an envelope, which fixes the infrastructure in order to describe what the message contains and the directives for the appropriate treatment of the message,
• a set of encoding rules that concerns the data structures that are determined by the application and
• a condition, that represents the distance process of querying and responding

The implementation of the previous two protocols allows the Web Services to communicate each other, irrespectively from the architecture of processor, operating system, language of programming and environment of implementation. The general target of Web Services is to create interoperability between the computers that communicate, in order to exchange information.

### 3.2 Google Web Services

The Google search engine provides also its services via ‘Web Services’. It gives the possibility to the programmers of adapting the service in their applications that may be implemented in web pages or in applications in the local computer of the user. In order to use Google Web Services, the programmer should first follow the process of registration in order to be added in the list of users and then be given a unique serial number. Then, with the implementation of application in some programming language, the serial number (it will be explained below) is used in order to execute several searches.

For the process of registration, the user/programmer should visit the address http://www.google.com/apis/ [9]. The steps that somebody should follow are explicit and simple. In the process is contained also the step in which somebody can download Google API. This file contains libraries for various programming languages but also ready applications, for testing the capabilities of Google API.

The capabilities that the search engine provides via Web Services are the following:

1. **Search (Search Request):** it gives the possibility of implementing a search, corresponding to the Advanced Google Search. Briefly, the following choices are available:
   a. search phrase
   b. choice for the start results (it concerns the appearance)
   c. biggest number of results
   d. filters of search
   e. restrictions of regions
   f. filter of content inadequate for minors
   g. restriction of linguistic content

   It must be mentioned that the company gives the restriction of ten returned results in every query. To exceed the restriction programming tricks should be applied.

2. **Spelling Request:** by this option is given the possibility to the user to execute a spelling search. In other words, querying with a phrase with spelling mistakes, is returned the nearest proposed corrected approach. No search terms are given.

3. **Cache Request:** The last capability concerns pages that are not in effect anymore. The Google search engine maintains in cache some pages from old users’ searches. Thus, the search is being made in Google Cache. No search terms are given.

   In these three capabilities a common term exists. This is the users’ key which has the following form ‘arJE6Y5QFHJ1ipf47Nac4IdWYrPoojGk’. With this key the engine has the possibility to check the number of searches that each user makes in order not to exceed the daily restriction of searches that exist (1.000 searches).

### 3.4 Programming with Google Services

Google Services programming is simple. Even more, choosing a programming language for which exist ready-to-use libraries in Google API, the adaptation of essential methods in the programs is not a difficult task.

Substantially, because of the fact that an object-oriented ‘logic’ approach is underlying, the process which someone follows in order to send a query to the Google Services is almost common in all languages. The process is the following:

1. The soap-client object is created which communicate with the Google Service. The communication will become via SOAP protocol.
2. It follows the initialisation of object parameters of the soap client object with the suitable terms. Some of them are already mentioned.
3. Then, we have the call of the appropriate method of the object which communicates with the machine and sends the query. Then it waits for the answer, and finally the method returns structured data (in particular language-specific form) which contain the results.
4. In the end we take and we represent the data in a format that the user defines
4. Case Study

The application is implemented with the PHP (Hypertext Pre-processor) language. PHP is a flexible programming language that allows programmers to create web applications with dynamic content that react with databases. The results are presented through a web browser. PHP uses suitable software (interpreter) which is installed in the same computer that the web server is installed. Thus, when a .php file appears, the PHP mechanism interprets it, and then gives the results to Web Server to present the results.

4.1 PHP and Google API

Using PHP for the application implementation is considered as a suitable choice, because it provides both the appropriate tools for web application development and the proper bibliography for support. For the communication with the Google API a free distribution library is used. This library ("nusoap.php file), contains all suitable tools that are needed for the transformation of the SOAP protocol messages.

The format of the code files is similar to traditional PHP linked Web pages (.php). In specific points of the code, it takes place the presentation of the results, the registration of users and transaction of searches (fig.1).

All the attributes of the users (username, password, email, size, interests, and languages) are recorded and stored in a database file.

4.2 Description of the Application

When user visits the web page, he has to select one of the three following options:

1. Sign In
2. Sign Up
3. Modify Account

4.2.1 Sign In Option

The first option (sign-in) is available only if a user has already created earlier an account (via the second option – sign up). In order to be recognized, the user is asked for his username and password. If an error occurs in any of the two fields a warning message appears that warns the user for his mistake.

Figure 2 – Introductory Web page

After user recognition, an informative Web page follows (fig. 4), in which all the user-related attributes (username, password, e-mail, interests, page size threshold and language) of the user profile are presented.

Figure 3 – User signing in

The content of the ‘Interests’ attribute determines user’s searches. The Google search engine is guided according to this content. In addition, the attribute page size threshold, determines the biggest size of pages that will be presented in the search results. By pressing the button ‘Go for a Search’, the actual personalized search page is appeared (fig. 5).

Figure 4 – User profile

Figure 5 – Web search page
A text box is available in which user has to fill in the search term(s), a process similar to common search pages. But in addition, to the right side of the textbox, a number is reported which concerns the number of words that the user has the ability to use as (supplementary to his profile-based search keywords) search terms. This is because of the restriction that the Google search engine has (maximum 10 search terms). Note that the user may put as many search terms as he wants, but the search engine will count as actual search keywords only those that combined with the ‘interests’ attributes are making total 10 words.

After pressing the search key, the ten first search results are presented. Also, if there is a page size restriction, then only the pages that do not exceed this restriction are presented.

4.2.2 Sign Up Option
In this option the user creates a personal account, by giving all the attributes which were mentioned in the previous section. First, the user is called to give a username, a password and an e-mail. If the username already exists, a proper warning message is presented to him. Otherwise, the new username is registered and the user is called to build his profile (fig. 6). The preferences that concern the user are the interests (multiple choices), the bigger size of returned page and the languages in which the returned pages are displayed (multiple choices).

**Figure 6 – Constructing User Profile/Account**

4.2.3 Modify Account Option
With this option, a user may modify the profile which has created in the past. First, he must be recognized as a legitimate user (user-password authentication). Then, as is depicted in fig. 7, in the above part of the Web page, the current (old) attributes of the user are presented. Below, all the user’s profile elements that can be modified (email, password, interests, maximum size of page, and linguistic restrictions) are shown. When the user is done with the changes, he must press the button ‘Modify My Account’ in order to store them for later use.

**Figure 7 – Modifying profile**

5. Conclusions
Search engines grew quickly, trying to cover all the ‘types’ of the billions of documents online, and they still continue to evolve today. In particular, Google API gives developers an official way to access the Google search results with automated queries.

Our goal was to help the searching efforts of novice and experienced Web users towards their desired intentions. Our approach focuses in personalizing Web search results, meaning that the resulted Web pages should be based on the interests of the individuals. The collection of such information, explicitly or implicitly (e.g. from the products that are bought or the pages that are visited) from the application, after suitable treatment can lead the user to products or services in a more accurate way. Thus, the search time is decreased and the environment becomes more user-friendly. The right management of user interests may provide valuable solutions and companies already consider it as a very strong tool: by making the essential studies and slipping in suitable campaigns, in concrete groups of consumers that assemble certain characteristics.

Welcome to Google Personalized Search

Signed In as alex
Password: ****
e-mail alex
Your Interests: music, cars,
Selected page size: 34
Your selected page languages(s):
English, Greek,

Go & Select > Sign Out

New Email
New Password

Select new interests:

Define the new page size? No Yes

Change your language restriction(s):
Arabic Chinese(S) Chinese(T) Czech Danish Dutch English Estonian Finnish French German Greek Hebrew Hungarian Icelandic Italian Japanese Korean Latvian Lithuanian Norwegian Portuguese Polish Romanian

Modify My Account

References
[http://www.personalization.org/SurveyResults.pdf](http://www.personalization.org/SurveyResults.pdf)


