Deploying Recommender System for the Masses

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Abstract
Many small and mid-sized e-businesses wish to integrate a recommender system into their website. Integrating an existing recommender system to a website often requires certain expertise and programming efforts, thus incurs substantial investments and may not be justified by the added value of the recommender system.

This demo presents a solution for integrating a recommender system as a service to an existing e-business without any programming efforts. The integration method is analogue to the way of the Google AdSense integration and the business model is adapted from the advertisements world. Initial feedback from real website owners indicates that such integration has a great benefit for both sides; the website owner and the Recommender System (RS) provider.

Author Keywords
Recommender System as a Service; Integration; Collaborative Filtering;

ACM Classification Keywords
H.5.m. Information interfaces and presentation: Miscellaneous.

Figure 2. The product page does not comprise any recommendations before the integration

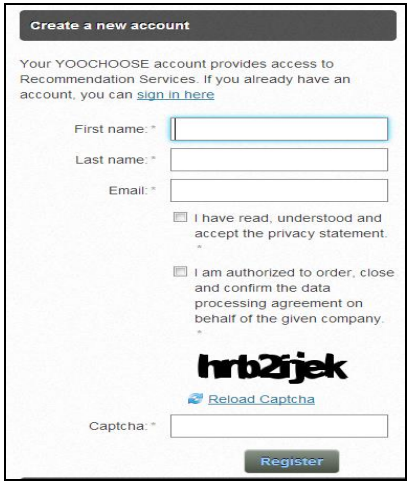

Figure 3. The customer go through basic registration process for creating an account

Introduction

Many e-commerce businesses record users' activities in order to enable personalization of their website, and recommend items to view or to purchase. Such personalization is expected to improve the user experience and satisfaction, and to increase the revenue of the e-business.

The decision of an e-business to apply personalization and integrate recommendations into their existing systems can be challenging and even risky, as the expected return on investment is difficult to predict. The required knowledge, expertise, and resources needed for implementing a personalized recommender system may be beyond the reach of medium and small e-businesses. To minimize the investment and risk, many small or medium e-businesses prefer to purchase the recommender system as a service [2]. Such services allow the e-businesses to online request recommendations for the active user through a remote server, which is not owned or operated by the e-business owner. These services can be purchased and activated rapidly. They can also be turned off without any major cost in case of an unsuccessful deployment that does not withstand the goals of the e-business owner. Thus, such services reduce the required initial investment and represent very little risk to the e-business.

Nevertheless, the integration of a recommender service requires sending information to the service, reading information from the service and presenting the recommendations in the page layout for the active user. Sending and reading information to and from the service is done via REST API [1] which is provided by the RS service provider. Presenting the recommendations is often done by the website itself. The knowledge of how to integrate to REST API and present the recommendations in the website may not be available for a web-shop as many of the small and medium e-businesses are not programming their website by their own but rather generate it using e-commerce platform solutions such as Magento[1], Freewebstore[2] and the like. The fact that a payment to a recommender service may be beyond the reach of the website owner, is not cancelling their need to personalize the content in their website; a need for a simple and straightforward type of recommendations such as "users who clicked this also clicked that" and popularity lists.

This paper presents a framework which enable smooth integration, programming free, of a recommender system service to small and medium websites. The service provides simple, but yet very efficient, type of recommendations. By applying a set of clicks, the owner of the website is generating an appropriate script which then needs to be planted in each web page where recommendations should be presented. Such integration is analogue to the Google AdSense integration, where there is no interaction at all between the service provider and the end consumer and no programming skills are needed.

The Integration Framework

Following is a description of the architecture of the system which enables the fluent integration. The system generates the appropriate *'tailor-made'* script, which in return, once it is planted in the html code of a

[1] http://www.magentocommerce.com/

[2] http://www.freewebstore.org/

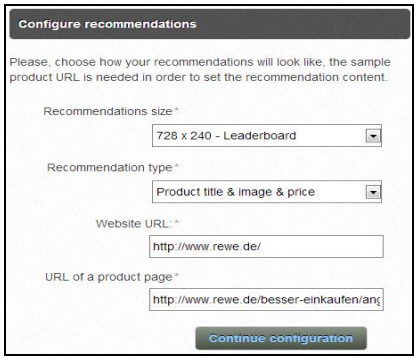

Figure 4. Defining the presentation style of the recommendations. Also the website URL and the product page.

Figure 5. Using the markup tool to define the Meta data of each item on the simulated product page.

Figure 6. Example of a title markup.

page, enables the entire interaction between the website and the recommender service. Following is a description of each one of the modules in the framework.

1. **Recommender Service** – This module responsible for accepting and storing events from the website, building recommendation models and answering recommendation requests. The module has its own architecture which enables to provide recommendations as a service. See Netflix tutorial[3] for details on such a module.

2. **Registration Application** – This module lets the customer register to the recommender service and provides the GUI for the interaction.

3. **Page Retriever** – This module accepts one valid URL of a product page from the customer website, and then generates an identical page in the system.

4. **Recommendations Markup** - This module enables the mark up of the information the customer wishes to present along with each recommendation. The input for this module is the generated page from the *Page Retriever*. The output is the script that has to be planted in the customer web pages to enable the interaction with the *Recommender Service*.

5. **Crawler** – The crawler collets all the items information which are going to be presented later as recommendations.

[3] http://recsys.acm.org/2012/tutorials.html#building

Figure 1 presents the integration process and the workflow among the modules. The numbers on the arrows in the figure illustrates the order of the operations on a typical integration.

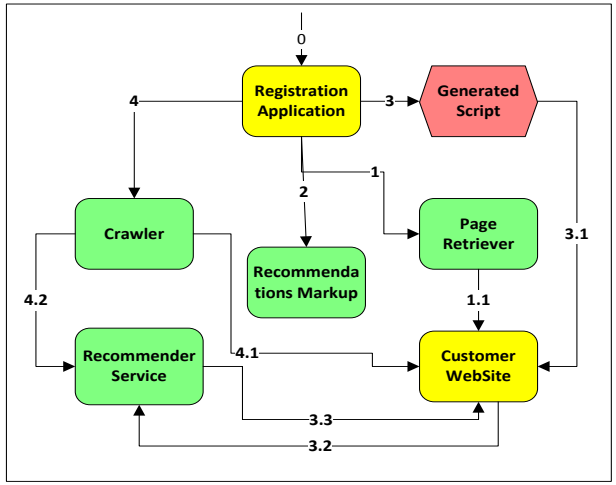

Figure 1: The components of the framework and the interactions among the modules.

Step 0 – a customer inserts some personal data and the URL of his website in the *Registration Application*.

Step 1 – the *Registration Application* uses the *Page Retriever* for obtaining the structure of the product webpage of a customer. The result is a simulated webpage which looks identical to the customer product page.

Step 2 – Using the *Recommendations Markup* module, the customer specifies on the simulated product web page, the location of the recommendations and the desired information that will be attached to each

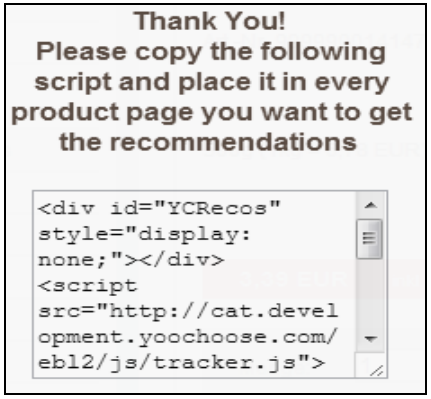

Figure 7. The script that has to be plant in every page the customer wish to get recommendations.

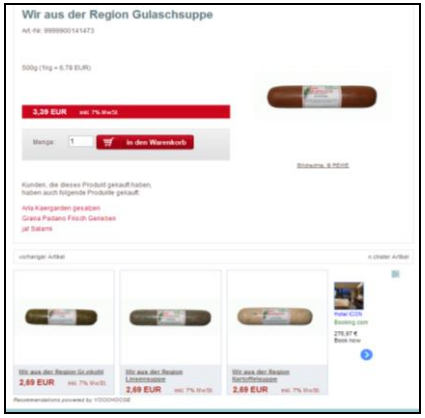

Figure 8. Finally, after planting the script, the product page will comprise recommendations as seen beneath the main product.

recommendation; information such as title, price, description etc.

Step 3 – The *Registration Application* then generates a script which should be planted in every webpage in which the customer wishes to see recommendations. The script enables 3 things:

1. Tracking user's activities.
2. Retrieving recommendations from the recommender service.
3. Presenting the recommendations together with one item from the advertisement provider (i.e. Google AdSense.)

Step 4 – the Registration Application triggers the Crawler to obtain all the needed information about the products for enabling the presentation of those products as recommendations later on.

In practice steps 3 and 4 in figure 1 occurs simultaneously. Crawling time depends of the size of the website and may take up to a few hours. Once steps 3 and 4 are completed the end-users of the website accept recommendations immediately. Initially, when no user activity is available, the system will deliver random recommendations, and eventually when the system has some user profiles, the recommendations will be provided out of a CF model with popularity lists as the fallback model.

Figure 2-8 are snapshots illustrating the steps that typical customer will go through in the GUI while integrating the service. Its starts from a product page without recommendations (figure 2), going through the integration process (figures 3-7) and ends with the same product page from figure 2, but now the page comprising the recommendations (figure 8).

The Business Model

In order to avoid any interaction between the owner of the website and the RS provider, we decided to present one advertisement with every 3 recommendations on the website. This advertisement is practically funding [3] the service and can potentially make it profitable to the recommender system provider. Such a business model turned out to be very successful and is used by leading players in the market of recommender systems as service; players such as Taboola, Outbrain Yoochoose and more.

Conclusion

We described a framework that enables the integration of a website to an existing recommender system and allows the website to 1) easily register to the service, 2) send user activity events and accept recommendations, 3) present the recommendations as desired. All these achieved without any programming knowledge and efforts from the web shop side. This framework has been implemented and is available for integration for any desired customer. We believe that such a service is desired by many small and mid-sized e-businesses. **Finally, the above described service is available at http://free.yoochoose.net**

References

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