Optimized advertising content delivery in affiliate networks

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ABSTRACT

This study tackles the problem of advertising content distribution in affiliate networks. We model the affiliate network as a new business-to-business relationship in which a master site tries to improve its profits by properly targeting the advertising information. In our specific case, we will optimize discount coupons delivery for one of the biggest coupons site in the world. In our study we will employ adapted recommendation strategies based on collaborative filtering methods. The purpose of the present paper is to correlate the display of advertising information on affiliate sites with the actual improvements in sales, as a direct method to obtain the user rating which does not exist.

Categories and Subject Descriptors

K.4.4 [**Computer and Society**]: Electronic Commerce—*Distributed Commercial Transactions*; H.3.4 [**Information Storage and Retrieval**]: Systems and Software—*User profiles*

Keywords

recommender systems, collaborative filtering, affiliates, content delivery

1. INTRODUCTION

This paper describes the research proposal we are working at and which is part of my PhD thesis. It specifically targets electronic business by tackling a new and emerging business-to-business relationship. In electronic B2B, a provider has various means of attracting new customers, one of them being to supply and promote discount coupons. A proper platform for spreading out advertising information regarding discounts is required, and the information providers should possess intelligent tools to observe and evaluate the efficiency of the discounts information distribution. Affiliate programs represent possible solution to be adopted. In e-commerce, an affiliate is a website which links back to an e-commerce site like Amazon.com. While in classical e-commerce, the provider can easily compute the efficiency and the effectiveness of a particular affiliate, because it can register all products sold through that affiliate, in discount information advertising this operation is no longer possible. In discount advertising, the customer usually buys the product directly from the provider e-commerce platform and the provider has no mean to directly identify how the customer acquired the information about the discount. Thus, classical tools for personalized content delivery can not be directly applied for optimizing the advertising delivery information, due to the fact that the direct feedback loop is missing.

In this paper we will give a brief description of the research problem stressed in the paragraph above, stating out the challenges we are facing. The paper is organized as follows. Section 2 presents the research problem of my PhD thesis. In section 3 we present the state of the art, mainly concerning the intelligent techniques for content delivery and studies concerning the affiliates problem. Section 4 describes the main challenges we face in our study, while section 5 presents the wow-coupons.com use case. We conclude the paper by presenting our future plans.

2. RESEARCH PROBLEM

Our main research problem is to build an e-business system in the area of affiliates marketing and content delivery. Specifically, we try to develop a delivery system for a major coupons site. Coupons represent a well-established way of providing benefits to customers for a specific activity to improve their business.

Online coupons or online coupon codes are discounts and bargain deals for all major on line stores and shopping sites on the Internet. Online stores creates discount codes to select groups of customers. By using coupon codes some groups of people will enjoy discounts when shopping online, like free shipping. Discount coupons is a way to save with on line shopping and some codes will be automatically applied at checkout. Other codes must be copy pasted intro a special coupon text box before to confirm the order.

An independent research agency made a recent survey on behalf of Pay By Touch on over 100 shoppers that were questioned in May 2007. The survey proves [12] that shop-

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pers develop a positive response to discount schemes if these are both highly targeted and convenient to use. In fact, the survey reveals that 88% of shoppers would use discount coupons, if these were more focused on their product preferences and were available in store while they were shopping. Of those surveyed, 95% of shoppers who used a retail loyalty card have received in-store discount coupons. However, 75% of these shoppers said they frequently *forget* to redeem them even if some of the discounts offered were on items they normally buy. Other factors that contributed to low redemption rates were the inconvenience of having to carry pieces of paper around and the fact that discounts were mostly for items the shopper did not have a history of buying. Therefore, it seems clear that retailers who offer targeted discounts and make it easy for those offers to be redeemed, could have a compelling way to develop customer loyalty and increase profit.

In our study case we want to specifically develop and implement a content delivery system for one of the top coupons site in USA (http://wow-coupons.com/). From now on, we will name this site as the master site. Our system will search, select and deliver coupons on behalf of 3'rd party sites that sell or recommend products, or for community sites that offer valuable user targeted content. Delivery will be targeted to a network of affiliates, established in order to enhance information dissemination. Delivered content will assist the site visitors, the community members in their online shopping activities and will help them to save money when they buy products. Our main target is to optimize the system such us to deliver highly targeted discount coupons. For our target, we intend to adapt recommendation systems and collaborative filtering technologies. Another feature of our interest is to technically enable the coupons site to deliver the content in real-time, i.e. without the usage of off-line information exchange with the affiliates. When a new coupon is added on the master site, the content delivered on the affiliate sites should be seamless updated.

Collaborative filtering is of our interest because it is a way to establish what items to display to web users who have browsed some ads or made purchases in the past. Collaborative filtering software compiles purchasing information on customers to pool them into clusters and uses some cluster members' purchasing patterns to predict the buying habits of others in the same cluster. It does this in real time and, for instance, puts an ad on the customer's screen while he or she is making a purchase [10]. In our case we want to display targeted discount coupons to users that are going to make a purchase. For example, we target an online shopping website that makes discount recommendations for the products the customer has in her shopping chart. This will help her to save money and also to develop a strong loyalty for that online shop because it proves that the shop cares about the customers and their needs.

To directly apply collaborative filtering, we need to collect and represent different partner sites and people preferences. Preferences are typically based on item ratings (i.e. posteriori feedback) explicitly delivered by users. The system recommends products which were evaluated positively by another similar user or by a set of such users.

Our main challenge is that we cannot collect the user ratings or preferences because we deliver the advertising content (coupon codes). The coupon code for a particular product and promotion campaign is the same, regardless the site that publishes it. When a user applies a coupon by buying a product, we do not have a direct method to identify the affiliate site that published the coupon to the user. Therefore, in our business setup, we do not have the feedback loop mechanism to allow us to use a classical collaborative filtering method.

Instead, we want to implement a module part of the master site system that will allow it build a profile for each affiliate. This module will track down and monitor how many times an affiliate user viewed and clicked on every coupon displayed. On the other side, the master knows the number of products sold per every coupon delivered to all affiliates. All these will aggregate in a statistical information that will replace the classical feedback from the partners and will provide the affiliate profile. The master can optimize and improve the coupons delivery algorithm for the entire affiliates network.

In this section we described our research problem in the terms of our B2B relationships. But, the problem is more general, spanning over all business relationships where direct feedback or user rating is not available. By tackling the affiliates problem, we intend to prove that intelligent techniques for content information delivery are more suited and can enhance the profit of the advertisers, even if there are only statistical glues about the real profile of the information users.

3. STATE OF THE ART IN THE FIELD

In this section we will investigate the state of the art in the fields covered by our research. We should emphasize that there is a lot of bibliography tackling recommender systems and collaborative filtering. Regarding the affiliates, there are a lot of business studies concerning the affiliates in e-commerce setups. In e-commerce setups, the feedback loop is closed because the master can identify through which channel a specific purchase was performed. Therefore, besides a proper advertising, one of their biggest challenge is how to compensate or reward each affiliate, accordingly to the profits they generated. In our study we are not interested in designing a proper reward scheme for affiliates, we suppose that we have good mechanisms to maintain the network and make it growing.

3.1 Recommender systems and collaborative filtering

Recommender systems are an important part of recent e-commerce. They enable the increase of sales by suggesting to users selected products on offer. The problem of how to choose the most suitable items, possibly with respect to the user's inclinations, is a challenging research problem that has been investigated for many years [3]. The purpose of a recommender system is to eliminate the need for browsing the entire item space by presenting the user with items of interest early on. Recommender systems strive to recommend items that users will appreciate and rate highly, often presenting items in order of highest predicted ratings first

[5]. The most well-known example of collaborative filtering is Amazon. The purchase recommendations are based on the following rule: "users who are interested in item X are also likely to be interested in item Y".

Four fundamental approaches to recommendation can be mentioned: demographic filtering, collaborative and content-based recommendation, and simplified statistical approaches [2]. We will describe them according to [3].

In *demographic recommendation*, users are classified based on their personal data, which was collected during the registration process, survey responses or other feedback methods. Each product is assigned to one or more classes with certain weights and the user is attracted to items from the class closest to their profile. This is attribute based recommendation.

Collaborative recommendation is typically based on item ratings explicitly delivered by users. The system recommends products, which have been evaluated positively by another similar user or by a set of such users, whose ratings have the strongest correlation with the current user. This is user-to-user correlation.

Content-based recommendation focuses on the similarity between products, usually taking into account their features like textual descriptions, hyperlinks, related ratings, or co-occurrence in the same purchased transactions or web user sessions. Items that are the closest to the most recently processed (viewed), are recommended regardless of user preferences. This is item-to-item correlation. Association rules and sequential patterns are the most interesting techniques used in recommendation based on item-to-item correlation. They are usually applied to data sets related to items such as purchases, ratings of TV programs, navigation paths rather than directly to item attributes.

In the *statistical approach*, the user is shown products based on some statistical factors; usually popularity measures like averages or summary ratings (the best rated), and numbers of sold units (the best buy) [9].

The *information overload* problem affects our everyday experience while searching for knowledge on a topic. To overcome this problem, we often rely on suggestions from others who have more experience on the topic. However, in web case where there are numerous suggestions, it is not easy to detect the trustworthy ones. Shifting from individual to collective suggestions, the process of recommendation becomes controllable. This is attained with the introduction of *Collaborative Filtering* (CF), which provides recommendations based on the suggestions of users who have similar preferences. Since CF is able to capture the particular preferences of a user, it has become one of the most popular methods in recommender systems [11].

A web site or other online service that receives extensive traffic has the potential to analyze the resulting usage data for the benefit of its user population. One of the most common applications of such analysis is collaborative filtering. A web site offering items for sale or download can analyze the aggregate decisions of the whole population, and then make recommendations to individual users of further items that they are likely to be interested in. The recommendations made to a specific user are thus based not just on his or her own previous actions, but also on collaborative information, the information collected from other users in the system [4].

Collaborative filtering algorithms can be categorized as [7]:

- User-Based algorithms: operate on the assumption that consumers who have bought similar products in the past will prefer to buy similar products in the future
- Item-Based algorithms: operate on the assumption that items that have been co-purchased in the past will continue to be co-purchased in the future

Regarding the technical mean of delivering the recommendations, CF are split in [8]:

- memory-based algorithms, which recommend according to the preferences of nearest neighbors. They utilize the entire user-item database to generate a prediction. These systems employ statistical techniques to find a set of users, known as neighbors, that have a history of agreeing with the target user (i.e., they either rate different items similarly or they tend to buy similar set of items). Once a neighborhood of users is formed, these systems use different algorithms to combine the preferences of neighbors to produce a prediction or top-N recommendation for the active user. The techniques, also known as nearest-neighbor or user-based collaborative filtering are more popular and widely used in practice.
- model-based algorithms, which recommend by first developing a model of user ratings. Algorithms in this category take a probabilistic approach and envision the collaborative filtering process as computing the expected value of a user prediction, given his/her ratings on other items. The model building process is performed by different machine learning algorithms such as Bayesian network, clustering, and rule-based approaches. The Bayesian network model formulates a probabilistic model for collaborative filtering problem. Clustering model treats collaborative filtering as a classification problem and works by clustering similar users in same class and estimating the probability that a particular user is in a particular class C, and from there computes the conditional probability of ratings. The rule-based approach applies association rule discovery algorithms to find association between co-purchased items and then generates item recommendation based on the strength of the association between items.

Both practical experience and related research have reported that memory-based algorithms present excellent performance, in terms of accuracy, for multivalue rating data. On the other hand, model-based algorithms are efficiently handle scalability to large data sets [11].

3.2 Affiliates marketing

Affiliate marketing is a web-based marketing practice in which a business rewards one or more affiliates for each visitor or customer brought about by the affiliate's marketing efforts. A merchant, also known as an advertiser or retailer, is a web site or company that sells a product or service online, accepts payments and fulfills orders. Affiliates (also called publishers) place merchants' ads, text links, or product links on their web sites, shopping engines, blogs, etc. or include them in e-mail campaigns and search listings in exchange for commissions on leads or sales.

4. MAIN CONTRIBUTIONS EXPECTED

We expect to contribute in several main areas.

From the systemic point of view, we intend to define the overall picture comprising all business to business relationships. Figure 1 presents an overall sketch of our system.

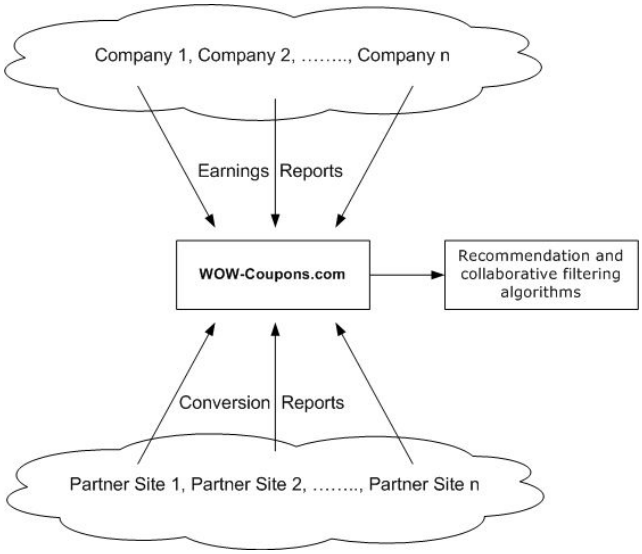

Figure 1: The overall picture of the B2B affiliates problem

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From a technical point of view, a challenge is how to pack the content delivered to affiliate sites so as the partners will seamlessly accept the content and publish it into their websites. The content should be delivered in such a way that we will be able to register the number of views per coupon and number of clicks per coupon. We envisage the usage of server-controlled web development techniques that exchange small amount of information behind the scene. AJAX technologies [1] are a good candidate for our reason. We intend to fully describe our solution from the technical point of view.

From a algorithmic point of view, our research raises several open issues:

- to develop a statistical analysis tool in order to relate in a significant manner the collected information about content display (number of views and clicks) and the received payments from the earning reports. Statistical analysis will provide a way to collect the required feedback in the collaborative filtering methods
- to select a proper user profile management scheme. This is highly related with adapting a recommendation system or collaborative filtering method to our setup. Up to now, we only investigated several alternatives, but we did not established which algorithm would be more suited for us. We expect the ICEC doctoral symposium to allow us to progress on this issue, by having discussions with highly esteemed experts
- to compare the intelligent content distribution to the actual functioning of the affiliates system. Actually, there is not too much intelligence in the system, in the sense that the master delivers to each site the coupons related with the latest marketing campaign added in the master's database. In order to allow for a non-biased comparison, we need to design a controlled experiment on wow-coupons.com, covering a defined period of time and a stable part of the affiliates network. Designing and running the experiments are a big challenge, because, in meantime, we need not to downward the business performance over the period of the experiment.

5. WOW-COUPONS.COM

We started this research because we intend to improve the way that WOW-Coupons.com delivers the coupons for the affiliate sites. The actual system delivers the last coupons added on the master site, organized by store and by category. Up to now, this delivery scheme proved to be winning, but in nowadays this module needs some improvements because we intend to enhance the user usage of time and also the profits wow-coupons.com makes from the affiliates network. We will try to do a brief description of the site that will use the recommender system that we want to provide below.

The overwhelming majority of consumers in the US collect coupons to help them make the most of their money. Consumers spend plenty during the holiday season, and with tightening budgets, they are spending money where they see the best deals. During the holidays, an impressive 71% of survey respondents [12] say they're likely to use the Internet to research and compare holiday products and gifts.

WOW-Coupons.com is the fastest-growing coupons site on the web. It is a winner of 2005 LinkShare Gold Link "Innovative Affiliate" award. Averaging around 600,000 unique visitors a month and with a steadily growing community of e-mail newsletter subscribers, currently more than 80,000, it commands positions at the top of the search engines. A few time ago the company launched the UK version of

the site WOW-Coupons.co.uk. Categories include printable vouchers with Printable Retail, Printable Grocery, Printable Restaurant and Printable Travel Coupons subcategories, as well as Online Coupons.

Printable retail coupons section will provide real coupons buyers can take to favorite major retailers and national franchise stores. Shoppers choose the discount, print it out, and go shopping without needing to sign up. The process eliminates clogged inboxes with endless promotional e-mails from dozens of mailing lists. Grocery printable vouchers section will provide the grocery coupons users need, when they need them. Print coupons to save on favorite brands at supermarkets and drugstores everywhere. Restaurant printable vouchers section will provide coupons that can be printed out and used to save money at restaurants across the nation. When eating out may seem like an extravagance, think again and enjoy dinner. Travel and entertainment printable vouchers section will provide discounts and vouchers for diverse traveling destinations whether in US, U.K. or internationally. Travelers can still afford to take vacations or visit the family. The site has printable travel coupons and offers for car rentals, accommodations, amusement parks, museums and lots more.

Just like printable vouchers, the best and biggest retailers and service providers offer online coupons and special discounts. The difference is, these can be used only for purchases made online. On the site visitors can browse great offers, go straight to a favorite store (arranged alphabetically or by date posted) to see the latest deals, or to use the navigation menu on the right side of the site. When an item is found, the user can follow directions in the description of each coupon to be sure that savings have been applied before paying for an order.

For implementing the architectural design for coupons delivery, we employed the XML standard to provide an RSS [6] service. Wow-coupons.com has many sites that download the RSS and display the content that we deliver. For some affiliate sites we created a special customized RSS feed. Every coupon is part of a category and has a simple XML format. Now the system generates around 1500 different XML files that can be used on the Internet. The system generates an XML file and update it hourly for every company that have coupons in the database.

6. FUTURE PLANS

Our future plans intend to cover the above mentioned issues. We are only in the incipient stage of our research, because I have spent all the first year in taking exams and now, we worked on defining a proper problem and researching various technologies for this problem. Up to now, Wow-coupons got implemented without the optimization feature and to perform the optimization mentioned in this paper is a good plan for future research. We also think that this study will represent a good opportunity to advertise to the affiliate marketing community the potential of intelligent techniques.

7. ACKNOWLEDGMENTS

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