

Buzz-Based Recommender System

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ABSTRACT

In this paper, we describe a buzz-based recommender system based on a large source of queries in an eCommerce application. The system detects bursts in query trends. These bursts are linked to external entities like news and inventory information to find the queries currently in-demand which we refer to as buzz queries. The system follows the paradigm of limited quantity merchandising, in the sense that on a per-day basis the system shows recommendations around a single buzz query with the intent of increasing user curiosity, and improving activity and stickiness on the site. A semantic neighborhood of the chosen buzz query is selected and appropriate recommendations are made on products that relate to this neighborhood.

Categories and Subject Descriptors

H.3.3 [Information Storage and Retrieval]: Information Search and Retrieval – *Information filtering.*

General Terms: Algorithms, Design, Experimentation

Keywords: novelty, recommenders, serendipity, buzz

1. MOTIVATION AND BACKGROUND

Research in Recommender Systems has typically focused on collaborative filtering and popular products. The downside of a popularity based approach is that products can remain popular over a long period of time impacting the novelty aspect of product finding. Our recommender system stresses on freshness, novelty, popularity and limitedness in product recommendations. Our approach is to identify products that relate to certain aspects of user behavior that are subject to huge surges and falls. We use queries as proxy for the collective user behavior and look for query bursts that are unusual and worth displaying in headlines.

In the next section we describe our *Buzz of the Day* web system which recommends merchandise around one buzz term daily. In section 3 we describe diverse classes that cover the gamut of recommendations from our system over a long period of time. We also describe evaluation of recommendations. In section 4 we discuss the kind of recommendations generated by the system. Finally we discuss the contributions of our work and plans for future work in section 5.

2. BUZZ OF THE DAY

Figure 1 below shows a screenshot of our social recommender *Buzz of the Day* application. The application displays a unique

page every day. Figure 1 shows the content for one particular day (03/04/2008 with buzz query “scarlett johansson”).

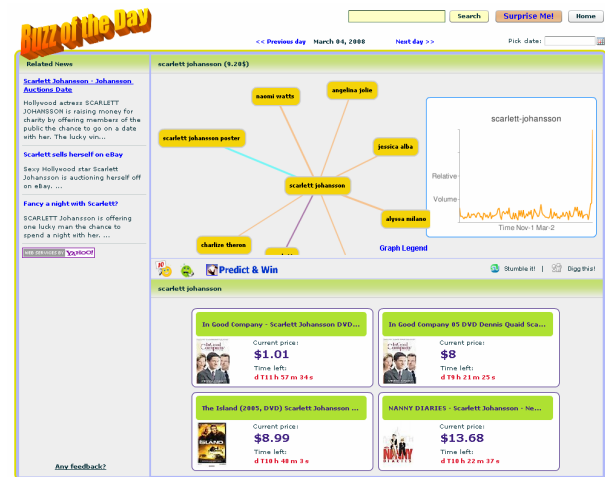


Figure 1 Screenshot for *Buzz of the Day* Application. It shows modules related to news, trend graph for buzz query, semantic query network and merchandise items.

2.1 Buzz Queries

We use queries flowing into the eBay US site as a dataset for this application. As described in [1] we use a bi-state automaton based generative model to detect bursts in queries. The bursts are ranked based on occurrence of burst query in news articles and amount of inventory matching the query. After ranking the daily query bursts in such a manner, the top burst is picked up and is used for *Buzz of the Day* merchandising.

2.2 Semantic Space Around the Buzz

As shown in Figure 1 we not only display the buzz term and related merchandise but also a network of queries which gives the users an option to view merchandise related to a variety of terms that might be related to the buzz term.

As described in [2] we build a semantic query network using textual similarity between queries (T_s), similarity mined from user queries in same sessions (S_s) and semantic similarity based on a kernel function based on previous history of closed transactions (K_s). We combine the 3 methods linearly to get a composite similarity score $C_s = \alpha T_s + \beta S_s + \gamma K_s$, where α , β and γ are coefficients which determine the weights for the different kinds of similarity methods. Every individual method has its own advantages and limitations. A combination of the three methods proves effective to get high quality recommendations. The

network can capture specialized products related to the buzz query, competing products, similar personalities and products and also current trends.

2.3 Related News, Merchandise for sale

As shown in Figure 1, the left side of the page has a panel with related news which usually reflects the causality of the buzz.

The bottom of the page displays the related merchandise on sale. By default it shows merchandise for the buzz query. When a user clicks on different query recommendations in the query network, the merchandise shown changes according to the recommendation that is clicked on.

There are two emoticons on the page for social feedback, which a user can click to show liking or disappointment sentiments on viewing the page. There is a “Surprise Me” button, which randomly shows one *Buzz of the Day* page from the archives. The temporal graph indicates the intensity with which the query suddenly became popular. Also alongside the query, we show a value of the query, which is calculated based on the value of recent inventory matching that query sold on eBay.

3. CLASSIFICATION AND EVALUATION

Sports Mem, Cards & Fan Shop	54	eBay Motors	2
Other	37	Jewelry & Watches	2
Cell Phones & PDAs	26	Health & Beauty	2
Clothing, Shoes & Accessories	22	Crafts	2
Tickets	21	Electronics	2
Collectibles	20	Sporting Goods	2
Entertainment Memorabilia	19	Home & Garden	1
Video Games	19	Stamps	1
Toys & Hobbies	14	Dolls & Bears	1
DVDs & Movies	11	Computers & Networking	1
Music	10	Cameras & Photo	1
Books	9	Everything Else	1
Coins & Paper Money	3	Live Auctions	1

Figure 2 Recommendations classified into eBay taxonomy

We classified around 284 buzz recommendations from the system using eBay taxonomy. The eBay taxonomy comprises of around 25 main categories. The classification is shown in Figure 2. As seen in the figure, the categories “Sports Memorabilia, Cards & Fan Shop”, “Cell Phones & PDAs”, “Clothing, Shoes & Accessories” and “Tickets” constitute around 43% of total recommendations which shows that these categories are more sensitive to buzz as compared to others like “Home & Garden”, “Stamps” and “Dolls & Bears”. External systems like keywords advertising could leverage this buzz sensitivity information to optimize the price and refresh frequency of keywords. Around 13% of buzz recommendations get classified in the “Other” category. These are buzz queries which cannot be tied to a specific category. They usually pertain to odd and unusual items that get listed on eBay, some examples being “seattle toilet” and “virgin mary pretzel”.

We created a site <http://www.buzzaday.com> and for evaluation opened it up by invitation to 100 users. The evaluation criterion was binary. The user would click on one of the two icons indicating “I like it” and “I don’t like it”. A total of 113 votes were received and recorded. Out of these 113 votes, 83 votes were thumbs up and 30 votes were thumbs down. Around 68 unique recommendations were evaluated. We observe that popular items like “3g apple iphone” and events like “us open

tennis” tend to get votes from multiple evaluators and might have conflicting votes from different evaluators.

3.1 Thumbs Up Evaluations

Bulk of the positively voted recommendations fell in the “Tickets” and “Sports Memorabilia, Cards & Fan Shop” categories. The impression percentage of recommendations in “Tickets” is 7.4%. However, the coverage of “Tickets” in positively voted recommendations is around 29%. Recommendations for tickets related to current sports, music and other events are positively received. The evaluators in general did believe that the quality of the recommendations was good which is indicated by the fact that more than 73% of the votes were positive. An analysis of negative votes is described in section 3.2.

3.2 Thumbs Down Evaluations

An analysis of the recommendations that were voted down showed some interesting facts. It was observed that the recommendations provided for February 14th 2008 (Barack Obama; related to presidential campaign) and April 1st 2008 (Ric Flair; related to his last wrestling game) were given a negative vote. It is possible that the evaluators expected the recommendations to be around Valentine’s day and April Fool’s day respectively. As the recommendations are based on purchase behavior and demand bursts, in fact recommendations related to a seasonal event are usually seen before the event. For example, a recommendation for “valentine post cards” is seen on February 10th 2008, when people start looking for valentine’s day related products as the day approaches. Also, some specific recommendations based on eBay activity tend to get voted negatively possibly because evaluators don’t have sufficient context for it.

4. RECOMMENDATIONS

Timely recommendations for products related to buzz queries can have a significant commercial benefit. eBay is a large and diverse marketplace, and we are able to merchandise inventory pertaining to celebrities and sports stars, historical items, tickets for events, seasonal items and also new products. Depending on external events and time of the year the system might recommend items ranging from cheap easter dresses to expensive dodge cars.

5. CONCLUSIONS AND FUTURE WORK

In this paper we described a social recommender system which incorporates novelty, popularity, serendipity and limited quantity merchandising based on wisdom of crowds. We also showed how some categories are more sensitive to external buzz events than others. As part of future work we would like to personalize buzz recommendations based on user history and recommendations. We would also like to incorporate community reaction and feedback to improve the recommendations.

6. REFERENCES

- [1] Parikh N., Sundaresan N. Scalable and near real-time burst detection from eCommerce queries. KDD 2008. 972-980.
- [2] Parikh N., Sundaresan N. Inferring Semantic Query Relations from Collective User Behavior. CIKM 2008, Napa, CA, October 2008.