

ON THE NEED FOR INCENTIVES TO SUPPORT PERSONALIZATION SYSTEMS

Turning Users into Active Providers of Contents and Metadata

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Abstract: Research in personalization systems has made enormous progress in the last few years. However, the phenomenon of information overload is taking the state of the art to a dead end, due to the lack of metadata to describe the growing number of available contents. In this position paper, we take a look at the problem and suggest a research roadmap to find a way out, working on the idea of providing incentives to the end users to become active providers of contents and metadata.

1 INTRODUCTION

In recent years, we have witnessed the development of new communication technologies and a rapid growth in the amount of information available. In this scenario, the users would be expected to benefit greatly from a wide range of services delivering news, entertainment, education, health care advice, commercial facilities and so on. However, the current situation may be better referred to as one of *information overload*, since it frequently happens that the users are faced with an overwhelming amount of information. A similar situation was seen in the 1990s with the exponential growth of the Internet, that made users feel disoriented among the myriad of contents available through their PCs. This gave birth to the successful *search engines* (e.g. Google and Yahoo), that would retrieve relevant web pages in response to user-entered queries. Nonetheless, the advent of new devices (Digital TV set-top-boxes, mobile phones, media players, ...) brings into scene consumption habits that render the search engine paradigm insufficient. For various reasons, it is no longer realistic to think that users will bother to visit a site, enter queries describing what they want, and select particular contents from a list. In response to that, the scientific community is devoting huge efforts to the design and provision of personalized information services (Ardissono et al., 2004; Chorianopoulos, 2008; Im and Park, 2007), with a new paradigm of *recommender systems* proactively selecting the contents that best match the

interests and needs of each individual at any time (Lee and Yang, 2003; Hung, 2005; Cao and Li, 2007; Tsunoda and Hoshino, 2008).

2 THE PROBLEM

Recommender systems work by matching *user profiles* against *metadata* that describe the available contents (Adomavicius and Tuzhilin, 2005; Burke, 2002; Lim et al., 2008). The point we want to highlight is that, precisely due to the problem of information overload, content providers are already incapable of producing metadata to characterize the growing amount of material; they might provide some metadata for the new contents they produce, but certainly not for the many ones that already exist, neither for user-contributed ones. As long as automatic markup or nearby techniques (Guio and Jay Kuo, 2001; Wang et al., 2004) are not yet mature enough to fill in this gap, the peril lurks in the medium term that personalization engines may collapse for lack of input.

Echoing the ongoing revolution of the Web 2.0, the solution to this problem can only come from the end users, who should be engaged not only as content producers, but also as producers of metadata to annotate resources. This is already happening to some extent in *social tagging* Internet sites like del.icio.us, CiteULike and Technorati, but the amount of information so gathered is still several degrees of magnitude

lower than needed for a holistic scenario of personalized services in diverse applications and over multiple devices. In our opinion, taking the social approach to a new scale is not just a question of providing suitable tools and interfaces for the task in more services and devices, in the belief that the users will start to use them just like they started to massively contribute text, photos and videos to sites like Wikipedia, Flickr or YouTube. Contrary to providing contents, providing metadata is an ungrateful activity, because nobody sees the metadata: one does not gain visibility to other users, and so gets no feedback from whoever may be benefitting from his/her contributions.

3 THE SOLUTION

To bridge the crucial difference between providing contents and providing metadata, our position is that it will be mandatory to design *incentive schemes* to reward the users for any valuable information they provide (e.g. with coupons for pay-per-view services, free recharge vouchers for prepaid mobile phones, hours of premium access to certain contents, discount on broadband connections, technological gadgets, etc) and to build the knowledge bases for the recommender systems in a collaborative fashion. Probably, the best context for these incentive schemes will be that of *social networks* like MySpace or Facebook, though enhanced with *trust and prestige indicators* to promote serious involvement among the contributing users. Likewise, it will be necessary to research into how to ensure the *traceability* of each user's contributions, including contents, metadata and even recommendations to others.

In addition, innovations will be needed regarding the *usability* of the interfaces offered to the users to enter information and to interact with the social network, especially knowing that the methods employed thus far on the Internet (as accessed from personal computers) are not well suited to the input and presentation capabilities of other devices. Research will be needed on the design of specialized interfaces able to tune the incentives offered to the users depending on the type of information they provide—for instance, to compensate for the inconvenience of typing text using a remote control or a keypad.

Internally, advances must be pursued to work with novel, rich *data structures* halfway between ontologies and folksonomies. In this regard, to enable automatic processing of the knowledge bases, it will be necessary to introduce structure in the universe of tags that may be coming from a social network, but without the traditional well-formedness and consistency

requirements of ontologies to reckon the fact that different viewers may well provide contradictory categorizations for the same contents or products. This approach, supported by enhanced *data mining* techniques (Han and Kamber, 2005), is necessary to exploit all the knowledge captured in potentially contradictory metadata, with no need to restrict the reasoning to consistent subsets as it happens with most of the works in literature.

The final grand topic we envisage relates to the *business models* of personalized information systems, rethinking the relationships among content and service providers, network operators, advertisers and users around the innovations of the incentivized social network, with special concern for data ownership and privacy issues. In this point, it is worth noting that a wealthy flow of information from the users may provide the foundations for a new framework to perform audience and market studies in diverse areas of application, which will be crucial to support the strategic actions of the involved stakeholders.

4 A POSSIBLE SCENARIO

The following is a scenario that illustrates the aforementioned innovations in the context of personalized advertising through Digital TV set-top boxes and mobile devices, including glimpses of the following:

- business models in personalized t-commerce;
- incentives to the TV viewers, graded to the value of the feedback provided;
- incentives to other users in the consumption chain;
- indicators for audience and market studies.

On Wednesday evening, channel INCENTV-SPORTS will broadcast a UEFA Champions League match between Real Madrid C.F. and A.C. Milan in pay-per-view mode. To decide what ads to deliver during the transmission, the channel managers decide to follow the audience stereotypes of “people who like football” and “people who like travelling”, so the head-end is scheduled to deliver material related with football (sports clothing, merchandising, almanacs, tickets for upcoming matches, etc) and tourist destinations in Spain and Italy.

It's Wednesday, and Alice goes to her favourite bar to watch the game on TV (she prefers this instead of paying €10 to watch it in home). Since there are be many people in the bar, the TV screen

displays the most relevant ads according to the audience stereotypes, while the individuals can receive personalized offers in their mobile phones. In a given moment, Alice presses a YELLOW button in her mobile to indicate that she wants to learn more about the product currently advertised in the bar's TV, but later (RED would mean that she is not at all interested in that stuff, while GREEN would mean that she wants to learn more about the offer right now). Following this indication, once the first half of the game is over, Alice's mobile vibrates to face her with an interactive application that lets her browse t-shirts of different clubs, prices and so on. Alice could buy one item using the application, but now she doesn't want to. However, thanks to the incentive schemes of INCENTV-SPORTS, she can still benefit from providing some information about the offered products. The more information, the greater the reward:

- By simply providing numerical ratings (from 0 to 10), she collects points that she may exchange for backgrounds, screensavers and tunes for her mobile phone.
- By tagging products with words from a given vocabulary, she gets points to exchange for products also advertised on INCENTV-SPORTS.
- By entering new tags to classify products, she wins discounts to watch the next match at home (e.g. €0.1 per tag, to a maximum of €2). Textual comments would provide additional discounts of 1€.

Prior to sending it out, Alice can review the data that will be sent to INCENTV-SPORTS, finding that she can supplement what she entered with context information given by the bar owner (e.g. describing the bar's atmosphere or common likings of its clients). Thus, the bar owner can also get rewards, proportional to the amount of feedback gathered from his clients and the amount of products they buy. In fact, next week he will be able to offer a new match for free.

On Friday, the INCENTV-SPORTS managers start processing all the feedback gathered from the football match. Firstly, it is noticeable that there has been very little activity around tourist destinations ads. This indicates that a football match is not a suitable place to advertise travels, so the stereotype "people who like travelling" loses relevance with regard to football. In contrast, there has been much activity around sports stuff, measuring great disparity in the viewers' reactions to certain items that fitted well within the stereotype of "people who like football". In response to these observations, an analyst suggests to specialize the stereotype, introducing subclasses of "supporters of A.C. Milan" and "supporters of Inter Milan". As a result, during the next Champions League round,

the supporters of A.C. Milan are not faced with merchandising of Inter Milan and vice versa. Everyone is happier with the publicity received and an increase occurs in the sales figures.

5 CONCLUSIONS

With the growing amount of contents available through different media, personalized information services face a risk of starvation due to lack of metadata to reason about. In order to solve this problem, we have argued that it is necessary to turn the users into active providers of metadata, for which they must be given suitable incentives in a social network. Realizing this view will require much research in incentive schemes, business models, user interfaces, knowledge modeling and data mining techniques, among others.

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