Serendipitous Encounters along Dynamically Personalized Museum Tours*

Leo Iaquinta
Universitá degli Studi di Bari,
Dipartimento di Informatica
via E. Orabona, 4
Bari, Italy
iaquinta@di.uniba.it

Marco de Gemmis
Universitá degli Studi di Bari,
Dipartimento di Informatica
via E. Orabona, 4
Bari, Italy
degemmis@di.uniba.it

Pasquale Lops
Universitá degli Studi di Bari,
Dipartimento di Informatica
via E. Orabona, 4
Bari, Italy
lops@di.uniba.it

Giovanni Semeraro
Universitá degli Studi di Bari,
Dipartimento di Informatica
via E. Orabona, 4
Bari, Italy
semeraro@di.uniba.it

Piero Molino
Universitá degli Studi di Bari,
Dipartimento di Informatica
via E. Orabona, 4
Bari, Italy
piero.molino@gmail.com

ABSTRACT

Today Recommender Systems (RSs) are commonly used with various purposes, especially dealing with e-commerce and information filtering tools. Content-based RSs rely on the concept of similarity between items. It is a common belief that the user is interested in what is similar to what she has already bought/searched/visited. We believe that there are some contexts in which this assumption is wrong: it is the case of acquiring unsearched but still useful items or pieces of information. This is called serendipity. Our purpose is to stimulate users and facilitate these serendipitous encounters to happen. The paper presents a hybrid recommender system that joins a content-based approach and serendipitous heuristics in order to provide also surprising suggestions. The reference scenario concerns with personalized tours in a museum and serendipitous items are introduced by slight diversions on the context-aware tours.

1. BACKGROUND AND MOTIVATION

RSs allow a customized information access for targeted domains. They provide the users with personalized advices based on their needs, preferences and usage patterns. Sometimes RSs can only recommend items that score highly against the user's profile and, consequently, the user is limited to obtain advices only about items too similar to those she already knows. This drawback is referred as *over-specialization* and it prevents surprising finding from taking place. Indeed, the RSs are required to provide novel and even serendipitous advices. As explained by Herlocker [2], novelty occurs when the system suggests an unknown item that the user might have autonomously discovered. A serendipitous recommendation helps the user to find a surprisingly interesting item that she might not have otherwise discovered (or it would have been really hard to discover).

The idea of serendipity has a link with de Bono's "lateral thinking" [1] which consists not to think in a selective and sequential way, but accepting accidental aspects, that seem not to have relevance or simply are not sought for. This kind of behavior helps the awareness of serendipitous events, especially when the user is allowed to explore alternatives to satisfy her curiosity. Therefore the demonstrative scenario concerns personalized tours within a museum. Indeed, in addition to the "classical" recommendations that exploit the learned user profile, the system provides also programmatically supposed serendipitous recommendations and it arranges the whole of them in a personalized tour.

The serendipitous suggested items are selected exploiting the learned user profile so that they cause slight diversions on the personalized tour. Indeed the content-base recommender module allows to infer the most interesting items for the active user and a personalized tour is proposed according to the spatial layout, the user behavior and the time constraint. But the resulting tour potentially suffers from overspecialization and, consequently, some items can be found no so interesting for the user. Therefore the user starts to divert from suggested path considering other items along the path with growing attention. On the other hand, also when the recommended items are actually interesting for the user, she does not move with blinkers, i.e. she does not stop from seeing artworks along the suggested path. These are opportunities for serendipitous encounters. These considerations suggest to perturb the optimal path with items that are programmatically supposed to be serendipitous for the active user. Perturbing the optimal path with slight diversions does not compromise the system benefit to guide the user across the museum under a time constraint because the user behavior is constantly monitored and personalized tour

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http://ims.dei.unipd.it/websites/iir10/index.html

eventually updated.

2. SERENDIPITOUS RECOMMENDATIONS

Toms [4] suggests four strategies to introduce the serendipity: 1) Role of chance or 'blind luck', implemented via a random information node generator; 2) Pasteur principle ("chance favors the prepared mind"), implemented via a user profile; 3) Anomalies and exceptions, partially implemented via poor similarity measures; 4) Reasoning by analogy, whose implementation is currently unknown.

In [3] we propose an architecture for content-based RSs that implements the "Anomalies and exceptions" approach to provide serendipitous recommendations alongside classical ones. The basic assumption is that serendipity cannot happen if the user already knows recommended items, because a serendipitous happening is by definition something new. Thus the lower is the probability that user knows an item, the higher is the probability that a specific item could result in a serendipitous recommendation. The probability that user knows something semantically near to what the system is confident she knows is higher than the probability of something semantically far. If we evaluate semantic distance with a similarity metric, like internal product which takes into account the item description to build a vector and compares it to other item vectors, it results that it is more probable to get a serendipitous recommendation providing the user with something less similar to her profile.

According to this idea, items should not be recommended if they are too similar to something the user has already seen. Following this principle, the basic idea underlying the proposed architecture is to ground the search for potentially "serendipitous" items on the similarity between the item descriptions and the user profile.

3. PERSONALIZED MUSEUM TOURS

RSs traditionally provide a static ordered list of items according to the user assessed interests, but they do not rely on the user interaction with environment. Besides, if the suggested tour simply consists of the enumeration of ranked items, the path is too tortuous and with repetitive passages that make the user disoriented, especially under a time constraint. Fig. 1 shows a sample tour consisting of the k most interesting items, where the k value depends on how long should be the personalized tour, e.g., it deals with the overall time constraint and the user behavior. Finally, different users interact with environment in different manner, e.g. they travel with different speed, they spend different time to admire artworks, they divert from the suggested tour. Consequently, the suggested personalized tour must be dynamically updated and optimized according to contextual information on user interaction with environment.

Once the personalized tour is achieved, as shown in Fig. 2, serendipitous disturbs are applied. Indeed, the previous personalized tour is augmented with some items that are along the path and that are in the ranked list of serendipitous items according to the learned user profile. The resulting path most likely has a worse fitness value and then a further optimization step is performed. However, the further optimization step should cut away exactly the disturbing serendipitous items, since they compete with items that are more similar with the user tastes. Therefore serendipitous items are differently weighed from the fitness function: their

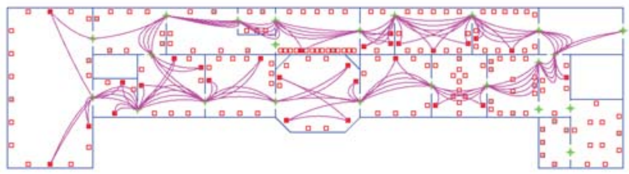

Figure 1: A sample tour consisting of the ranked k most interesting items

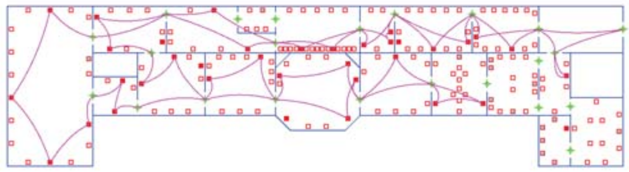

Figure 2: Optimized version of the tour in Fig. 1

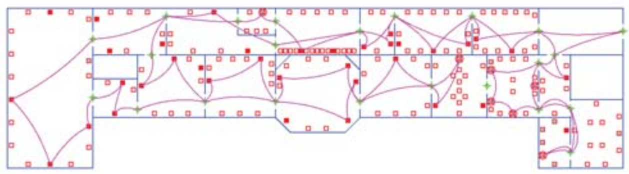

Figure 3: The "good enough" augmented version

supposed stay time is changed. This implementation expedient also deals with the supposed serendipitous items should turn out not so serendipitous and the user should reduce the actual stay time in front of such items. Fig. 3 shows a "good enough" personalized tour consisting of the most interesting items and the most serendipitous ones. It is amazing to note that some selected serendipitous items are placed in rooms otherwise unvisited. More details and an empirical evaluation about serendipitous perturbations effects are presented in [3].

4. REFERENCES

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