

COLLECTeR Europe 2006

Proceedings edited by
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Published June 2006



Proceedings

University of Applied Sciences Northwestern Switzerland
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Collaborative Electronic Commerce Technology and Research

Background of COLLECTeR Europe 2006 in Basel, Switzerland

The COLLECTeR series of conferences (<http://www.collecter.org/>) was established to link research centres at universities to form a basis for collaborative research in Electronic Commerce.

Conference Topic 2006: Collaborative Business

The “networked economy” challenges organizations to consider the use of Collaborative Business, namely the combined deployment of groupware and e-business infrastructures. Mobile computing technology and collaboration support have reached a level that makes a seamless integration of communications and data processing economically feasible. This constitutes our notion of Collaborative Business: the timely bundling of communication, coordination, and collaboration activities.

The focus of COLLECTeR Europe 2006 is on new forms of Customer Relationship Management (CRM) – including mobile CRM – that cover the whole value chain and use new working modes. This concerns questions related to the optimisation of channels, the improvement of customer acquisition and retention, and after-sales contacts and services.

Aim

COLLECTeR Europe 2006 is a forum for researchers to present and discuss their current and ongoing work. In order to stimulate a lively discussion the number of participants is limited to approx. 30 people. The aim of the event is to bring together researchers and practitioners to discuss foundations and industry potentials of Collaborative Business. This includes the exploration of the effective deployment of novel technologies and services.

Contributions are grouped into sessions covering the following topics:

- Digital archiving, privacy and property rights
- Personalization
- Markets and business processes
- Mobile and ambient business
- Communities and Work Group Collaboration
- Social systems
- Security devices and secure communication

All paper submissions to COLLECTeR Europe 2006 represent the original work of the authors. There were no rigid guidelines regarding paper size for the final research papers. We asked to submit between 6 and 8 pages.

The social event, the conference dinner, lunches and breaks were sponsored by Ecademy, the National Network of Excellence of the Swiss Universities of Applied Sciences for E-Business and E-Government.

Basel, June 2006

Petra Schubert and Daniel Risch

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myLandscapes.ch – Explaining Recommender System Principles in a Web-based Application

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Work in Progress

Abstract

myLandscapes is a personalization demonstrator offering insight into some common personalization and recommender systems approaches. Instead of products that are offered in e-shops, myLandscapes provides pictures of landscapes which can be rated, labelled and sent to friends. myLandscapes is able to predict future user ratings and to explain similarities both between users and pictures. The predicted values are used to display landscapes based on user's preferences. The main advantage of offering pictures in this application is that users do not need previous knowledge in a specific domain. People can easily assess whether or not they are attracted by a landscape and therefore cannot only rate pictures without previous knowledge but can also judge resulting predictions at first glance. The application is a first prototype and will be further developed in the future.

1 Introduction

Personalization is about the interaction between a company and a customer on a one-to-one basis. The aim is to match user needs and therefore maximize the long term customer value. Due to the interactive characteristics of web-based applications – compared to other media like newspaper, television or radio – the WWW is particularly suited for personalized services. Over the past years there has been a lot of research in the broad field of personalization focusing on recommender systems e.g. by Sarwar et al. 2000, Adomavicius and Tuzhilin 2005, Herlocker et al. 2004. Privacy concerns have been discussed by Ackermann and Cranor 1999, Preibusch 2005, Risch and Schubert 2005. Complementary research on personalization concepts was presented by e.g. Peppers and Rogers 1997, Pal and Rangaswamy 2003, and Schubert and Koch 2002. Most publications implicitly mention the need of customer and content specific data to adapt interfaces, customize content and predict future user needs. To really match user needs on a one-to-one basis, customer specific data has to be available in an appropriate amount and in fairly good quality. As only a small part of customer specific data like e.g. contact information can be used directly to support cus-

tomers and to personalize their shopping experience, data like ratings of products, transaction history or logfile data has to be analysed and aggregated to get useful information.

This paper introduces a personalized, web-based application which aims to demonstrate different personalization and recommender systems approaches. It represents work in progress at the Competence Center E-Business Basel.

2 Motivation

Personalization of e-commerce applications has been a major research area of our research group during the last six years. The literature research and the information we obtained throughout our projects with partner companies showed that the profit of personalized applications as well as the knowledge that could be gained by analyzing customer specific data is still not sufficiently exploited. To demonstrate the potential of personalization features, we decided to set up a so called personalization demonstrator which is able to explain some personalization and recommender system concepts.

Another motivational aspect for this project is based on work by Herlocker et al. [2000]. They point out that recommendations are often computed in a black box and users are not able to effectively understand why certain products were suggested to them. Therefore, myLandscapes (www.mylandscapes.ch) is meant to provide as much information about the computation and origin of recommendations as possible.

Finally myLandscapes.ch serves as demonstrative part of a Ph.D. thesis on the usage of customer profiles in e-commerce applications.

3 myLandscapes.ch

3.1 Concept

The idea of myLandscapes.ch was to set up an application which should be able to apply and explain personalization and recommender systems approaches. Instead of products like CDs or DVDs myLandscapes “provides” pictures that can be rated, tagged and sent to friends. There are some advantages of rating pictures instead of movies (e.g. www.movielens.org) or CDs and books (www.amazon.com, www.gnode.net) in an application that aims to demonstrate the functionalities of recommender systems: Humans are able to judge visual impressions rather quickly and therefore do not need to know a lot about a specific contextual area. This reduces (a) the time needed to judge the “products” on the Web site on first sight and (b) the time needed to judge the *recommendations* for the products.

As can be seen in Figure 1 the main window of myLandscapes is divided into four areas. Area 1 marks the title bar and contains some superior navigational elements. In the second area the landscape-photographs are displayed. The third area shows additional information on how the pictures are selected and includes functionalities to rate, label, and search photographs. Area 4 contains the secondary navigation right below the photograph and all explanatory information to guide the user.

To enter myLandscapes the user must register by entering username and password. Further information can be provided voluntarily. After a new user has registered, he will be asked to rate 10 randomly selected pictures of the myLandscapes database. These

ratings are needed to set up a basic profile of a new user. Then the user is free to explore the other parts of myLandscapes.

In the following sections we will provide insight into the different parts of myLandscapes.

3.2 “Landscapes”

The transactional area of myLandscapes is labelled with “landscapes”. There are four subcategories, namely “rate”, “label”, “search” and “send”.

In the “rate”-section the user can rate any picture on an 11-point-scale from 1 to 10 by clicking on one of the straps on the right hand side. In this mode the pictures are displayed randomly. If a picture has already been rated by a particular user in an earlier session, he receives rating information and can either keep the former rating or overwrite it by a new one.

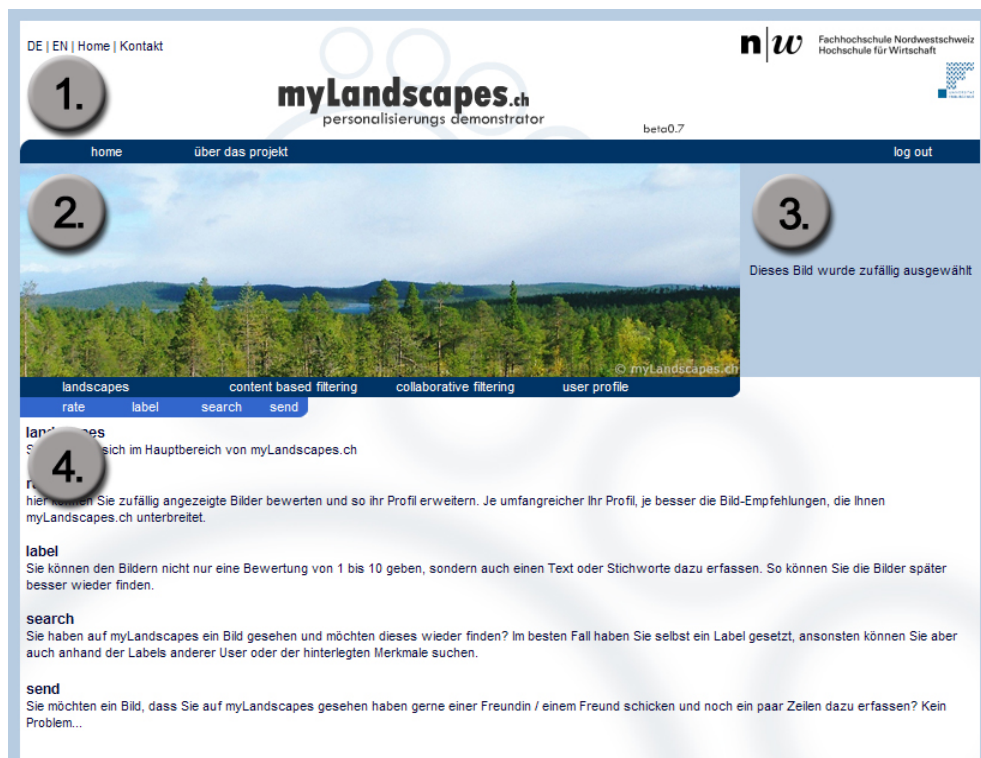


Fig. 1: User interface of myLandscapes.ch

In the “label”-area the user can add as many tags to a picture as he likes. This is useful to find specific pictures in future sessions.

To find pictures that were previously labelled by the current user or by other users he can navigate to the “search”-area. There are two possibilities to find particular pictures: (a) to search in the labels of all users or (b) to limit the search-functions to the own labels.

If a user has found a photograph that he would like to send to a friend, he can click on the send button while the photograph is displayed in area 2. After entering the message and an E-Mail-address myLandscapes sends an e-mail to the receiver, telling him that a myLandscapes-E-Card is waiting for him or her on the myLandscapes server.

3.3 Content Based Filtering

As mentioned above, myLandscapes provides insight into recommender systems approaches. These approaches are normally divided into content-based and collaborative filtering methods and have been broadly addressed in research (see for a state-of-the-art discussion [Adomavicius/Tuzhilin 2005]). Content-based filtering follows the idea of recommending similar items based on similar item characteristics. Therefore every item has to be described in a pre-defined, structured manner.

In the case of myLandscapes, every picture is described based on colour, time of year, items on the photograph, keywords, town/region, and country. A software agent compares the characteristics of every picture with the characteristics of all the other pictures and calculates the degree of similarity. This is done by summarizing all matching characteristics (one point for every match) and dividing it by the number of single characteristics of picture A.

For every picture that is shown in area 2 of the interface, myLandscapes.ch displays three pictures that are most similar to the first one. For every picture the user has the possibility to ask myLandscapes why this picture is referred to as similar to the other one. myLandscapes then presents the attributes of picture 1 and picture 2 in a table. Matching characteristics are marked green (Figure 2).



picture 1			picture 2		
attribute	category	weight	attribute	category	weight
Natur	Keyword	0.8	Natur	Keyword	0.8
Weiss	Color	0.8	Küste	Keyword	0.8
Grün	Color	0.8	Weiss	Color	0.8

Fig. 2: Comparison of similar pictures

3.4 Collaborative Filtering

In contrast to content-based filtering, the collaborative filtering approach uses the similarity of users to recommend items which similar users have bought or rated with high values. In the collaborative filtering area the application presents four pictures that are most likely to match user's preferences. The pictures are chosen based on estimated ratings for pictures the user has not rated yet. The estimation process can be divided into two steps. First a group of K nearest neighbours has to be found. Therefore the similarity of every pair of customer is calculated. This is done by using the cosine similarity measure shown in (a) [Sarwar et al. 2000, 162; Adomavicius/Tuzhilin 2005, 738]

$$sim(a,b) = d(x,y) = \cos \alpha(\vec{x}, \vec{y}) = \frac{\vec{x} \cdot \vec{y}}{|\vec{x}| \cdot |\vec{y}|} = \frac{\sum_{i=1}^n x_i y_i}{\sqrt{\sum_{i=1}^n x_i^2} \sqrt{\sum_{i=1}^n y_i^2}} \quad (a)$$

where $d(x,y)$ is the degree of similarity between user A and user B ($sim(a,b)$). The similarity is calculated based on the rating vectors \vec{x} for user A and \vec{y} for user B. x_i refers to the rating value of user A for item i , whereas y_i refers to the rating value of user B for item i . The advantage of the cosine similarity measure compared to other similar-

ity measures (e.g. city-block-distance) is, that the values for $d(x, y)$ are standardized to +1 for identical vectors, 0 for orthogonal vectors and -1 for converse vectors. Therefore, users with a similarity near +1 are most similar. The group of K nearest neighbours can then be chosen by simply selecting any number of K users with the highest similarity value. Figure 3 shows a section of the overview of K nearest neighbours for user A, including the name of the corresponding neighbour, the number of ratings, the calculated cosine similarity measure and a graphical representation of the similarity. The number of ratings refers to the number of pictures that have been rated by both, user A and user B. To avoid very similar neighbours based on only one corresponding rating, the similarity in myLandscapes is only shown if user A and user B have both rated at least 3 pictures which have been also rated by the other user.

Neighbour	# of ratings	cosine similarity	
Marc	9	0.97099	
Uwe	7	0.799922	
Raphael	9	0.786239	

Fig. 3: Overview of K nearest neighbours for user a

After having calculated the similarities between user A and all other users, a memory-based (also heuristic-based) approach is used which has been described in earlier work [e.g. by Shardanand/Maes 1995; Resnick et. al 1994]. To calculate predictions of ratings for pictures that user A has not rated yet, different approaches have been proposed. One widely used approach which also considers that users may use the rating scale differently is shown in (b). It therefore uses the adjusted weighted sum.

$$r_p(a, i) = \bar{r}_a + \frac{\sum_{b \in K_n} (r_{b,i} - \bar{r}_b) \cdot \text{sim}(a, b)}{\sum_{b \in K_n} \text{sim}(a, b)} \quad (\text{b})$$

In (b) the variables are named as follows;

$r_p(a, i)$ refers to the predicted rating of user A for item i ,

\bar{r}_a is the average rating of user A,

$r_{b,i}$ is the rating of user B for item i ,

\bar{r}_b indicates the average rating of user B,

$\text{sim}(a, b)$ is the cosine similarity measure from formula (a) and

K_n refers to the K nearest neighbours.

After having calculated the predicted ratings for user A, the pictures with the highest predicted rating value are shown in the section on collaborative filtering.

3.5 User profile

In the “user profile” section every user can browse the data which is stored about him. Starting with the section myData he can access the area with the registration data (username, password, gender, year of birth) and change it if necessary. myHistory offers some insight into the user’s logfile information by displaying user date and time of the last visit, number of visits and number of rated pictures. The section myRatings

provides an overview on all rated pictures of the user and also mentions the rating value as well as date and time on which the rating was entered. As shown in Figure 3, myNeighbours shows the five users that are most similar to the user that is logged in. Finally, myPreferences lists the probable preferences of a user based on its ratings and the characteristics of every rated picture.

4 Limitations

The Personalization Demonstrator myLandscapes is still under development. There are still some shortcomings in respect to usability and technical implementation. Moreover, it has not yet been tested by a large number of people. This is necessary to optimize the interface as well as the used algorithms.

5 Further Work

The current state of myLandscapes is satisfactory to demonstrate some basic personalization and recommender systems approaches. The shortcomings mentioned in section 4 will be addressed in future versions of the Web site. The rating scale which at the moment is limited on one dimension will be enhanced by further dimensions to improve the predictions and to test more sophisticated approaches. The testing of the application with a large number of students will be performed shortly.

6 Conclusion

myLandscapes aims at providing insight into personalization functions and recommender systems methods. Even if some real world applications make intensive use of recommendations, most users are not able to reason why certain items have been suggested to them. This can lead to the belief that shop administrators do not really use sophisticated recommender systems but instead pretend to create a personal note at the same time offering regular items on stock.

Once myLandscapes will be finished, it should become a self-explanatory application which offers insight into the ways of how recommendations can be made. It can help interested web users and customers to get a deeper understanding of what e-commerce applications mean when talking about personalization in general or use claims like “especially for you”, “customer with similar taste” or “your group of neighbours”.

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