Towards a Residential Micro-Location Based Product and Service Recommender System

1 Introduction

Context aware product recommender systems are an ongoing field of [1]. Contextual information in this case can for example be the customer's mood, her age, or place of interaction between the recommender system and the user. The well-established pervasiveness of smartphones even allows to extend a customer's context by location (e.g. [2]) which is easily derived using GPS or WiFi. As soon as the location of a person is known it is simple to recommend suitable products. In the retail industry it is of particular interest to know where exactly in the store a customer is located to send out personalized coupons or offers related to the specific department. While in theory very interesting, it has been shown that the technology available is either inconvenient (e.g., NFC tags placed on shelf) or unreliable (e.g., Wi-Fi triangulation). Lately Apple introduced iBeacon [3] which overcomes some weaknesses of GPS and Wi-Fi and theoretically allows in-store navigation. That way a recommender system would be able to recommend truly context aware recommendations using micro-locating services, e.g., promoting current wine discounts only to customers standing in the wine department.

It is reasonable that all those technologies try to provide recommendations near the actual product to provoke immediate purchase decision. Various mobile shopping apps exist, allowing customers to purchase products or services wherever they are and independent of a physical point-of-sale in their proximity. Thus, as smartphones are ubiquitous the point of sale became ubiquitous as well (cf. Amazon or Ebay). Taking this into account we are currently developing a micro-location based recommender system that is aware of the current location of the customer in her own apartment. This allows to recommend suitable products there similar to in-store promotions based on the actual place of interaction between the recommender system and the user.

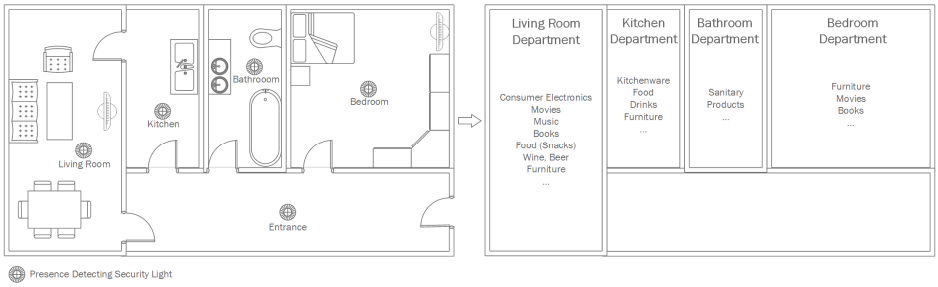
2 A residential micro-location based recommender System

We extend the idea of offering micro-location based recommendations in-store to an in-home scenario by arguing that customers are more accessible to recommendations if they factor in the current situation. Transferring the idea of in-store navigation where we would recommend wine related offers if standing in the wine area we recommend products and services based on the customers' position in the apartment. Figure 1 shows an exemplary architectural plan of an average apartment. For the sake of simplicity we assume every apartment has a living room where people probably spend most of their time, a bathroom for personal hygiene, a kitchen for preparing (and maybe consuming) food, and a bedroom to get rest. We furthermore assume that there is some kind of entrance where the event of somebody entering or leaving the apartment can be tracked. Similar to in-store locating it is not trivial to locate a customer in a specific room of her

apartment. In our experimental setup we will use the Comfy security solution [3] which is capable of determining the presence of a user in a specific room. This presence information is then used by Cosibon's [4] mobile product recommender system to determine relevant products in the consumer's current context, i.e., the place of interaction.

We regard the apartment of a user as a retail store and the room the interaction happens as the respective department. Consequently we will only recommend products and services related to the respective department. That might be consumer electronics in the living room, food in the kitchen, sanitary products in the bathroom and so forth. A sample mapping of a customer's apartment to the respective departments is shown in Figure 1. We also included some examples of suitable product categories.

Fig. 1. Mapping the customers' apartment to retail store departments



Let A be an apartment, P be the set of available products and $p \in P$ be an item. Every product has an associated set $p_d \subseteq A$ indicating the relevant rooms (i.e., departments). The set S of products to be recommended for a given room $r \in A$ is the simply calculated as $S(r)=\{p \in P | r \in p_d\}$. While this first approach is limited by the fact that the customer actually needs to be in her apartment, the second approach uses a weighted measure to determine how relevant a product is based on the presence history. Therefore, the second approach is applicable everywhere, since it relates the presence with the product. By evaluating the presence data we can derive the importance of a room to an individual, mapping this against the importance of a product to a room using some similarity function. Furthermore, for every room r we assign a weight ω_r indicating the usefulness of that product for the room.

$$sim(p,A)=1_{S(A)}(p)=\frac{\sum_{r\in A}\omega_r(p).\frac{presence_{customer}(r)}{presence_{avg}(r)}}{\sum_{r\in A}\omega_r(p)}$$

That way for example, if a customer spends a lot of time in the kitchen although we know she has also has a living room we might assume she is interested in cooking and thus will more likely recommend kitchen related products or services. In any case both approaches are planned to be part of a two-step recommender system. We will use the presented approaches to pre-sort results based on the respective and then use Cosibon's existing recommendation algorithm to return a more detailed recommendation based on further information like purchase history or personal interests.

3 References

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