ProductFinder: A Location Aware Product Information Display For Retail Environments

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ABSTRACT

Orientating oneself and finding products in retail stores is a well-known problem. Common modern retail stores have up to 10,000 m^2 and they offer not fewer than 100,000 products. At the same time, situated public displays and digital signage more and more find their way into such stores. We introduce the *ProductFinder*, an intelligent product information system for situated interactive public displays in retail environments. Connecting to the store's product database as well as to a market layout service, the *ProductFinder* forms a new digital connection between the physical store and its digital backend. Our system allows customers to lookup the placement of products in the store while providing filters for ingredients and allergens. We report on the results of an long term in-the-wild study on how customers interact with the *ProductFinder* and what they are searching for.

Author Keywords

Public displays, intelligent information systems, retail environment

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

INTRODUCTION

In this work, we introduce the *ProductFinder*, an intelligent product information system for situated public displays in retail environments. Connected to the store's product database as well as to a market layout service, the *ProductFinder* forms a new digital connection between the physical store and its digital backend. Our system allows customers to lookup the placement of products in the store while providing filters for ingredients and allergens. It shows the current location of the desired product in its corresponding shelf visualized on a virtual floor map. Customers can search either on a full-text search for specific terms, categories, shelves or product departments. Moreover, the *ProductFinder* further supports direct touch interaction for browsing the products, enabling a direct interaction with the virtual representation of the market without text input.

Figure 1. This figure illustrates the *ProductFinder* terminal in the retail environment. The user interacts via direct touch.

Furthermore, we evaluated in consideration of log data (search queries, touches, and feedback) how customers use the *ProductFinder* and what they are searching for. According to this analysis, the *ProductFinder* contributes to customer satisfaction, and gives the customer most welcome assistance.

RELATED WORK

Current installations in a supermarket are "long-in-the-tooth" barcode scanner systems or big screens displaying advertisement of products. Apart from retail environments, most of the public displays are interactive through touching the surface and allow users to walk up to the display and interact with them. Touch is accurate and provides a natural tactile feedback for the end of interaction. Cumby et al. [1] presented an intelligent shopping assistant designed for a shopping cart mounted tablet PC. In contrast to their very personalized approach for which customers have to login with a loyalty card, we allow anonymous interaction with the system. We record only touch coordinates and search queries without any registration process.

In contrast to existing hand-held shopping assistants [3] or instrumented shopping carts [4, 2], the *ProductFinder* user interface is optimized for the use on static portrait-formatted

PerDis '17, June 07–09, 2017, Lugano, Switzerland.

ACM ISBN 978–1–4503–5045–7/17/06.
http://dx.doi.org/10.1145/3078810.3084351

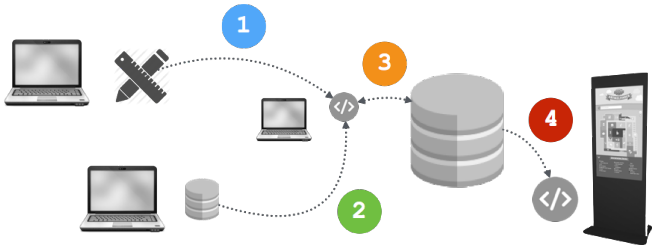

Figure 2. (1) A customized floor-planning toolkit is used to model the market layout. (2) The product data is provided by the market's inventory control system. (3) Here, the spatial and product data are coupled and imported into our database. (4) Finally, the system requests the data from its database.

displays as an enhancement for the sake of clarity and orientation compared with the limited screen real-estate on mobile devices. Furthermore, compared to the aforementioned work, our system is fully implemented and was deployed into a retail store.

PRODUCTFINDER

We deployed a prototype of the *ProductFinder* at three locations in a local retail store with more than 100,000 products, 224 shelves and 35 departments on an area of more than 15,000 square meters across two floors, serving about 40,000 customers per week. The system was running on a 46-inch touch-enabled display. Apart from a large number of features like a smart virtual keyboard and the possibility to filter the search results by features (e.g. organic, vegan, free of lactose or gluten), we also integrated an auto-completion functionality of the entered search term and made the market map interactive. The positions (coordinates on the map), identities and names of each department and shelf were drawn previously in a floor planning tool, exported and stored in `JSON`-format on a server, as well as imported to a local database (see (1) & (3) in Figure 2). The interaction is realized through single-handed touch interaction. Because of the portrait format of the touch-enabled large display we defined a standard user body height as 170 cm. In order to make the *ProductFinder* suitable for wheelchair users and for smaller people (or children) the search layer can be moved to the bottom of the user interface.

LOG DATA ANALYSIS

Our *ProductFinder* was deployed from September 2014 to August 2016, in a so called hyper-store with over 10,000 square meters and over 100,000 products. From the beginning we logged anonymously interaction of customers with the devices. We gathered data over 300,000 database queries and 1,200,000 touches. All data is anonymous. The following analysis is narrowed down to data from 2015, preventing seasonal distortions. We assumed a break of 60 seconds between two touches to the screen of a device as a new session (meaning a new user). We observed altogether 30,453 sessions, lasting between 18 and 71 seconds (50% of data; $M = 55.79, SD = 62.64$). Only 1,530 sessions (5.02%) consisted only of one touch to the screen, most sessions (50%) consisted of 9-30 touches. Most user interaction took place on weekend (on Sunday the store was closed) and in the evening (5pm - 8pm). There were no differences in usage patterns between the two devices, except a lower number of sessions (17,183 vs. 13,270).

On average 1.76 ($SD = 1.34$) unique search terms were entered per session, resulting in 41,078 search terms at all. Most searched products in 2015 were: salt (458, 1.11%), chips (420, 1.02%) and mustard (298, 0.73%). Most of the time, the people were looking for terms that could be matched directly to shelf names (e.g. salt, mustard with 79.48%), instead of departments (e.g. chips, cheese, or wine with 15.49%) or even products (e.g. a specific product name with only 5.03%). The usage statistics show a high acceptance of our *ProductFinder*. Unfortunately, we had no access to the exact number of customers per day. But we assume that the number of user interactions is in accordance with the number of customers in the store. This would explain the higher usage rates in evenings and weekend.

CONCLUSION AND OUTLOOK

In spite of the many advantages that the ProductFinder terminal in a market has to offer, there is still the fact that the frustrated customer first has to find the terminal itself in the store. This crucial limitation makes a mobile version of the system as urgently needed. Furthermore, people who are under time don't tend to visit hypermarkets with more than 2,000 square meters. So, they could import their grocery list into the mobile version of the ProductFinder and let the system navigate them through the market on the shortest or fastest way. This feature among others might be the reason why customers prefer a store to another.

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