Ma$$iv€ - An Adaptive Mobile Shopping Assistant

Fredrik Boström, Patrik Floréen, Joonas Kukkonen, Eemil Lagerspetz, Petteri Nurmi*
Helsinki Institute for Information Technology HIIT Department of Computer Science, P.O. Box 68, FI-00014 University of Helsinki, Finland
firstname.lastname@cs.helsinki.fi

Peter Peltonen, Petri Saarikko
Helsinki Institute for Information Technology HIIT
P.O. Box 9800, FI-02015 Helsinki University of Technology TKK, Finland
firstname.lastname@hiit.fi

EXTENDED ABSTRACT

Grocery shopping is one of the most fundamental everyday activities. For most customers a shopping list is an integral part of the shopping experience. Studies have suggested that shopping lists serve, e.g., as memory aids [1], as a tool for budgeting and as a way to efficiently organize the routine like shopping visits [6]. The central role of a shopping list is also highlighted by a study on mobile retailing where potential customers assigned highest priority to features that help them create and manage shopping lists [3].

Retailing provides an interesting domain for ubicomp applications, not because of the domain's large business potential. Many proposed ubiquitous retailing applications are based on instrumented shopping assistants (e.g., an intelligent shopping cart) and also often rely on RFID product identification, see e.g., [2, 5]. A user study by Newcomb et al. [3] suggests that users prefer applications they can use on their personal devices. Thus, the focus has shifted towards assistants that run on a PDA or a mobile phone. In our work, we do not rely on RFID technology, but allow product identification through any available means, such as barcodes or, if available, RFID tags.

The central role of a shopping list provides a fundamental challenge for mobile shopping assistants. Writing a shopping list on a piece of paper is relatively easy and straightforward, whereas typing a shopping list on a mobile device is slow and cumbersome due to the limited input capabilities of the mobile devices. Hence, before mobile shopping assistants can reach widespread usage, they need to make creation and management of shopping lists easy as well as provide enough added value to the customers that justifies the effort of typing in the shopping list. As a step towards this goal, we are currently developing Ma$$iv€, an intelligent shopping assistant for mobile devices. The work is conducted together with industrial collaborators, including a large store, in a national Finnish research project. The language of Ma$$iv€ is Finnish as it has been targeted at the local population.

*Corresponding author

Figure 1. Screenshot of the Shopping List management feature of Ma$$iv€. The user can add and remove products, modify the number of items to purchase and mark items as collected.

In Ma$$iv€, customers create shopping lists using natural language. A screenshot of the shopping list management feature is shown in Fig. 1. In addition to supporting shopping list creation and management, the goal of Ma$$iv€ is to provide product recommendations, information about special offers, information and suggestions about recipes, targeted advertisements, navigation information inside a store and so forth. In the interface, each feature is represented using a tab pane. Ma$$iv€ has been developed as a web-based application that emulates a standalone application. As the target device we have used the Nokia E61i since it provides a full keyboard and a relatively large display.

In this extended abstract we briefly introduce the main features of Ma$$iv€. The first three features have been implemented whereas the latter features are currently under development.

Natural Language Shopping Lists

Contrary to previous shopping assistants, Ma$$iv€ allows users to write shopping lists using natural language and without requiring any predefined product taxonomy. Association rule mining is used to suggest possible

shopping list entries. The association rules are mined from previous entries of the users and hence the suggestions are also expressed in natural language. The most common suggestions are generic product descriptions such as milk or cheese. Possible future extensions include supporting speech input and scanning for shopping lists from SMS text messages.

Natural Language Search

Whereas customers tend to use natural language for describing products, grocery stores use product specific information. In order to provide information about product offers, location of products etc., the natural language entries in shopping lists need to mapped into products in a store. As part of Ma$$iv€, we have developed a grocery retrieval engine that supports this task. User evaluations have indicated that our retrieval engine can determine appropriate products for approximately 80% of shopping list entries. More details about the retrieval engine and its evaluation are given in [4].

Product Recommendations

In addition to suggesting shopping list entries, we provide product recommendations to users. The product recommendations are calculated in two steps. As the first step, we use the grocery retrieval engine to map entries in a user's shopping list into potentially relevant products. This step is needed to obtain an understanding of the user's interests. In the second step, we combine the retrieval results with an item-based collaborative filtering algorithm. The product recommender has been developed using a shopping basket dataset from our collaborating store with information about the corresponding loyalty-cardholders.

Location-Triggered Advertisements

Our plan is to integrate the product recommendations with advertisements. First of all, matching the recommendations against a database of current product offers makes it possible to rank the advertisements based on how interesting they are to the user. Secondly, the location of the user can be used to trigger the advertisements when the user is near the corresponding products. In Ma$$iv€, we use a commercial WiFi-positioning engine to locate the user.

Recipe Support

We have integrated Ma$$iv€ with a recipe database. The goal is to make it possible to easily add items from recipes to the user's shopping list. We also plan to detect and recommending recipes based on the items on a shopping list. If it seems from already selected items that a certain dish is to be prepared, the missing ingredients can be suggested to the customers as reminders: "Did you forget the eggs?"

Shop Navigation

A common task for shoppers is to find a particular product. To facilitate this task, Ma$$iv€ will include navigation support. We will implement different ways of providing the information and evaluate these ways with real customers: textual information about where to find the product (e.g., aisle number), a map view of the shop, pictures showing the direction of where to go, and providing directions using landmarks ("go towards the meat desk") with optional voice output.

Current Status

In addition to continuing the implementation of additional features, we are currently undertaking initial user experiments that focus on the usability of the user interface. Unfortunately, at the time of writing we do not have enough data to draw conclusions about other features than the natural language search. We are also launching a field study during fall 2008.

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