Ma$$iv€ – An Intelligent Shopping Assistant

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Abstract. Our intelligent shopping assistant, Ma$$iv€, is a web application for mobile phones that aims to help users with their everyday grocery shopping by offering features such as natural language shopping lists, product recommendations, special offers, recipes and in-shop navigation. This short paper briefly describes the current and planned features of Ma$$iv€.

Introduction

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 routine shopping visits [2]. 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 least 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., [4, 5]. A user study by Newcomb et al. [3] suggests that users prefer applications they can use on their personal devices. Thus, our focus is on assistants that run on a PDA or a mobile phone.

We have developed a mobile shopping assistant, Ma$$iv€, that runs on mobile phones. Ma$$iv€ is as a web application, and can thus in principle run on any mobile device with an AJAX capable browser, but so far we have focused our development on the Nokia E61i, which is a 3G mobile phone equipped with a QWERTY keyboard and WiFi (Fig. 1). In the following sections, we briefly describe the current and planned features of Ma$$iv€.

Fig. 1. Photo of Ma$$iv€'s shopping list feature in use on a Nokia E61i mobile phone.

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.

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 [6] and [7].

In order to speed up text entry on mobile devices, we have integrated predictive text input that uses association rules mined from a large amount of shopping data in order to rank the suggestions made by the system, based on the user's current shopping list. For example, if the user's shopping list already contains ice cream, chocolate sauce might get ranked higher because of a rule *ice cream* $\Rightarrow$ *chocolate sauce*. This leads to the correct item being suggested after fewer key presses when compared to traditional frequency based systems. We conducted a user study, and found that text input speed increased by approximately 40%, while error rates dropped by over 80% compared to the non-predictive version [8].

Product Recommendations

In order to make personalised product recommendations, we have combined our grocery retrieval engine with generalized association rules mined from a large set of shopping data. We first use the grocery retrieval engine to translate the natural language items on the user's shopping list into actual products in the store. We then look for the actual products, and their parent categories, in the antecedents of a large set of generalized association rules. The scores from the grocery retrieval engine are combined with the interest of the association rules in order to rank the recommendations. Details about the implementation and user study results can be found in [9].

Special Offers

In a survey on feature preferences that we conducted in our partner supermarket, features that could help the customer to save money, e.g., price comparison and special offers, were ranked the highest. To this end, Ma$$iv€ can display all of the current special offers in the supermarket. In the future, we plan to sort and rank these based on the users's interests and current shopping list. We could also suggest recipes based on what's on special offer.

Recipe Support

A common scenario is that a person is doing his or her grocery shopping after work, but is unsure of what to cook. The person might have some left over ham in the fridge, and would like to make use of it. In this scenario, the person could use Ma$$iv€ 's recipe search feature to look for recipes containing ham. The ingredients can then easily be added to the shopping list if desired.

In the future, we plan to detect and recommend recipes based on the items on the shopping list. If it seems from already selected items that a certain dish is to be prepared, the missing ingredients could be suggested to the customers as reminders: "Do you also need eggs?"

Future Work

Shop Navigation

A common task for shoppers is to find a particular product. To facilitate this task, we plan to integrate navigation support into Ma$$iv€. 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. The user is located using a commercial WiFi positioning engine.

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.

Concluding Remarks

Developing Ma$$iv€ as a web application has proven to be challenging due to unpredictable browser behaviour and very limited debugging options. So far we have been able to work around these limitations, and we expect the situation to improve rapidly as mobile web applications become more and more popular.

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References

1. Block, L.G., Morwitz, V.G.: Shopping lists as an external memory aid for grocery shopping: Influences on list writing and list fulfillment. Journal of Consumer Psychology **8**(4) (1999) 343–375
2. Thomas, A., Garland, R.: Grocery shopping: list and non-list usage. Marketing Intelligence & Planning **22** (2004) 623 – 635
3. Newcomb, E., Pashley, T., Stasko, J.: Mobile computing in the retail arena. In: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (SIGCHI), ACM (2003) 337–344
4. Metro Group: Future store initiative. (`http://www.future-store.org/fsi-internet/html/en/375/index.html`) [Retrieved 06-21-2008].
5. Roussos, G., Tuominen, J., Koukara, L., Seppala, O., Kourouthanasis, P., Giaglis, G., Frissaer, J.: A case study in pervasive retail. In: Proceedings of the 2nd international workshop on Mobile commerce (WMC'02), ACM (2002) 90–94
6. Nurmi, P., Lagerspetz, E., Buntine, W., Floréen, P., Kukkonen, J.: Product retrieval for grocery stores. In: Proceedings of the 31st Annual International ACM SIGIR Conference on Research and Development in Information Retrieval, ACM (2008) 781 – 782
7. Nurmi, P., Lagerspetz, E., Buntine, W., Floréen, P., Kukkonen, J., Peltonen, P.: Natural language retrieval of grocery products. In: Proceedings of the 17th ACM Conference on Information and Knowledge Management (CIKM'08), ACM (2008)

8. Nurmi, P., Forsblom, A., Floreen, P., Peltonen, P., Saarikko, P.: Predictive text input in a mobile shopping assistant: Methods and interface design. In: Proceedings of the 13th International Conference on Intelligent User Interfaces (IUI), ACM (2009)
9. Nurmi, P., Forsblom, A., Floreen, P.: Grocery product recommendations from natural language inputs. In: Proceedings of the First and Seventeenth International Conference on User Modeling, Adaptation, and Personalization. LNCS, Springer (2009) Accepted for publication.