Intelligent Pervasive Framework for Consumer-Supplier Interaction

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Abstract

Ever-increasing capabilities of modern mobile devices and their relatively low prices make them widely popular and motivate their use in many previously unexplored areas. Large numbers of mobile devices, coupled with their wireless connectivity medium and mobility make them perfect building blocks in numerous pervasive environments. In this short paper, we present an adaptive pervasive framework that enables a context-aware intelligent matching of consumer preferences with current retail store offerings that employs mobile wireless devices.

1. Introduction

Small handled devices, such as wireless personal digital assistants (PDA) and internet-enabled wireless phones, have limited capabilities such as slow processor speed, small amounts of memory and short battery life. However, performance characteristics of the high-end PDA's available today approach those of low-end laptops of several years ago. While this still does not make them an acceptable replacement of modern laptops or workstations, currently available wireless mobile devices may be a perfect fit in some applications that do not require supreme computing capabilities. In particular, pervasive environments require computing devices that are wireless, mobile and small in size [5]. Advances in distributed network programming technologies, such as Sun's Jini [1], Microsoft's Universal Plug-and-Play (UPnP) and HP's JetSend, make it even easier to effectively use mobile devices in pervasive environments.

The framework presented in this paper uses mobile devices as building blocks to create a pervasive environment to enable an effective communication between consumers and retail suppliers. It includes an adaptive context-aware intelligent client application for mobile devices that is capable of storing information about the consumer's preferences. Each supplier (e.g. a retail store) is equipped with a server capable of storing a list of current offerings and/or the complete inventory. The objective of our framework is to assist the consumers to avail present offerings of a given supplier by intelligent and adaptive matching of the current supplier information with the consumer's preferences.

2. Related work

There are a number of projects that focus on enabling pervasive computing using mobile devices. The interactive workspaces project at Stanford University focuses on seamless integration of mobile appliances. Omnisphere [3] project is a communication and information environment for wireless services based on context, user preferences and device capabilities that allow construction of complex services from simple ones. HP's Cooltown Project [4] is a "vision of a technology future where people, places, and things are first class citizens of the connected world, wired and wireless - a place where e-services meet the physical world, where humans are mobile, devices and services are federated and context-aware, and everything has a web presence."

3. Vision

Our goal is to enable an intelligent and adaptive matching of consumer shopping preferences and interests to the current offers of a given supplier. Suppose that John is a consumer with a wireless

PDA or any other portable computing device that is capable of storing and maintaining the list of John's shopping interests and preferences categorized by the types of products John usually buys or is interested in buying. A store that John visits (suppose, it is a Virgin Megastore) is equipped with a server that contains the up to date information about the current specials, sales and offers. This server may also contain a full list of products in the store's inventory. All products are categorized by their type. Each product may have links to other related products. For example, a Virgin Megastore might suggest that if John is interested in Sting, he may also like old recordings by Police, whose "Greatest Hits" album is currently on sale.

The client application on John's PDA is capable of connecting to the Virgin Megastore's server and can communicate the list of John's preferences to it. The server returns a list of special offers on products that match the client's requirements. Additionally, the returned results may contain secondary information, such as products related to the ones that are of interest to the consumer. These results are organized in such a way that the consumer can navigate through them and choose to obtain more information about each product. In the process of navigation, the client application on John's PDA analyzes which products John chooses to explore further and it may add them to the list of John's preferences, but with a lower priority.

4. Implementation

We considered different technologies that enable dynamic networking of devices such as Sun Microsystems' Jini, Microsoft's UPnP and HP's JetSend in order to select the "best fit" for our application. Even though Microsoft's UPnP is built on open Internet and networking standards and provides mechanisms for dynamic network formation by supporting discovery/join and leasing, it is restricted to dynamic spontaneous networking of devices only and does not support software services at present. Also, it is not a protocol-independent architecture as it mainly depends on SOAP for remote invocations. HP's JetSend is a protocol-independent technology that enables intelligent communication between JetSend-enabled devices without the need for device driver installation. Though it is protocol independent, it is also limited to facilitate device-to-device communication and thus does not fit our purpose.

Sun's Jini is an open source, community driven, protocol independent distributed networking technology that enables spontaneous dynamic networking of services. Jini's service oriented architecture simplifies the implementation of the elements of pervasive computing [2]. It views both devices and software as services thus eliminating the hardware/software distinction. It supports discovery, joining, leasing and remote event handling needed for ad hoc dynamic network formation and allows dynamic downloading of code eliminating the need for device drivers. Jini provides the required infrastructure that is well suited to implement the proposed framework through its support for dynamic plug and work of services.

6. Summary and future work

In this paper, we presented an adaptive pervasive framework that can be used by retail suppliers to match their current sales and promotions with the interests of individual buyers. Currently, we are working on the detailed design of this framework and are in the early stages of prototyping. The working prototype of this framework will include a server that contains a store inventory with its current offers and a client application that runs on a PDA and can communicate with the server. The framework will use Jini's service-oriented approach and dynamic spontaneous networking abilities that facilitate pervasive computing to equip consumers with relevant details to enjoy their shopping experience.

This project may be further extended to accommodate devices such as lower-end PDA's and mobile phones which are more resource constrained both in terms of memory and processing power than the category of devices that we have addressed in this paper.

7. References

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