Wireless Marketing of Ephemeral Personal Goods: the Case of Auctioning Screen Estate for Wireless Advertisements

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Abstract. We consider the notion of *ephemeral personal goods* that can be traded wirelessly, capitalizing on the anytime anywhere capability of mobile and wireless technologies which permits immediacy of action. More specifically, this paper considers a market-based mechanism for controlling the flow of advertisements from businesses to the mobile devices of potential customers. The mechanism relies on recognizing that the screen estate of a mobile device user at appropriate contexts (e.g., time and place) is a commodity in itself, and that businesses might pay to "purchase" or "rent" the screen estate of the masses, and in doing so, purchase the right to send advertisements to users. We describe an implementation using the JADE-LEAP multiagent toolkit, and discuss open issues.

1 Introduction

There is an unprecedented virtual proximity between businesses and customers, made possible by the growth of wireless Internet technologies. Customers can be reached anywhere, anytime, at least in principle. Such anywhere anytime capability permits immediacy of action and so, opens doors for new forms of commerce. In this paper, we consider the notion of *ephemeral personal goods,* which refers to items belonging to an individual that can be traded for monetary gains but these items are ephemeral in the sense that they might only have marketable value for a limited time and/or their highest value is only at a specific period. Outside of this period, the item might not be as valuable – the item should not be sold too early or too late. Due to the time factor, immediacy of action in trading such goods is important. We consider an example of an ephemeral personal good that is traded wirelessly via an auction in the area of wireless advertising.

Indeed, mobile and wireless marketing,[1] including wireless advertising, will play an important role for the growth of businesses, and so will location-based advertising

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[1] See http://www.mmaglobal.com/

[5,7]. However, an outstanding issue is the cost to customers, who might face unprecendented spamming. Customers can opt-in to receive wireless advertisements of interest, when they are ready or simply feel like it, but this is only one way customers can control this channel. The incentives and potential benefits should continually outweigh costs in order that customers might be encouraged to keep this channel open.

This paper presents a market-based mechanism for controlling the flow of advertisements from businesses to the mobile devices of customers. The mechanism relies on recognizing that the screen estate of a mobile device user at appropriate contexts (e.g., time and place) is a commodity in itself, and that businesses might pay to "purchase" the screen estate of the masses. Various pay-to-surf or pay-to-view-ads companies have surfaced in the past, and so this idea of purchasing, or renting for a period of time, a user's "desktop screen estate" (and hopefully, the user's attention) is perhaps not new. Here, we do not comment on the business virtues of this idea and consider a variant of such an idea. We consider how a mobile device user could auction off its screen estate at certain times for certain periods, thus (for a small fee) opening its doors to advertisements in a restricted way, with at least small guaranteed incentives. By adjusting the price of his/her screen estate, the customer can regulate the volume of advertisements he/she will receive. And the screen estate value of responsive users (users who respond often to such advertisements) might be higher than non-responsive users. It is perhaps too early to comment on the business success or failure of such a model, but we mainly consider the technical aspects in this paper.In the rest of this paper, in Section 2 we detail what is it about screen estate that we have viewed as a commodity. Section 3 describes the mechanism by which screen estate can be auctioned off with the help of intelligent software agents. Section 4 concludes the paper, and discusses open issues.

2 Screen Estate as a Commodity

Users of mobile devices sell *screen-estate-items*, which roughly quantifies the resources a user is making available to view advertisements on his/her device. A screen-estate-item is a tuple:

(<device location>,<date and time>,<duration>,<size>,<minimum price>)

where <device location> refers to the current location of the device, <date and time> refers to the current date and time of day, <duration> refers to the duration for which the user is making his/her screen space available to display advertisements, <size> refers to the size of the screen estate for viewing advertisements (size can be stated relative to the device, e.g. full screen or half-screen, or number of lines of text), and <minimum price> refers to the minimum price the screen-estate-item will sell for. Two other important pieces of information that accompanies a screen-estate-item are the user's interest profile, and device characteristics, the former is needed to help

vendors target their advertisements, and assess if they should join in the bidding,[2] and the latter, to help determine the actual characteristics (e.g. color, etc) of the advertisement. These properties which define a screen-estate-item enables advertising that is much more contextualized, and targeted, and enables the vendors to know more about the situation of the user. For example, a screen-estate-item such as the following tuple describes the situation of a user on Bourke Street Mall (a shopping Mall in Melbourne) during the typical 1pm lunch hour, opting in to receive advertisements at full-screen mode for the next 2 minutes.

(Bourke Street Mall, 4 March 2003;1 pm, 2 minutes, full screen, $0.50)

This clearly describes an opportunity for nearby (within 150m of the user's location, say) food vendors to target this user. Other attributes might be worth adding which adds value to the screen-estate-item by providing more information to vendors of what the user might spend money on, including the mood of the user (e.g., bored, sad, nervous), the intentions of the user (e.g., hungry and looking for food), or the user's wish-list.

3 Selling Screen Estate via Location-Based Auctions

In our prototype implementation, the user selects a set of values to define a screen-estate-item to be auctioned. Our prototype is implemented using a multiagent system based on the JADE-LEAP toolkit (http://leap.crm-paris.com/) running on a Palm OS emulator.

3.1 JADE-LEAP

Intelligent multiagent systems refers to systems consisting of a set of interacting agents, where each agent is a software entity (a process or a thread) that exhibits autonomous, proactive, communicative (with other agents and/or with users using high-level interaction protocols), and adaptive behaviour. Such agents should also be capable of limited amounts of reasoning (e.g., to carry out a pre-programmed bidding strategy). JADE-LEAP [3] is a toolkit for building multiagent systems where the agents reside on mobile devices and stationary devices. Agents can run in the Java2 MicroEdition environment on a small device, and interact with agents on stationary devices over a wireless network.

3.2 A Prototype System
The reason for using agents is to automate the process of auctioning screen-estate-items, both for vendors, which potentially deals with hundreds or thousands of sellers

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[2] However, vendors might want to send the advertisements regardless of the profile, even if the product might not match the user's interest profile. This is because, the profile might not be an exhaustive description of the user's interest, or the user might like what is being advertised.

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at a time, and for sellers who are on-the-move and would not want this process to be a burden to them. Moreover, we leverage on existing FIPA work on standardizing interaction protocols and toolkits that implement such protocols, thereby shortening implementation time. Figure 1 shows the user interface for defining a screen-estate-item. Figure 2 sketches the architecture of the system.
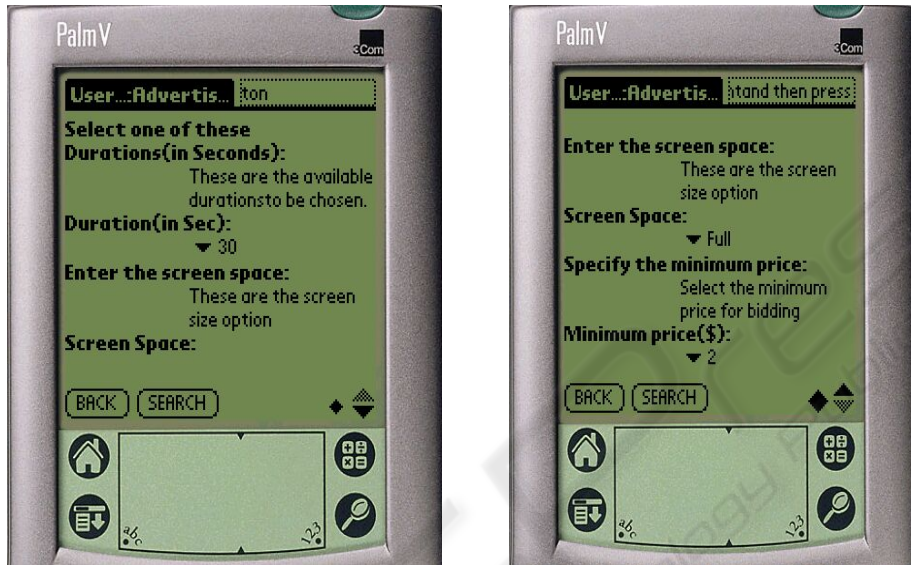

Fig. 1. A series of pull-down menus to help the user define a screen-estate-item.
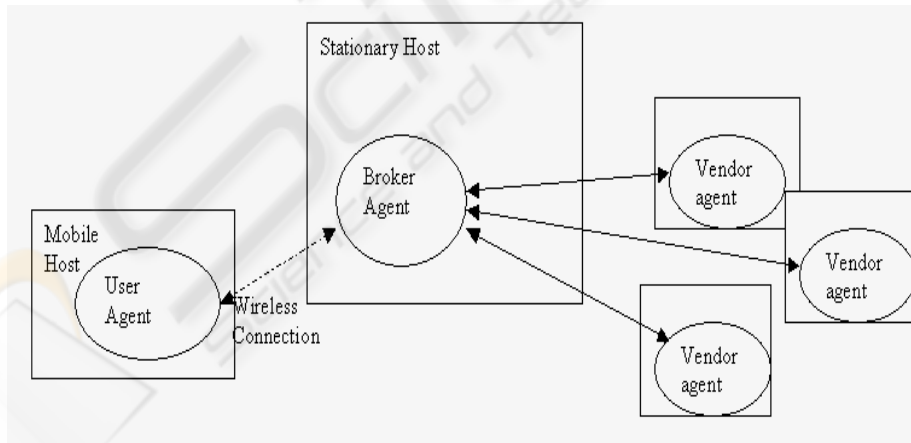

Fig. 2. The multiagent system for a location-based auction

The basic architecture should have the following agent types:

- User Agent: its runs on the mobile device. It interact with the user and server-side agent. It accept queries from the user, sends it to Broker Agent and gives the result back to the user. The protocol between the User Agent and the Broker Agent is based on the *FIPA Brokering Interaction Protocol Specification (http://www.fipa.org/specs/fipa00033)*. Figure 1 are screen dumps of the user agent.

- Broker Agent: the main role of the broker agent is to coordinate the auction process, from assembling interested vendors, regulating the auction (as the auctioneer), to finalizing the transaction if a sale takes place.

- Vendor Agents: it represent the actual retailers like Myers etc. It decides what price should be offered in a particular round of the bidding process. Such agents might make decisions based on pre-programmed strategies.

The Broker Agent interacts with Vendor Agents using the *FIPA English Auction Interaction Protocol Specification (http://www.fipa.org/specs/fipa00031)*. User agents might interact with Broker agents over short-range wireless networks such as Bluetooth, Infrared, or Wireless LANs, in which case location information comes for free.

Once the user has defined a screen-estate-item for sale, he/she sends it to the Broker Agent which then initiates an auction with vendors to sell the item. Once the screen-estate-item has been sold, the winning vendor is permitted to send advertisements to the user in the way prescribed in the definition of the screen-estate-item. The User Agent and Broker Agent can ensure that the restrictions specified in the screen-estate-item definition are adhered to. For example, the vendor can only send advertisements for a fixed period and not longer – the Broker Agent or the User Agent might stop the flow of advertisements after the specified period.

The utility of the auction mechanism is that the user can set a price of his/her screen-estate-items, and this price acts as a filter for the amount of advertisements that gets sent to the device. The higher the price, the fewer the advertisements. Hence, our approach is more general than simply having the user opt-in or not opt-in to receive advertisements. The user has the option of opting-in (by setting the price to zero) or opting-out (by setting the price to infinity), or choosing an option in between these two extremes, i.e. receiving some advertisements.

Multiple instances of the agent types can be used to cope with large numbers of customers concurrently.

3.3 Broader Scope of the Work

The broader scope of this work is the integration of a number of special purpose location-based services grouped together under the concept of a location-based e-marketplace that is superimposed on a physical marketplace [4]. Such a location-based e-marketplace will virtually integrate the vendors of the physical marketplace and provide new ways for users to interact with these vendors while the user is in sufficiently close proximity to these vendors. Figure 3 shows the opening menu of the user agent with three options: (1) modifying the user profile, (2) entering a user query to initiate a location-based reverse auction as described in [4], and (3) selling a

screen-estate-item as described in this paper. Selecting the third option leads to the screens as shown in Figure 1. Other shopping helpers (e.g., [2,6,8]) might be integrated as another option within the user agent. The enabling networking technology for such location-based e-marketplaces might be the proliferating hot-spots [1].

Fig. 3. The user agent's opening menu.

4 Conclusions and Open Issues

We have proposed the concept of auction-based filtering of wireless advertisements by considering parameterized screen estate as a commodity. We see that it is possible to define screen-estate-items and to sell them to vendors anytime anywhere as long as there is supporting infrastructure in the environment (e.g., appropriate servers). However, users might not want to spend time configuring screen-estate-items while on-the-move. For greater convenience, users should be able to pre-configure a variety of screen-estate-items and sell them in just one-click. Filtering of advertisements will also benefit from information about user interests stored in user profiles. But such profiles should be stored locally (on the mobile device) for privacy reasons. This implies filtering on the mobile device which might be resource intensive - we envision future mobile devices to have greater resources for such purposes.

Our current on-going implementation is only simulation work and shows that the method proposed is feasible in principle, but there are a number of outstanding issues to tackle for the idea to be feasible in practice:

- The system should allow the user to adjust the price even after advertisements start to arrive. For example, if the user finds that too many advertisements are coming in, the user can raise the price (or conversely, if too few advertisements are coming in, the user can lower the price). Alternatively, the user agent might do that automatically given some pre-programmed

rules. This feature might require continual auction processes whereby the user's new prices can be employed without delay.

- There is a need for a reputation mechanism for users. For example, it is always possible that a user signs up for advertisements, i.e. effectively opts-in, and then not view any of the advertisements at all, or that when advertisements arrive, they are immediately deleted. One way to overcome this problem might be to use interactive advertisements or to keep a history of the user's responsiveness to advertisements viewed. A user who often responds to advertisements viewed might have a higher screen-estate value. If a user never responds to any advertisements, he/she might lose credibility and few vendors might bid for his/her screen estate.
- The user has little control over the advertisements sent to the user's device. Offensive or inappropriate material might find their way into the user's device, unless the user agent performs some local filtering - in this regard, textual materials might be easier to analyze than multimedia.

Our approach might also be integrated with existing location-based advertising middleware (e.g., [5]).

We think that there is a rise in personal assets that the individual can sell on-demand and screen estate for wireless advertisements is only one possibility. There are other digital assets such as information or services that can be wirelessly marketed in an ad hoc manner. For example, one could sell information, recommendations, referrals, or be a shopping advisor for certain period of time.

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