Distributing Event Information by Simulating Word-of-Mouth Exchanges

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Abstract. Word-of-mouth is a persuasive but error-prone and unreliable mode of communicating personally relevant event information in a university environment. In this paper we present a design, early prototype, and the results of preliminary usability tests for Augmented Word-of-mouth Exchange (AWE), a portable system that models and enhances word-of-mouth communications. AWE simulates word-of-mouth exchanges by automatically transmitting accurate and persistent information about community events between physically proximate devices, and by visualizing the popularity of each event. The system uses physical proximity between mobile devices to help users filter incoming information and determine its relevance.

1 Introduction

As the number of communication channels we use and amount of information we receive through them increases, so does the quantity of irrelevant and redundant information that people receive. Filtering what information is of interest or importance becomes a difficult task that requires time and attention. In determining what transmissions are most important, people take into account several factors, such as the source of the information, the channel through which it was transmitted, and the party to which it was communicated. As they become increasingly bombarded by various electronic and traditional methods of communication, the utility of lightweight interfaces to help them determine the relevance of information and facilitate filtering becomes apparent.

Predicting the potential relevance of information is a challenging task for which there are many possible approaches. We chose to take advantage of the fact that a person is likely to find something relevant if people with similar interests, or in a similar context, found it relevant. Furthermore, people who share space or interact frequently are likely to share some common ground and have similar interests. Using increasingly popular personal digital assistants (PDAs) with wireless networking capabilities, we can take advantage of encounters to transfer information between people who are likely to share interests. Our goal was to design a system that would

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help users filter information by using the relevance of proximity that handheld devices afford.

The Graphics, Visualization, and Usability Center at Georgia Tech is an interdisciplinary organization that holds over 40 events a year. To broadcast event information to its members, the GVU Center relies on email, posters, web pages, and word-of-mouth. We researched how GVU members receive information about events and found that while mass email, posters, and web pages present event information accurately and completely, and are persistent artifacts, they tend to broadcast information to a broad group of recipients, some of whom may find the information irrelevant or not of interest. We found word-of-mouth to be a highly influential but error-prone and unreliable mode of communication. The close, personal context typical of word-of-mouth heightens the influence and relevance of this mode of communication. There is no guarantee, however, that the information communicated is accurate or complete. In addition, the messages communicated are transient, thus requiring the recipient to commit the information to memory, or actively record it. For example, when a student is informed of an event by her colleague, she is more likely to pay attention to that communication than to a mass email advertising the same event, though the information may be inaccurate or forgotten later.

In this paper, we describe Augmented Word-of-mouth Exchange (AWE), an event information dissemination system designed to overcome the shortcomings of word-of-mouth communication while preserving the advantages it offers.

2 Design Motivation

Our design is motivated largely by the observation that people who are frequently in close physical proximity often share interests or activities, and information relevant to one person in this context is likely to be relevant to others. In the environment that we observed, individuals who are located near each other, or who encounter each other frequently, are likely to share some form of context. For example, individuals who work in the same lab will have colleagues in common, share space, be engaged in similar types of research, or be affiliated with the same organizations. Likewise, people who work in labs on the same floor of the same building may be performing research in similar areas and will come into contact each other on a regular basis. These people are likely to chat while working or mention events when they meet, and it is these exchanges motivated by proximity and collocation that we wished to mimic with our system.

In our interviews with students, we found that one of the factors that influences participation or attendance at an event is the knowledge of labmates' or colleagues' interest in it. We aimed to take advantage of the social factors that influence people to attend an event by providing users with information about the attendance plans of the groups of people with whom they share context or interests.

Taking advantage of potential shared interest may help to simulate the personal nature and likelihood of relevance in word-of-mouth communications, but we were also interested in preserving the fidelity and persistence of information that electronic means provide. We did not set out to create a system that would replace either word-of-mouth or more formal means of transmitting event information. Rather, we wanted to incorporate the benefits of email or posters into a word-of-mouth style communication, to give users both the potential relevance of face-to-face communication and complete and accurate information.

3 Design

We first illustrate our design with this scenario:

> *The GVU Center plans a talk on mobile computing and a barbecue for students. In addition to advertising using mass emails, they also beam the event information using RF beacons located in the building. Matt, an architecture student who is running AWE on his PDA, walks by one of these beacons in the morning and receives notification of these two events. He decides that he is not interested in the talk and specifies that he does not plan to attend it, but chooses to attend the cookout. Later he passes by Liza, a computer science student who has not yet received information about these events on her handheld. The event information is transmitted to her device, as are Matt's attendance plans. Liza immediately decides to attend the barbecue, but is unsure whether the talk will be important to her. The fact that Matt is not planning on attending it is shown to her as a low planned attendance for the general public at this event. As her indicated interest groups are the Everyday Computing Lab and the Future Computing Environments groups, Matt's plan to not attend the talk does not affect the group popularity metrics on her device. She then goes to her algorithms class, and finds that the planned attendance rate of the public for the talk continues to be low. However, when she enters her lab and information from her labmates devices is transmitted to hers, she finds that a high percentage of her interest groups are planning on attending it, so she decides it must be relevant and chooses to attend.*

The AWE system is designed to allow users to automatically transmit event information to each other, and provide users with a view of outside interest in the event, a dynamic indicator of its potential relevance to the user.

When the GVU Center advertises an upcoming event, necessary information such as the event's title, description, time, and location are beamed from beacons located near the GVU office to devices running AWE that pass within close range. These devices continually transmit the information to other devices within a range of a few meters, thus propagating the event information through proximity.

When users receive notification of a new event, they can indicate tentatively whether or not they plan to attend the event (see Fig. 1). AWE keeps track of the percentage of encountered users who plan on attending the event, and updates this metric when it passes new devices. This propagation of dynamic interest information allows users to see the interest level of the general public in an event, information she may use to determine its relevance to her.

Fig. 1. The listing for the event through which the user can schedule his planned attendance and view the event's current popularity levels

This model of information transfer, however, does not guarantee that all information gathered through proximity is relevant to the recipient. Some degree of filtering is necessary to prevent users of the system from being bombarded by irrelevant event or attendance information as they will likely pass by other users with whom they share little or no context, and in whose attendance they are not interested.

To reduce the effects of this irrelevant information, we utilize interest groups. Interest groups help the user to judge whether the event is relevant to him by indicating if other people who share his interests are planning on attending. Our system allows the user to select groups with whom he shares common interests, or in whose event attendance he is interested. When the user comes into contact with members of these groups, metrics that track the popularity of events among the user's interest groups are updated, reflecting the planned attendance of the people encountered. This information is visualized alongside indicators of the overall popularity of the event. By allowing the user to view the popularity of upcoming events among specific groups as well as the general popularity of the event, the user is better informed of what events will be most relevant to him (see Figs. 1 & 2).

3.1 System Details

AWE requires an application installed on a Personal Digital Assistant (PDA); radio frequency (RF), peer-to-peer communication services available on the same PDA; a desktop application to install both the AWE application and the user's group preferences on the PDA; RF-enabled beacons to broadcast new events to users; and an application to enter new events to be broadcast by the beacons. The AWE application is the heart of the system for end-users and consists of a main screen listing all events received by the application. The name, date, and public and group rankings for each event are listed in the main screen. Users can sort on any of these dimensions to facilitate navigation of the events. A checkbox next to each event indicates whether the user has scheduled this event in her calendar (see Fig. 3).

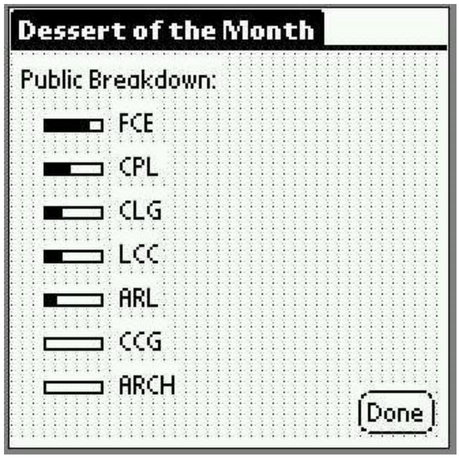

Fig. 2. The display showing the event's planned attendance among groups of users

Fig. 3. The main AWE screen listing all events received by the user

Selecting an event brings up a detailed description of the event. From this screen, users can automatically add the event to the PDA's calendaring program, delete it, view their schedule on the day of the event, or see a finer-grained view of the popularity of the event for individual groups.

When users add the event to their calendar through AWE, the application records this information, then later exchanges this information with other AWE-enabled devices to generate popularity rankings of events. That is, AWE uses a person's intent on attending an event as the method of determining the relative popularity of an event. To maintain privacy, a user's scheduling information is not made available to others; it is only used to generate the event rankings.

To implement the communications model promoted by AWE, information must be exchanged automatically without requiring intervention from the user. For this reason, we require a PDA enhanced with RF, peer-to-peer communications, for example, those offered by Bluetooth[11].

Event rankings show the popularity of the event with the general public and with user-selected groups. AWE therefore needs to know in what groups the user is interested, as well as of what groups the user is a member. The web-based desktop program for AWE provides the facilities to collect this information and to install both the application and user's group information on the PDA. The creation and subscription to user groups in our system is currently left to administrators as opposed to the individual users, much in the way that administered email groups are often handled. This feature also reduces opportunities for users to monitor the behavior of specific individuals.

We place "beacons," or stationary, RF-enabled broadcasting devices, in the environment to transmit new events to users who pass by. The location of the beacons influences the propagation of the message; thus they are placed in locations with meaningful context, for example, outside the GVU Center's office. A form-based application enables individuals to create new events to broadcast via the beacons. In our design, we have focused on the case where one organization generates new events, and do not consider the possibility of users generating their own events.

4 Relevant Research and Related Work

MemeTags [1] are digitally enhanced name tags that store and exchange "memes", or text-based sayings, with other name tags in line of sight of each other. When a user finds a meme they like on another's device, they can copy it to their own name tag. The most popular memes are presented on a "community mirror" for viewing by all. AWE shares with MemeTags a similar communication scheme and a similar "ranking" of the most popular information, but differs in its application space and intent.

Recommender systems [5, 10] promote the concept of peer review to create meaningful and relevant reviews of everything from books to websites. In particular, AWE promotes a form of *social navigation* [2] by implicitly capturing and sharing information regarding planned attendance. AWE also differs from most recommender systems by being completely decentralized in nature.

Previous work in wearable communities [5, 8] has addressed similar needs for peer review and filtering. Much of this prior work requires explicit action on the user's part to maintain relevant filters, such as rating the quality of an interaction. AWE gleans this information from an action that directly benefits the user, in particular, adding an event to the calendar.

Horvitz's work on mixed-initiative user interfaces outlines design principles for intelligent systems that attempt to infer user goals. The current AWE prototype uses a simple metric of proximity for filtering, but any future work incorporating more sophisticated intelligence will be influenced by these principles.

5 Status and Results

At this time, we have built a prototype of the AWE application which runs on a Palm III. Using this prototype, the user can read about an event, indicate whether she plans to attend it, and view the group and public planned attendance ratings. Using Wizard of Oz[1] data, the user also receives notification of new events, and changes in group and public attendance information. We have also created prototypes of the web-based forms through which new events are created, but this information is not automatically propagated to the devices.

We performed some initial usability tests in which we gave the device with the application to ten GVU members and students and asked them to evaluate the interface. Many of the evaluators were skilled in HCI techniques; to these participants we administered either an hour-long cognitive walkthrough exercise or heuristic evaluation exercise [4, 6]. The cognitive walkthrough exercise allowed participants to evaluate the usability of the interface by following a prescribed set of steps including finding and reading about a particular event, examining and assessing the group popularity of the event, viewing one's own calendar, and scheduling the event. The heuristic evaluation entailed that the participants explore the prototype, evaluating it specifically in regards to a set of system-specific heuristics, including visibility of system status, consistence of interface design, recognition over recall, and user control. With the few participants unfamiliar with HCI techniques, we performed more informal evaluations, allowing them to try the interface and give freeform comments.

Based on user feedback, we made several modifications to our design. In the earlier designs of this system, group selection was a feature of the application on the device, allowing users to add or edit their interest groups directly on the PDA. We found, however, that having setup and configuration features directly on the device greatly increased the complexity of the interface, necessitating more interaction screens, and making the application, as a whole, less lightweight. In addition, the

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[1] We simulated portions of the system in order to evaluate the initial design concept and user interaction.

small screen did not lend itself well to the potential for having long scrolling lists of interest groups, which were better viewed on a standard monitor.

While our tests were concerned primarily with the usability of the interface, we also wanted to gauge the extent to which people found the attendance indicators to be useful and desirable features. We found that most test participants appreciated having this data available and would use it to help them decide what events to attend, but were also concerned about others tracking their attendance as they passed.

6 Future Work

Our next step is to fully implement AWE using real RF sensing and real GVU event information so that we can deploy the system and test its utility as a communication tool that provides awareness to aid its users. In addition to completing the system as we designed it, there are also several changes in the design that we would like to try.

One area of exploration is the creation and maintenance of interest groups. As users' interests change, or as they find themselves becoming increasingly involved with other groups, how can we allow them to easily edit their group membership in a way that does not require too much attention? In addition, could the system automatically classify users into groups based on their attendance patterns in relation to others?

Finally, we need to consider the implications of using physical proximity as a means of inferring common interest or context. Deployment of our device will help us to determine to what extent shared space is an accurate and reliable metric. We will also need to experiment with various thresholding functions to determine what kind of physical proximity is nontrivial for assuming shared context; we will need to consider the duration and frequency of encounters to decide whether they are relevant. Understanding the relation between common interest and physical proximity will be especially necessary if we are to scale up the number of events, broaden the user base, or consider a physical space larger than the few buildings for which our prototype was built. [9]

7 Conclusion

We have presented the design of AWE, a decentralized system designed to mimic and enhance the word-of-mouth communications model. By using an augmented word-of-mouth model of communication, the system gives users complete and accurate information while simulating the personal relevance of face-to-face communication. To do so, the system takes advantage of the fact that one can gather data through proximity using handheld devices. By paying attention to the event attendance of people nearby, who are likely to share context, the system enables the user to filter event information based on others' planned attendance. It gathers and provides data that help users determine the relevance of upcoming events.

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