Castaway: Context Aware Status/To-do list
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Hypothesis

The larger hypotheses motivating the concept of Castaway are twofold. First, we hypothesize that people would be able to remember more tasks, organize their tasks more efficiently, and spend less time worrying about forgetting tasks if they had a flexible, multimodal (voice, paper, mobile phone, email, web) “ready to hand” way to create, centralize, integrate, access, manage and carry out the diverse and numerous tasks, appointments, and reminders typically stored in “To-Do” lists, address books, day planners, calendars and human memory. Second, we further hypothesize that people would be able to remember more tasks, receive fewer interruptions at inopportune times, and spend less time worrying about forgetting tasks and about receiving distracting and unwelcome interruptions if the centralized “To-Do” database were status and context aware, and took the initiative, when appropriate, to deliver reminders of these various tasks based on both the temporal and spatial attributes of the tasks, as well as the combination of these types of attributes.

Given the current course-related time constraints, the specific hypotheses we intend to test are that 1) a significant proportion of items and tasks on To-Do lists (mental or artifact-based) are associated with particular geographic locations, 2) the organization of, and indexes to, these items in memory are not only temporal, but also spatial, and 3) receiving notice of these items based on their spatial features and the person’s geographic location will enable people to remember and carry out more tasks than if they had relied solely on memory or on non-location based methods (such as a paper list or PDA).

Evaluation Plan

As there is currently little known about people’s practices of recording and accessing location-based tasks, we propose to carry out two exploratory data collection efforts. The first study will be a diary study of sorts. We will ask participants from the CS147 class to send to us, or otherwise log, all the items that they might put on a To-Do list or otherwise want to remember and/or be reminded of. We will encourage participants to actively “call in” whenever the moment arises that they encounter or think of a new to-be-remembered item. We will attempt to make this logging as flexible and painless as possible, offering students the options of calling in, sending an email, sending an SMS (the cost of which we will reimburse), or creating a paper log to be handed in at the end of the study. Specifically, we will ask participants to specify whether the To-Do item is temporally-based, spatially-based, a combination of temporal-spatially based, or other. We will then analyze the corpus of To-Dos to determine 1) the percentages of temporal, spatial, temporal-spatial, and other types of To-Dos, 2) the mean number of unique locations within and between subjects, 3) the relative prevalence of specific (e.g. my office) vs. generic (e.g. any drug store) location-based items, and 4) individual differences in To-Do frequency and type, and logging modality preferences. Aspects of the actual corpus may suggest further analyses, as yet unforeseen.
The second study will examine current practices in recording and carrying-on-your-person of To-Do lists. We will randomly sample from Stanford students passing by White Plaza. We will briefly interview them as to their current To-Do list habits. Specifically, we will ask what types of To-Do lists they use (including both what format (such as paper vs. PDA) and what types of items (such as things to do, things to buy, things to tell people, etc.)). Do they have multiple To-Do lists? Are these organized by type? How accessible/portable are their various To-Do lists at that moment and in general? We will also inquire as to what electronic devices they currently have on their person (e.g. cell phone, laptop). Further, we will also ask them to speculate on whether location-based reminders would be useful and/or desirable, and on what would be on their wish list for ideal To-Do organization?

If time permits, we will also conduct studies to assess the usability of various aspects of the novel map-based interface we are proposing. As the proposed interface is so novel, there are several components whose usability is unknown and might affect acceptance or effectiveness of our system. For example, one question is whether users will mind inputting their tasks into the system. Here there is not only the question of whether they would be willing to do so at all, but also whether the specific modes of interaction we design are optimal. We will further be interested in users’ perceptions of the display and organization of items on our To-Do list interface. In addition to observation-based metrics of usability, we would attempt to elicit specific user satisfaction feedback on the various components of our interface.

Also if time permits, we will conduct a comparative study between users who are equipped with our system, and users who are not. The study will attempt to parcel out the benefits of using our system over using various graded levels of similar systems (e.g. ranging from users who use no task or status management tools to those who use a variety of them, such as a PDA, IM status management, paper calendars, etc.). The evaluation will examine both the effectiveness and acceptance of context-aware reminders. The evaluation will focus primarily on the usefulness (value-added) for users, as well as on the perceived hassle (cost) of using the system. For example, did users of our system remember more things and carry out tasks more efficiently (as in fewer trips doubling back to accomplish something that was forgotten the first time)? How did users of our system rate the amount of time spent on task management, and how does this compare to ratings by non-users?

**Current Prototype**

*General Overview*

Castaway is divided into three components:

1. Supporting the input of tasks
2. Viewing and managing those tasks
3. Automatically generating context-aware alerts
We have begun prototyping a web-based system that addresses the first two components. (We would probably wizard-of-oz the third component for initial user studies, as location tracking is rather expensive.) Castaway currently supports the following functionality for an individual user:

- **Create new tasks.** Although our intention is that most tasks will be input via a mobile interface, we want to leave open the option of creating tasks in a stationary environment. Whereas the mobile phone is ideal for brief tasks to be recorded, a web-based interface is more appropriate for adding more detailed tasks.

- **View/edit their current tasks.** Because mobile input can often be quick and dirty, the web-based interface allows for the refinement of these tasks. Moreover, the list of tasks to the left allows users to scan and search for particular tasks.

- **Visualize their tasks via an interactive map.** Through Castaway users can associate tasks with individual locations (e.g. Home or 630 Serra Mall), several locations, or natural language descriptions of generic places (e.g. gas stations, grocery stores). The map allows the user to see which tasks are associated with what locations. Moreover, Castaway will allow users to interact with the map to refine which locations are associated with a particular task. For example, if a user has “Buy milk” associated with “grocery stores,” but doesn’t like one of the grocery stores that the system suggests, the user will be able to remove the association between the task and that particular location.

Screenshots of the current prototype can be viewed in the Appendix.

An interesting point to note is that although we’ve explicitly built a system to address task creation, management, and visualization, our evaluation is, in its own way, a prototype. By having subjects (the “user”) submit their tasks to us (the “system”), we get a pretty good sense of what modes of task input are most popular with users (choosing among email, AIM, SMS, phone, etc.). For example, if users tend to e-mail in their tasks significantly more than they SMS them, this would be a testament to the fact that allowing tasks to be submitted via email would be an important feature in the final system.

*Implementation Details*

Castaway is web-based to maximize portability. It also leverages AJAX in order to make navigation and search as seamless as possible. For the map-based visualization, Castaway uses the Google Maps API to generate and display maps, the Yahoo! Geocoding API to relate addresses to latitude/longitude, and the Yahoo! Local API to relate generic location descriptors such as “movie theaters” and “grocery stores” to meaningful locations.
To simulate the mobile aspect of the system, preliminary mockups will probably be made using static HTML pages on an OQO.

**Further Development**

By the end of the quarter, we will likely not have enough time to first complete a prototype and then test it on users. To accommodate the shortened time span, our approach will involve conducting evaluation and development in parallel. Data collected from our evaluation will directly inform the development of our prototype; insights gained from building the system will directly inform both the questions asked during the evaluation period and the type of analysis conducted. For example, if during the evaluation period we begin to notice that a mere 10 percent of all tasks is location-based, we would deemphasize the map-based visualization in our current prototype. On the development side, if we are able to build a prototype involving Ron’s Smart Paper that can import handwritten tasks into the system, we might focus our White Plaza questions on how people currently track and manage their tasks on paper.

What’s most exciting about this system is the scalability of all its components. Take, for instance, the inputting of tasks. Although we’re currently focused on inputting through a mobile interface and the refinement of that input on a web interface, many more possibilities exist: paper-based (as alluded to above), speech-based, and much more.

Another component of the system that scales well is the context-aware aspect. For now, the system is designed to deliver either SMS messages or voice mails to a user based on that user’s location. The possibility exists, however, for many more actions to be taken based on where one is. For example, when in a movie theater the system could automatically send a message to your phone to silence itself (this was actually one of the original motivations for our system).

**Related Work**

Previous research has suggested that people are able to make use of various types of cues when accessing memory for events, including spatially-, temporally- and agent-based features of the memory (Taylor & Tversky, 1997; Wagenaar, 1986). However, this research has focused on memory for past experienced or studied events. The current study will examine memory for planned events and activities.

Prior research has also shown that associating memory items with visualized, spatial locations can increase recall of those items, as in the Method of Loci (Gruneberg, 1992; Kemp & Van der Krogt, 1997). Here we propose to take advantage of a less arbitrary and therefore potentially more powerful spatial cue: the location associated with a task. Our research will investigate the benefits of a sort of externalized Method of Loci, in that we will offload the location-based recall of items to our Castaway system.

In 2004, research was conducted on TaskVista (Belotti et al., 2004), a “task list manager” that has helped informed the design of Castaway. Interesting takeaways, for example,
include findings that people dislike being forced to add metadata to a majority of their
tasks (due date, attendees, etc.), and that an effective task management system must be
very lightweight (i.e. compact and unobtrusive). Although interest in the social context
of task management was mentioned, spatial context was not mentioned as subjects
worked in an office all day and conducted many of their tasks in a confined space.

Recent research has also explored the integration of paper and digital notes in task
management (Lin, 2004). What’s particularly interesting about this research is the
proposed model for a task’s lifecycle:

![Task Lifecycle Diagram]

Whereas our evaluation process examines the Trigger and Record phases (what sort of
things get people to record their To-Do’s), the prototype currently addresses the Maintain
and Refer phases. As more information is gathered regarding the Trigger/Record phases,
we will begin prototyping interfaces in those areas.

Belotti, Victoria et al. (2004). What a To-Do: Studies of Task Management Towards the
Gruneberg, M. M. (1992). Effect of visibility of the loci on recall using the method of
loci. In M. M. Gruneberg & P. E. Morris (Eds), Aspects of memory, Vol. 1: The
Lin, Min et al. Understanding the Micronote Lifestyle: Improving Mobile Support for
23(3), 202-204.
Years. Cognitive Psychology, 18, 225-252.
Figure 1: General View. In the left column, the user sees a list of all their tasks/reminders in blue. The green, bracketed categories denote the type of trigger the user has requested. The Where/When areas display any locations and/or times associated with the particular task. The right area has two panes: a detail pane for displaying details associated with a particular task, and a map pane for displaying a location-based visualization of those tasks.
A user can click on a particular task to load the detail information for that task. In this case, the user has clicked on the “Check Mail” task on the left column. Based on the current configuration, Castaway would send an SMS with the message “Remember something!” anytime the user is near a post office, regardless of time.

Sometimes voice reminders can be more helpful/descriptive than SMS reminders. In this case, a user has set up an alert to trigger whenever that user is near the grocery store. The contents of the message are a recipe, which would have taken too long to input via SMS.
Figure 4: Task Creation View. Users can create new tasks via this interface by clicking the “Add new item” link. Although we don’t intend for this to be the primary way in which users input tasks, having this functionality will still be helpful, especially for the bulk entry of tasks. Evaluation will determine what other methods of input are appropriate (mobile, paper, etc.).

Figure 5: Basic Map View. By checking on the box to the left of the task, a user can visualize the location associated with a particular task. In this case, the user has set up an SMS reminder to trigger the next time he is home. The map informs the user that “Home” is 178 Ayrshire Ct., but it can be configured to some other address.
Figure 6: Complex Map View. The user can also overlay the locations associated with multiple tasks. In this example, the user sees all the locations associated with three tasks: “Silence cell phone,” “Buy oil,” and “Kleenex.” The potential to overlay locations is one of the more powerful features of Castaway; through this visualization the user gets a sense of what locations are important, and what areas of a city provide more “value” than others.