OwnTime: A System for Timespace Management

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ABSTRACT
We describe OwnTime, a system for facilitating timespace management, and discuss the results of a user study comparing the disruptiveness of meeting establishment without and with the system. The study indicates that the OwnTime system shows potential for improving users' time management. We also raise relevant issues about computer mediation in traditionally interpersonal tasks and note further work to be done in areas such as context-aware and wearable computing.

Keywords
Timespace management, lightweight interaction, CSCW

INTRODUCTION
Time management is a complex activity, involving the coordination of multiple tasks and multiple parties. O'Conaill and Frohlich, for example, define *timespace* as the intervals of time into which people organize their work, and note challenges in timespace management in the face of interruptions and given the importance of unscheduled workplace communication [1]. Traditional methods of timespace management, which assume formal and stable task schedules, are too rigid to support informal meetings. Ad-hoc time management, on the other hand, can be inefficient and disruptive, as the person one needs to meet with may be out or engaged, requiring interruption or indefinite postponement of the meeting, sometimes repeatedly [2]. Interruptions are pivotal timespace events, as one study shows that even after the interruption ended, in 40% of cases subjects did not return to their original activity, even though prior to the interruption there had been no indication that the activity was finished [1].

OwnTime is a system, which attempts to bridge these gaps in timespace management support, allowing flexible meeting scheduling and lessening disruption. Normally, noticing visitors and engaging with them demands a large cognitive context switch away from the current task. OwnTime uses abstract graphical representations of parties with whom the user may want to meet, ideally shown on a translucent headworn display, to minimize cognitive disruption. In short, it is an attempt at a minimal solution to the joint projection problem [4], establishing the participants, roles, actions, timing, commitment and grounding, within the realistic context of other pre-existing, ongoing projects.

Parties who want to meet with an OwnTime user run a client program to briefly inform the system of their identity, a meeting topic if desired, and their short-term availability in minutes. When a meeting is thus requested, a transparent figure is presented to the OwnTime user, informing them of a potential visitor. If engaged, the user may ignore the figure, which will fade away in a minute. Alternately a single click (regardless of pointer position) will display the three pieces of meeting information to the user (see Figure 1). The user may then click a second time, indicating the information has been noted and a meeting can take place within the visitor's specified time availability, or do nothing, upon which the information will fade away in a minute; the decision about whether a meeting is possible is reported back to the potential visitor. This extremely lightweight interaction is designed to minimize the visual and cognitive impact of the meeting information on the user, so that deciding on the potential meeting will disrupt the ongoing task (whether another meeting or writing a conference paper) as little as possible.

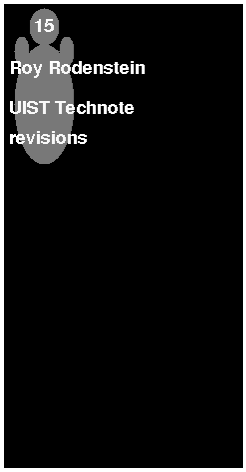

Fig. 1: Information about a potential meeting is displayed

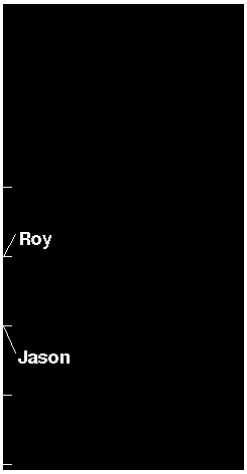

Fig. 2: Roy is still available for a meeting, Jason is not

EXPERIMENTAL SETUP
We conducted a study with 42 subjects to compare OwnTime's disruptiveness with face-to-face interruptions. We hypothesized that OwnTime would allow for informal interruptions by visitors that were less intrusive than direct engagement.

Subjects read passages and answered multiple-choice questions testing their recall and comprehension for each paragraph, advancing to the next passage if all questions

were answered correctly or having a chance to reread the passage and attempting to answer the questions again. The dependent variable measured was time until subjects had answered all questions correctly, for each passage. Subjects performed this reading and quiz task for six passages while wearing translucent VirtualIO Glasses. During three of the passages they were not interrupted; during one passage they were informed of a visitor through OwnTime's display, clicked to request the meeting details, and after reading these clicked a second time to accept the meeting (approximately a 5-second interaction); during another passage a visitor came by and, in a scripted 5-second interaction, asked the subject for a meeting; and during another passage a visitor came by and, in a scripted 30-second interaction, discussed an issue with the subject.

The subjects were college students in 13 different majors who received credit for psychology classes for their participation. They ranged in age from 18 to 23 and were evenly distributed by gender across conditions. The three types of interruption were evenly and randomly distributed to account for possible ordering effects.

	OwnTime	5-second interruption	30-second interruption
Reading and quiz	413 sec.	416 sec.	460 sec.
Attempts	8.4	9.0	9.6

Table 1: Average time and answer attempts per story

STUDY RESULTS

We focus on time required for the reading and quiz as well as number of attempts required to correctly answer the quiz questions as measures of performance and concentration. As shown in Table 1, the results follow the predicted trend. Overall, 25 of the 42 subjects (60%) performed faster when interrupted via OwnTime than when interrupted in person for 5 seconds. ANOVA calculations show that due to high variance these results are not statistically significant. Trimming one outlier, however, shows a statistically significant difference between the OwnTime and 30-second interruption cases (p=0.03). As far as number of attempts, an ANOVA shows no significant difference, while trimming two outliers shows statistical significance in fewer number of attempts required in the OwnTime case than the 30-second interruption (p=0.04). When asked on a questionnaire which method of meeting management was less disruptive, in-person or OwnTime, 29 of 42 subjects (69%) felt OwnTime was less disruptive.

DISCUSSION AND FUTURE WORK

The study is encouraging in showing that a timespace management system such as OwnTime can be minimally disruptive to ongoing tasks. Opportunities for timespace management abound. For example, Whittaker et al report that 88% of meetings in their study were terminated by a third party engaging in conversation with one of the participants [3]. Thus, it is often the case that while the interruption is attended to, which according to that study takes 2 minutes on average, the party one was meeting with is kept idle.

Given the results of the study, we are confident OwnTime is a positive step toward addressing the many remaining challenges in timespace management for interpersonal collaboration. OwnTime aids in initiating interactions and controlling interruptions [2] as a compact solution to the joint projection problem, as discussed; it can reduce the occurrence of failed meeting attempts when calling on others [3]; and it can recenter the balance between initiator and recipient in synchronous meeting requests, minimizing their disruptiveness so that focus on ongoing tasks is not lost [1]. OwnTime also displays a queue of accepted meetings with the initiator's name as a cue which moves down along a set of 15-minute tick mark delimiters (see Figure 2), aiding with tracking of time, which people are notoriously inaccurate at doing [5], and providing a record of interactions [1]. Further details about the OwnTime system architecture can be found in [6].

The minimalist interface concepts developed in OwnTime can be extended to other methods of synchronous communication, such as pagers and the telephone, which require a strong attentional shift in order to deal with them. Additionally, further work on fine-grained, dynamic timespace management could be very fruitful in the context of wearable computing due to its possibilities for context awareness. For example, scheduling agents could make use of OwnTime to note an opportune time to request a meeting for their owner, adjusting other tasks' schedules to these opportunities, which in turn other parties' scheduling agents can take into account in planning those parties' tasks.

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