Avatar Proxies: Configurable Informants of Collaborative Activities

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INTRODUCTION AND MOTIVATION

In the physical world, every user exists at one and only one place, but in a collaborative virtual environment (CVE), other paradigms are achievable such as a user existing at more than one place at a time. In a collaborative environment, a user is typically engaged with one *primary activity* at a time. As the number of collaborative activities increases, users are unable to maintain *focal attention* on all activities, and must offload some cognitive effort to a peripheral attention sphere. This delegation of attention—the movement of primary activities as focal attention to *secondary activities* as *non-focal attention*—requires that users remember certain parameters of context switching, such as *what* the secondary activities are, and more importantly, *when* to switch their focal attention to these activities. Keeping track of these context-switching parameters is itself a cognitive load that often degenerates focal attention on primary activities.

Our goal is to augment users' cognition by delegating the work of remembering context-switching parameters to other entities in a collaborative environment. We call these entities *avatar proxies* because our implementation is in a CVE where users are iconified as avatars, but the techniques and results are general to a broader range of collaborative environments. Avatar proxies notify users when they are required to switch their focal attention to secondary activities.

DESIGN RATIONALE

Avatar proxies are user-configurable entities chartered to perform specific tasks as a surrogate for the user's actual presence. Avatar proxies present an identity to other users that is easily recognized as a representative of the owning user (e.g. as a faded or slightly modified version of the user's actual avatar). They are not fully enabled agents that can self-create strategies or originate autonomous efforts. A user can create multiple avatar proxies in different locations and for different purposes while maintaining a central collective view of all deployed proxies. Avatar proxies inform users of task completion and/or progress. Notification is an option specified by the user when instantiating a new avatar proxy. Avatar proxies have a limited, user-defined lifetime and automatically expire even if the purpose of the proxy was not fulfilled.

Avatar proxies act as indicators of social activity in a shared context. Ackerman and Starr [1] argue the importance of social activity in computer supported cooperative work (CSCW) systems. They suggest that just knowing others are doing some activity has consequences on the outcome. Avatar proxies extend the passive visualization of social proxies [3] to a more active role since they are user-created and configurable. Avatar proxies are similar in basic functionality to reporting agents [4]. Users creating avatar proxies have more control since they are able to configure avatar proxies to detect specific collaborative activities. The notification capabilities of avatar proxies make it possible to inform a user synchronously while inside the environment (e.g. popup message window) or asynchronously while outside (e.g. email).

USER EVALUATION AND DISCUSSION

We implemented avatar proxies in MOOsburg: a CVE that models the town of Blacksburg, Virginia [2]. It has collaborative tools and is based on an interactive map that provides access to virtual places. Figure 1 depicts a user,

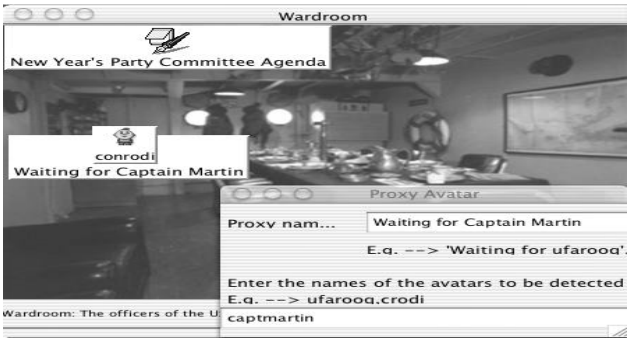

Figure 1. Creating an avatar proxy in MOOsburg.

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"conrodi", who is configuring an avatar proxy to wait for the entry of user Captain Martin into the Wardroom, a location in MOOsburg.

Our formative evaluation was primarily motivated to find out how users would react to the concept and functionality of avatar proxies. The formative evaluation consisted of four male volunteers. The subjects had various degrees of prior experience with MOOsburg, from naive to expert. Each subject performed three tasks of increasing difficulty involving avatar proxies. We asked our subjects to think aloud as they completed the tasks. This protocol allowed us to gauge how subjects received the proxy notion. All tasks were timed, although timing issues were de-emphasized to our subjects.

The first formative evaluation task instructed the subject to create an avatar proxy that would detect when another user, Donald, entered a virtual location. After creating an avatar proxy, the subject was instructed to move to another location in MOOsburg. We engaged the subject with a sideline activity while Donald moved to the location occupied by the proxy. We observed how quickly the subjects were able to recognize the resulting notification and how reasonable their resulting actions were (e.g. returning to the location to have a discussion with Donald). The second task instructed the subject to create an avatar proxy that detected the discussion of a specific agenda item. The third task consisted of constructing multiple proxies to detect both Donald's presence and the progress of a meeting agenda. After the evaluation, each subject was asked to complete a short questionnaire that assessed their level of understanding of avatar proxies and the usefulness of the concept.

All subjects were able to complete all tasks successfully. Subjects were able to combine individual proxy tasks to resolve more complex goals (such as returning to a meeting only if a certain individual was there and a specific agenda item was being discussed). Our post-experiment questionnaire revealed a consistent appreciation for the overall concept of avatar proxies and their utility in a CVE.

All subjects indicated avatar proxies provided leverage in detecting collaborative activities; on a scale of 1 to 3 (least to most useful), all subjects selected 3. Unsolicited comments such as "pretty cool", "definitely like the idea," and "I liked all of them" support a conclusion that avatar proxies are a workable construct. Although we did not implement email notifications as an option, all subjects rated it as a future feature. This result suggests that although the users were not tasked with asynchronous scenarios that would lend themselves to email notification, they realized on their own that such situations might arise. This result suggests that avatar proxies not only facilitate synchronous interactions but can also provide significant long-term task awareness during asynchronous collaborations.

CONCLUSION AND FUTURE WORK

Proxies may be used in a variety of domains/applications such as CSCW and meeting systems, office and workplace environments, Instant Messengers (IMs), CVEs, command and control systems, and many others that involve multiple activities at their core. For example, IMs could support interesting capabilities if they implemented basic proxy primitives that allowed the proxy to examine contents of incoming message streams. A user participating in a group chat might lose interest in the conversation unless certain key phrases (perhaps about the user) came through. A proxy could allow this user to focus on other chat sessions with the confidence that any discussion containing specified fragments would cause the proxy to alert. In command and control scenarios, a complex proxy could monitor the information stream coming from several reporting agencies for a set of coincidental events, thereby allowing the proxy owner to concentrate on other work until the situation changed.

Avatar proxies augment cognition and support activity awareness by delegating collaborative articulation work to user-configured surrogates. The full range of potential application domains needs investigation, particularly high pressure, time critical applications such as command and control. In collaborative environments, the social implications of avatar proxies on other users of a system (in particular, whether and how their activity might change based on the perceived presence of a proxy) define another area worthy of study. Finally, it would be interesting to implement avatar proxies in a context where it would take hours or days for a proxy to activate in order to investigate additional complexities such as appropriately resetting the user's context. Overall, we see a diverse opportunity for investigation based on applying the fundamental notion of avatar proxies in various domains.

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