BuddySpace

Large-Scale Presence for Communities at Work and Play

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1 Social presence and scale

Our research addresses the question of how presence in networked environments can enhance the sense of social participation and well-being among isolated individuals in very large virtual communities. Large-scale presence poses a special challenge, and for this reason we aim to leverage the 'buzz' and 'feel-good factor' evident in certain kinds of large crowds. As Donath (1996) asks: "Is there a design that would make palpable the sensation that one was indeed on-line in the company of millions of other people?" Such a sensation could of course be thrilling, but it may equally be daunting, confusing, annoying, or simply irrelevant, depending on the context. We therefore pose a slightly different question. In particular, we want to know *"how can we create and sustain very-large-group 'buzz' at work, study, and play?"*

We know that the presence of very large numbers (millions) of people can be represented visually using density plots on maps (Dodge and Kitchen, 2000), and in very compelling ways such as the NASA Earthlight map (NASA, 2000) which shows the most densely populated areas on our planet via a stitched-together global panorama of night-time satellite photos revealing the illumination patterns of city lights. This is more than a visual gimmick: it provides the observer with a new and emotionally-involving way of seeing patterns of human social systems at a current snapshot in time.

How can we harness this type of impact for large collaborative communities? We have some clues from massively multiplayer online games and virtual worlds such as Everquest and Asheron's Call. We believe that the world of massive online gaming can be used as a very useful metaphor for re-creating a similar experience within the work context. Indeed, a notable massive-scale effort in a work context was that of the IBM Social Computing group which created WorldJam (Halverson et al., 2001) – the largest-ever corporate online brainstorm, which leveraged the crowd 'buzz' to collect ideas from over 50,000 IBM employees in a 72-hour period! Within our own work environment, the aforementioned examples are illuminating: The Open University has over 180,000 active students annually studying hundreds of courses at a distance, literally around the world (Daniel, 1997). Being remote, these students lack an important aspect of a typical student's experience – social interaction with their fellows.

Beyond the issue of representing such a large community, there are other concerns. For instance, what is the added value of being part of a 'virtual crowd'? What is the effect of 'presence awareness' of people sharing similar interests (e.g. a course topic)? Can this awareness be turned into a meaningful *social experience*? For the answers to these and similar questions, we are looking into ways to enhance social interaction and facilitate the establishment of relationships among isolated individuals.

Considering distance learning and the distributed work place, we know from the work of Nardi and Whittaker (2000) that it is users benefit from knowing 'who else is around'

and, from the work of Whitelock et al (2002), that presence of peer-group members can not only enhance the emotional well-being of isolated learners but can improve problem solving performance and learning. However, can this 'well-being' be achieved on a large scale and with individuals who barely knew or saw each other before? Can the phenomena that permeate the 'play world' be transplanted into work and collaborative learning? We think the answer is "*yes, they can*". To this extent, we have undertaken the design and implementation of a scaleable presence-oriented environment called BuddySpace, which we describe subsequently after first 'setting out our stall'.

2 A draft 'manifesto' – ideas & hunches for discussion

Here we present six of our motivating themes (many of which already taken as 'dogma' within the gaming world), and suggest some associations with work practice:

- **Big scale is an asset, not a liability.** We need to think beyond 'performance bottlenecks': consider that certain interactions such as chanting, swarming, and Mexican Waves, *only* make sense at large scale. Within the work context, consensus-forming and 'bloc voting' in large organizations have their most profound impact on a large scale.
- **Crowds do 'behave'**. When you put a bunch of people together, things happen – even without leaders and without rules. Drawing on the example of large crowds above, informal means for expressing opinions (even 'cheering' or 'booing') have the right effect with a larger group that 'co-ordinates itself voluntarily'.
- **Automatically constructed groups facilitate 'early buy-in', whereas self-constructed groups facilitate 'sustained use'.** Establishing a sense of identity and understanding 'ground rules' in any collaborative communication incurs a certain cognitive startup cost. Establishing 'a priori' group membership can lower this entry cost, yet allow *ad hoc* customization to ensure long-term viability. Consider the case of distance learning courses for which hundreds or thousands of students per course enroll. Providing a 'start-up' group of like-minded individuals is a good way to build the bonds of the group.
- **'Presence' is entirely a state of mind.** Much work on 'tele-presence' concentrates on fidelity to real-world appearance, tele-operators (robot arms), 'being there', or avatars to convey a 'nearly there' impact. In contrast, we believe that the key to presence lies in the *knowledge* of others' existence, plans, motivations, intentions, and attention. These entirely mental states convey the essence of presence. Put more strongly, our conjecture is that this mental presence is both *necessary* to achieve communal impact and *sufficient* to induce the aforementioned 'feel-good' or 'buzz' in others. This presence awareness is normally easier to achieve face-to-face, so at a distance and at scale other ways are needed to achieve or induce an analogous feeling.
- **Good visualizations, grounded in familiar metaphors, are an important key to scalability.** People need to see (or hear) the overall '*gestalt*' of what is happening in order to know that it *is* happening. The grounding in familiar (visual) metaphors enables people to focus on the content of the situation rather than incurring cognitive overhead to make sense of what is shown. Familiarity

obviously changes with the contexts and needs people work in. Hence, different visual clues must be supported to convey information in a natural way. Consider geographic maps automatically generated for distance learners. They are an abstraction that we learn to parse and comprehend as children, but they are ubiquitous and interpretable by the majority of the population. Maps are not the only visualization, but they are an especially salient one. Seeing fellow students/workers in *my region* or *close by* who can be contacted to form a self-support group is invaluable.

- **Context matters.** With our emphasis on a presence, it is essential to be able to understand, analyze and convey the *context* of a collaborative or communicative act. It is impossible to interact meaningfully if the participant does not know the context of an action. In the gaming world this is simple – who is a friend or foe depends on where the gamers are, who they are, what do they do, etc. At work, the user solving a particular problem and seeking the *right* community to work with, should approach the community through his or her problem. In other words, the appropriate group may be created *ad hoc* based upon a user's query (e.g. 'find all in region X, who are online and on-site'). This is not a formal group; it only makes sense within the context of the user's particular query/problem.

3 Our testbed: BuddySpace

BuddySpace (Eisenstadt et. al., 2003) is a lightweight communication and collaboration tool reflecting the ideas from section 2. It is designed to assist Open University (OU) students in finding others with similar interests, working or living in the same area, and to encourage them to establish relationships through regular and spontaneous social interaction. Earlier work – e.g a virtual Pub Quiz for OU students (Scott & Eisenstadt, 2000) – shows that it is not only possible, but also desirable to foster relationships between isolated students through recreational social activities. We are currently experimenting with several variants of BuddySpace in areas as diverse as formal support to distance learners and distributed computing research project participants, as well as multiplayer games. Experiments in all these areas show possibilities of a dynamic use of presence – allowing people to form groups on the fly, and demonstrate social behaviours that are not possible within predefined groups and automated presence.

3.1 BuddySpace@Work: Jabber messaging, scalable maps, new presence

BuddySpace has been conceived as a tool to support the process of community building by marrying a collaboration tool with appropriately rendered contextual information. The current research prototype tackles the following tasks from our 'manifesto':

1. advanced presence management,
2. rich, customizable, and interactive graphical visualizations (map displays),
3. automated buddy list generation facilitating immediate access to a community,
4. high degree of scalability in making sense of diverse communities.

These tasks are built on top of an instant messaging protocol (Jabber) that supports conversations and presence awareness. Since the set of presence states in the core Jabber protocol is limited, we developed several enhancements better representing both physical

location and mental state (see e.g. states (c) in Fig. 1). The presence status is just one of several possible contexts. Further context information can be obtained automatically (*pushed*) or *requested* from location-aware technology or knowledge of a particular community. Filtering of such contextual information, provided by BuddySpace, allows users to find people or items (e.g. documents) relevant in a given context.

One way to present contextual information in an easy-to-digest and scaleable form is via a graphical display. BuddySpace enables the visualization of automatically-generated groups, such as (g) in Fig.1, using different projections and metrics. Map (b) shows an office layout for the Knowledge Media Institute. Map (e) shows project groups clustered on a larger scale. Automatically-generated clusters, for example (f), show collaborative groups of workers on a particular site. Office layouts or clusters are examples of (abstract) forms that provide contextual information enabling *ad hoc* group interaction. Our mapping plug-in embeds the up-to-date presence of individuals into a visually familiar display. It supports map sharing, personalization, and provides access to all interactive actions directly from the map, such as sending messages, chatting, or group-wide collaboration. The important scalability issue is solved by a variation of the algorithm producing the clusters (Komzak & Slavik, 2003).

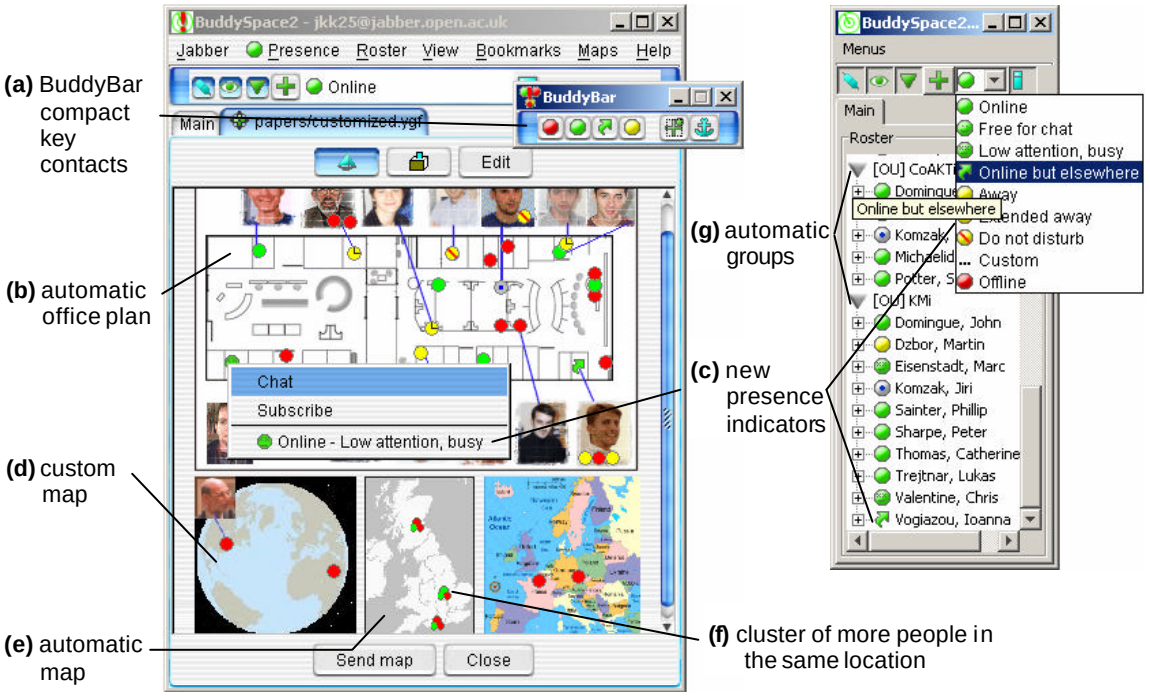

Fig. 1 : Typical BuddySpace map view with 4 maps (office layout, world, UK, Europe) and contact list with both custom and automatically generated groups, showing enhanced presence state indicators.

Community support includes automatically-generated group membership and maps for each group. This is done by a server-side component accessing corporate directories and other information systems. Thus, a newcomer has immediate access to people from the same unit, course, or tutorial group. Each user may have more than one automatically generated group and/or map reflecting his/her involvement in several social interactions (each with a different sub-group of contacts).

Around 10,000 users have downloaded BuddySpace at the time of writing (June 2003). Notable uses include deployment within Open University foreign language courses and a massively distributed computing project to analyze climate change, climate*prediction*.net.

The initial studies support our belief from section 2 that an automatically (pre-)populated group of individuals sharing an affiliation or objective is instrumental in forming functioning communities. Furthermore, filtering contextual information allows 'sub-groups' to be set up *ad-hoc*, depending on the user's interest.

We aim to reflect dynamic social interaction using different kinds of rich contextual information. Various *informal* facilities such as online 'chill-out sessions' or user's 'opinion' or 'intention' profiles are expected to complement 'standard' means of collaboration. People can observe each other's activity, and adjust their behaviors. The informal means should encourage users to form dynamic groups, which may in turn lead to a truly social behavior. Moving from automatically-generated group clusters to spontaneously-formed ones is one of the key challenges in any CSCW environment. Playful interactions can help illuminate relevant issues.

3.2 BuddySpace@Play: playful presence => emergent behaviours

Anecdotally, we know of numerous lunch-table and coffee-room inventions or water-cooler/vending-machine deals. More formally, we know from (Desouza, 2003) that workplace game rooms enhance tacit knowledge transfer at work. What are the equivalents of these 'chance encounters' during the recreational activities in the *virtual, presence-mediated worlds*? In the process of identifying the elements to support an engaging social experience, we have been inspired by playground games. The basic challenge is to provide 'just enough' of an environment that is conducive to forming rules and relationships rather than enforcing them. As a first-pass through our metaphor of playground games and our manifesto point that *crowds do behave*, we embedded a few games into our presence-based framework.

The first of these is a simple 2-D 'Bumper Car' game as illustrated in Fig. 2. At its most basic, this game is about driving around, 'bumping' and chasing. However, put many people in one arena, and interesting patterns emerge. People can dynamically declare their 'allegiance', which is reflected in the colour of their bumper car (e.g. there are pair/triples of orange/green circles chasing loners in Fig. 2).

In a study with 22 participants we introduced different challenges to explore both *goal-based* and *spontaneous, ad hoc team work* through play. In what was suggested as a 'collaborative Pong' game, without any prior agreement or communication channels other than mere presence, people took their own initiative to split spontaneously into 'defenders' and 'attackers'. They followed their goal to 'send a ball towards the opposite line' and adjusted their moves according to where their team mates were. In another, less goal-oriented challenge participants were asked to form groups using colour as identity, and chase each other. Swarm-like movement, alliances on the fly and spontaneous unpredictable clustering at the end of the game were observed. People demonstrated different tactics, like following the larger team (occasionally this resulted in everyone being divided among two dominant factions/colours) or being a 'rebel' and challenging others to chase them. In another case, a 'self-assumed' leader, 'a rogue' would start some creative activity like a 'dance-like' movement and others would follow! These are

particularly interesting examples of emergent, unplanned, and *ad hoc* interaction – based purely on the *awareness of other people's activity* at any moment.

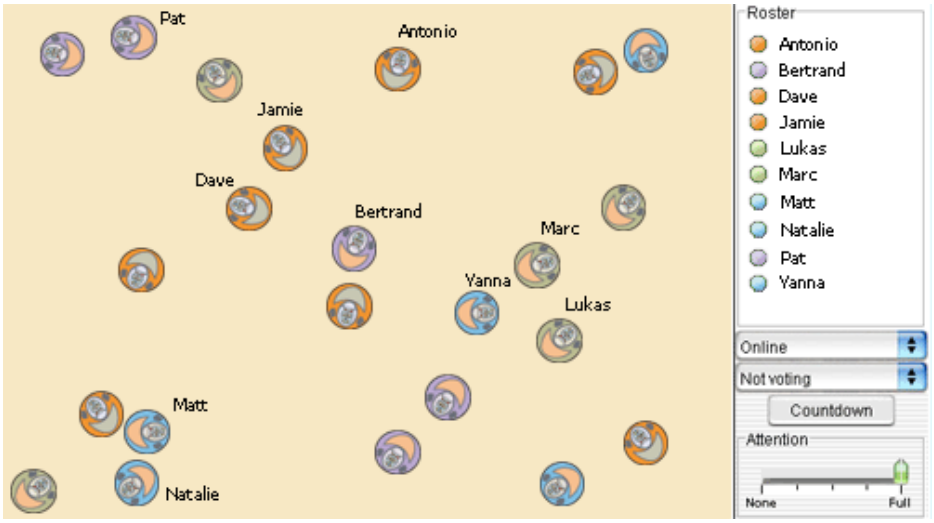

Fig. 2. The Bumper Car game: alliances are formed among cars with the same colour.

Visual clues based on presence, colour, movement and a simple explicit instruction can become the testbed for complex emergent social behaviors triggered by one individual, elaborated by another, until adopted by a whole group. In the real world, various aspects of group dynamics and social behaviour follow very similar patterns. We also observe people undertaking roles implicitly, groups being formed and expanded on the basis of interpersonal dynamics in a given workplace environment, as well as the emergence and acceptance of self-assumed leaders.

These natural dynamics can be facilitated through the design of collaborative environments that empower users to decide upon the *context* of their interaction and create *dynamic, ad hoc*, self-constructed clusters. Forming alliances is fundamental in the workplace. We can envisage alliance formations among individual co-workers without them having to 'flaunt' their opinion confrontationally with the whole department. Rather an 'opinion' or 'intention' presence profile can communicate their will and concerns to key members of the community in an unobtrusive way, much like putting up a flag/vote for people to see. When these 'opinion states' of various people converge, an ad-hoc group – an alliance – will emerge.

4 Conclusions

In this paper we sketched how a presence-based framework can be used in the workplace to model and re-create various types of rich social interaction. We argued that in addition to supporting the explicit aspects of people's collaborative work, a conducive environment should facilitate such factors as *ad hoc* interaction, dynamic and emergent group formation, *and* contextual integration of interaction into a particular situation. Rich social interaction in our environment called BuddySpace was re-created using relatively simple foundations: (i) a variety of rich visual displays, (ii) on-the-fly group/map generation techniques, and (iii) familiar metaphors gluing the bits together. We also outlined a potentially illuminating transition from the explicit aspects of collaborative

work support to the world of massive gaming communities. While the explicit foundations enumerated above help to build and understand formal communities, gaming experience, if properly transplanted, can cater for the *dynamic and ad hoc aspects* of human interaction. We drew several parallels from 'play' to 'work', which we believe are among the essential challenges for future generations of collaborative work support tools.

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We gratefully acknowledge funding support from The Open University, The UK Engineering and Physical Sciences Research Council under grant number GR/N15764/01, and The UK Natural Environment Research Council.