

7 Future Directions

7.1 Likely Fruitful Directions

Creating an online sociable environment is a complex challenge, and in working toward it several directions for further research have presented themselves, ranging from graphical techniques to ambitious problems such as browsing conversational history. Among the most accessible is allowing more flexible display of participant identity. Unobtrusive popup displays showing user-selected personal data on hobbies or affiliations, for example, can help participants learn about each other and perhaps give rise to casual conversation about these bits [Rodenstein 1999].

The level of identity information is always an important consideration in social interaction. Voice is a primary identity mechanism in *Talking in Circles*, but some participants may feel their real voice is too personally identifying in certain conversations. Optional pitch shifting of a user's speech could provide them with a comfortable degree of anonymity while retaining the multiplicity of communicative cues it provides. An area within the environment or separate room, for example, could perform varying degrees of anonymizing such as modification of voice and display of all circles in the same color.

Also useful would be further work on the environment's background (or backgrounds, for multiple rooms or a more extended space). While *Talking in Circles* provides sound booths as graphical backgrounds with numerous useful qualities, the space as a whole is still relatively bare or, more to the point, immutable. Some persistence in the backgrounds, whether explicitly allowing participants to paint on backgrounds collaboratively or perhaps to implicitly display

some history of activity or motion as part of the background, some informative wear on the space [Hill 1993], could be quite interesting.

History itself, of course, can be very useful for conversation. *Chat Circles*, which uses a similar spatial metaphor, provides a linear history of messages for each participant plotted over time, which allows one to piece together conversational threads [Donath 1999]. A more spatially-contextualized history function that can allow visual playback of the activity in the space to aid in selecting points of interest in the history and then let users browse the audio from certain groups or areas within the space would be quite powerful. Audio browsing is generally difficult due to its single-threaded, sequential nature, but techniques such as *braided audio* can help explore several segments more fluidly [Schmandt 1998]. Since global speech recording can be invasive, differentiated areas within the space are also useful here, so that participants who would like their conversational history maintained could move within a marked recording area.

Other input/output modalities are also of interest. On the input side, some form of non-explicit input, to complement the existing system's focus on direct manipulation, could work well. Some display of skin temperature or heartbeat, for example, could function as an implicit differentiator of participants as well as add a human element [Picard 1997]. An output device such as a force-feedback mouse, meanwhile, could provide ground for experimentation with greater degrees of tangibility than the current collision-prevention and orbiting provide, as well as permit different parts of the space's background to have a different feel as participants move over them.

7.2 Other Potential Directions

In addition to the promising directions outlined in the previous section, two areas for extension of *Talking in Circles* of unclear potential are the addition of a notion of gaze direction and higher-dimensional audio spatialization. Gaze direction has long been known to play an important role in face-to-face conversation. A recent study, for example, suggests that gaze direction is highly correlated with the speaker someone is attending to or the listener they are speaking to [Vertegaal 2000]. One interesting approach is the use of directionalized graphics as participants' representations to indicate their gaze direction [Donath 1995-I]. Explicit indication of gaze direction on the computer screen, however, requires constant manual user input, while automated gaze-direction detection has hardware and performance requirements the average computer does not yet fulfill. It would be interesting, however, to study how gaze direction is affected and used when constrained to a screen-sized space containing representations of numerous people.

As mentioned in the User Experiences chapter, an oft-mentioned feature is 2D or full 3D audio spatialization. While the benefits of spatialization for an increased spatial feel as well as for audio stream separation are important, the mapping from users' 3D environment to the 2D overhead-viewpoint used in *Talking in Circles* may be more confusing than beneficial. Without doing head-tracking, the audio spatialization would depend wholly on the participant's position in the space and not on their gaze direction, unlike spatialization in real spaces [Cherry 1957]. Nevertheless, in limited use left-right spatialization may still be helpful.