Supporting Group Brainstorming

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The Problem: Group brainstorming is most effective when its environment captures the ideas its participants generate in a useful form. We seek to develop such a computer-supported environment to record, organize, and distribute brainstorming results, as well as facilitate the brainstorming process itself. The kinds of group brainstorming situations we would like to facilitate might include:

- Consider potential uses for Human Genome Project data.
- Generate ideas for new research projects in the Intelligent Room.
- Propose fruitful directions for the field of AI in the next 10 years.

Motivation: *No good idea should ever be lost.* An evolving repository of ideas would be an invaluable resource, for example, as a source of research topics. We believe a computer-assisted brainstorming system could have several advantages over pen-and-paper note-taking:

- *It lessens the memory load on participants.* The system can generate a summary of past brainstorming sessions, to remind participants of previous ideas and stimulate new discussion.
- *It performs background processing.* By analyzing the content of the idea archive, the system could introduce participants with similar interests, or search for related content on the Web.
- *It facilitates the brainstorming process.* A brainstorming system can manage turn-taking and vote-taking, moving the participants toward consensus on a chosen solution.

Previous Work: A brainstorming system is distinguished from computer-aided design and project management tools, which are tailored for design execution. Instead, we seek to assist the early, conceptual phase of problem-solving, when many alternatives are considered.

Electronic brainstorming systems have been used successfully [1, 2]. We seek to extend these approaches by (1) focusing specifically on collaborative (as opposed to private) brainstorming, (2) enabling users to express their ideas with natural modalities, and (3) developing a system that “thinks off-line” about the ideas it captures.

Approach: Our approach is first to understand how people brainstorm effectively without computer support. To do this, we will collect and distill the principles used by professional brainstorming facilitators, then develop a system tailored to assist the process, using technologies like the following:

- Digital whiteboards and pen tablets to permit natural input modalities, like design sketches and handwritten notes;
- Natural language understanding systems, like START [3], to index and distribute the idea archive in a semantically-aware fashion;
- Knowledge visualization tools (for example, Plexus [4]) to allow navigation through and sensemaking of the idea archive.

Evaluating the system through usability and performance studies will test our assumptions, assess its effectiveness, and suggest further opportunities for investigation.

Difficulties: We believe that a system that aims to support a group process should complement face-to-face interaction, not replace it. Achieving this goal in the field of CSCW has thus far proven difficult. However, a surprising result is that the main bottleneck in group brainstorming is that only one person can speak at a time [5]. This suggests potential for a system that could better integrate private and group brainstorming.

Impact: A usable brainstorming tool is a valuable addition to the intellectual infrastructure of a research and design organization. Exposing such a tool to the larger audience of Internet users would be an untried experiment in geographically distributed, collaborative brainstorming on a large scale.

Future Work: A long-term goal of our work is to create a natural environment for design rationale capture. Eventually, we want to integrate systems for computer-supported brainstorming and deliberation with intelligent tools for design sketching and assistance [6, 7] to allow designers to record the "how" and "why" of their designs, not just the "what."

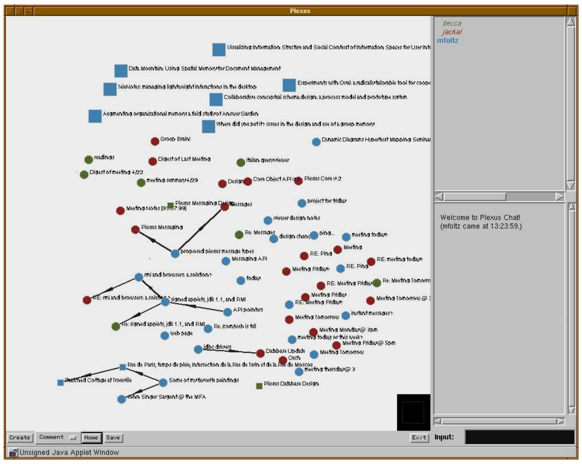

Figure 1: Plexus, a collaborative information space to support research groups. (Developed in collaboration with William Neviett, MIT Artifical Intelligence Laboratory, and Rebecca Xiong, MIT Laboratory for Computer Science.)

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References:

[1] R. B. Gallupe and W. H. Cooper. Brainstorming Electronically. *Sloan Management Review*, Fall 1993.

[2] W. T. Neveitt. Spatial Knowledge Navigation for the World-Wide Web. MIT PhD. Thesis, September 2000.

[3] B. T. Katz. From Sentence Processing to Information Access on the World Wide Web. *AAAI Spring Symposium on Natural Language Processing for the World Wide Web*, 1997.

[4] M. A. Foltz and R. Davis. Information Architecture. MIT Artificial Intelligence Lab Abstract, September 1999.

[5] M. Diehl and W. Stroebe. Productivity Loss in Idea-Generating Groups: Tracking Down the Blocking Effect. *Journal of Personality and Social Psychology*, 61(3), 1991.

[6] C. Alvarado. A Natural Sketching Environment: Bringing the Computer into Early Stages of Mechanical Design. MIT Master's Thesis, May 2000.

[7] M. Oltmans. Understanding Naturally Conveyed Explanations of Device Behavior. MIT Master's Thesis, May 2000.