Design Document for COBRAS[1]

By: Roman Stanchak and Saket Navlakha

CMSC 838V
April 15, 2008

1. Introduction

Traditional person-to-person group brainstorming suffers from three major limitations: (1) free riding; (2) productivity blocking; and (3) evaluation apprehension. An ideal electronic brainstorming tool should address these shortcomings while retaining the dynamic, interactive nature of group brainstorming. Moreover, while the nominal goal of brainstorming is to maximize the number of ideas generated, a variety of secondary goals have been proposed as also having value[1]. In particular, it has been suggested that brainstorming helps build organizational memory in terms of design decisions and creates a "status auction" amongst participants.

To address these limitations and secondary goals, we have created an online collaborative mind-mapping tool called **COBRAS**. Mind-maps are visual representations of ideas and how they are connected to each other[2]. They were first developed by Tony Buzan and have received substantial attention in the literature as a means for brainstorming and problem solving. Usually, mind-maps are laid out like a tree which makes it easy to identify relationships and dependencies. This layout has also been proven to help transfer memory into long-term memory and increase recall[2].

The remainder of this document is structured as follows: Section 2 describes the general functionality of our tool and how it supports brainstorming. Section 3 examines the limitations of in-person group brainstorming and describes how our tool deals with these shortcomings. Section 4 describes how our tool addresses several of the secondary goals mentioned above. Section 5 examines common criticisms of electronic brainstorming tools. Finally, in section 6 we conclude.

2. General description of COBRAS

The nominal goal of brainstorming is to maximize the number of ideas generated. Our tool directly supports this goal by representing the idea generation process as a tree with the central issue as its root node. Users can build upon this tree by connecting an existing node to a Problem, Idea, or Comment (PIC) node. A link can exist between any two types of nodes. For example, a problem node can be connected to an idea node, which can be linked to another problem or comment node.

The rationale for different node types is twofold: first, it attaches categorical, semantic meaning to each node in the tree; and second, it allows for contributions to be "refined" over time. As a result, every relationship is given an implicit "type"; i.e. instead of just saying "node u connects to node v", we can say, "a possible solution to problem node u is idea node v."

[1] **C**ollaborative **O**nline **B**rainstorming by **R**oman **a**nd **S**aket

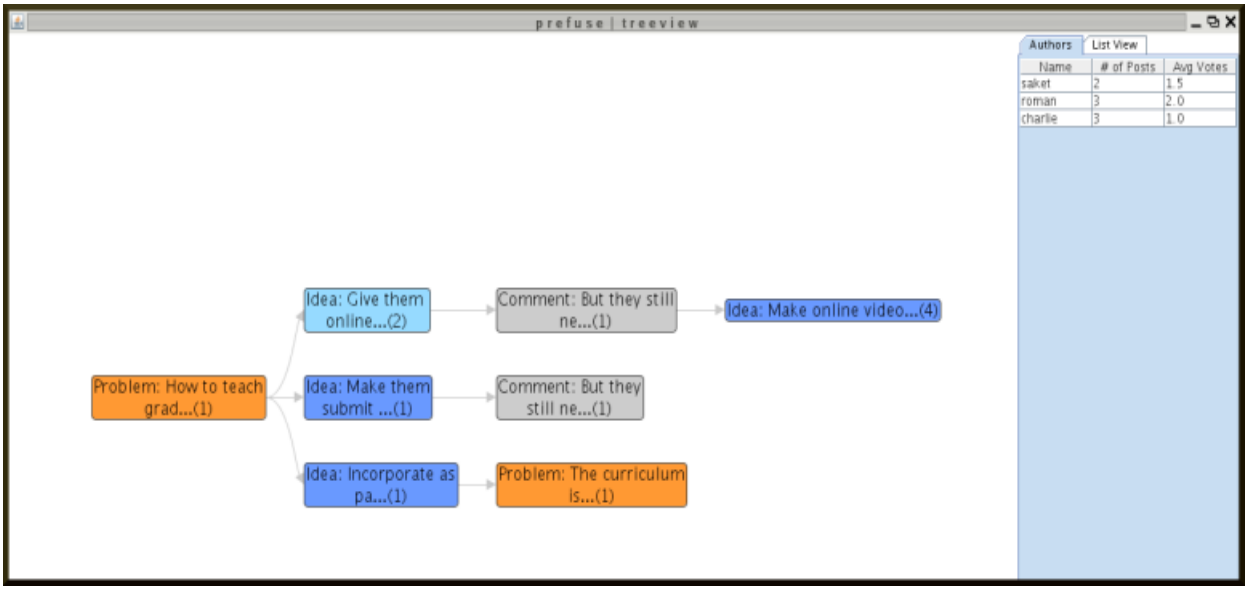

Figure 1: Overview of our tool

Every PIC node can also be voted on by others. Votes are essential to the brainstorming process because they allow for good contributions to be identified and their corresponding author to be recognized. To serve this purpose, every individual is asked to provide a username before using the tool.

We implemented COBRAS using an asynchronous Java technique that does not require reloading of the page on change events. This allows the user to see real-time updates from others, while maintaining the opportunity for independent thought. Enumerating paths along the tree also allows the user to easily identify relationships and dependencies, which helps to build off other contributions. The representation is dynamic in nature, and allows the user to scroll, zoom in, or zoom out on any part of the display.

3. Minimizing the limitations of person-to-person group brainstorming

a. Free-riding: This occurs when individuals in groups do not feel accountable for producing ideas, and as a result, devote less effort. Our tool attempts to avoid this problem by listing each contributing participant's name along with the number of posts that author has submitted (See Figure 2 below). Consequently, participants who devote less effort can clearly be identified in the list.

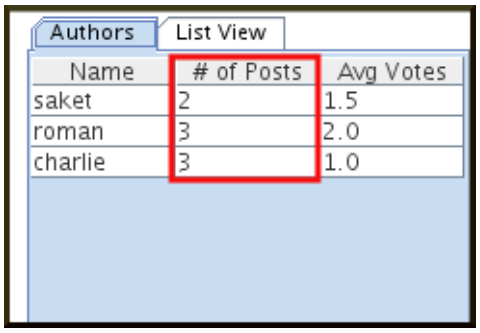

Figure 2: Authors tab in sidebar, highlighting # of Posts.

b. Productivity blocking: In person-to-person group brainstorming, individual idea generation can be blocked for two reasons. First, participants must wait their turn to talk; and second, listening to others hampers thinking. Our tool attempts to avoid these problems by its electronic nature. Several participants can login at once and asynchronously add content. Participants can also choose when to read others' contributions, thereby not hampering their own thinking. Furthermore, our tool does not force individuals to follow a linear flow of conversation. Users are free to build upon any previously suggested PIC.

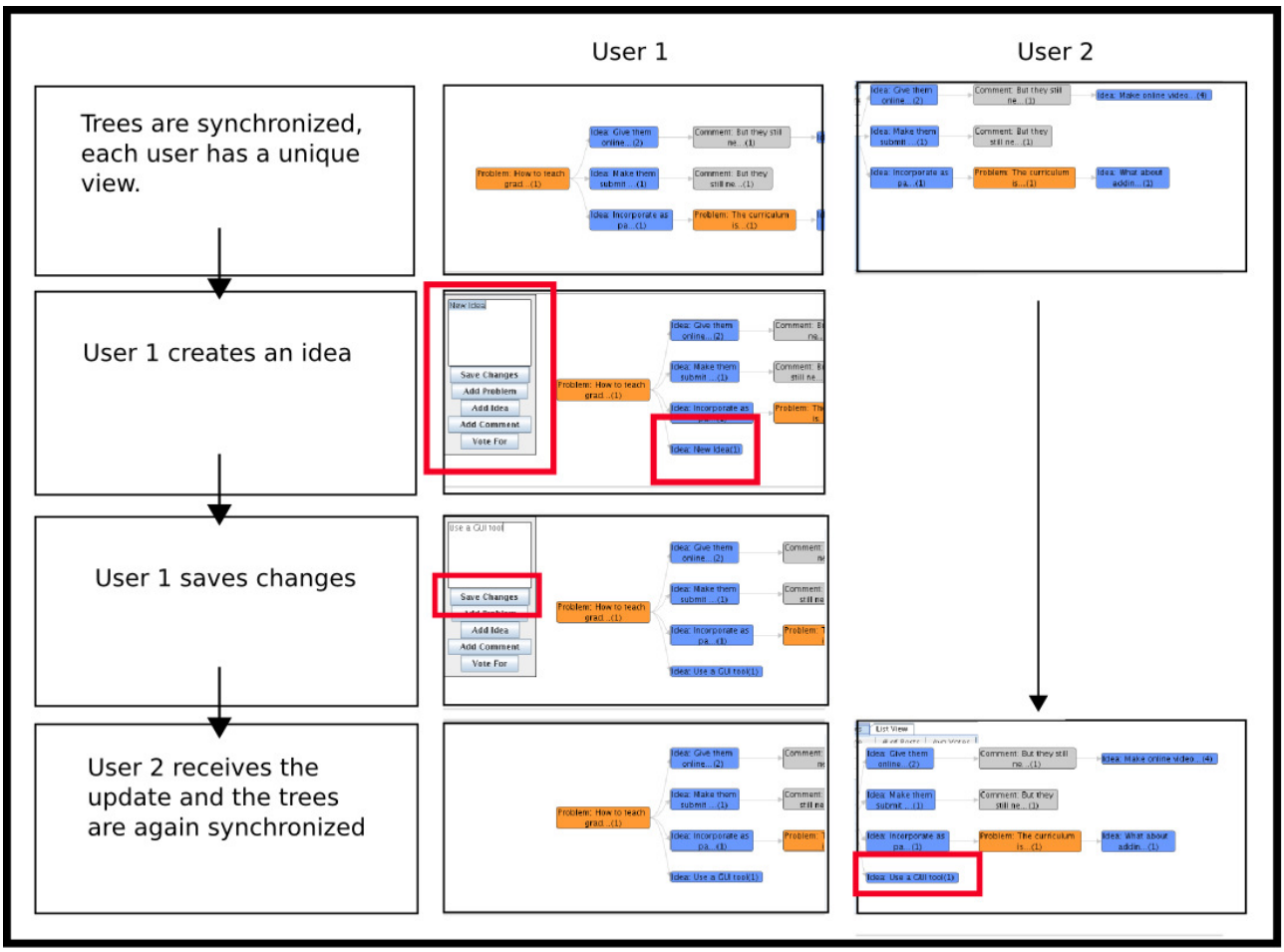

Figure 3: Time series display of two users using COBRA simultaneously.

c. Evaluation apprehension: This occurs when group members may not express some ideas because they worry about what others think. According to [1], this has mostly been observed to be problematic in a social setting. In such a context, people's initial reactions are clearly visible and there is no physical "escape". Little evidence has emerged, however, suggesting that this is a problem electronically. In our tool, people are not forced to face their peers nor some authority figure in the room. So as long as wild ideas are encouraged and not frowned upon, we believe our tool is less susceptible to the problems of evaluation apprehension. More importantly, however, PICs posted do not include the contributor's name. Therefore, even if someone posts a "bad" idea, it cannot directly be correlated with an individual.

4. Secondary goals

a. Building organizational memory: According to [1], a good brainstorming tool also should draw on, add to, and maintain stored information from an organization's past that can be brought to bear on present decisions. Our mind-map representation serves this purpose: first, it brings the internal knowledge representations of a wide variety of individuals together into a simple and standard representation that everyone can understand and contribute to; second, it clearly documents how a particular design decision (or PIC) arose, which can be stored by enumerating the paths in the tree from the root to the decision node.

Moreover, all PICs are listed in the sidebar (See Figure 4 below) with a count of the number of votes it received. This allows participants to easily identify the top-rated, quality PICs. It also clearly documents the entire brainstorming session, which can be later annotated, modified, or saved, thereby adding to an organization's memory.

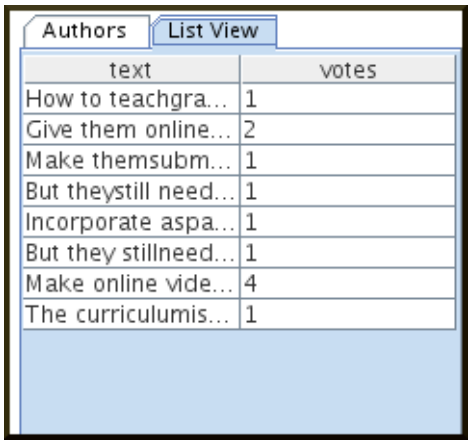

Figure 4: List View tab in sidebar.

b. Status auctions: A good brainstorming tool should also create a competitive environment where people can strive to be recognized and noticed based on their contributions. Above, we mentioned how each PIC is listed in the sidebar along with the number of votes received. Moreover, in the "Authors" tab we also maintain an updated list of each *participant* and the number of votes he received (per contribution). Participants who contribute the "best" PICs are clearly distinguishable from this list as those with the highest

average vote count. See Figure 5 below.

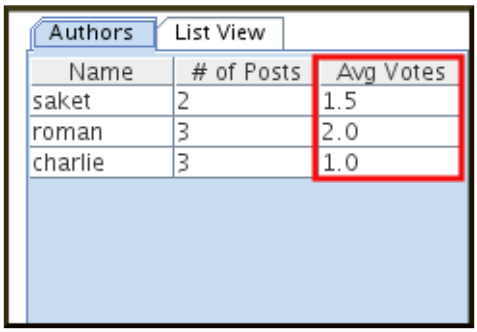

Figure 5: Authors tab in sidebar, highlighting avg. votes.

5. Common Criticisms of Electronic Brainstorming Tools

In addition to addressing the drawbacks, a successful electronic brainstorming tool must retain the positive aspects of in-person group brainstorming. The primary advantages to in-person group brainstorming are: (1) immediacy; (2) a "fun" social forum; and (3) use of "standard" inter-personal verbal communications. A brief description of each of these properties and a commentary of how our tool supports them follows.

(1) Immediacy refers to the fact that when an idea is proposed, it is immediately available for the group to build upon. In our tool, an idea is proposed via a user creating a new leaf node in the mind-map. This action triggers an immediate synchronization with other participants, who will see this new idea "grow" out of the mind map they are viewing on their screens. Feedback to a proposed idea can come in two forms: implicit in the form of derivative problems or ideas; or explicit through creation of a linked comment node in the mind map, or "voting" for the idea.

(2) In [1], IDEO engineers describe brainstorming as a fun social forum. There is plenty of evidence that electronic communication tools are "fun" to use and encourage socialization (e.g. chat applications, online social networks, massive multiplayer online games, etc). Our tool retains two important properties for online-socialization: real-time group-interactivity and a lack of rules governing input. A participant in the brainstorm sees input from all other participants and is free to "say" anything in response to the existing ideas (limited only by social convention or the rules set forth at the start of the brainstorm).

(3) The use of standard inter-personal verbal communication in group brainstorming is beneficial for two reasons: First, most people have been doing it their entire lives; and second, body language, tone of voice, and other non-verbal cues hold important information. Electronic tools incorporating video and teleconferencing emulate these modes of communication to some extent. At the current iteration, COBRAS incorporates only textual modes of communication: audio and video teleconferencing functionality could be added in the future. However, it is unclear how to incorporate this functionality without also introducing drawbacks such as productivity blocking and evaluation apprehension. Future work could address this issue.

6. Conclusion

Traditional group brainstorming has its advantages and drawbacks. A successful electronic brainstorming tool should address the drawbacks while retaining the advantages. We've described COBRAS, our collaborative online brainstorming tool, and discussed how it addresses the problems of free riding, productivity blocking, and evaluation apprehension, while retaining positive aspects of in-person brainstorming. We've also identified several additional secondary goals described in [1] that our tool supports.

References:

1. Robert I. Sutton and Andrew Hargadon. **Brainstorming Groups in Context: Effectiveness in a Product Design Firm.** Administrative Science Quarterly, Volume 41, Pages 685-718, 1996.
2. Tony Buzan. **The Mind Map Book.** New York: Penguin, 1991.