

# A Visualization to Facilitate Productive Discussions

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## ABSTRACT

We present a method for viewing an e-mail discussion intended for use by participants during the discussion. The display technique is designed to help participants identify positions, arguments, and evidence, and make clarifications and corrections. As compared to other systems for computer-supported argumentation, our design places fewer formal constraints on users, preferring facilitation rather than prescription in its approach.

## Author Keywords

Argumentation, CSCA, threaded e-mail, treemaps.

## ACM Classification Keywords

H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces—CSCW.

## INTRODUCTION AND RELATED WORK

Although groups of people often engage in extended discussions with the intention of pooling ideas and making better decisions, discussions are not always as productive as we might like. If a discussion comes to involve many factors and viewpoints, participants may find it difficult to keep track of arguments and evidence, make corrections, and understand the rationale for an eventual resolution.

Several software projects attempt to aid the organization of collective knowledge by helping users build the content of a discussion into a predefined information architecture. For example, gIBIS [3] and Compendium [2] classify discussion elements into node types such as *issue*, *position*, or *argument*, and define a fixed taxonomy of relationships by which the nodes are linked into a tree. The Coordinator [4] requires users to select one of 11 action types (such as *request*, *promise*, or *offer*) for each conversational “move.” Reason!Able [5] and Tree Trellis [6] enable users to construct a tree of supporting and opposing arguments.

Some argumentation systems emphasize the use of sources and evidence, which we view as vital to making discussions

productive. SenseMaker [1] lets users arrange claims into nested rectangles and place colour-coded dots representing evidence into relevant rectangles. ClaiMaker [8] lets users enter statements that paraphrase research papers and create a general graph by joining them with connectors such as “is consistent with” or “is analogous to”. Rich Trellis [6] allows users to highlight fragments of arbitrary Web documents and arrange them into an analysis tree together with indicators of the perceived reliability of each source.

## APPROACH

While there is much value to be gained from a structured representation, we feel that too much emphasis on the classification of arguments and their relationships impedes flexibility and usability in practice. ClaiMaker and Rich Trellis offer dozens of logical connectors, focusing on annotating and formalizing existing documents in order to enable automated reasoning, whereas we are interested in helping the users understand each other and find consensus.

Many designs implicitly assume that users will follow the rules of the system and employ the components of the system as the designers intended. Though it may be possible to expect such conformance in an educational setting, in general one cannot even assume that users will choose to use the system at all. Therefore, our primary assumption is that participants will continue to use their current tools and abide by current practices unless they have a compelling motivation to do otherwise. We aim to facilitate rather than to prescribe constructive behaviour.

## E-MAIL PROCESSING

Electronic mailing lists are an extremely popular tool for long-term discussion. They are easy to understand, straightforward to administer, and require no special client software. Since mailing lists are such a prevalent discussion medium, we have chosen them as the baseline to augment.

Our tool processes messages as they arrive, generating and updating a Web-based display to help organize arguments and evidence. Participants can guide the construction of this display by following the formatting conventions we describe below, but they are not required to do so. Thus, as they write messages they are also manipulating a shared knowledge artifact. We aim to provide a display useful enough that participants want to use it in addition to their e-mail client. (In future we may add Web-based posting.)

The most common method of arranging e-mail messages into threads is to make a tree where the nodes are entire messages and child nodes represent replies. We can reveal

more of the content in each message by taking advantage of a common convention: users often quote relevant lines of another message, prefix the lines of the quotation with “>”, and follow the quotation with their reply. In Zest [9] and in our current design, each instance of this construct yields a new reply node linked to its parent. Multiple reply nodes can share the same parent but quote different parts of it.

A message that does not reply to any others introduces a new topic at the root of a new tree. A replying node is classified as a supporting or opposing statement if the text begins with “[+]” or “[−]”. (A participant can reply with one of these marks and no text to merely indicate support or opposition.) A replying node is classified as a question if the text begins with a sentence ending in a question mark.

## DISCUSSION VIEW

Figure 1 exemplifies the current design of our visualization. The text block running across the top of the figure is the focal topic of the thread. Positions and arguments on the topic are placed in blocks from left to right below the topic block. Further replies are in turn arranged from left to right beneath their parent blocks, with supporting blocks on the left and opposing blocks on the right. Questions are shown in smaller orange blocks nested within their parent blocks.

This layout technique (reminiscent of a treemap [7]) is designed to address two problems with the typical outline-style layout of a threaded conversation. First, when shown using lists indented within lists, the nodes of a conversation tree appear in depth-first order, which places sibling nodes vertically far apart: replies to earlier siblings push later siblings further away from their parent. Placing responses in columns brings them nearer to their parents and gives them more equal footing; none of them can be pushed off the bottom of the screen. A second problem with indented lists is that they waste space. Even when the conversation is linear, with each node replying to the last, successive levels are indented further and further. In our layout, a linear conversation becomes a single column of text blocks.

Our layout method has the drawback of limiting the depth and breadth of the tree because narrow columns of text are hard to read. Our current solution is to show only a few levels and allow the user to click on a node to navigate to deeper levels of detail. When a non-root node is the current focus, as in Figure 2, the first sentences of its ancestors are shown in small type above the focus node to give context.

We expect that references to sources and supporting evidence will be cited as URLs, so URLs found in the text are called out and displayed first for emphasis. All the URLs in nodes too deep to be displayed are listed in the nearest visible node, which makes citations easier to find and also makes the absence of citations more obvious.

Questions are separated from the main tree of the discussion in order to distinguish the main arguments from clarifications and to allow the flagging of unanswered questions to help promote their resolution. Once a

participant has answered a question concerning one of his own statements, anyone may quote an excerpt of the answer and indicate their satisfaction with a “[+]” mark, which causes the selected excerpt to appear next to the original statement where it can serve as a clarification or correction.

The design strives to encourage certain behaviours. The first sentence of each block is shown in bold, encouraging users to write paragraphs that begin with topic sentences. Author names are de-emphasized in order to focus attention on substance rather than speakers. Though it may seem simplistic to assume every node beginning with a question is a request for clarification, we are interested in finding out if this rule will encourage participants to make arguments using direct statements instead of rhetorical questions.

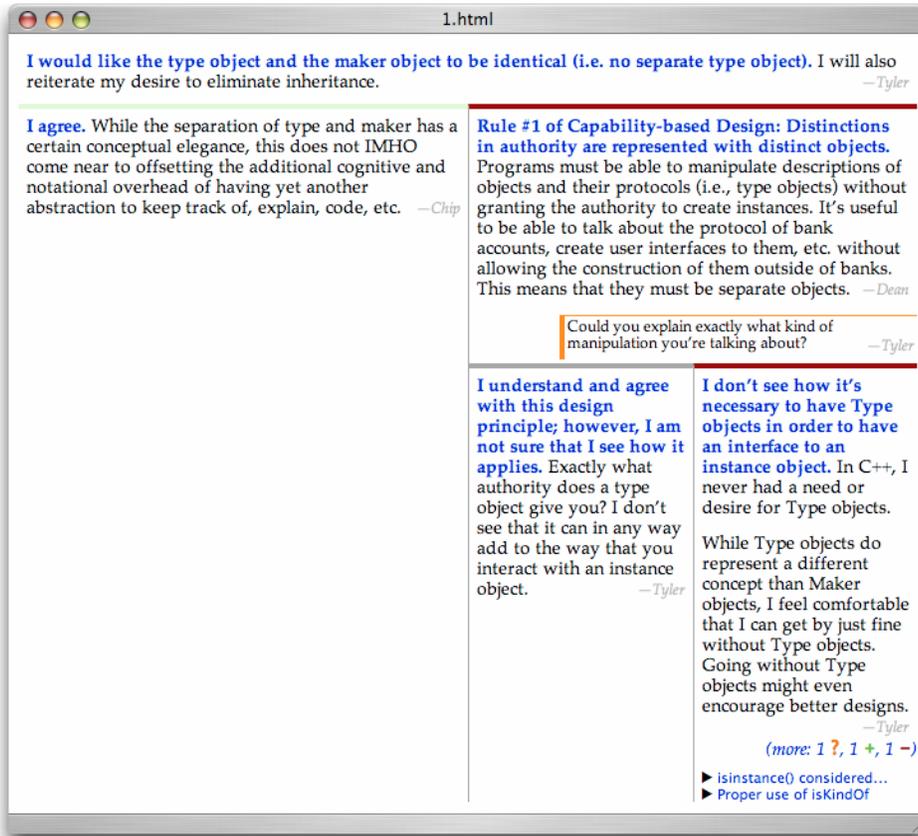
## CONCLUSIONS AND FUTURE WORK

The design presented here aims to help participants identify the positions on a given issue, clarify the arguments supporting each position, and encourage them to cite evidence for their arguments, while incurring minimal transition cost from current practice. We feel that this design space offers many interesting possibilities for further exploration. The distribution of horizontal space among columns can be adjusted to indicate the relative levels of support for statements. A search interface should be added to help participants locate relevant arguments from previous discussions. A zooming user interface is a natural fit for navigating a treemap. Our design ideas have yet to be tested by participants in an ongoing group discussion.

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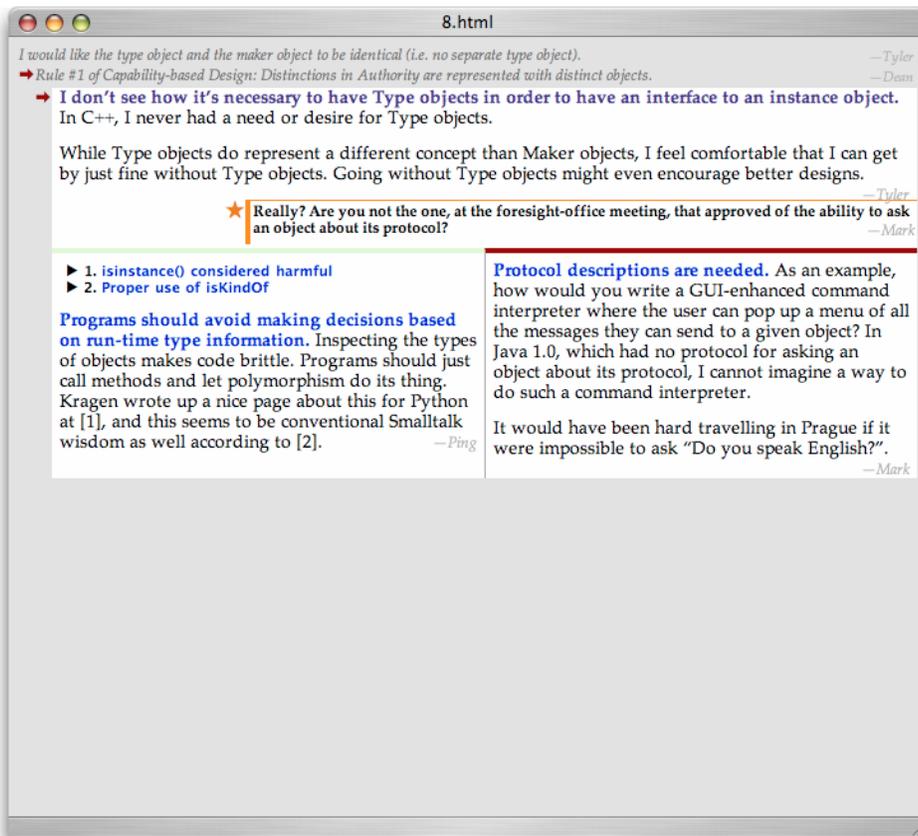
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**Figure 1.** In this view, the focus is on the root node of a topic, shown at the top of the display. The space below the root node is divided between a supporting statement on the left and an opposing statement on the right. The left block has a light green bar on top to suggest agreement with the root node, while the right block has a dark red bar on top to suggest opposition.

One question, shown in a nested block with an orange border, has been asked in response to the statement beginning “Rule #1”. Two replies to this statement appear below it, one neutral and one opposing. Supporting and opposing blocks come from text sections that were prefixed with [+ ] and [- ] in the original e-mail messages; the neutral block comes from an unmarked paragraph.



**Figure 2.** Clicking on the “more” link or the first sentence of the bottom-right block in Figure 1 shifts the focus to the node beginning with “I don't see...”, yielding the display shown here. The two ancestors are shown on single lines above the focus node. The question in this figure is marked with a star to indicate that it remains unanswered.

The supporting block on the lower left was generated by a message that cited two URLs. These URLs are replaced with the numbers “[1]” and “[2]” in the text and listed as hyperlinks at the beginning of the block. The text of each link comes from the title of the referenced webpage. The lower-right block in Figure 1 also shows these links in its list of all URLs in its descendants.