Project Report: Mass Narrative Representation

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for Cyberneutics

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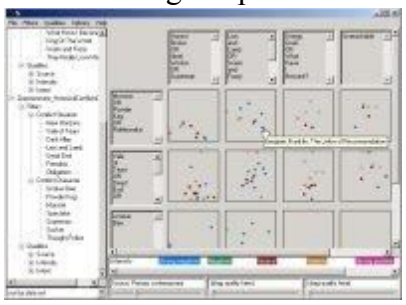
as part of HARP project

Table of Contents

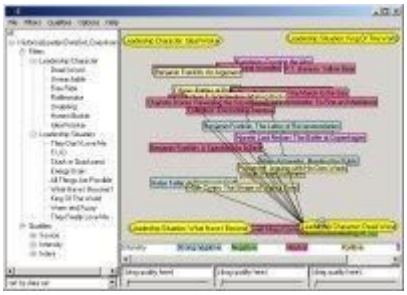
This is a 2004 report I wrote as part of a research project into ways to look at lots of stories at the same time. "HARP" stands for "Human Augmentation of Reasoning through Patterns", and "Cyberneutics" was the group I wrote the report for.

Executive Summary

This is a report on a research project whose goal was to explore issues related to the task of representing large volumes of narrative data for the purpose of decision support. Such software would a) help people compare situations and events in order to provide insights into a particular situation or decision; b) help people to be aware of, understand and use multiple perspectives in understanding a situation; and c) help people to detect weak signals and distinguish meaningful from meaningless patterns. Five prototypes were produced, as follows:



The **Sliding Panels Prototype** is a "power user" application, used to explore narrative patterns in detail. The user asks detailed questions by building and juxtaposing many complex queries.



The **Clusters in Space Prototype** is also used to explore narrative patterns in detail. The user drags filters to a "space" and looks at how sense-making items cluster in the space as they are attracted to any number of different filters. As the user drags a filter, the attached items "follow" it, creating a dynamic visualization of connectedness.

The **Jumping Indicators Prototype** is a simple yet graphical look at the data. The user can look at data indexed to any of the filters or qualities as little "blips" along a "graph line". This prototype is best for serendipitously moving through the data without forethought, though it some complex queries can be done in it.

In the **Text Panels Prototype** the emphasis is on a very simple interface with very little to learn. There are only three basic elements: a list of all available indexes; a list of sense-making items (SMIs) that match the indexes clicked on in the first list; and the text of the selected SMI. The columns are used to compare queries.

The **Web-like Prototype** looks and works like a web search engine, with a (prototypically simple and brute-force) natural language query, which finds items in the database based on matches (full or partial) to attributes of filters. The user can also browse the database in several different ways, moving around looking at the different elements involved.

This report describes the background of the project, the development of each prototype, and

learnings and conclusions from the work.

Section One: Background

Goals

There are (at least) three goals of narrative representation in HARP.

1. It will help people compare situations and events in order to provide insights into a particular situation or decision. This means helping people compare and contrast similarities and differences among many situations, at both concrete and abstract levels.
2. It will help people to be aware of, understand and use multiple perspectives in understanding a situation. This means helping people compare similarities and differences among many perspectives on the same situations.
3. It will help people detect weak signals. This means helping people make sense of data and test hypotheses in order to distinguish meaningful from meaningless patterns.

Scenarios of use

For each of the three main goals outlined for narrative representation in HARP I have outlined one example scenario of use. Each is based on an actual incident during the previous use of narrative databases by our (anonymous) clients. (Note these stories are from my own memory and some of th details may not be right - still, the point is not to tell an accurate accounting but to give a flavor of how the tool might be used.) For each scenario I will consider: what took place; how the narrative database helped the client make the decision they made or discover the insight they found; what psychological dimensions come into play in the scenario; how narrative representation in HARP might better support such a benefit; and what requirements the scenario prescribes for narrative representation in HARP.

Scenario One: Narrative Reasoning

The client, a government official, was using a narrative database gathered by his staff in collaboration with consultants. He read a story about the actions and attitudes of a certain colonial power towards a less developed country during a conflict centuries ago, and realized that those actions and attitudes were similar in some ways to the actions of his government towards a less developed country today. He had not seen that similarity before and was surprised by it. This discovery led him to think about his government's relations to that country in a slightly different way.

Psychological aspects

Psychological factors at play in this scenario include:

1. Effective pattern matching and analogy use in decision making, as studied by Klein and others in the field of naturalistic decision making. Klein's book *Sources of Power* (1998) summarizes over a decade spent observing and interviewing decision makers in the field. What Klein and his colleagues found was that effective decision makers do not compare options or calculate and rank expected utilities; they match patterns. They look through their memories and find a pattern that fits. The first pattern that fits, they use. If they can't find a pattern that fits, they mentally simulate a future pattern and see if that fits. (Analogical pattern

matching is also studied in case-based reasoning, but usually in very limited domains and with little scope for uncertainty and multiple perspectives on complex issues.)

2. Narrative reasoning as a complement to logical reasoning, as studied by Jerome Bruner (e.g., Bruner 1986) and Walter Fisher (e.g., Fisher 1985), who believe that humans are "storytelling animals" and that we make sense of the world through examining and juxtaposing narratives. Narrative reasoning is the preferred tool in situations in which there are vague and conflicting forces, and in which conclusions depend on assumptions based in values and beliefs that are difficult to articulate and surface. These situations defy logical reasoning and require a different mode of thinking, which luckily we all become adept at from childhood. However, narrative reasoning is given short shrift in decision support, largely because it is considered "soft" or unimportant, which is a loss.
3. Ineffective pattern matching and analogy use, as studied by Neustadt and May (1986), who describe three ways in which limited perspective can effect the use of analogies. First, certain patterns may have an allure that does not correspond to their appropriateness but stems from attendant emotions such as fear. Of these it is the unstated historical analogies held in common (Pearl Harbor, Chamberlain) that are the most dangerous. Second, certain patterns may have excessive strength because they are connected to what Neustadt and May call “folk memories”, or memories close to personal experience. Third, certain patterns that *should* be brought to mind are neglected because they are painful or uncomfortable.
4. Analogy use for decision making in groups, as studied by George (1980), who points out that the social dimensions of the decision making unit in foreign policy and corporate life are manifold. At least three major forces act at the group level. First, decision making is increasingly institutionalized as you near the top of organizations, restricting the range of acceptable patterns. Second, communication about issues becomes simplified as you move up the ladder of power. Third, and most dangerously, patterns are often selected for the purposes of advocacy but presented as aids to logical reasoning.

Software design

In software terms, in this scenario the user looked at an abstracted archetype, looked at the list of stories linked to it, read some of those stories, saw the similarity between the stories so indexed, and applied the lesson from one situation and one set of players to another.

In this case there was only one archetype involved (probably, although a theme might also have been used). So simply seeing a list of items linked to an archetype is in itself a powerful use of the system. However, there are human limitations to doing this that representation can help to ameliorate. For example: How many stories are there linked to that archetype? Can the user read all of them? If not, which stories should he read? How should he choose which ones to read? What criteria might he want to consider? Might he want to filter out those items from certain dates, or from particular perspectives, or from particular locations, or that mention particular phrases or events? Or might he want to see only anecdotes, or shorter items, or news reports, or man-on-the-street interviews? Or might he want to glance over a hundred story titles at random to see which ones look interesting? The user needs essentially to "muck around" in the data, to use the benefit of serendipitous encounter, to bring him to insights he could not plan or expect.

Emergent filters are abstract representations of similarity across many domains, and the user can use them to filter the data set, then gain overviews within the resulting items to choose which

items they want to look at in more detail. In this scenario, the abstract (emergent filters) and the concrete (non-emergent filters) work together, because things may be similar at the concrete level (say the same geographic area) and different in the abstract (say different types of conflict), or similar in the abstract (say the same power differential) and different in the concrete (say different centuries). This is where Neustadt & May's (1988) recommendation to test analogies for appropriateness comes in. Comparing and contrasting items based on *both* the abstract and the concrete, in juxtaposition, helps the user to think about what is similar and different about two situations or events or behaviors. Often people only look at the concrete aspects (time, place, nations, troops, types of weapons, types of governments, etc) and ignore abstract differences, like how public opinion changed, or whether (or how) honor or saving face was involved, or whether people were tricking each other or putting their cards on the table.

From a community point of view, users need to be able to remember (and thus communicate) particularly useful similarities and differences between items (and situations, behaviors, etc) so that they can be reused.

Requirements

The important aspects of narrative representation for HARP, from this scenario, are:

1. The ability to compare and combine abstract *and* concrete characterizations of events and situations and behaviors, in a dynamic way that allows for flexible exploration and serendipitous encounter throughout the data set.
2. The ability to quickly browse many hundreds of items and get their essential meanings very quickly in order to find the most useful items in a short amount of time (without reading hundreds of items).
3. The ability to save, reuse and communicate comparisons and combinations (essentially, queries and views) in order to use them again.

Scenario Two: Us and Them

At a client, top-tier managers and their employees went through the identical archetype-derivation exercise based on the same set of stories collected from employees at all levels. The top managers were then presented with their archetypes and the employee archetypes together. Basically, the top-manager archetypes were of heroic workers shouldering heavy burdens for the good of the company, and the lower-level employee archetypes (of the top managers) were of selfish, arrogant power-mongers who brooked no dissent and lived off the hard work of their subordinates. The top managers were angry and upset, and said that this could not be the way their employees felt; but it was explained to them that the employees had gone through the same exercise as they themselves had, and that this was the result. After they had calmed down, they began to look more carefully at the archetypes created by the employees. They read a few of the stories linked to them, and began to change how they approached the other group of people.

Psychological aspects

Understanding the point of view and frame of mind of one's allies and adversaries is critical to policy and intelligence work, both to interpret the actions of others and to predict their reactions to one's actions. Several concepts from the literature and from our own research converge on the

basic point that people often have simplified of views of other people or groups considered alien to themselves, and that has an impact on decision making and foreign policy. From psychology there is the “fundamental attribution error”. This says that people attribute their successes to “dispositional causes”, or their personalities, and their failures to “situational causes”, or bad luck, while at the same time they attribute the successes of others to situational causes and the failures of others to dispositional causes. In other words, if we both fail, I'm having a bad day and you are an idiot; and if we both succeed, I'm a genius and you are having a run of good luck. From sociology comes “ingroup-outgroup perception”. This says that people typically have perceptions of homogeneity in excess of reality with respect to any “outgroup” they are not part of (hence “they all look the same”), as well as perceptions of heterogeneity in excess of reality with respect to any “ingroup” they are part of. From foreign policy there is the “unitary actor assumption”. This says that people tend to represent the totality of everyone included in each collective actor (a state, an underground terrorist organization, the UN) as one actor with one set of beliefs.

In addition to negative aspects of self-other perspective limitations, people have positive characteristics that can come into play here: curiosity about how other people see things; wanting to expand one's horizons; an "itch" to challenge the assumptions of oneself and others; and so on.

Software design

In software terms, in this scenario the users examined emergent filters created by themselves and by another group. They looked at the attributes describing those emergent filters and at pictures drawn to represent character archetypes. They looked at information about how the archetypes were derived and by whom. They were able to juxtapose two sets of archetypes. And they read stories linked to those archetypes.

In terms of system design, the main requirement for people using the system under this scenario is to be able to "drill down" through indexed data in order to be able to learn about the context of the *indexing* as well as of the data. Expecting people to accept indexings based on simple authority has no place in a system such as this - giving people context and understanding does. In this case users are looking at similarities and differences, as in the case of analogizing, but here they are looking at similarities and differences between groups of *people* rather than between situations. So the people involved are important here - who told the stories, who heard them, who collected them, who indexed them, who derived the archetypes, who decided what metadata to include, and so on. This means several things:

1. Users need a way to trace indexings for not just one but a whole set of items back to the indexers who described them. And they need to be able to query on indexer identities, or possibly parts of identities (just demographics?) to determine whose opinions they are examining.
2. Users need to be able to "take apart" emergent filters to see where they came from. They need to see who derived them and when and where and by what process; they need to see their attributes; they need to see how their attributes link to other attributes; and they need to see some "exemplar" stories to see how the filters play out in practice. Also, users need to be familiar with the derivation of emergent filters (perhaps via training) so that they accept the process as valid.

3. Users need to be able to learn more about the context of item collection, to better evaluate the provenance of items. For example, rumors might be given greater weight, or less, depending on the task. This is the place of narrative and "conventional" indexing.
4. Users need to be able to see the same stories indexed from multiple points of view; and they need to see the same stories linked to emergent filters derived by different groups; and they need to see stories they know are "their" stories intermingled with "other" stories.

From a community perspective, people need to be able to save, reuse and communicate queries that help to understand points of view - say, here are twenty stories you can read if you want to think about how an Arab thinks about money. Or, run this query if you need to deal with the French Department of State. This use is similar in some ways to the "travel manners" software used by multi-national corporations to help people avoid making faux pas and souring deals. There may be other reasons to communicate such things among community members as well, but they would be in the same category - saved lists of items, queries, filters, identities - all centered around remembering and communicating ways of getting to know particular frames of mind.

Requirements

The important aspects of narrative representation for HARP, from this scenario, are:

1. The ability to drill down and examine contextual details about items and indexings and filters and identities in order to evaluate them and the people who were involved with them.
2. The ability to compare and contrast items based on data about how and when and why and by whom the items were collected and indexed.
3. The ability to see as much contextual information about the items as possible concerning their narrative aspects (origin, voice, etc) to make sense of them and see similarities and differences among groups of items from different groups of people.
4. The ability to characterize oneself, either through an exercise or through making archetypes on the fly, and querying the data on that to look for similarities and differences (and related, the ability to have the system help with this sensemaking by suggesting alternatives - opposite, goes with, supports, etc).
5. The ability to save, reuse and communicate information about groups of people, cultures, points of view, and so on.

Scenario Three: Detecting Weak Signals

We were collecting stories for a client about the abuse of one of its products. Customers who were using the product in a way which was not intended and was dangerous. Through using the narrative database, we found out that when it came to describing how the customers were apathetic about using the product correctly, the staff interviewed had few "personal experience" stories and many "historical truth" (i.e., not personal experience) stories to tell. It seemed that customer apathy was almost more of a cultural belief among the staff than something they had personally experienced. Thus, one of the outcomes of the project was realizing that the staff didn't have as much exposure to customers and customer experiences as they should have had in order to help those customers use the product in the best way. The finding that staff "knew" about customer apathy not from actual experience but from hearsay, was a signal in the noise of beliefs

and opinions about customer behavior.

Psychological aspects

The psychological factors involved in this scenario are better studied and more commonsensical than in the other two scenarios. On the negative side, there is groupthink, self-deception, complacency, naivete, lack of curiosity, and so on: all the reasons people don't look beyond the "obvious" answers. On the positive side, there is curiosity, an interest in experimentation and discovery, and a willingness to suspend and test assumptions.

Software design

In terms of software, the people in this scenario looked at the archetype of the apathetic customer against the theme of misuse, and looked at how many stories were based on personal experience versus "historical truth". What they did was almost like running an experiment: they tested a hypothesis, saw a trend, and obtained a result. The result was not what they would have expected - it was counter-intuitive - and it changed their thinking and led to new options. This use of the system is different from the other uses and is more like data mining than analogizing or juxtaposing perspectives. Users might "ask questions of the data", such as: Who feels more strongly about this issue, Iraqi shopkeepers or Iraqi Christians? Or, if Palestinians and Israelis have indexed the same stories, where will the similarities appear? Will the common ground be where one expects it to be, or will it be in places one hadn't expected? Will there be elements in the comparison that one can use and work with?
If the system under this scenario is supporting people doing experiments with the data, the visualization should do two things: it should help users *explore* the data in many different and useful ways that lead to flexible and productive experimentation; and it should help users *manipulate* the data in flexible yet easily graspable ways. So, users need to be able to see lots of data at once, in a way that shows lots of trends - but not "canned" trends, trends they can experiment to provide. And they need to be able to transform the data quickly and intuitively, by simply (say) grabbing things and dragging them around. They also need to save, reuse, and communicate experiments and hypotheses.

Requirements

The important aspects of narrative representation for HARP, from this scenario, are:

1. The ability to view large quantities of data quickly, intuitively, and flexibly, in order to see patterns that both suggest and test hypotheses.
2. The ability to manipulate data quickly, intuitively, and flexibly, in order to test hypotheses and run experiments.
3. The ability to save, reuse and communicate libraries of experimental manipulations in order to enhance community and individual memory surrounding experiments and trends.

Representation contexts

There is not only one context under which representation might be used in HARP; there are several. I will briefly note them here (and this list might expand).
1. Query: The user is looking at the system in order to find those germane to their needs of the

moment. They are using all the metadata associated with the stories (filters, narrative indexing, other indexing, text search) in their search.
2. Experiment: The user is looking at the system in order to find patterns in the data and see things from new perspectives. They are not concerned with finding particular items, but they are concerned with particular tasks, like doing thought experiments and "asking questions of the data".
3. Serendipitous encounter: The user is looking at the system, sort of in a "back burner" mode, not particularly looking for anything or running experiments, but just open to getting an idea of the whole database and finding things serendipitously.
4. Community: The user is looking at the system from a community standpoint, to see what has been happening in the system lately, who has been using it, what people have been talking about, and so on.
5. Admin: An administrator is looking at the database to see how complete it is, to see what needs to be done in terms of collection and indexing and user support.

For the purposes of this prototyping work, I will only be concentrating on the first three contexts, as appropriate representations for the other two contexts are less problematical.

Summary of all scenario requirements

Looking at the requirements of all the scenarios, they can be folded into three main capabilities:

1. Compare and contrast - Juxtaposing information in various ways, whether during experiment or serendipitous exploration.
2. Drill down - Looking deeper into something, whether it be how an archetype was derived or which SMIs have been read the most.
3. Manipulate - Making changes to the system, whether to do with creating one's own filters or views or queries, or using the system to do complex thought experiments.

Section Two: Mockups and Prototypes

Sliding Panels Application

Sliding Panels Mockup

Description

The main part of the screen is a large grid, with filters and qualities as columns and rows. Any filter or family of filters, and any quality "value" or set of quality "values" can be placed as rows or columns - thus any possible combination can be made. Rows and columns appear in the grid space by virtue of being dragged there from a master list of available metadata on the left hand side. (This list features in all three graphical prototypes.) The user can drag any item from the list to form new rows or columns.

Inside each "cell" of the grid is a lot of little representations of items - squares or circles or other shapes. Within each cell the items are arrayed by one of two things: they are in text-like rows, sorted by legend symbols and (secondarily) a quantitative axis of the user's choice (e.g., item length); or they are scattered around in the grid cell's space on an XY "mini-plot" based on two quantitative or ordinal axes.

The user can grab and "slide" any row or column "on top of" another row or column, thus performing an AND query. In other words, the item-representations within the cells affected change to show only those items in which both the underlying row/column and the new slid-on-top row/column are true. Thus I might slide the "Cowboy" archetype on top of the "Mastermind" archetype, and the only items I would then see in the cells of that column would be items in which BOTH the Cowboy and Mastermind archetypes are present.

The user can also "merge" any two rows or columns, creating a double-wide column or double-high row and performing an OR query. The user will do this by selecting the two columns or rows and choosing "Merge selected" from a popup menu. This might be used more for quality values that are similar, like "negative" and "strong negative", or for two filters that are similar, like "Hero" and "Superman".

The virtue of this "sliding panels" design is that the user can very quickly and flexibly manipulate what is being seen in order to "ask questions of the data". They can basically throw items around as fast as they can drag and drop things (assuming the software can keep up). Identities can be incorporated into this design simply as stored combinations of panels which can be called up again.

There are two other elements to the visualization besides the sliding panels. The color and shape (redundantly) of the SMIs is determined by a legend based on any quality the user chooses. Thus "personal experience" items might be red stars and "heard about" items might be blue diamonds. Also, the user can filter out items from the visualization based on "dynamic query" sliders for all remaining qualities. These will be as pioneered by Ben Shneiderman: on the left of the slider is "ALL" (no filtering) and the remaining choices are distributed across the slider. Thus, the user may choose to see only items in which the perspective is non-US. The user will populate the dynamic-query area and the colored-legend area by dragging qualities (not filters) from the overall list on the left-hand side.

The user can "brush" or "hover over" SMIs to read titles. This visualization will also incorporate "two-tier brushing", which is that if the user hovers over an item for a short period of time, they will see only the title of the item (as expected). However, if the user hovers over the item for longer, the hover text will expand to show the first segment of text (say the first paragraph). That way the user has two levels of browsing before they have to decide to view the whole item, which they would do by clicking on it, or maybe right-clicking or double-clicking.

Multiple items can be selected to a list by clicking on a grid cell (to select all items in that cell) or by rubber-banding within the cell.

Why make this prototype?

This idea is a combination of three things: (a) the original Python prototype with its rows and columns, which were useful because you could see a lot of things at once and because you could see items against other items; (b) Ben Shneiderman's "FilmFinder" interface which incorporates an XY graph along with "dynamic query" sliders and a color index, which is useful because it allows for a lot of data to be played with at once; and (c) the triangle-query idea, which is useful because you could "mix" archetypes quickly to get complex queries. In general there is a need to be able to manipulate categories and filters, but in a way that allows the user to see the entire database at once on one screen. This is sort of a "power user" visualization, in that many sophisticated things can be done with it. It might also be the hardest to explain, but that might an acceptable thing given its power.

How does it address the scenarios of use?

This prototype will address all of the scenarios of use, and could be very powerful; but it could also be confusing and too complicated.

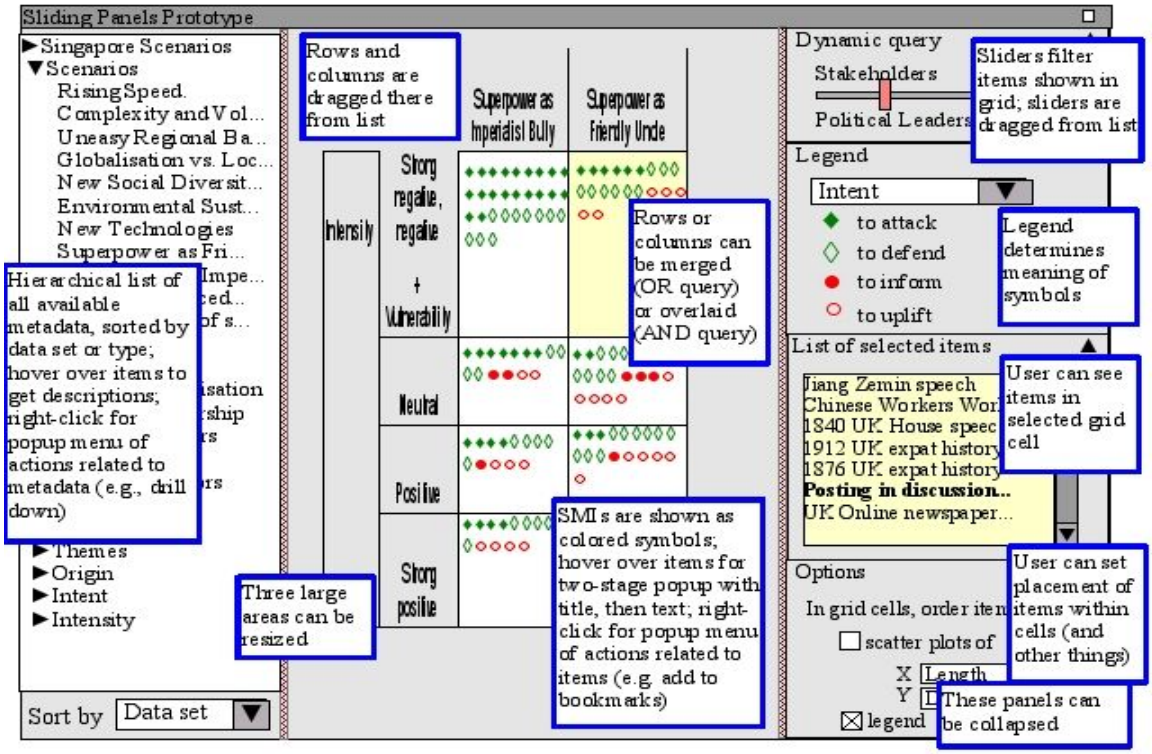
How does it address the requirements of the scenarios it addresses?

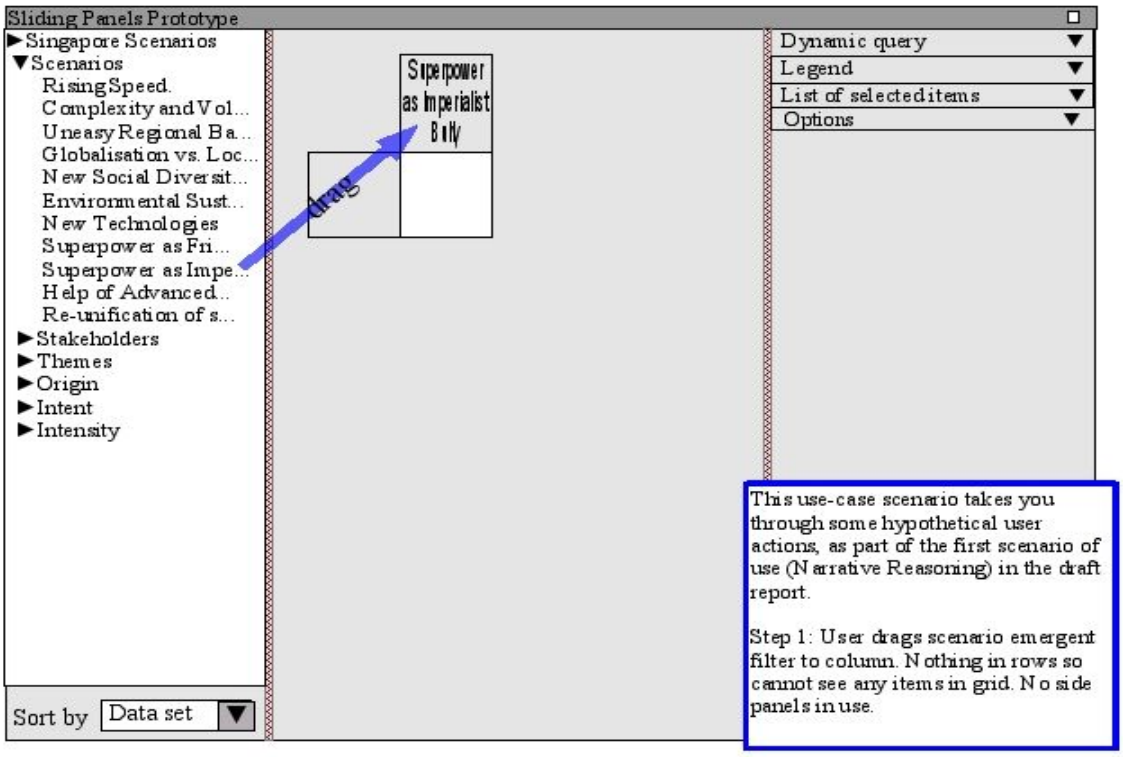
This prototype is high on comparing and contrasting, and on manipulating data. It is lower on drilling down because it doesn't give explicit attention to it.

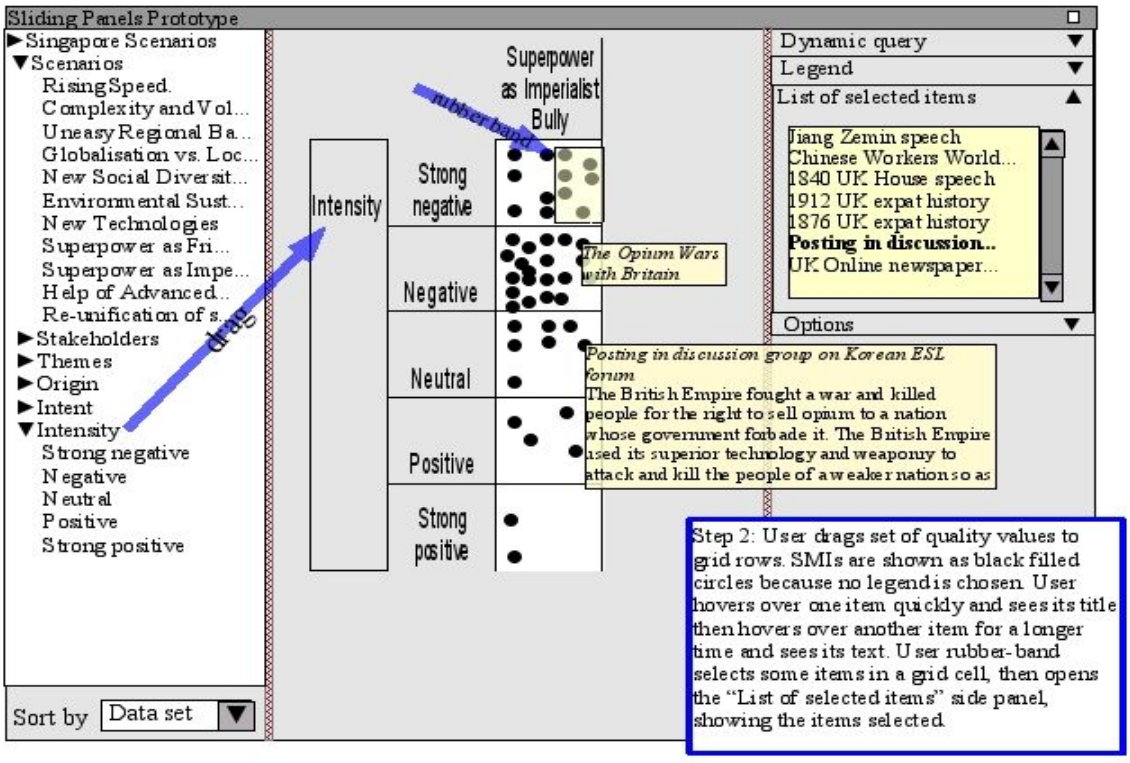
How does it address the contexts of use?

In all the graphical prototypes I am considering here, I am not considering a "plain" query, because that is not very problematical, so this context is not a main focus of the prototypes; however, this prototype can be used for some queries. There is much support for experiment in this prototype (it is probably the strongest for experiment) as many variables can be quickly played with. It doesn't have as much support for serendipitous encounter as things will be more cut and dried.

Mockup screens




Sliding Panels Prototype
Singapore Scenarios
Scenarios
Rising Speed.
Complexity and Vol...
Uneasy Regional Ba...
Globalisation vs. Loc...
New Social Diversit...
Environmental Sust...
New Technologies
Superpower as Fri...
Superpower as Impe...
Help of Advanced...
Re-unification of s...
Stakeholders
Themes
Origin
Intent
Intensity
Sort by
Data set
Superpower as Imperialist Bully
drag
Dynamic query
Legend
List of selected items
Options
This use-case scenario takes you through some hypothetical user actions, as part of the first scenario of use (Narrative Reasoning) in the draft report.
Step 1: User drags scenario emergent filter to column. Nothing in rows so cannot see any items in grid. No side panels in use.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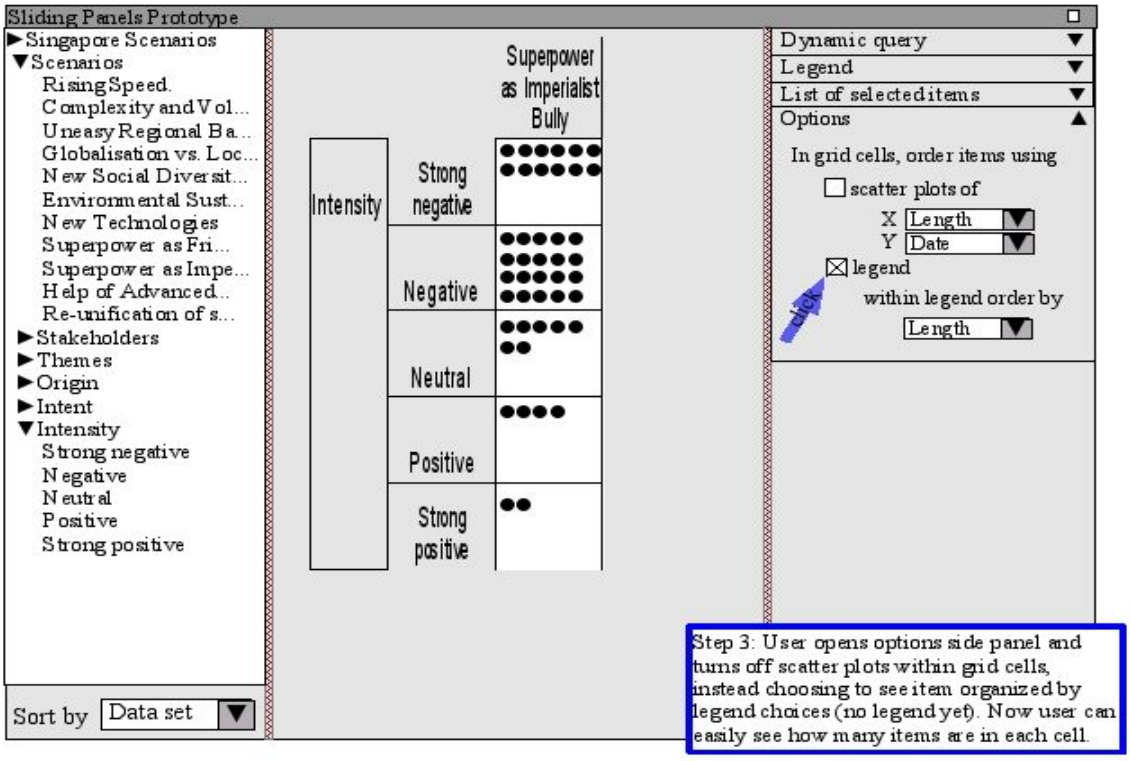
Stakeholders
Themes
Origin
Intent
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Sort by
Data set
drag
rubberband
Intensity
Superpower as Imperialist Bully
Strong negative
Negative
Neutral
Positive
Strong positive
The Opium Wars with Britain
Posting in discussion group on Korean ESL forum
The British Empire fought a war and killed people for the right to sell opium to a nation whose government forbade it. The British Empire used its superior technology and weaponry to attack and kill the people of a weaker nation so as
Dynamic query
Legend
List of selected items
Jiang Zemin speech
Chinese Workers World...
1840 UK House speech
1912 UK expat history
1876 UK expat history
Posting in discussion...
UK Online newspaper...
Options
Step 2: User drags set of quality values to grid rows. SMIs are shown as black filled circles because no legend is chosen. User hovers over one item quickly and sees its title then hovers over another item for a longer time and sees its text. User rubber-band selects some items in a grid cell, then opens the "List of selected items" side panel, showing the items selected.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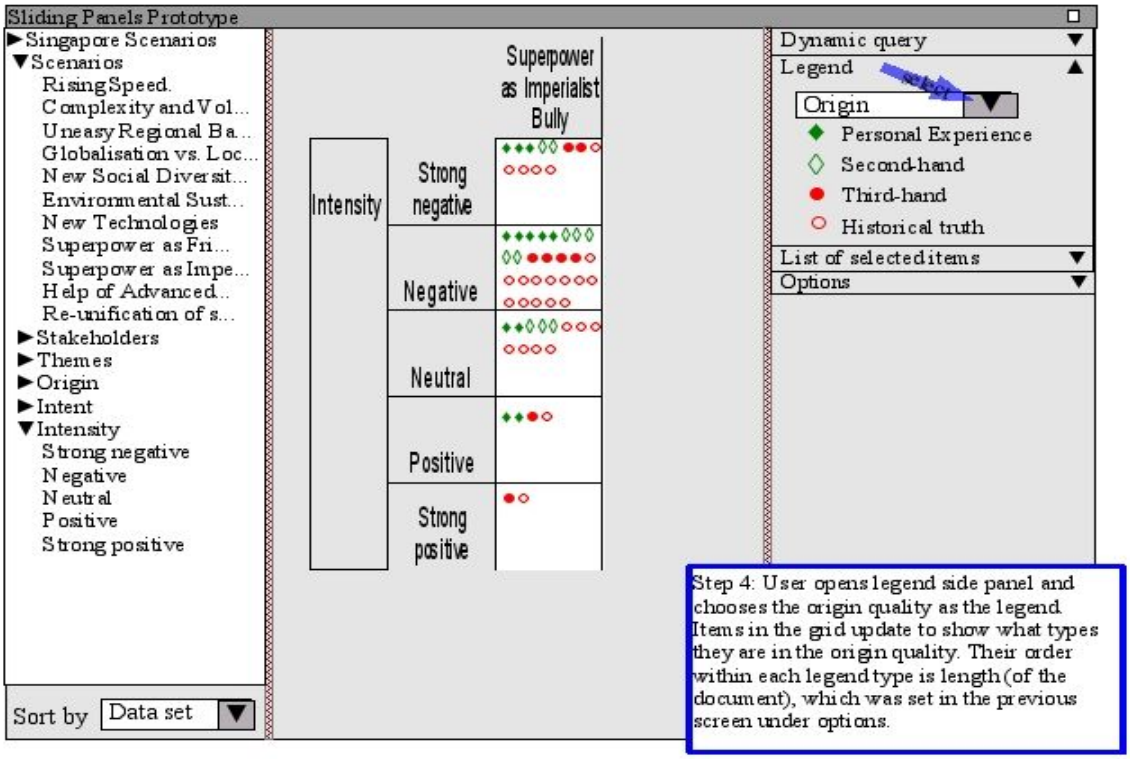
New Technologies
Superpower as Fri...
Superpower as Impe...
Help of Advanced...
Re-unification of s...
Stakeholders
Themes
Origin
Intent
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Sort by
Data set
Intensity
Superpower as Imperialist Bully
Strong negative
Negative
Neutral
Positive
Strong positive
Dynamic query
Legend
List of selected items
Options
In grid cells, order items using
scatter plots of
X Length
Y Date
legend
within legend order by
Length
click
Step 3: User opens options side panel and turns off scatter plots within grid cells, instead choosing to see item organized by legend choices (no legend yet). Now user can easily see how many items are in each cell.


Sliding Panels Prototype
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▼Scenarios
Rising Speed.
Complexity and Vol...
Uneasy Regional Ba...
Globalisation vs. Loc...
New Social Diversit...
Environmental Sust...
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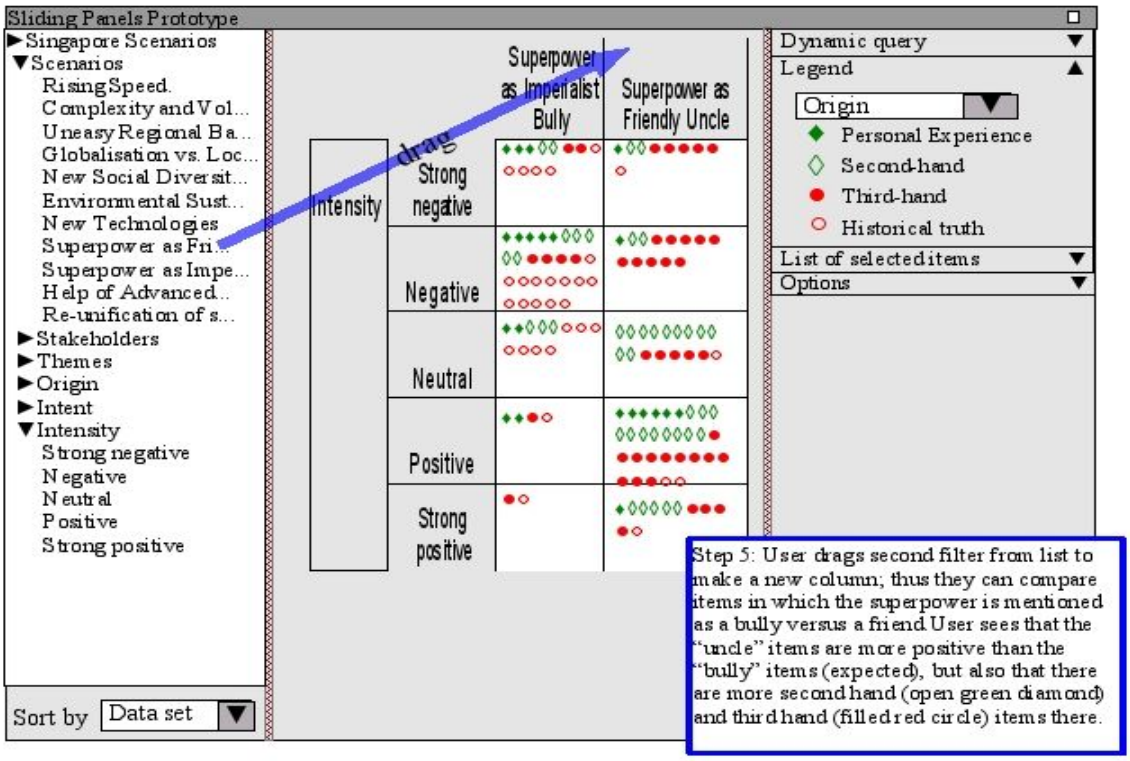
Superpower as Fri...
Superpower as Impe...
Help of Advanced...
Re-unification of s...
►Stakeholders
►Themes
►Origin
►Intent
▼Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Sort by
Data set
Superpower as Imperialist Bully
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 4: User opens legend side panel and chooses the origin quality as the legend. Items in the grid update to show what types they are in the origin quality. Their order within each legend type is length (of the document), which was set in the previous screen under options.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Re-unification of s...
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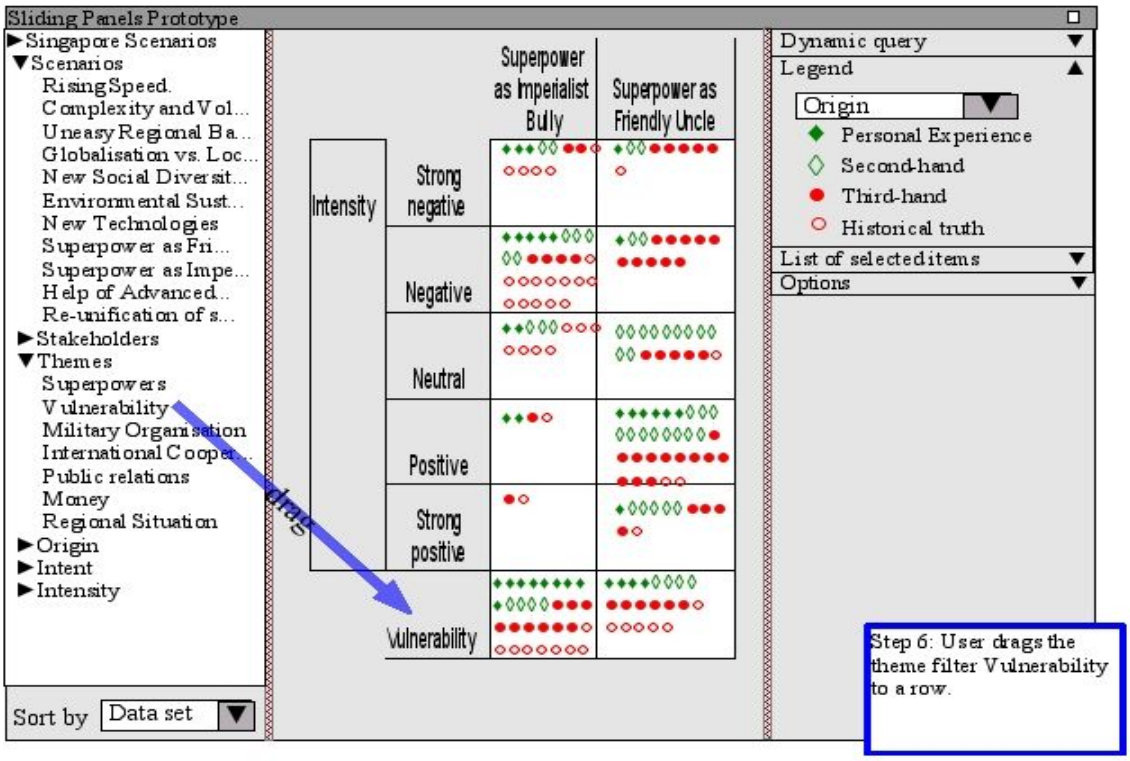
▶Themes
▶Origin
▶Intent
▼Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Sort by
Data set
drag
Intensity
Superpower as Imperialist Bully
Superpower as Friendly Uncle
Strong negative
Negative
Neutral
Positive
Strong positive
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 5: User drags second filter from list to make a new column; thus they can compare items in which the superpower is mentioned as a bully versus a friend. User sees that the "uncle" items are more positive than the "bully" items (expected), but also that there are more second hand (open green diamond) and third hand (filled red circle) items there.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Superpowers
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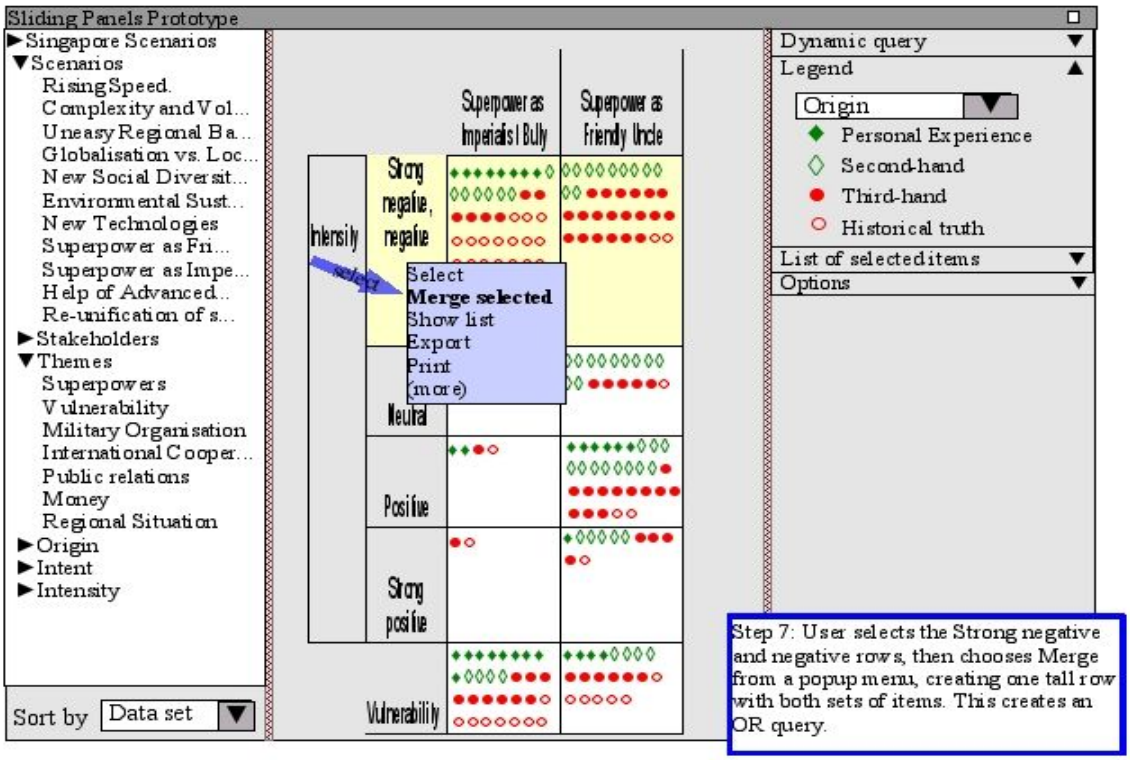
Public relations
Money
Regional Situation
Origin
Intent
Intensity
Sort by
Data set
drag
Superpower as Imperialist Bully
Superpower as Friendly Uncle
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Vulnerability
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 6: User drags the theme filter Vulnerability to a row.


Sliding Panels Prototype
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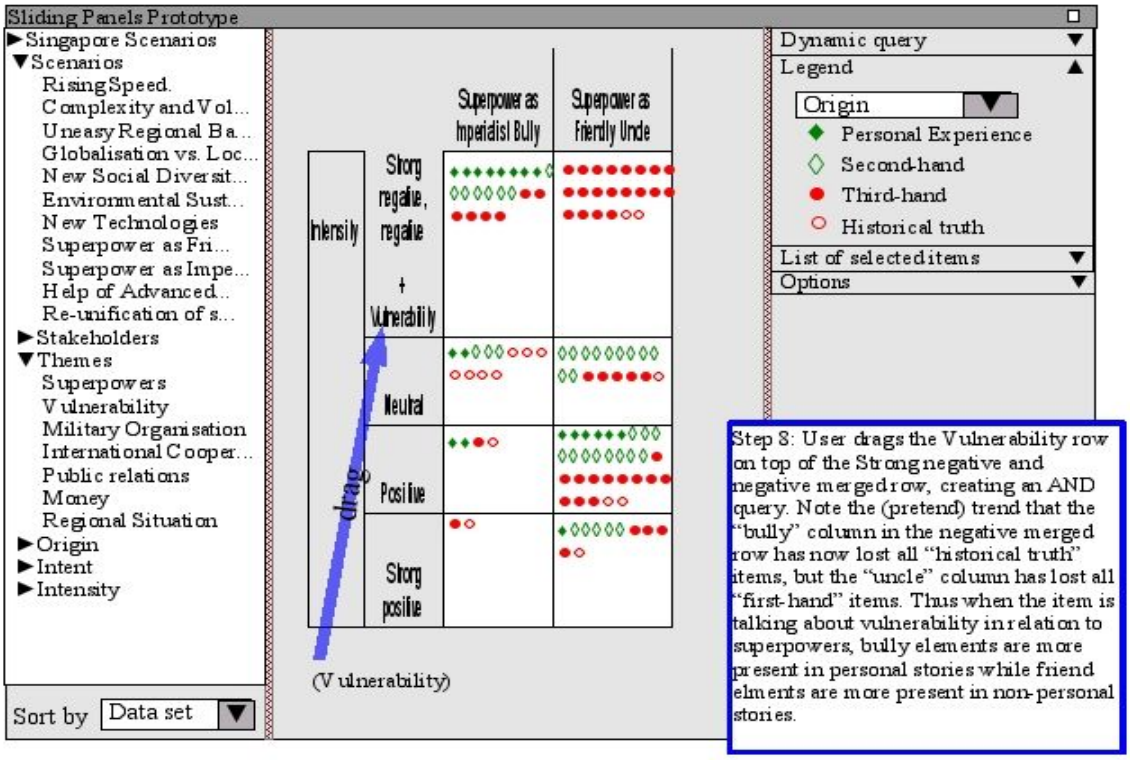
Superpowers
Vulnerability
Military Organisation
International Cooper...
Public relations
Money
Regional Situation
Origin
Intent
Intensity
Sort by
Data set
Superpower as Imperialist Bully
Superpower as Friendly Uncle
Intensity
Strong negative, negative
select
Select
Merge selected
Show list
Export
Print
(more)
Neutral
Positive
Strong positive
Vulnerability
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 7: User selects the Strong negative and negative rows, then chooses Merge from a popup menu, creating one tall row with both sets of items. This creates an OR query.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New Technologies
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Superpower as Impe...
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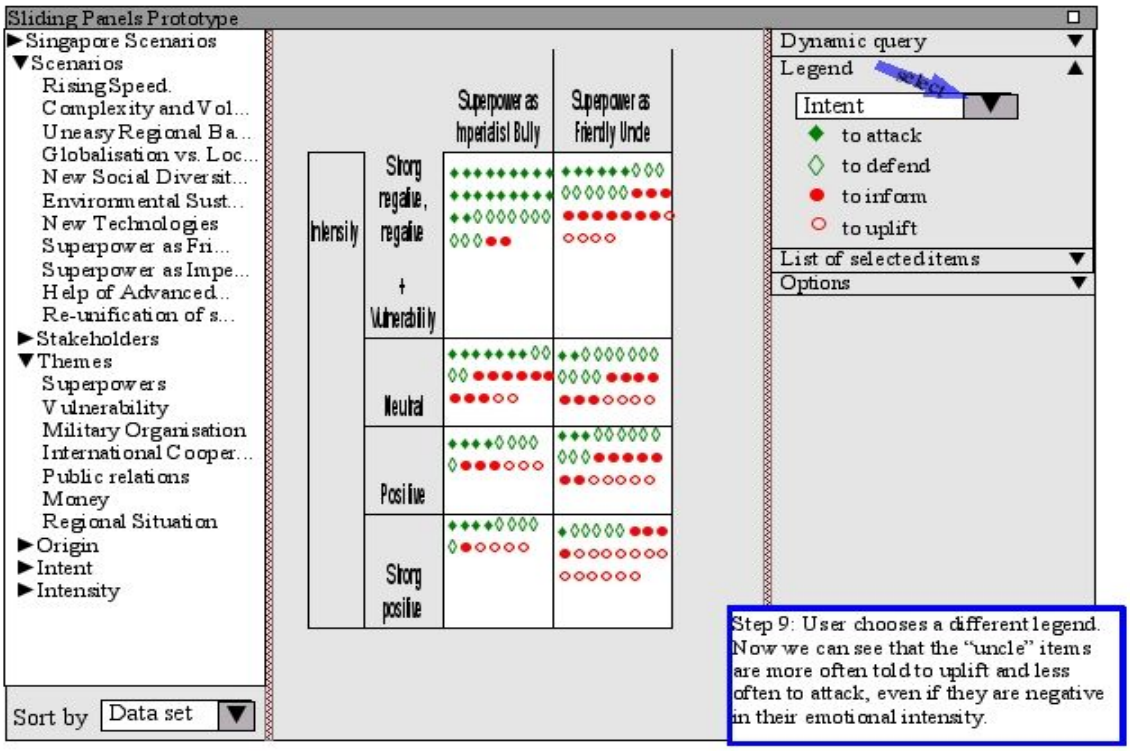
Re-unification of s...
▶Stakeholders
▼Themes
Superpowers
Vulnerability
Military Organisation
International Cooper...
Public relations
Money
Regional Situation
▶Origin
▶Intent
▶Intensity
Sort by
Data set
Superpower as Imperialist Bully
Superpower as Friendly Uncle
Intensity
Strong negative, negative + Vulnerability
Neutral
Positive
Strong positive
drag
(Vulnerability)
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 8: User drags the Vulnerability row on top of the Strong negative and negative merged row, creating an AND query. Note the (pretend) trend that the "bully" column in the negative merged row has now lost all "historical truth" items, but the "uncle" column has lost all "first-hand" items. Thus when the item is talking about vulnerability in relation to superpowers, bully elements are more present in personal stories while friend elments are more present in non-personal stories.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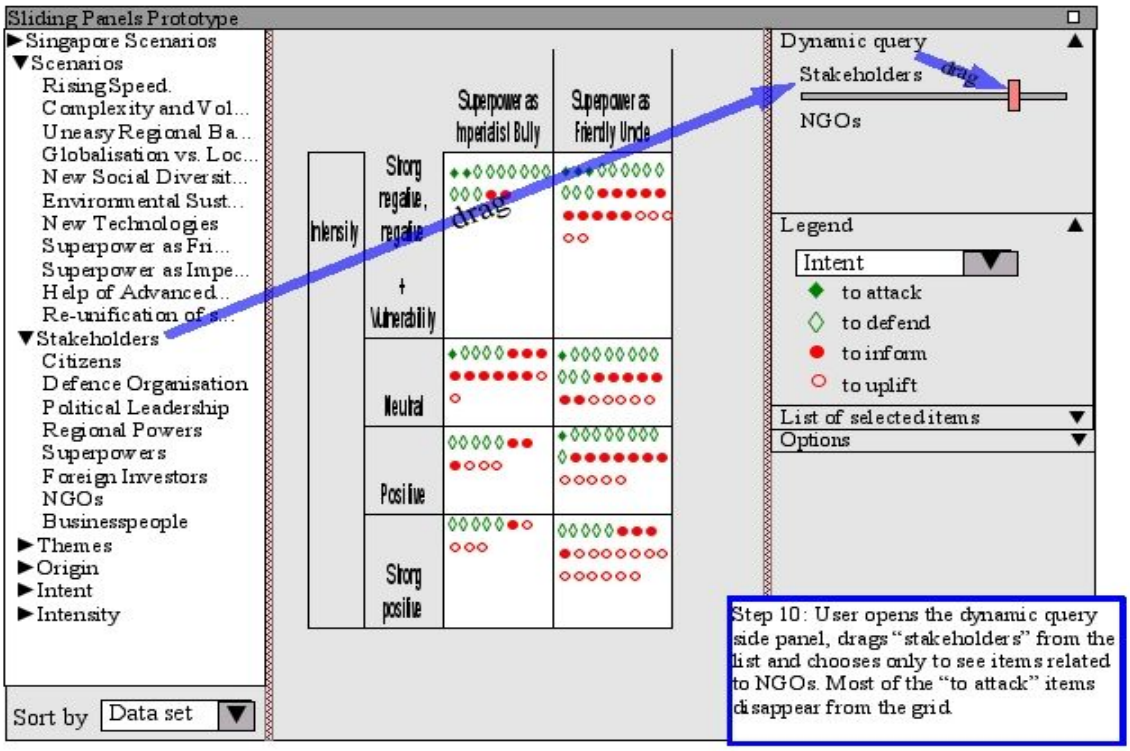
Superpowers
Vulnerability
Military Organisation
International Cooper...
Public relations
Money
Regional Situation
▶Origin
▶Intent
▶Intensity
Sort by
Data set
Superpower as Imperialist Bully
Superpower as Friendly Uncle
Intensity
Strong negative, negative + Vulnerability
Neutral
Positive
Strong positive
Dynamic query
Legend
select
Intent
to attack
to defend
to inform
to uplift
List of selected items
Options
Step 9: User chooses a different legend. Now we can see that the "uncle" items are more often told to uplift and less often to attack, even if they are negative in their emotional intensity.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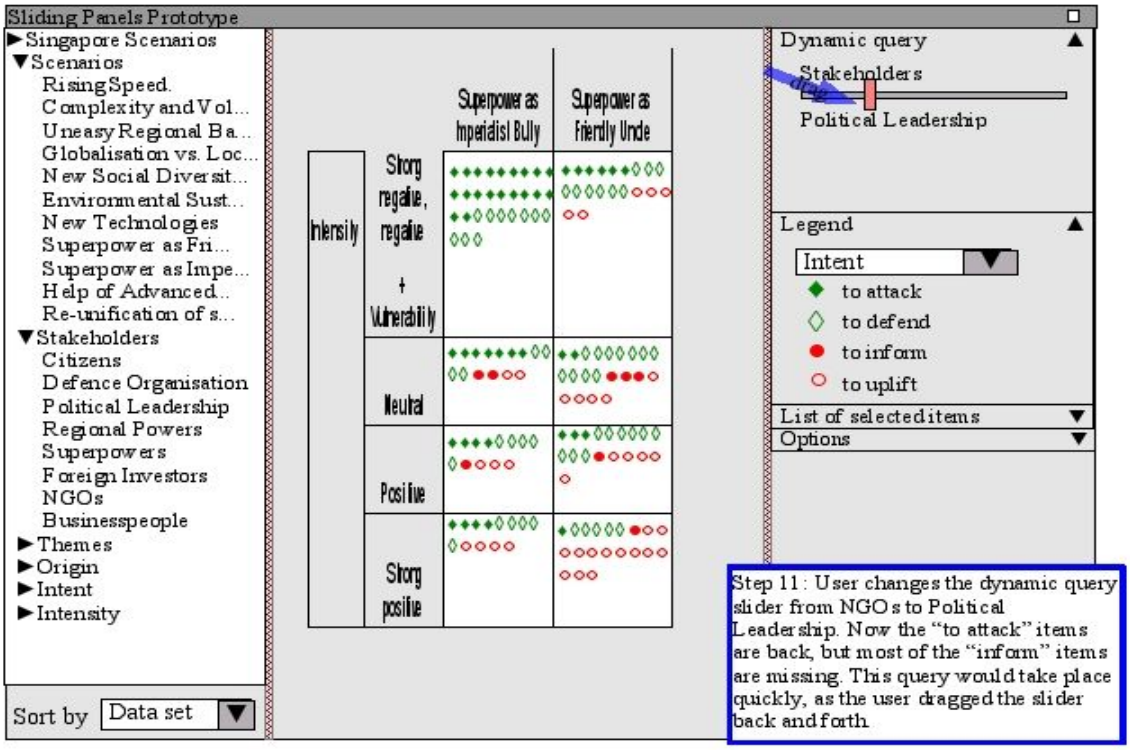
New Technologies
Superpower as Fri...
Superpower as Impe...
Help of Advanced...
Re-unification of s...
▼Stakeholders
Citizens
Defence Organisation
Political Leadership
Regional Powers
Superpowers
Foreign Investors
NGOs
Businesspeople
►Themes
►Origin
►Intent
►Intensity
Sort by
Data set
Superpower as Imperialist Bully
Superpower as Friendly Uncle
Intensity
Strong negative, negative + Vulnerability
Neutral
Positive
Strong positive
drag
Dynamic query
Stakeholders
drag
NGOs
Legend
Intent
to attack
to defend
to inform
to uplift
List of selected items
Options
Step 10: User opens the dynamic query side panel, drags "stakeholders" from the list and chooses only to see items related to NGOs. Most of the "to attack" items disappear from the grid.


Sliding Panels Prototype
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Re-unification of s...
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Defence Organisation
Political Leadership
Regional Powers
Superpowers
Foreign Investors
NGOs
Businesspeople
►Themes
►Origin
►Intent
►Intensity
Sort by
Data set
Superpower as Imperialist Bully
Superpower as Friendly Uncle
Intensity
Strong negative, negative + Vulnerability
Neutral
Positive
Strong positive
Dynamic query
Stakeholders
Political Leadership
Legend
Intent
to attack
to defend
to inform
to uplift
List of selected items
Options
Step 11: User changes the dynamic query slider from NGOs to Political Leadership. Now the "to attack" items are back, but most of the "inform" items are missing. This query would take place quickly, as the user dragged the slider back and forth.

Sliding Panels Prototype

Major changes from the mockup

Tree list

One change that is actually true for all the prototypes with "indexing trees" (that is, with a hierarchical list of all filters and qualities) is that the mockups say the user will be able to hover over items in the tree and also right-click to popup a menu to get details on those items. I never did this, for two reasons. First, the hover-over turned out to be harder and less attractive than I expected; but also, it seemed that the filters and qualities are explained by what the user is able to do with them (drag them places and see them in relation to other things). At least for the time being, there is almost no information about filters and qualities other than what they are linked to (sense-making items, other filters). In the future when there is more information about these things, like how and when and by whom they were derived, those popup windows will become more useful and more necessary. The one prototype that does have information on filters and qualities, the Web-like prototype, does I think have a good place for that information, but for the other prototypes it doesn't seem to merit the user learning things they can do for little benefit.

Viewing SMIs

I implemented hover-over "hints" or "brushing" differently in this prototype than in the Clusters in Space prototype. In that one the user started the hint by hovering over an item and holding the mouse still for a length of time, and if the mouse was still for even longer the hint would be replaced by a longer one (thus "two-stage brushing"). However, the mechanism to do that was clumsy and didn't work perfectly. So in this prototype I tried putting up the hint (SMI name only) when the user *moved* the mouse over the item (which you pretty much have to do to start hovering). Not only was that much easier and cleaner to implement, but the user doesn't have to wait and hold the mouse still (as some people have trouble doing). The downside is that you really don't want a large or two-stage hint popping up as you move the mouse around; but I had already seen in Clusters in Space that the two-stage hint was not all I had hoped it would be. In fact I'm now thinking it is better to just have the name of the item in brushing (if the item is represented by a dot) and get the rest of the information by right-clicking and choosing to see details from a popup menu. It is however an issue for testing whether I am right about this. People will be able to try the "hold still and read a long thing" version of hints in the Clusters in Space prototype and contrast it with the "move over and read a short thing" version in this prototype.

The idea of the legend having shapes was not implemented in this prototype. That is partly because I wanted to reuse already written code for implementing the legend (from Clusters in Space and Jumping Indicators). But also I felt it might be hard to distinguish the shapes in the little boxes - at that scale the difference between a circle and square and diamond is not that great. However, if I had had time I would have tried out the different shapes anyway.

Something I forgot to consider in the mockup was how to show linked SMIs, that is, ones connected to the selected filter through another "similar" filter. I tried a few different representations ("echo" rings, lighter color) but settled on unfilled squares. Note that these don't show how linked the items are (the number of matching attributes), but that comes out in the

item placement. Items are placed by their strength of connection to the filter they are actually linked to reduced by the number of attributes between that filter and the filter that is selected divided by five (the arbitrary maximum). Thus if you click on "Hero" and I am not connected to "Hero" but I am connected to "Saint" which shares two attributes with "Hero", I will be placed by my strength of connection to "Saint" (say 62) times 2/5, or 25.

The unexpected issue came up of where to put SMIs on one of the axes (x or y) when there is more than one filter or value in the query for that row or column. So for example if the user has dragged "(Hero or Saint) and Personal experience" to a row of boxes, where do those SMIs go on that axis? The program just averages all locations for each portion of the query. This is not perfectly correct, as some parts of a query will have a stronger effect than others, but I was not sure how to combine them and averaging them was expedient.

I did not (as was stated in the mockup) give the user any choice as to how the SMIs would be placed in the boxes, simply because there was only one choice available. I could have allowed the user to choose to see document length on both axes, but that is not really very important and is just a stand-in for a better variable. When and if more data is collected on SMIs, like date and location of collection, giving the user choices on how to locate the SMIs in the box will become more important.

The mockup had a sort of ordered view for the boxes, in which the items were all lined up in little rows. I didn't implement this for two reasons. First, there was the problem of what to do when you have too many SMIs to fit in the box in little rows - do you add a scroll bar? But for such small boxes, the scroll bar would take up a lot of space, and it would look ugly. And second, and most importantly, as soon as I saw the first scatter plot I realized that it was much more interesting than SMIs set in little rows. So that idea died pretty quickly.

I did add one thing which was not specified in the mockup, based on my prior experience with the Clusters in Space prototype, that having just "dots" to work with is very limiting. The user can "zoom in" on any one "box" and see its SMIs in a larger space and with names showing (and click on SMIs there and see their texts). The user can't change the queries in the zoomed-in window, but it does allow one to examine a particular set of results in detail.

Interacting with objects

In the mockup I said you could drag a whole family or filters or quality values to the grid at once. That turned out to be a bad idea, simply because you would usually want to be more precise in your querying than that. It was easily doable, but it immediately seemed like a bad idea. I came to the same conclusion in the Clusters in Space prototype.

As with the Clusters in Space prototype, the user looks at item details in a separate window instead of in a panel on the main window. As with that other prototype, this may or may not prove to be a good idea in testing. Note that here there are four ways to view SMIs: by right-clicking on one item by itself (it's a little tricky but bear with it); by rubber-band selecting within one box; by right-clicking anywhere in the box to get all items in the box; or by right-clicking in a row or column header to get all items in that row or column.

There was a similar issue to the other prototypes in terms of having the user drag things to existing, yet empty, objects on the screen instead of to empty spaces. I think that is in general an improvement over the mockups (as is the more realistic use of screen real estate).

The mockup says the user will "merge" (create OR queries of) rows or columns with a popup menu. I soon saw that would be cumbersome, and so I implemented both AND and OR combinations by dragging. This is better because the user can drag any row and column together, whereas in the mockup they would first have to place items in adjacent rows or columns. More on that later.

Good things

The moment I first saw the "graph boxes" in this prototype (with random data, even, to start) I knew they would be worthwhile. Especially the ability to populate so many comparisons side by side is very interesting and exciting. There is also some exploratory value to the boxes in that they are sort of like little correlation plots. The closer two filters are in meaning, the more the SMIs will form, if not a line, at least a coherent cluster. A box with two filters whose meaning is unrelated will show more of a scattered pattern. So one can explore similarities and differences between filters by placing them in rows and columns against each other. Of course one cannot use these patterns with quality values, because SMI placement on those axes is unrelated to meaning (thus it should be replaced with a meaningful placement as soon as possible).

Using the graph boxes also helps the user find "pivot items", which are items that are linked to several filters of interest and therefore can be more useful than other items for discussing and communicating complex situations. These pivot items can be seen graphically, in the lower right-hand corner of a box that combines two AND queries of filters one wants to consider. So for example if I want to explain that within a government there exists a complex situation involving honor, saving face, internal squabbling and power plays, and a populace increasingly dissatisfied with its leadership, if I have filters that match these conditions (and the larger the filter base the more likely I can find that combination), I can place these conditions together and look for items that involve them all (the strongest are the best examples). Those items, whether contemporary or historical (or even fictional) can be used as metaphorical examples to explain the situation.

In comparison to the other prototypes, this one probably supports "going deep" into the data the best, because the user can make many complex comparisons at once, and because this prototype is probably the most flexible in terms of what can be done with it. Having all the little boxes filled is like having many query applications open on one's screen at the same time.

Issues and problems

The "dots" problem is at its worst in this prototype. The user really has to do something to the SMI representations to find out what they represent. How much of a problem this is will depend on testing.

I mentioned previously that I did away with the cumbersome OR combination by menu. However, making the AND/OR distinction during the drag might be difficult to pick up. Because I wanted these both to occur within a drag (i.e., I wanted the user to be able to change their mind repeatedly during a drag), they must drag to the *center* of the header to create an AND query and to the *periphery* to create an OR query. We will see how well that works out. Even though it might not be as obvious as a menu item, I do think it provides more dynamic flexibility once the user has understood the difference.

SMIs are placed in the boxes by their strength of connection to filters, which is meaningful. For quality values, however, there is no "strength", so I just used the length of the text divided by the

length of the longest text in the loaded data (the same as for the Jumping Indicators prototype). This I recognize to be a worthless piece of information, but for now it is the only continuously varying variable available for quality values. I think it could be possible in future to use for this a "strength" of connection to the quality value based on the number of times some set of "indicator" words appears in the text. Say for "Personal experience" it is determined that indicator words like "I" and "my" are more likely to appear; placement of items on quality value axes could then depend on how many times those indicator words appear. That would then provide a meaningful value so that scatter plots that involve quality values would be useful exploratory tools.

An alternative, of course, is to have indexers provide strength scores for quality values, in the same way they do for filters, by dragging sliders. There is some merit to that approach, since people will be used to doing that already, and it may not take much more effort to drag a slider as it takes to click a check box. To some extent that choice depends on how important it turns out to be that SMIs can be placed in 2D space by these indexes. If for example the graphical prototypes were determined to be much less useful than the text-based prototypes, this would be a moot point.

Things not done

This entire prototype was written in about 12 hours, so I reused as much code as I could and left out more niceties than in the other prototypes. I had wanted to allow the user to change the size of the boxes and the number of rows and columns, but there wasn't time for that. I had wanted to implement multiple shapes in the legend, but that would have required making substantial changes to the legend code, which I reused without changing.

Also, on making the screen shots for this prototype, I find myself wanting to get more information on filters and attributes and linkages, which is easier to get at in some of the other prototypes. That could be added fairly easily via a popup menu item, but I don't have time for it now.

Open questions (originally in mockup report) reconsidered

Isn't this a little bit too complex and nerdy? Will there be any users interested in plumbing such a system to its depths? Would this only work for extreme power users or extremely detail-oriented people (like yourself)? Is the learning curve too steep? Is anyone going to sit through learning how to use all this?

> Actually, surprisingly, I find this prototype less difficult to learn to use than the Clusters in Space one. Of course I am not a good judge so that is a question for testing. It seems to me more accessible, mostly because many people are quite used to the row and column idea of spreadsheets.

Will people drag things? Will it be too much trouble? Would they rather choose "Add to Grid" from a menu? Is supporting drag and drop just not necessary, or is it wonderful and useful?

All of the prototypes support both drag-and-drop and doing the same operations from the menu (though not always in exactly the same way). Good GUI design requires that they continue to support both no matter what people do. Usually most people will like to click and drag, because it's faster, but you will always have some people who prefer the menu because they have a harder time holding the mouse steady.

Where will people drag things to when there is no grid/row/column there yet? Will there always have to be an empty row and column sitting there waiting for things to be dragged to it? Won't that take up screen space? Won't that be confusing and look messy?

This problem was dealt with (in this and other prototypes) by having "empty" items waiting for content instead of blank space.

Is having the list of all indexes on the left-hand side too "tech"-y? Will people not want to see that? Of course the next question then is how would you navigate the system without seeing that stuff - but still, one could ask if there is a more friendly way to present the "all available indexes" information.

I would say this is still an open question for testing, with all of the prototypes that use the tree list (Clusters in Space, Jumping Indicators, Sliding Panels).

Is there enough room on the screen for the large grid? Are the side panels taking up too much space? Should they be shrunk further or perhaps moved off to modal dialogs? For that matter, is the available indexes list taking up too much space, and should it be moved off to a dialog?

I discussed why the tree needs to stay on screen in one of the other reports; basically it's for object permanence and for the user to understand the centrality of filters and qualities. (Note, some of these questions have already been answered in this report, since this prototype came first in the "literature-based research phase report" but last in this report. But I'm leaving them here anyway to make sure they get answered.)

What will happen to the grid cells when you have something like 1000 or even 10,000 in each one? Doesn't the legend-symbol system then become kind of meaningless?

Yes, the legend does become somewhat meaningless when you have thousands of items, because many dots get drawn on top of each other and the color you are seeing (and the symbol if symbols were differing) is just what happened to land on top. However, one saving grace of this prototype is that because you have so many little boxes, it is nearly impossible to look at *all* of the data in one box. You would have to make a giant OR query to see all of the data. For example I looked at an old data file with about 700 items, and rarely did I see more than 50 items in one box, with some standard typical comparisons.

What about the XY graphs? Are there really enough indexes that XY graphs can convey meaning? Also, what happens when you have 10,000 items on a little tiny graph? How can you possibly look at them?

I don't think this is a problem since you are looking for trends in the patterns of items, not the individual items so much. Also see the answer to the question above.

Will hovering over item "dots" be good enough, or will people want to be able to read whole titles instead? If they want to read whole titles, where will they fit? Will it just take forever to get

a sense of anything if people are just hovering, hovering the whole time? Does that mean that using dots won't work?

> This was discovered to be a real problem in the Clusters in Space prototype, so I added a "zoom in" window to this one, where the user can read whole titles. Whether that works well enough will have to come out in testing.

This mockup doesn't have any space for the text of the current item. Is that okay, or is it a big problem? If you do need a "current item" space, where should it be? Should it be in a side panel, or always available?

> This has actually been a big problem with all of the graphical prototypes. Usually the texts of the SMIs are long enough that a lot of screen real estate has to be given over to showing them. Also, there is often more than one SMI at one (graphical) point, so there must usually also be a list box of item titles as well. In Clusters in Space and Sliding Panels I moved the examination of SMI texts off to another window, and in Jumping Indicators I kept them on the main window. I'm not particularly happy with *either* solution, though. Testing will help to show the best way to resolve this dilemma.

Should any of the mocked up side panels not be collapsible (like the legend or the list of items)? Should they not be there but be somewhere else?

> Most of these side panels have been removed or moved to the bottom of the window. There are screen real estate problems there too, but to some extent they are not fixable.

Is the legend going to work at all? Will there be enough useful single-choice metadata for it to be useful? What about the problem of people trying to use it on multi-choice metadata and being frustrated that they can't? Will the symbols just blur together when they are very small and not mean anything?

> Problems with the legend throughout, mentioned in reports on other prototypes.

What about the issue of how large or small to draw the item symbols? Should the size be dynamically calculated based on how many items are in the space? (If so what if different grid cells have widely differing numbers of items in them? Wouldn't that be confusing if some cells have tiny dots and some have large dots?) Or should the size be controlled by the user?

> I've completely avoided this issue by arbitrarily choosing the size of the "dots" (it's 5 pixels). This will probably cause problems when people have very small monitors (like on laptops) where each pixel is very tiny. The user should really be able to change the size of the dots to suit their environment. Dynamically calculating the size of dots based on how many items there are in the space would probably just confuse the user, as they would assume it meant something.

What happens if the dots one has to draw want to be on top of one another? For example what if you are XY graphing by length vs. date, and two items have the exact same number of words and collection date but are not the same item? Or, what if the cell you are drawing into is so small that you can't distinguish two SMIs from each other? What do you do then?

> There isn't much you can do with this given that you are dealing with a fixed amount of screen space and a potentially huge amount of data. The "zoom in" window helps with this, and also the user should be able to increase the size of boxes on the main window.

Is the dynamic query too much complexity on top of the grid? Should that be left out? (Note that in the mockup, in a change from the draft report, I decided that the user could have filters as well as qualities in the dynamic query.)

> Actually the dynamic query has turned out to be quite important and useful. In contrast to what this question says, I did not put filters in the dynamic query. Why not? I'm not sure. They are just not that kind of thing. This decision could be revisited later.

New questions for testing

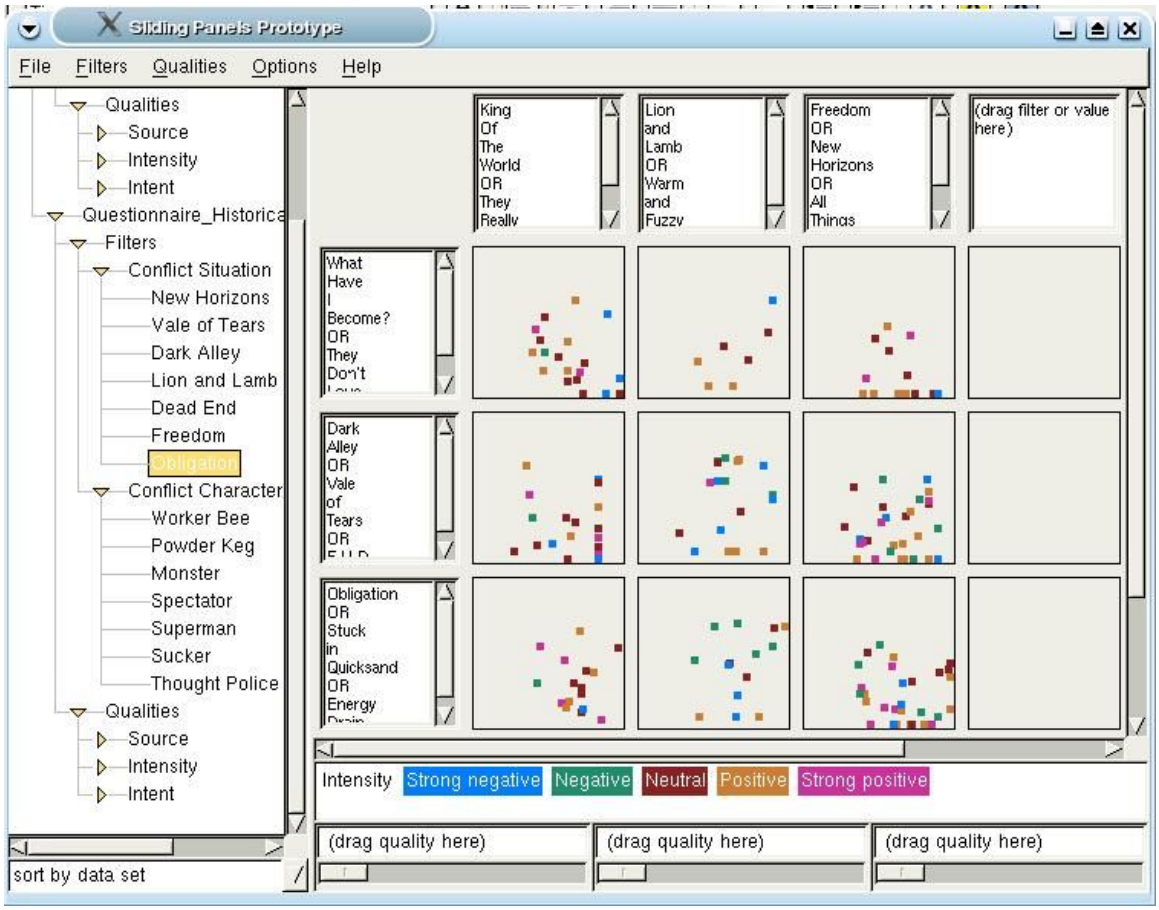
1. The "dots" issue is more strongly tested in this prototype than in any other. Will it be so frustrating to see dots and not know immediately what items they refer to that the prototype becomes less than useful? Or is that not a problem?
2. The separate window for reading SMI texts needs to be tested here as in the Clusters in Space prototype. Is it confusing and distracting to have a separate window come up with details on a selection, or is it fine?
3. How useful are the side by side queries the user can put together in this prototype? Is it as useful as it seems, or does it not really provide very much power?
4. Is this prototype too complicated? It seems simple, but things always seem that way to their makers. What will a novice to the system do with this prototype?
5. Will people really use the AND and OR queries, or will they just ignore that and use single queries? If people do use complex queries, what needs might they have that this prototype has not anticipated?
6. How does this prototype need to change to deal with many screen sizes and many user abilities to discern small objects and differing colors?

Prototype screen shots

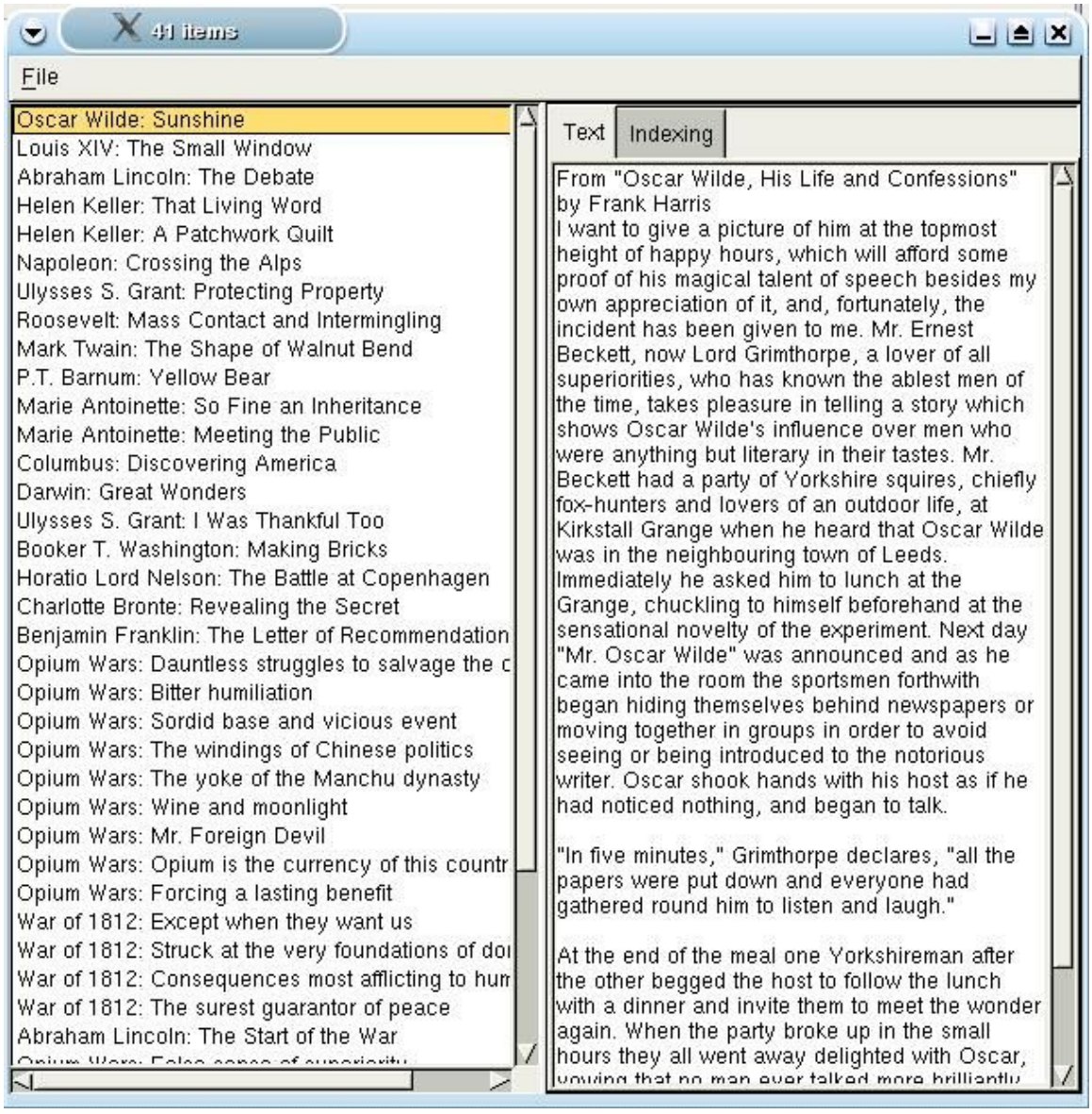
Here the user has opened the two historical sample data files and is exploring just one set of situational archetypes (the "leadership" ones). They have placed three pairs of comparisons on the top and side:

1. popular vs. unpopular (King of the World or They Really Love Me vs. What Have I Become? or They Don't Love Me)
2. happy vs. sad (Warm and Fuzzy vs. F.U.D.)
3. freedom vs. lack of it (All Things Are Possible vs. Stuck in Quicksand or Energy Drain)

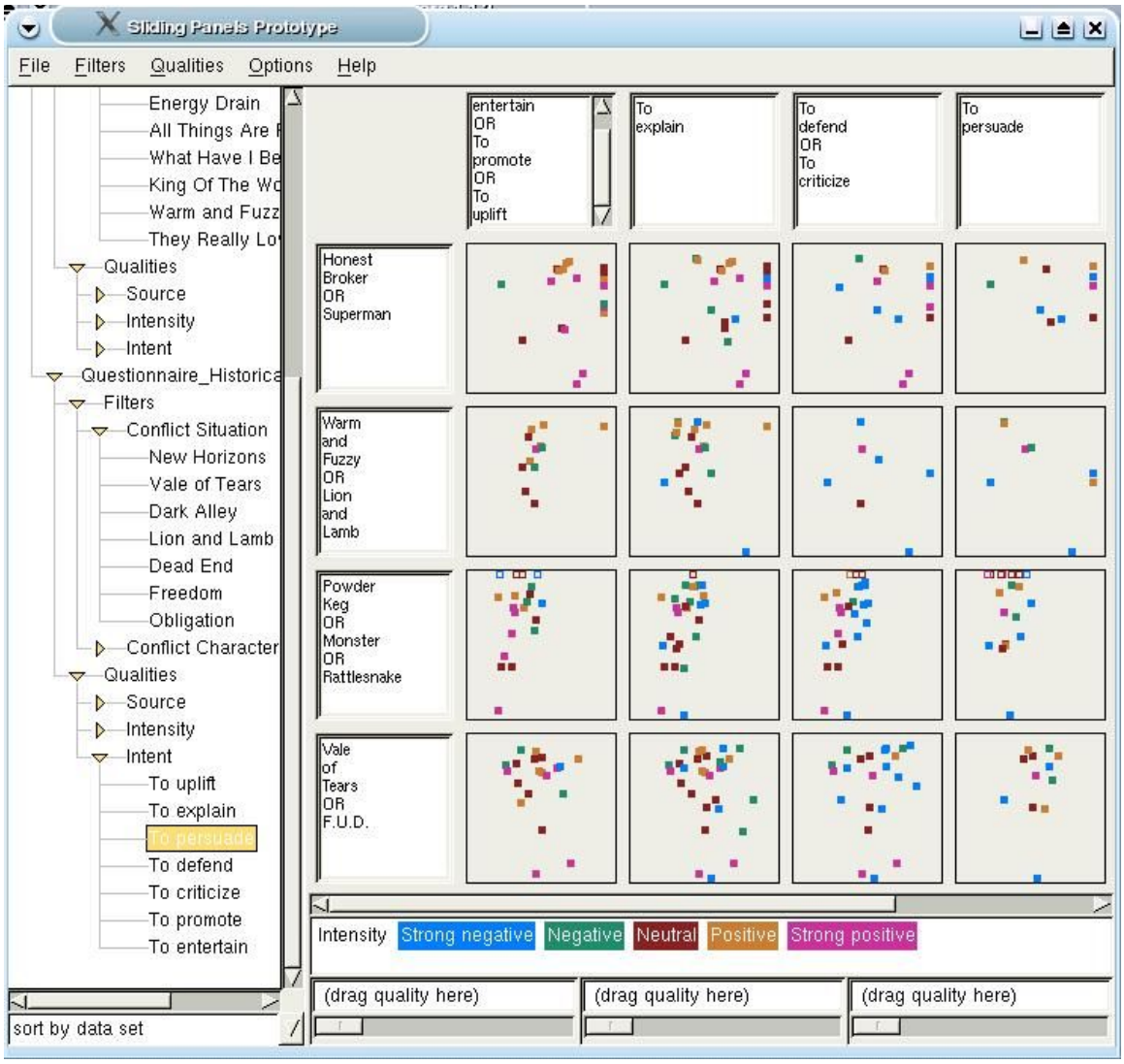
The user wonders what would make an item have strong showings for all of these pairs. Such a story (if it is a story) would be about contrasts. By moving the cursor around, the user finds three items that seem to be in the bottom right-hand corner of several of the graph boxes: "Booker T. Washington: Making Bricks"; "Oscar Wilde: Sunshine"; and "Benjamin Franklin: The Letter of Recommendation". And yes, each of these tells a story about a contrast between expectation and reality (the first two expected bad outcomes and saw good outcomes; the last expected good and saw bad). All of these would be candidates for discussing or conveying contrasts in terms of positive and negative values.



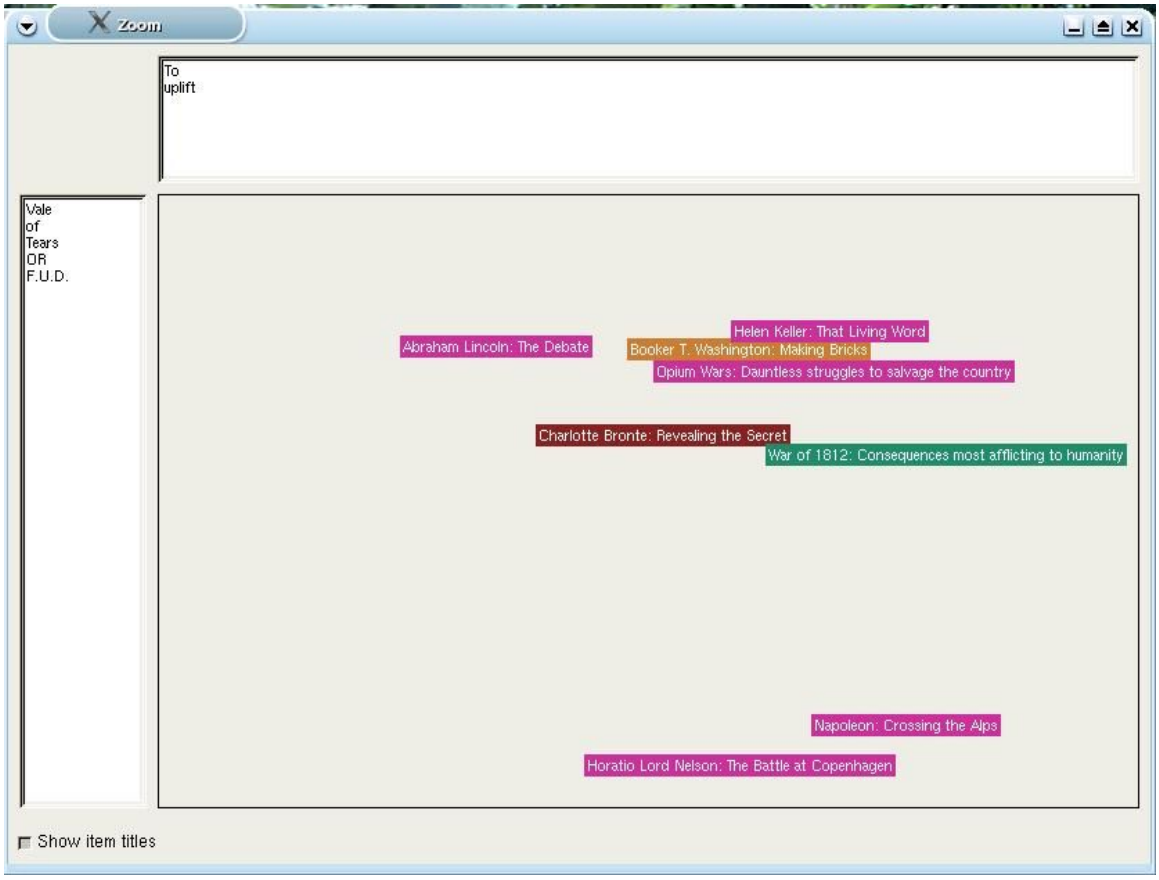
Now the user has decided to add situational archetypes from the "historical conflicts" set, to see if they can find more items in the high-contrast category. Note that the open squares which represent linked SMIs have gone away; this is because by OR'ing the two sources of situational archetypes the user has directly referenced the filters that were referenced by attribute matching before. Now three additional items seem to be prominent: "Opium Wars: Wine and moonlight"; "Opium Wars: The windings of Chinese politics"; and "War of 1812: The surest guarantor of peace".



Now the user has right-clicked on a row which has all the interesting items and chosen to see details on all items in the row. In the list are all six interesting items, and the user looks at each in turn. The interesting thing about the additional "historical conflicts" high-contrast items is that they are not stories so much as arguments that some thing which everyone thinks about one way can actually be seen in the opposite way. So again the user has found some interesting items in which opposites are at play, but has found a complementary set to perhaps use in a different way.



Now the user has cleared the grid and started again, looking at positive characters and situations (first two rows) alongside negative characters and situations (third and fourth rows), all versus the intent of the item, positive first (entertain, promote, uplift), then neutral (explain), then negative (criticize), with persuasion thrown in just because there was extra space. The user was wondering if they might find more positive-archetype items in the positive-intent SMIs, and vice versa. It's not obvious from looking at the dots if there is any such trend, so the user starts counting by opening windows on the items in each box in turn. They find out that in fact there are more positive-intent items linked to positive archetypes: the first two rows have positive-negative intent ratios of 24:18 and 12:7, and the third and fourth rows have ratios of 20:26 and 20:22. Not a strong trend, but possibly a useful one, and one the user can explore further. For example, the user might now start looking for SMIs to contrast between strong links to positive archetypes and intents and strong links to negative archetypes and intents.



The user wonders: what sorts of items might be found where negative situations are discussed (Vale of Tears or F.U.D.) but the items were (judged to be) told in order to uplift? The user removes the "to persuade" column and adds a separate "to uplift" column, then zooms in on the graph box combining "to uplift" with "Vale of Tears OR F.U.D". Interestingly, all of the items that appear there could be said to be propaganda-like, in the sense of promoting a particular point of view strongly or making a certain person or group appear in a good light. "Booker T. Washington: Making Bricks" is about how young people can be turned around when given a solid mission administered with a strong hand; "Opium Wars: Dauntless struggles to salvage the country" is part of a speech by Jiang Zemin; even "Charlotte Bronte: Revealing the Secret" is a sort of PR piece for the Brontes. The user wonders if an effective device for promoting an idea or person is to embed uplifting praise for that idea or person in a story about dangerous circumstances, which may seem more compelling or important to readers. The user might then turn to examining the opposite stories, those in which positive situations are told to criticize, and so on.

Clusters in Space Application

Clusters in Space Mockup

Description

Emergent filters and non-emergent filters are circles in space around which sense-making items cluster. Clustering is determined by a "spring tension" model, in which the program iteratively optimizes the location of all items (starting from a random distribution), with the "tension" on each "spring" determined by the similarity between two objects (item and filter), until the energy in the system reaches its minimum level. The user can grab filters and drag them around, and linked items follow. (Note that in the draft report I wanted to have filters place themselves in space in relation to other filters based on similarity (attribute-wise), but on reading more of the literature I decided that would be counter-productive, since part of what the user is doing is watching how the items move as they drag around the "membership" types.)

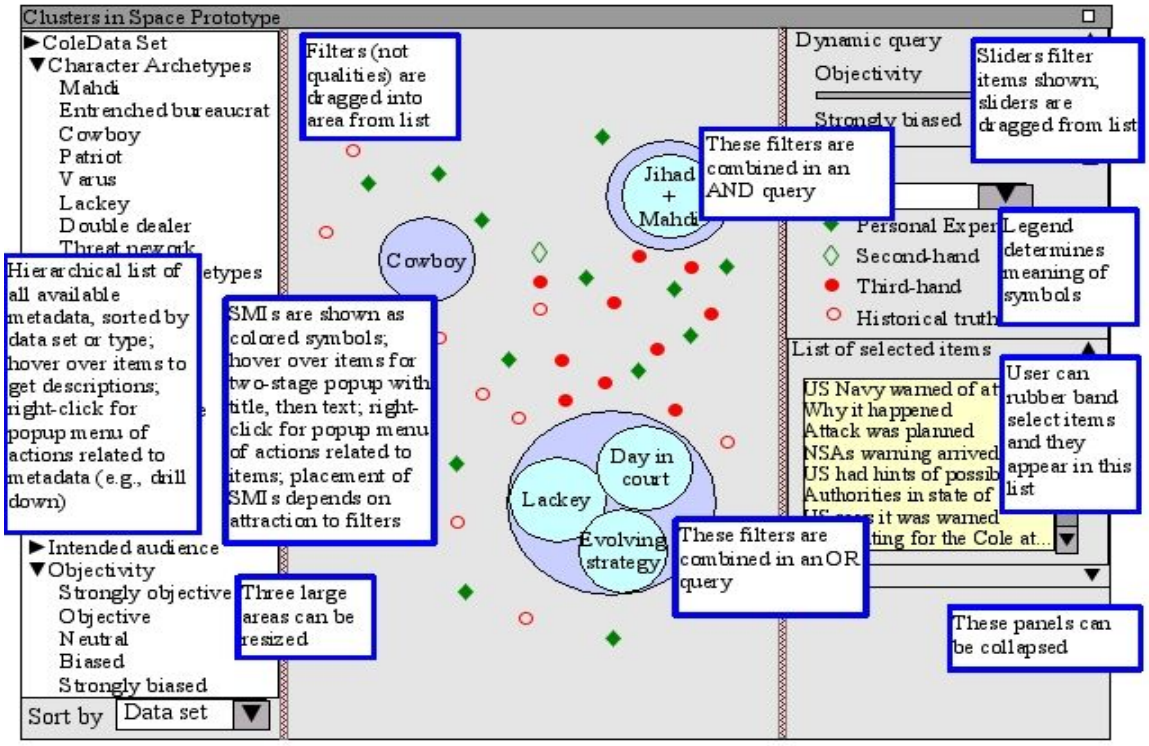
The user can also combine filters in the space in two ways:

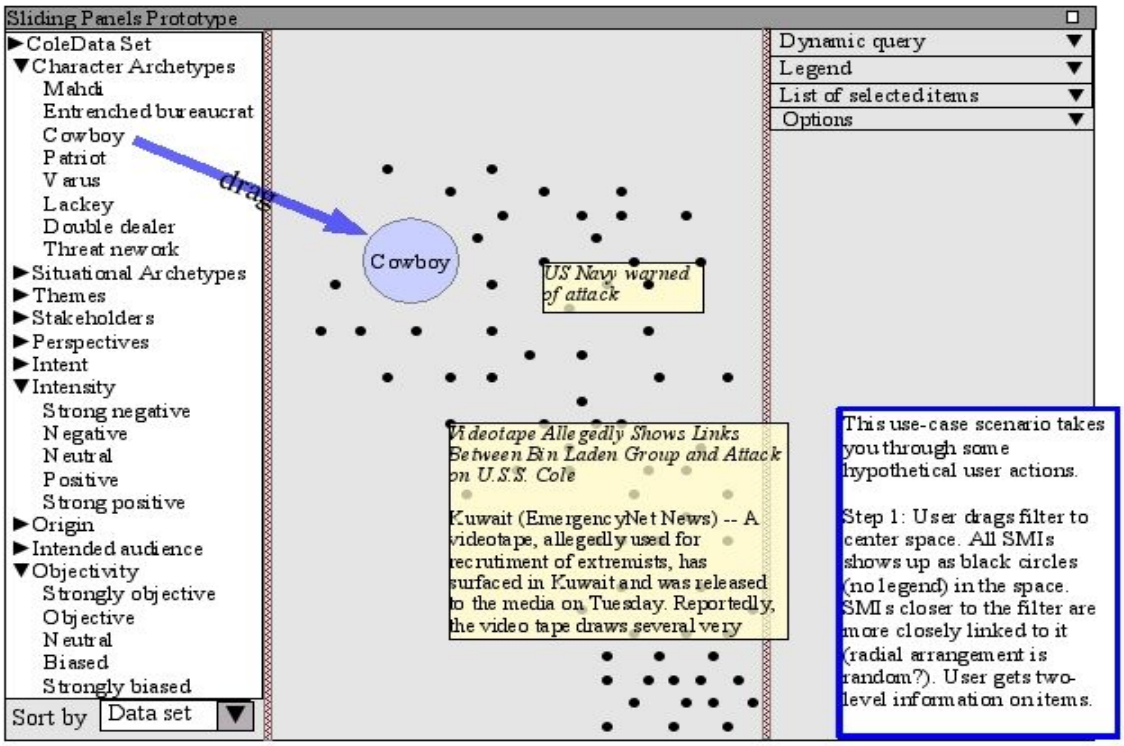
1. The user can drag a filter from the list or from the cluster space "on top of" another filter in the space. The two filters will form concentric circles, showing that they have been combined in an AND query. Only items linked to both filters will be drawn towards the combined composite.
2. The user can drag a filter from the list or from the cluster space "next to" another filter in the space. The two filters will sit next to each other, showing that they have been combined in an OR query. Any items linked to either filter will be drawn toward the combined composite.

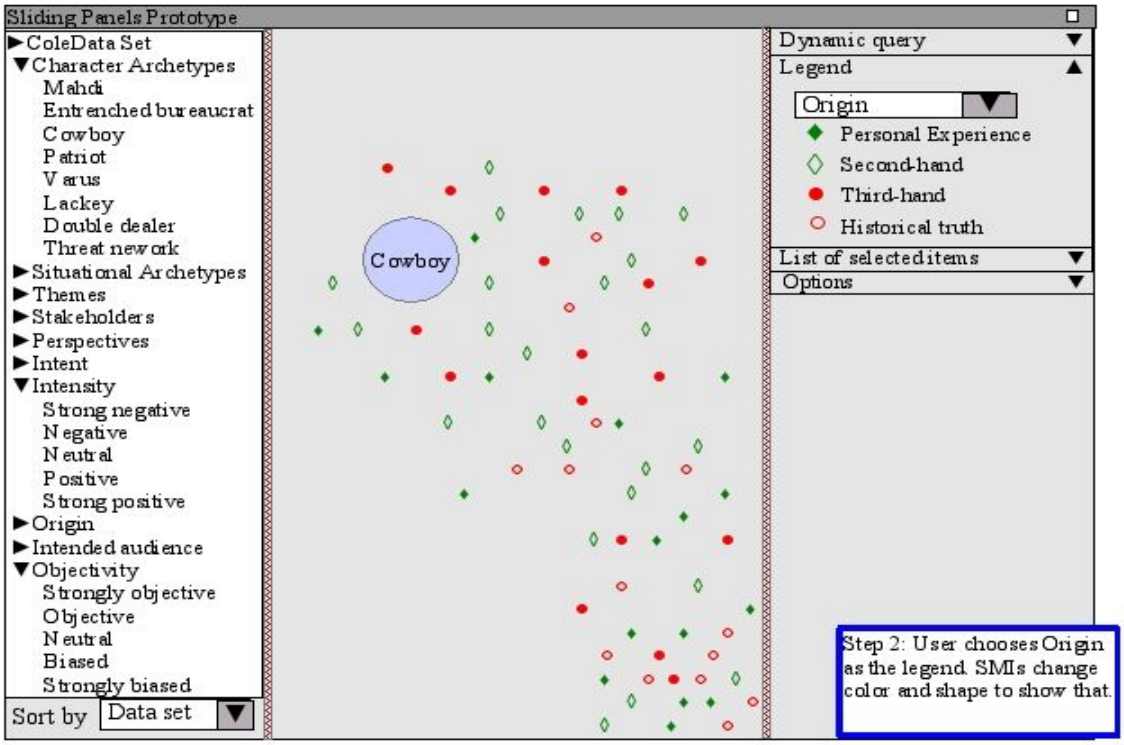
Qualities affect the cluster-graph in two ways: (a) by altering the colors/shapes of items (with a legend selection), and (b) by removing certain items from the display (with dynamic-query sliders). This is as with the Sliding Panels prototype. However, in this prototype you can't drag qualities to the tension-springs area, because I want to test if it's better when they are separate. Brushing (hovering) works as in the "sliding panels" display, with two levels of information given for an item hovered over.

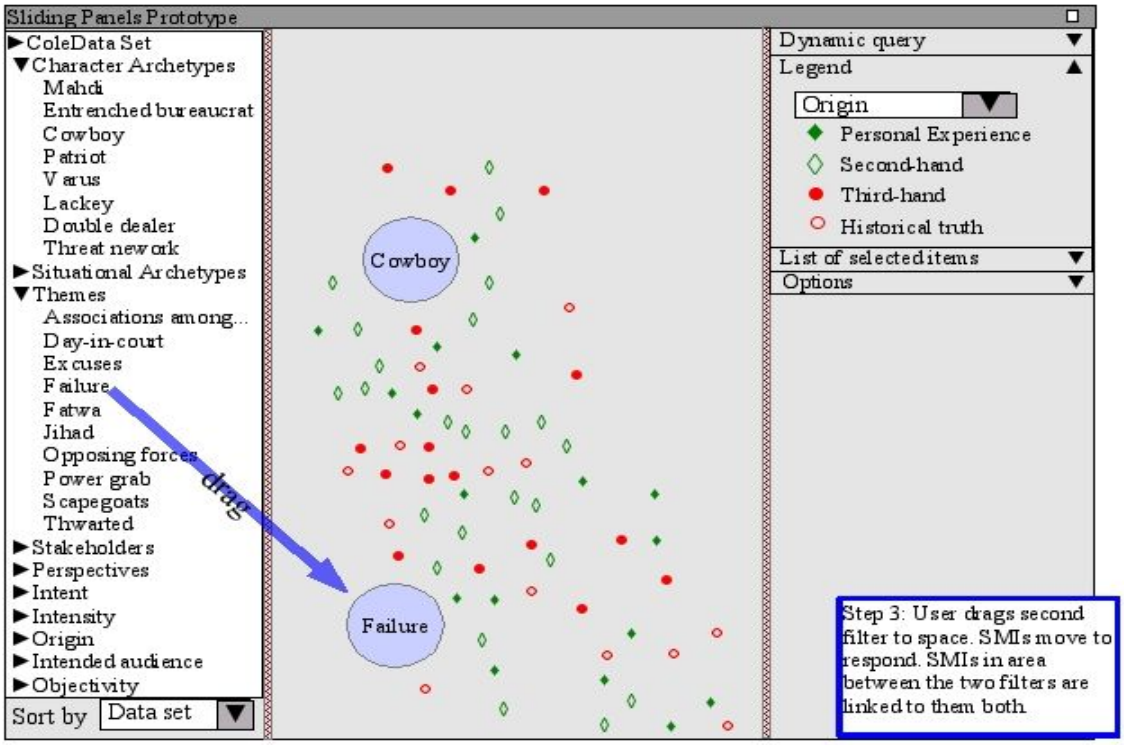
The user can drag any filter or family of filters to the clusters space, or any quality to the dynamic-queries space or the colored-legend space. Actually, that's not entirely true: the user cannot drag multi-select qualities to the legend space.

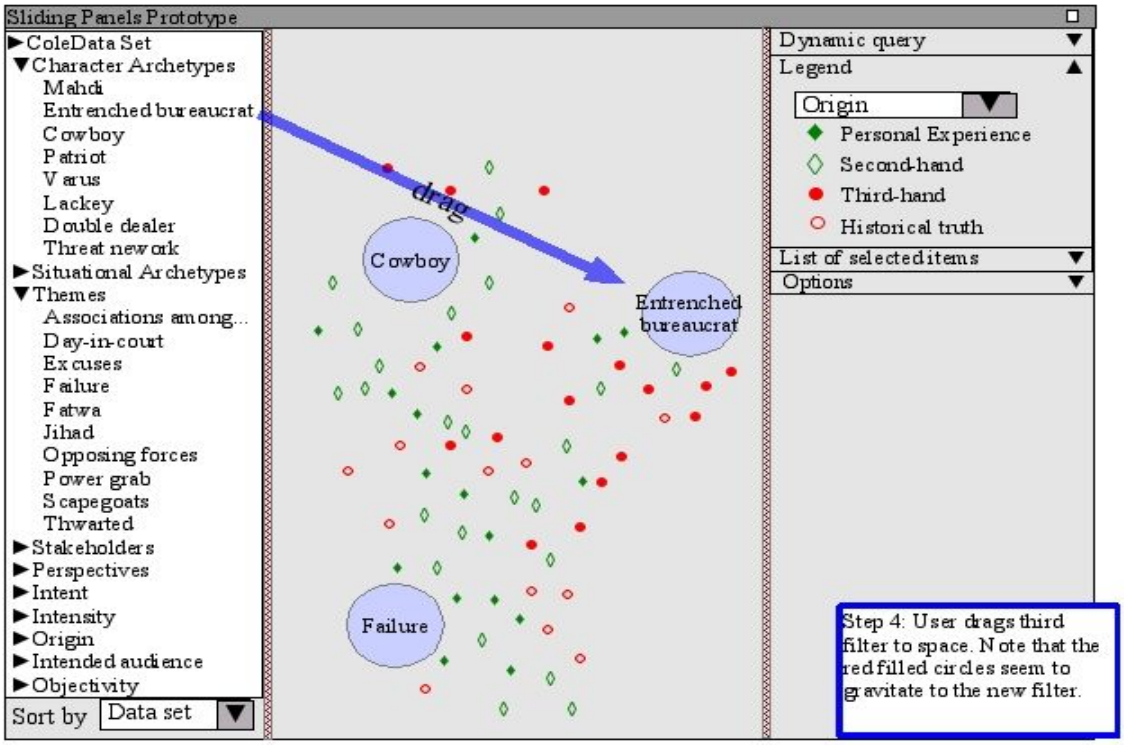
Mockup screens

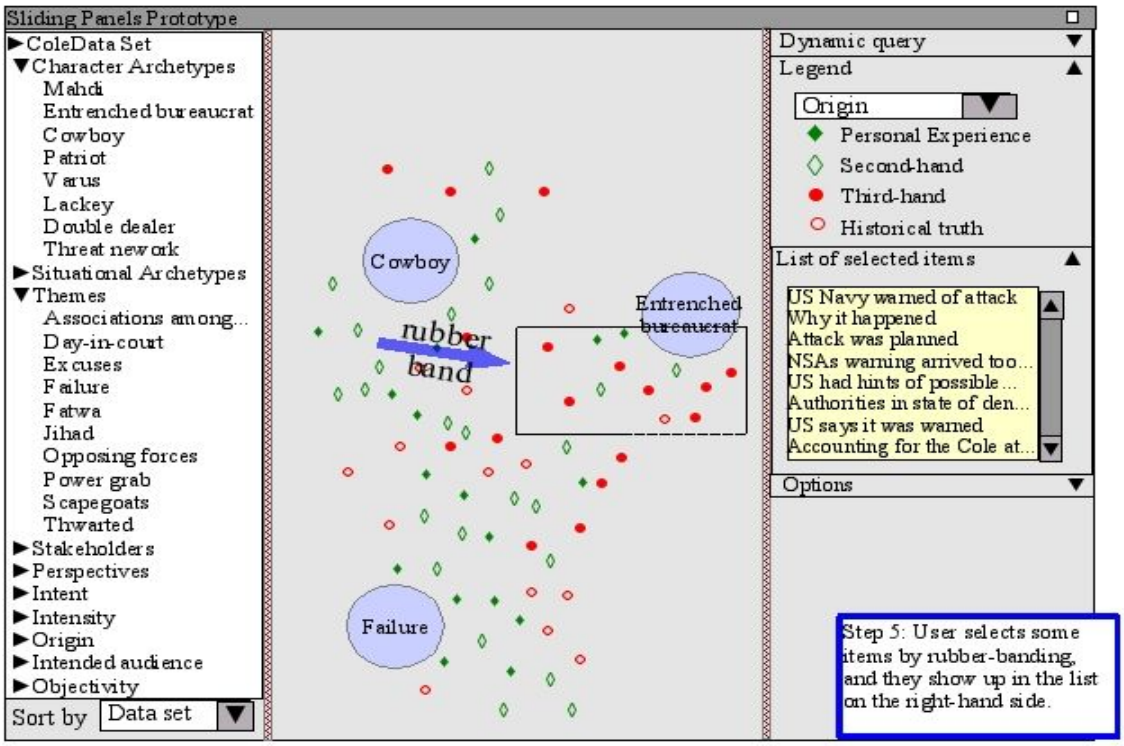


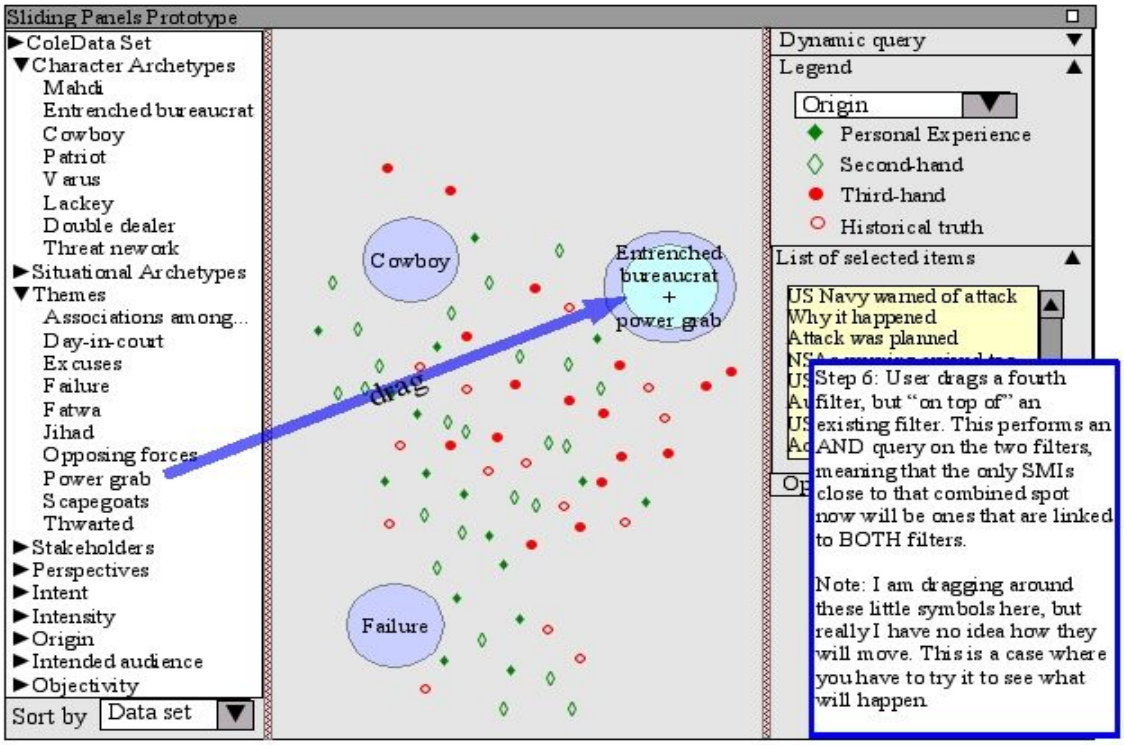

Sliding Panels Prototype
▶ColeData Set
▼Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
▶Situational Archetypes
▶Themes
▶Stakeholders
▶Perspectives
▶Intent
▼Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
▶Origin
▶Intended audience
▼Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
drag
Cowboy
US Navy warned of attack
Videotape Allegedly Shows Links Between Bin Laden Group and Attack on U.S.S. Cole
Kuwait (EmergencyNet News) -- A videotape, allegedly used for recruitment of extremists, has surfaced in Kuwait and was released to the media on Tuesday. Reportedly, the video tape draws several very
Dynamic query
Legend
List of selected items
Options
This use-case scenario takes you through some hypothetical user actions.
Step 1: User drags filter to center space. All SMIs shows up as black circles (no legend) in the space. SMIs closer to the filter are more closely linked to it (radial arrangement is random?). User gets two-level information on items.

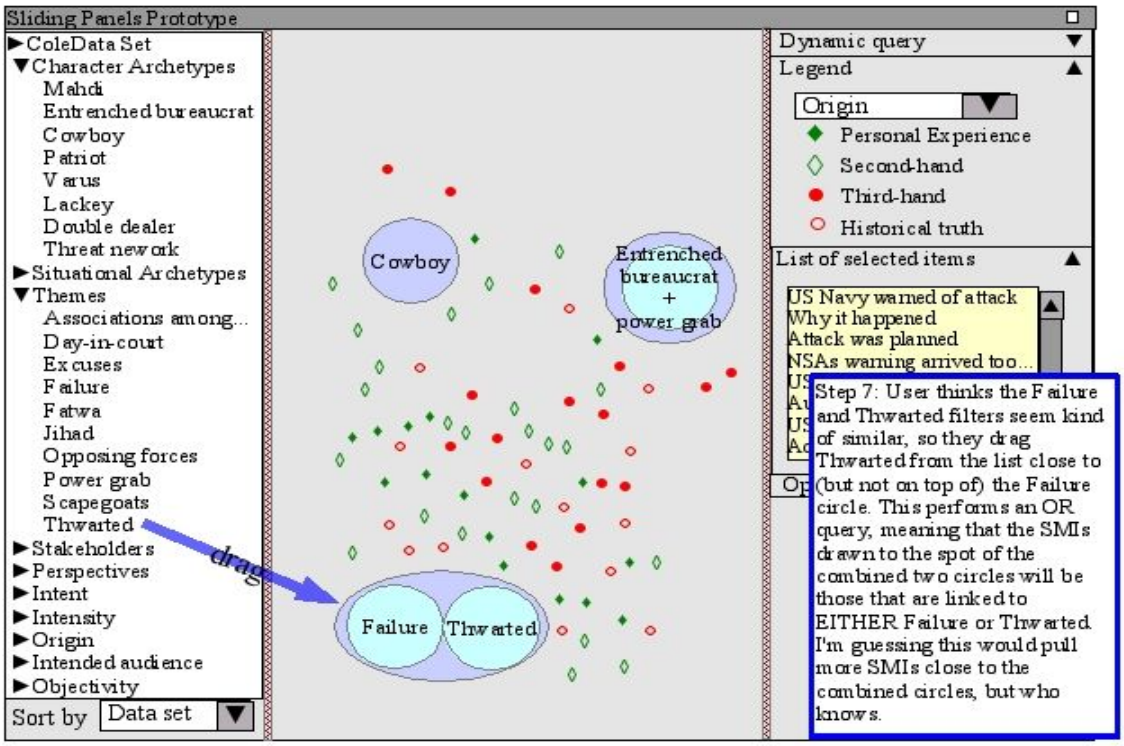

Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Stakeholders
Perspectives
Intent
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Origin
Intended audience
Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
Cowboy
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 2: User chooses Origin as the legend. SMIs change color and shape to show that.

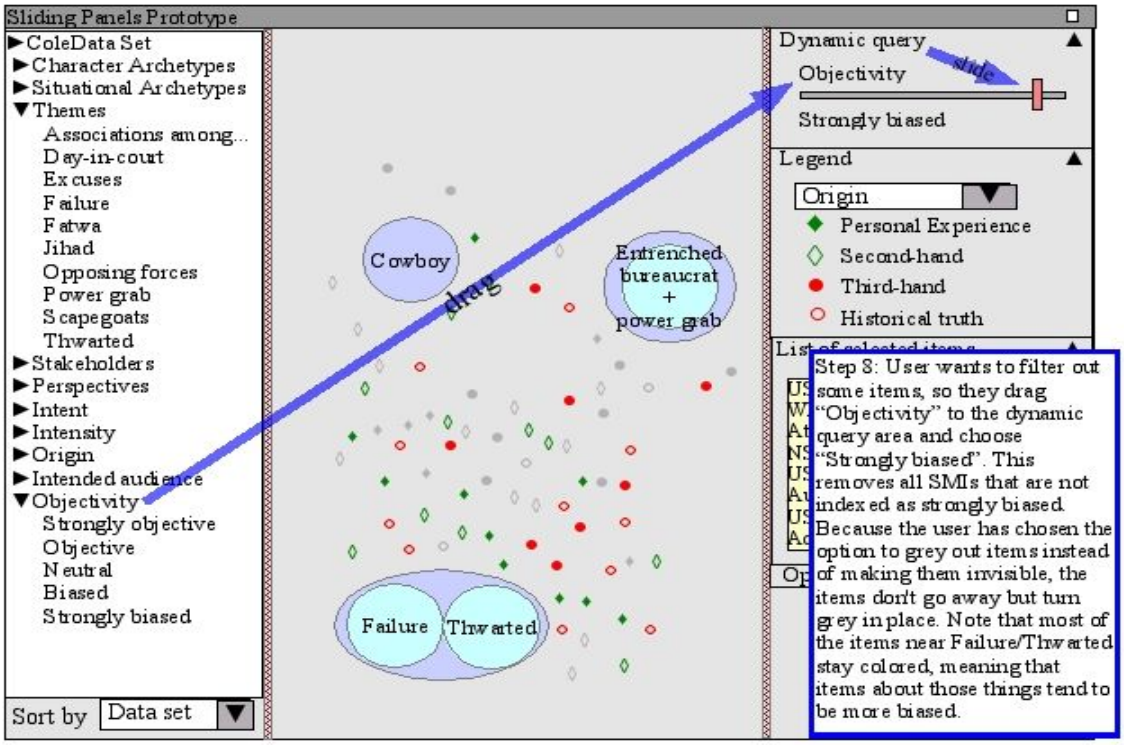

Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
drag
Cowboy
Failure
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 3: User drags second filter to space. SMIs move to respond. SMIs in area between the two filters are linked to them both.

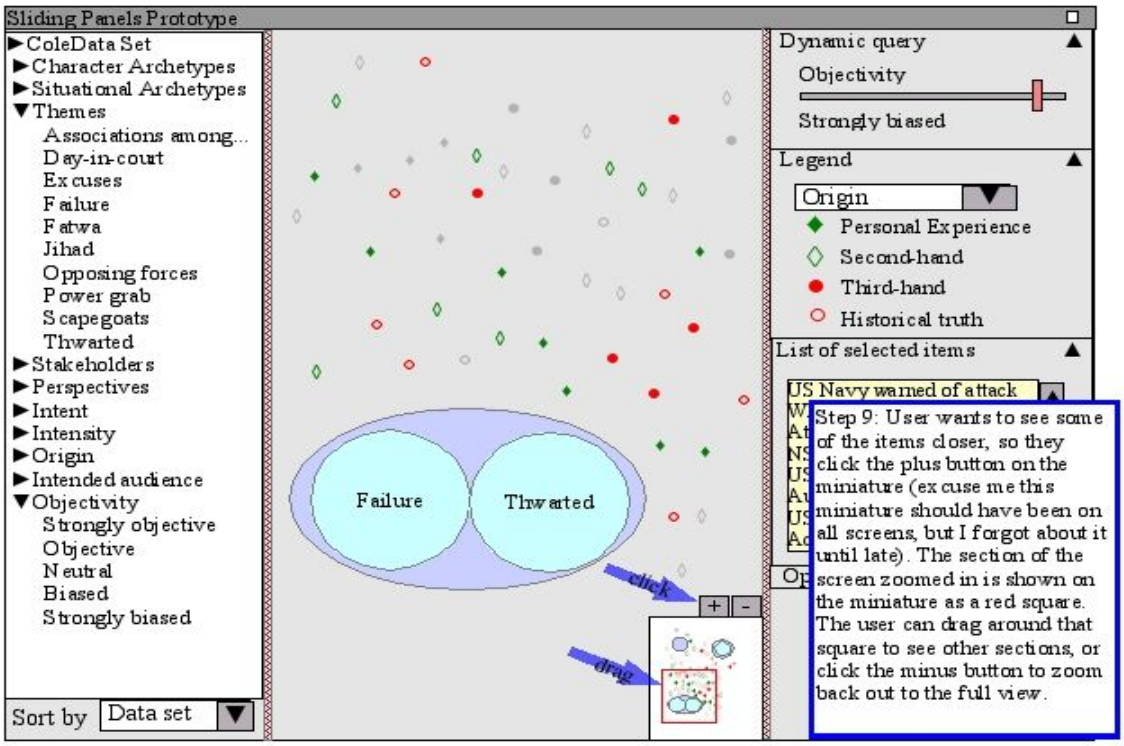

Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
drag
Cowboy
Entrenched bureaucrat
Failure
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
Options
Step 4: User drags third filter to space. Note that the red filled circles seem to gravitate to the new filter.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
Cowboy
rubber band
Entrenched bureaucrat
Failure
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
US Navy warned of attack
Why it happened
Attack was planned
NSAs warning arrived too...
US had hints of possible...
Authorities in state of den...
US says it was warned
Accounting for the Cole at...
Options
Step 5: User selects some items by rubber-banding, and they show up in the list on the right-hand side.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
Cowboy
Entrenched bureaucrat + power grab
Failure
drag
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
US Navy warned of attack
Why it happened
Attack was planned
Step 6: User drags a fourth filter, but "on top of" an existing filter. This performs an AND query on the two filters, meaning that the only SMIs close to that combined spot now will be ones that are linked to BOTH filters.
Note: I am dragging around these little symbols here, but really I have no idea how they will move. This is a case where you have to try it to see what will happen.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
drag
Cowboy
Entrenched bureaucrat + power grab
Failure
Thwarted
Dynamic query
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
US Navy warned of attack
Why it happened
Attack was planned
NSAs warning arrived too...
Step 7: User thinks the Failure and Thwarted filters seem kind of similar, so they drag Thwarted from the list close to (but not on top of) the Failure circle. This performs an OR query, meaning that the SMIs drawn to the spot of the combined two circles will be those that are linked to EITHER Failure or Thwarted. I'm guessing this would pull more SMIs close to the combined circles, but who knows.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
Dynamic query
Objectivity
slide
Strongly biased
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
drag
Cowboy
Entrenched bureaucrat + power grab
Failure
Thwarted
Step 8: User wants to filter out some items, so they drag "Objectivity" to the dynamic query area and choose "Strongly biased". This removes all SMIs that are not indexed as strongly biased. Because the user has chosen the option to grey out items instead of making them invisible, the items don't go away but turn grey in place. Note that most of the items near Failure/Thwarted stay colored, meaning that items about those things tend to be more biased.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
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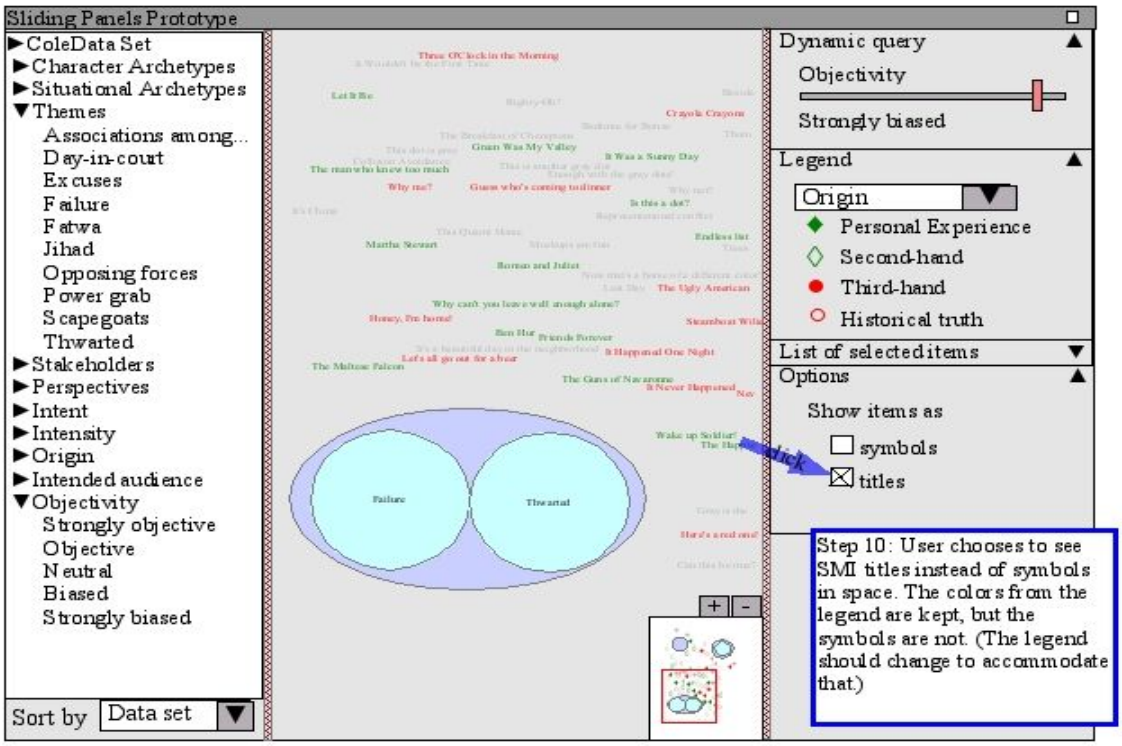
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
Dynamic query
Objectivity
Strongly biased
Legend
Origin
Personal Experience
Second-hand
Third-hand
Historical truth
List of selected items
US Navy warned of attack
Failure
Thwarted
click
drag
Step 9: User wants to see some of the items closer, so they click the plus button on the miniature (excuse me this miniature should have been on all screens, but I forgot about it until late). The section of the screen zoomed in is shown on the miniature as a red square. The user can drag around that square to see other sections, or click the minus button to zoom back out to the full view.



Why make this prototype?

This visualization derives principally from the "VisualWho" project and other visualizations that use "spring tension" models to portray similarity among items (these are often used to show network diagrams and web connections, for example). The reason this type of visualization is possibly appealing is that HARP is partly about similarities and differences among items - among emergent filters and among sense-making items - and it makes sense to find out what will happen if those similarities and differences can be seen and navigated visually.

How does it address the scenarios of use?

This prototype should support the Narrative Reasoning and Detecting Weak Signals scenarios well, as filters will be manipulated directly and distributions of items will be seen visually (so outliers and clusters can be picked out quickly). For the Us and Them scenario it will be less useful as it will be less easy to "drill down".

How does it address the requirements of the scenarios it addresses?

This prototype is high on compare/contrast, and on manipulate, but low on drilling down.

How does it address the contexts of use?

This prototype will be not very much used for query; it will be best for a combination of experiment and serendipitous encounter.

Clusters in Space Prototype

Major changes from the mockup

Symbols

The mockup shows symbols, like diamonds and circles and squares, as item markers. At first, I tried just displaying the item titles in little boxes, and very quickly I realized that the texts are superior for most contexts. It is just painful to hover the mouse over every item to find out what it is, but sweeping your eye over even a hundred short texts is something you can do almost without effort. So I abandoned the whole symbol idea for a while and went with titles in boxes with coloring to show the legend. Later I tried looking at an old data set with about 700 items, and looking at that it was better to switch to markers. However, as soon as I filtered the data set using the dynamic query sliders, the items got down to a smaller number and I immediately wanted to see the titles. So, if we assume that people will most often be looking at subsets of databases, I think they will most often want to see whole texts. I think the "dots" (squares) are useful as a temporary overview, sort of a bird's eye view, when looking at lots of data, but when one is ready to begin "mucking around in the data" one is probably going to choose to see titles. For that reason (mainly), I never finished implementing the symbols but just stuck with colored boxes, with or without titles in them.

VisualWho

I looked at the published VisualWho algorithm but ended up not using it for three reasons. First, the VisualWho authors spent a lot of effort generating partial attractions from items to the various "anchors", but we had partial attractions already, in the "strength" of links to filters. So I didn't need most of the calculations they were doing. Second, there seemed to be a typo in their paper so that one of the equations didn't make sense (or I am an idiot), and thus it was hard to go forward after that. Third, they described how they came up with colors and brightnesses for items in such vague terms that I couldn't easily replicate it.

So, I just took the general idea and applied it more simply. I didn't link color or brightness to anything, because they were used for the legend. Placement of items in the space depends on the relative strengths of attraction each item has for each filter in the space. These strengths are set during indexing. If items are attracted to more than one filter, the items come to rest through iterating over the various attractions many times (settled on 30 iterations as working well enough but not unnecessarily slow). There is also a "hidden" filter in the center of the drawing area to which all items are attracted - this avoids having items sit on top of filters (as long as filters tend to be placed near the periphery). It also spreads out items somewhat when only one filter is placed in the space.

Composite filters average the strengths of connection of each item to each filter in the composite; thus if an item is linked to "Cowboy" by a strength of 50/100 and linked to "All's well" by a strength of 20/100, and the user creates a composite filter "Cowboy OR All's well", the item will be linked to it by a strength of 35/100. OR and AND composites work the same way as far as strength of attraction is concerned.

Items can also be attracted to filters through indirect links, that is, I am attracted to the archetype "Cowboy" because I am linked to the archetype "Neer-do-well" and "Neer-do-well" is linked to

"Cowboy" because they share the attributes "strong", "unpredictable", and "interesting". In the case of indirect links, the attraction is the strength of attraction to the directly linked filter degraded by (times) the number of matching attributes divided by five, which is arbitrarily set as the maximum number of matching attributes. (That's from experience, though it should probably be a user-specified number.) I'm sure in future the algorithm could be improved to be more attractive or faster, but it works fairly well in its simplest form.

Screen widgets

As soon as I had the "drawing space" of filters and items working, it was of course apparent that it would want as much screen real estate as I could give it. So the idea of panels down the right side of the screen dropped away as ridiculous. The dynamic query bars and legend moved to the bottom of the screen where they would obscure the drawing area less. Also, this allowed the drawing area to come closer to an aspect ratio that would look more like a "screen", or maybe it's the golden rectangle, I don't know, but it looks better that way. The options panel was moved to the menu (partly just easier to program), and the selected-items panel was moved to a separate window. That last decision was something I was less sure of, because it means you have to have another window open. Previously the design was "neat" because the user could see everything within one screen. But even in the mockup for this design I didn't have the individual item showing on the main screen (just a list). It will be a question for testing whether it is better to show the item(s) in a separate window.

Other smaller things

The mockup says there will be hover-over tooltips or hints for items in the tree list of indexes. I didn't do that, partly because it was a bother but also partly because it didn't seem necessary. For filters, you can get the info after you drag the filter into the space, and if you want to see details on a filter you probably want to see what is linked to it as well. For qualities there is really nothing else to tell you than what choices there are, and you can see that by dragging a quality to the legend or a query box.

I didn't implement the feature that in the mockup, the user could specify that items not meeting the dynamic query choices would "gray out" instead of disappearing. I don't think it's a good idea, especially if you are looking at tons of items (especially titles) because it would negate the uncomplicating action of querying. I tried this out with "ghosted" boxes only (no fill, gray dotted line) and I don't think it added anything useful. Especially with the dynamic query responding to your mouse movements, you don't need to see the non-selected items.

In the mockup it says that the user can drag a whole "family" of filters to the space at once. I decided not to do that because I think it would be too confusing and because I think usually people are not going to want to look at more than three or four filters in the space at once.

I chose three dynamic query panels, in place instead of waiting to be created, because it seemed easier to understand. I think it is better to have the panels be there permanently and waiting for data rather than having the user look at an empty space and wonder what it is for. Also, people would probably rarely query on more than three things at once. Still, the user should be able to change the number of panels shown there, in the menu or something (but they should still be sitting there permanently).

Good things

Drag and drop worked out very well. I didn't implement it at first, just having buttons, and then when I did implement it the whole prototype got much more easy and fun to use. I think we will find this is a definite "must-have" for all prototypes. Although of course you need a backup system for people who have a hard time with dragging, so the menu works for that. What I didn't implement but would in a "real" program would be cursor changes when you are over something you can drag, feedback as to what will happen when you drop the thing you are dragging in the place you are at, and of course an undo system so you can fix unplanned drops.

Dynamic query works even better than I expected. Of course there is some delay in processing, though that could probably be reduced by a lot during optimization. However, if you know that, it is really useful to be able to drag the slider back and forth and see the data "respond". It is a very superior method to selecting something from a list and clicking on a button. Even if you know there is a delay, the immediacy of the response to your action (you are still dragging the mouse) is very useful.

The legend also worked out well, though there is the multi-select problem I talked about earlier. For qualities that have mutually exclusive values, it is very useful to see patterns. I thought about putting in a little popup when you drag a multi-select quality to the legend that says "This may be confusing because items can have more than one value for this quality", but then I didn't because I thought it might be too obtrusive. It remains an issue to be resolved.

Having the whole indexes list on the left side was also a good idea. Having them there permanently, and not in some popup box, is I think critical because the user has to become familiar with the indexes so that they have meaning and value to them. In general in GUI design it is important to pay attention to what appears to be "real" or permanently-existing on the screen and what appears to be ephemeral, because users will take the "real" things more seriously as objects they should understand. So I think having that list stay there is an improvement over previous designs where one couldn't see all the indexes all the time.

Something that wasn't in the mockup but which turned out to be quite useful is that when you click on a filter (or item), you can temporarily (until you let up the mouse button) see lines to all items (or filters) connected to it. This is very useful because you can click on lots of filters and items very quickly to compare them. In some ways it reduces the need for more deliberate comparisons as with side-by-side queries and the like, because you can see the patterns so close together in time.

Things I am not sure whether they are good or bad

The two stage brushing, I don't know. My implementation of it is somewhat lacking (some details I probably didn't do right and would have to investigate to fix). However, even if it was working correctly, I don't think it is as awe-inspiring as I'd hoped. Sure, you can get details on the items (and I put a LOT of details in there), but somehow it's not very helpful. Maybe it's because the details disappear again and you are reading it in a big hurry. Somehow I just keep finding it annoying and stupid. We will have to see what other users think.

Popping up details in a separate window as opposed to having them on the window itself, not sure about that either. I can't bring myself to put these things on the main window, because the loss of screen real estate to the "drawing area" would be so destructive, but on the other hand I'm

not sure if I like the separate-window approach either. It might be useful if people want to popup two or three windows with different lists of items and then compare them (you need to turn off the "Reuse Selection Window" option to do that), but then again I'm not sure how useful that is. To really test this, I should have the details window be "dockable", that is, either separate or inside the main window. I don't have time to do that right now.

Are the combined filters useful? I think so, but they don't seem as wonderfully magical as I had thought. It is nice that you can put two filters in the space, then put an "AND" combination in there, and see which ones they share, but it's just not as important as I thought. This will need testing to find out how (and if and how much) people use these. Also, there is a limitation on the combined filters in that you can't mix AND and OR types - thus you can't make a filter like "(Cowboy AND Do-Gooder) OR Vulture". Of course you could program that, but it could get really messy. And then we return to the question of are these really useful anyway.

Issues and problems

There is no "collision avoidance", so items sit all over on top of each other. That could be resolved later - there are lots of collision avoidance algorithms - but it is guaranteed to slow the program down. [The approach I would take (just to remember this or pass it on to someone else) is to make a sort of "grid" in which items simultaneously "register" their existence and try to avoid others in that spot of the grid. This is to avoid a pairwise comparison which would be horrific with many thousands of items.] My proximal solution to this was to just allow the user to drag individual items to "tease them out", and also to use a rubber-band box to select items in clumps, so that can see all the titles in a clump in another way.

I tried the prototype on an older database with 700 items and it was painfully slow. But it is probably easily optimized for speed with some little effort. I optimized speed of programming, not speed of operation.

Things not done

Zoom, didn't get to it. Not sure how useful it would be. Would take too long right now to find out. Don't feel it is a huge loss.

The font sizes should be editable. I would do that in a "real" version.

The user can change any legend color, which accommodates somewhat for color blindness problems; but a real program would allow the user to save and load color sets (and choose one set to load automatically) to permanently fix the color issue.

Open questions (originally in mockup report) reconsidered

What if the SMIs just sit on top of each other in the space and the user can't pull them apart? Won't it just look like a mess? Does this kind of thing scale up well? What if you have 10K or 50K items in the space? Will it work?

> The answer is, yes, they do just sit on top of each other in the space. There is a problem with collision avoidance (which might be fixable). However I think the dynamic query kind of saves this, because rarely will people want to stay on the "ALL" view and look at an entire database. In practice I think people will regularly filter down to a smaller number of items to look at, just because it isn't very consumable to human minds to look

at huge numbers of items (even if they are "dots") for very long. So, this requires testing, but I think this could be all right.

If the user drags two filters together (AND or OR), will then they be able to also have those filters in the space by themselves? Or will that mess up the system?

The answer is, it's fine to have the filters in the space by themselves as well. In fact it's useful and helpful to do that.

Won't it be confusing that some things can be dragged into the space and some can't? Wouldn't it be better to have some sort of popup menu that lists things you can put in the space, and not list any of the qualities there? Why let people be confused by showing them the whole list when they can't use the whole list everywhere?

I did consider having a popup list instead of a permanent list, but see my notes above about the usefulness of the permanent list. Also, I considered having two separate lists for filters and qualities. But finally, I decided on three things: First, that having menu items that say "Filters" and "Qualities" would lead users to take those types of objects seriously (whatever is in the menus is real). Second, that grouping items in the (permanent) indexing list under "Filters" and "Qualities" would lead users to understand that those two types of objects are different. Third, that though I don't have time to do it right now, the program can give the user feedback when dragging-and-dropping as to what they have picked up (is it a filter or quality) and what will happen when they drop it where they are dragging (if you drag that filter here, you will make a composite; if you drag that quality here, you will change the legend). I did make the concession of not expanding the questions in the list, so you have to go to extra trouble to see the answers there, because people can't drag the answers anywhere. We will need to test to see if these things work as far as people understanding what they can do with what.

What if I want to see "intensity" as a blob? Why shouldn't I be able to? Can't you convert those values to numbers and put it there?

I don't think that would be a good idea, having seen this prototype work. The filters and qualities really *are* different types of things, and having the prototype reinforce that is useful, not limiting.

Are these blobs going to be an even worse case of "hate these dots"? Will it be just too weird and new-agey for people? Will it seem fake or silly or not serious?

Well, that depends on testing, but my intuition is that this is a useful way to look at data. You can see patterns, you can look at lots of items at once, you can run around in the data. I think we would have to try using this prototype with some real tasks to see how that plays out. Also, the realization that titles are better most of the time removes the need for the "dots" question.

The screen real-estate question again - should the other panels be taken out to give more space to the blobs?

Yup. Did that. Though I have some qualms about the separate details window.

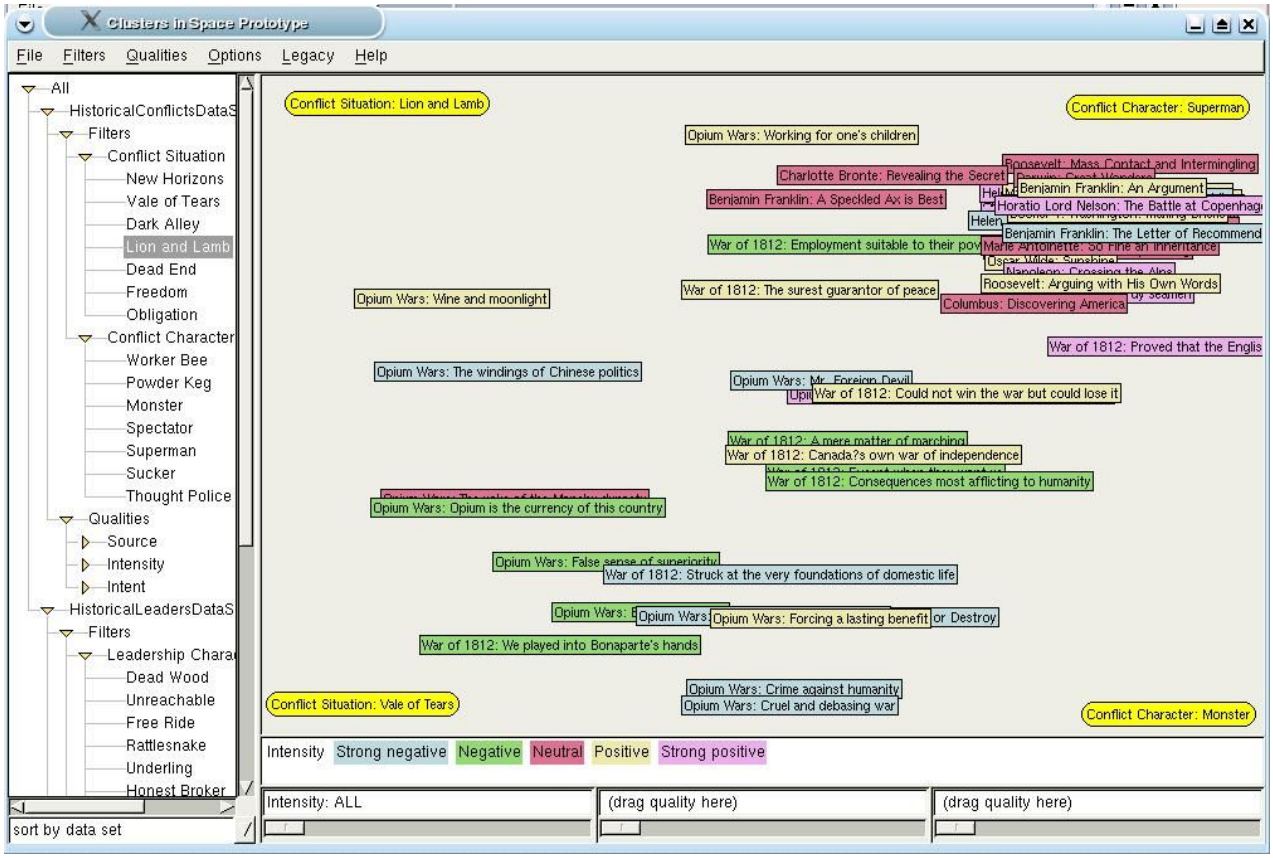
Will rubber-banding work in a way that's useful, or will it be impossible to select the items the user wants to select?

I think the simple rectangle works fine. People are also used to it from other programs.

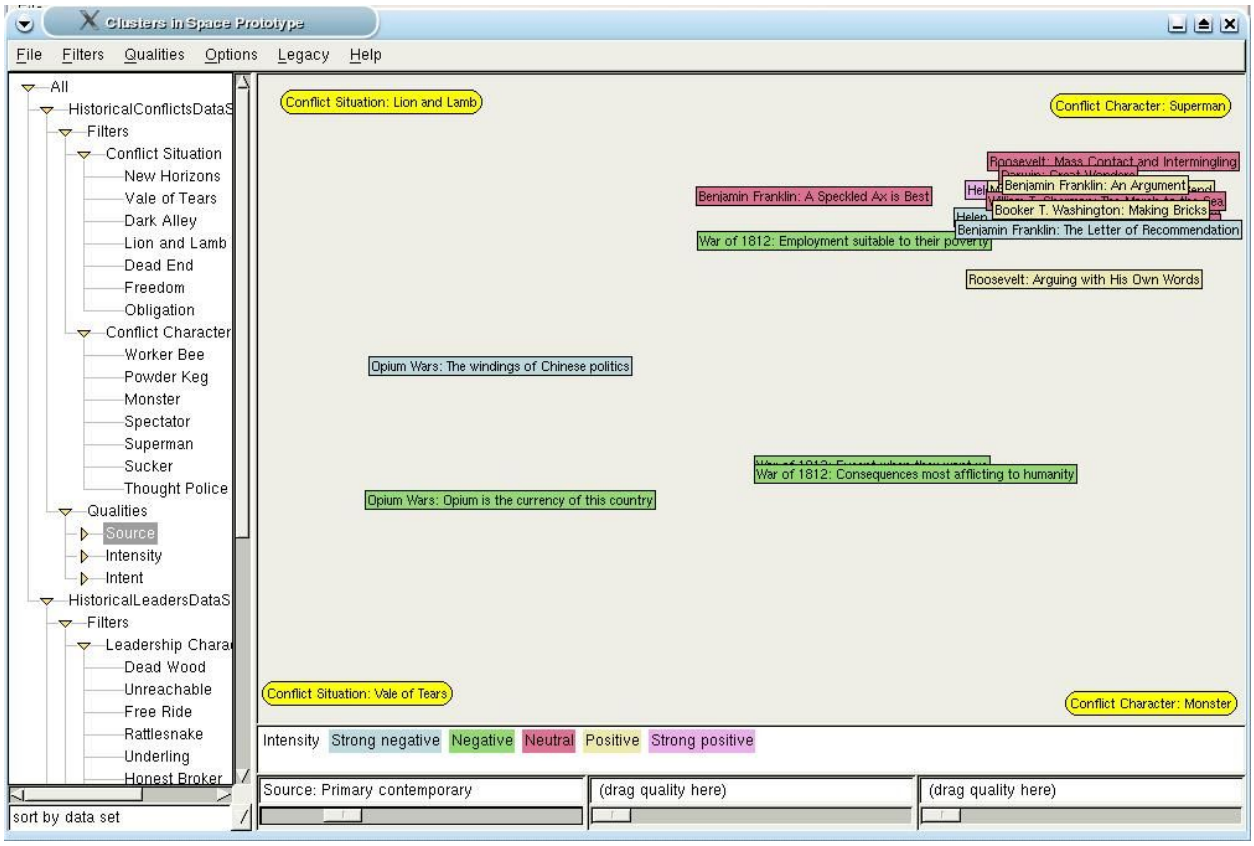
New questions for testing

1. Will it be a problem that the items sit on top of each other in the space? How critical will it be to implement a collision-avoidance system?
2. Will the popup window listing details on selected items be confusing or difficult, and should that function be included in the main window (using up space)? Or is having it appear in a separate window acceptable?
3. Will the function of the program be easily understood, or will it require a lot of explanation?
4. Will people pick up quickly the difference between a filter and a quality? Will they understand that the different types of object do different things? How important will it be to give them more feedback during drag and drop?
5. Will it be necessary to add tooltips to the tree list? Or is having them in the main "drawing area" good enough?
6. Will the legend and the dynamic query boxes be easily understood or will they be confusing?
7. Will combination filters be useful? Will people use them? How will they use them?
8. Will it be a problem that you can't drag a whole "family" of filters to the space? Will people want to do that? Or will dragging one at a time be adequate?
9. Will the two-stage brushing tooltips be useful or just annoying? Will people turn them off?
10. Will people use the "dots" option to not see the titles, or will they always want to see full titles? If they do use the dots, would they like to see different symbols (as in the mockup), or will one shape be adequate?
11. How will people respond to the indexes list on the left? Will they understand what it is? Will they use it?
12. How will people use drag and drop?
13. How will people deal with the issue of the legend and multi-select qualities? Will they take it in stride or find it confusing?

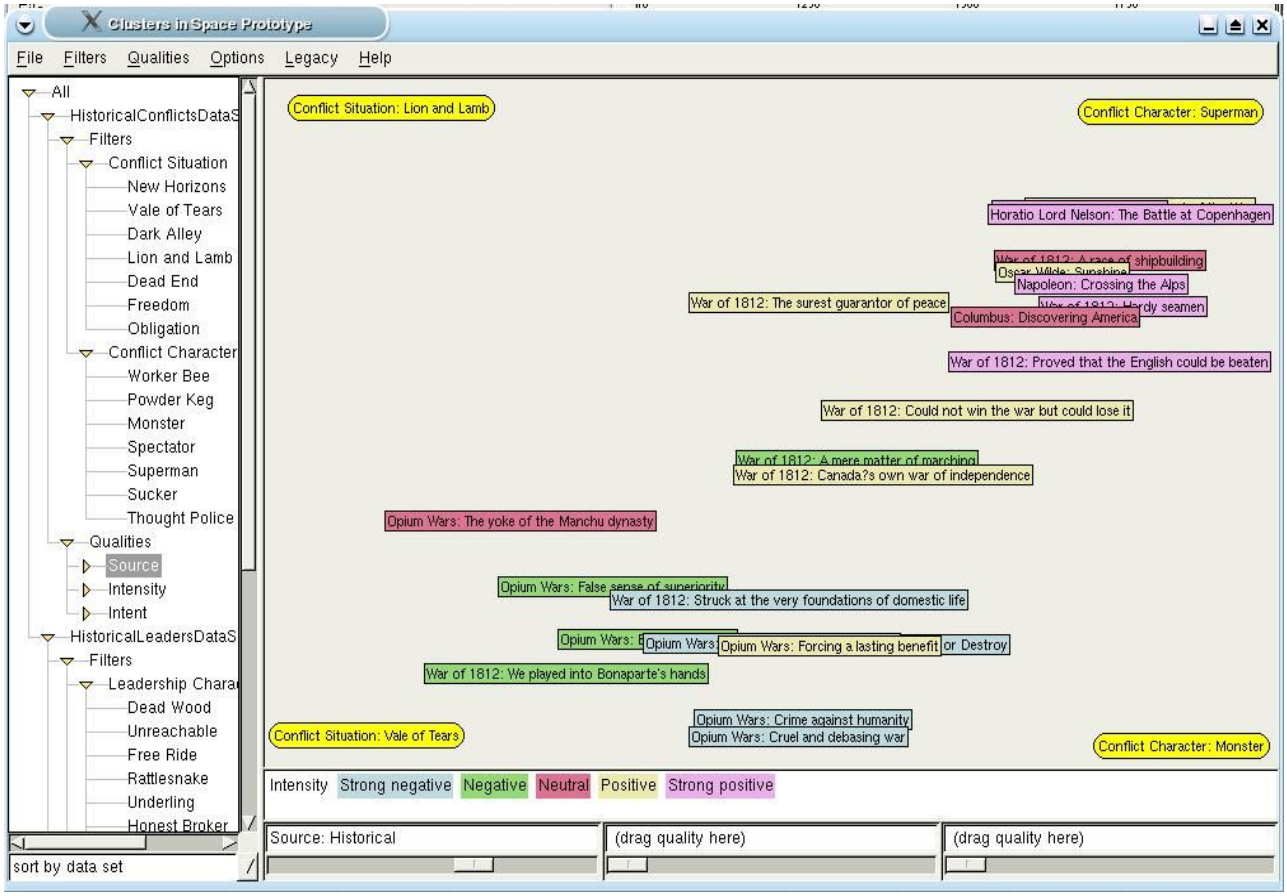
Prototype screen shots



This screen shot shows the two "historical" data files open with four filters dragged into the space and the "Intensity" quality as the legend. I've place two positive filters (Lion and Lamb, Superman) at the top of the area, and two negative filters (Vale of Tears, Monster) at the bottom. This might be a good way to direct people to use the tool, because it provides a de facto Y axis that has universal and quickly understood meaning. Note the larger number of items near the "Superman" character archetype.



This shows the same data but with the "Source" quality chosen in the first dynamic query box, so that only items from a "Primary contemporary" source are shown. Note that there are more items on the positive half of the implicit archetypal value axis, even though the *tone* of the items (as shown by the "Intensity" quality) varies through the negative-positive spectrum. I am not showing the "Secondary contemporary" choice here, but it is similar.



Here is the same data set with the "Source" query set to "Historical", meaning only items written years after the fact are shown. These items, unlike the contemporary items, are spread throughout the vertical space from positive to negative. That is an interesting little pattern in the data - that people writing at around the same time as events tended to describe them more using more positive archetypal characteristics than people writing about the same events later, who had a more balanced (or more varied) perspective. Of course that could reflect the nature of the data set itself (maybe contemporary items came from different places than historical items), but one would be prodded to look into that by seeing this pattern.

Jumping Indicators Application

Jumping Indicators Mockup

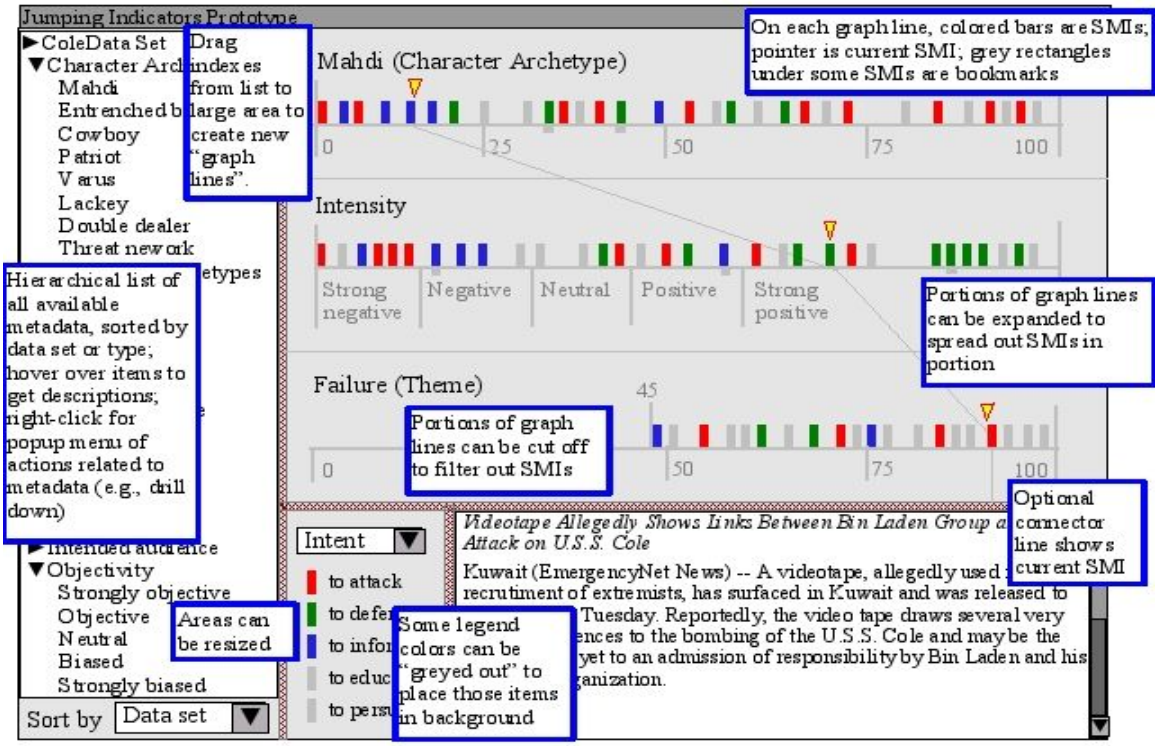
Description

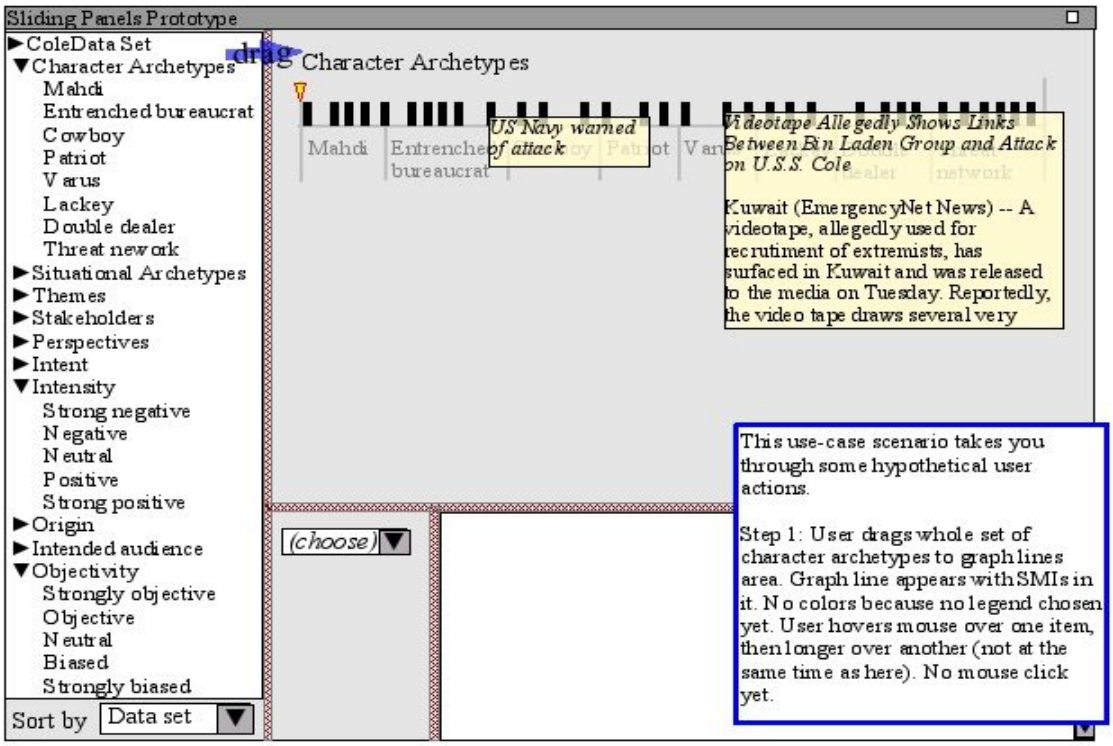
This is much like the "Glass Engine" visualization produced and published by IBM, with these differences:

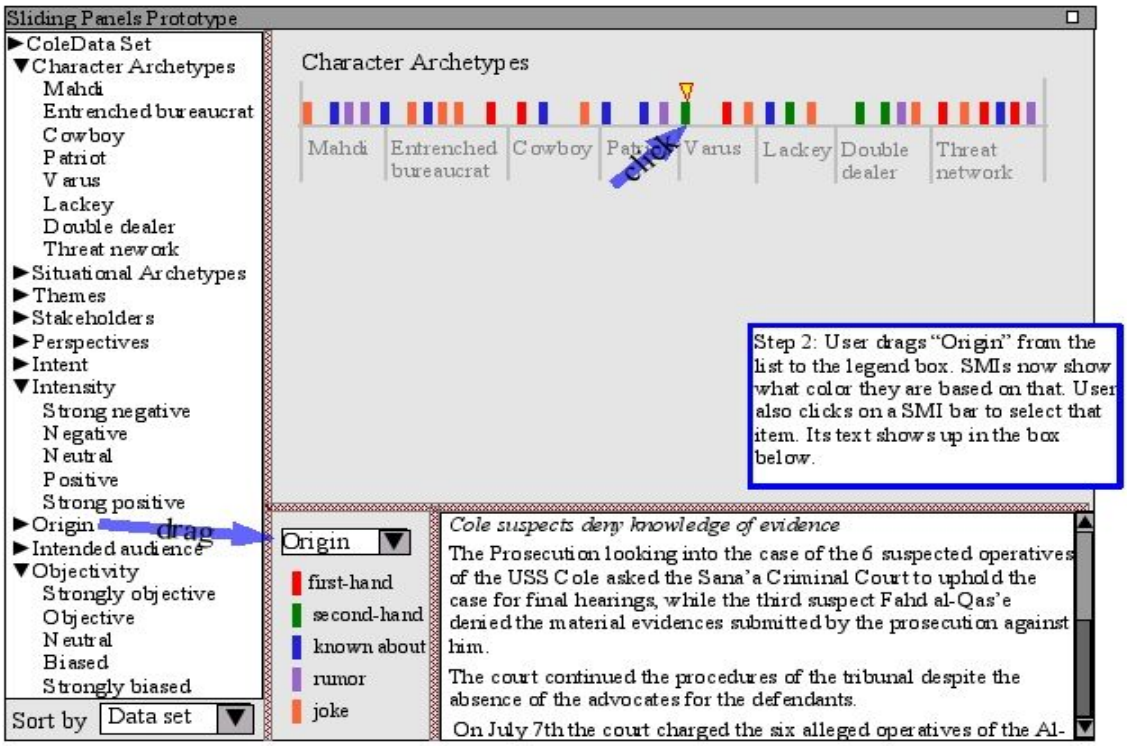
1. In the Glass engine the user grabs a bar and drags the whole bar. Partly because they seem to have had problems with users understanding that, and partly because I want to visually differentiate this prototype from the Glass engine, the bars will sit still and the pointers on the bars will jump around. This is actually somewhat like the displays in the sickbay on Star Trek, in which little "vital signs" pointers jump around on ranges as the person recovers from the alien incursion. So the user will point and click to move the currently selected item rather than sliding the whole bar. For that reason and because I want to convey that the lines are for more than just choosing selections, I will call them "graph lines" instead of "sliders".
2. The Glass engine has only something like six sliders. We have an arbitrary number of indexes, possibly as many as 20 or 30, for each data set, plus identities. So in this prototype there is a list of possible items on the left hand side (the same list as in the other graphical prototypes), and the user drags items to a "graph lines" area on the right hand side. There may be a practical limit on how many lines can be placed, but that will depend on the size of the user's screen (and conceivably this could be very large).
3. For single filters, the graph lines will show strengths of linkage. For a "family" of filters, the lines will show the whole set of filters, with strength placing items within each section. For qualities with a simple list of values, we can't arrange items continuously on the line; so within each answer "space", the prototype will adopt some continuous measure like the date of the item's publication/collection or its length (in words) in order to space things out. The choice of what to use to space items within discrete quality-value spaces will be a user option.
4. The user can hover over individual SMI marks and see the title of the item (with two-stage brushing as in the other prototypes). Thus they can preview titles without clicking and changing the current item (at which point they can see it in the area below the graph lines). They can also move the pointer dynamically (clicking and dragging) while the display changes as they move it. They can also use the arrow keys to move the selected pointer without using the mouse.
5. The user can bookmark items by right-clicking and choosing "Bookmark" from a popup menu while pointing at the item. That way the system will keep a list of things the user wanted to be able to come back to. The user will return to any bookmarked item by clicking on a little marker under the item. They can also get a list of bookmarked items (though it will not stay on the screen as I thought before, because that would use up valuable space for something not needed often).
6. As with the Glass engine, it will be possible to filter by qualities or strengths by "shortening" any bar to filter out certain ranges. This will reduce the number of items shown on all the bars. Something the Glass engine doesn't have but that I think could be very useful, especially with large amounts of data, is that the user can grab any of the bars that divide up the range in the

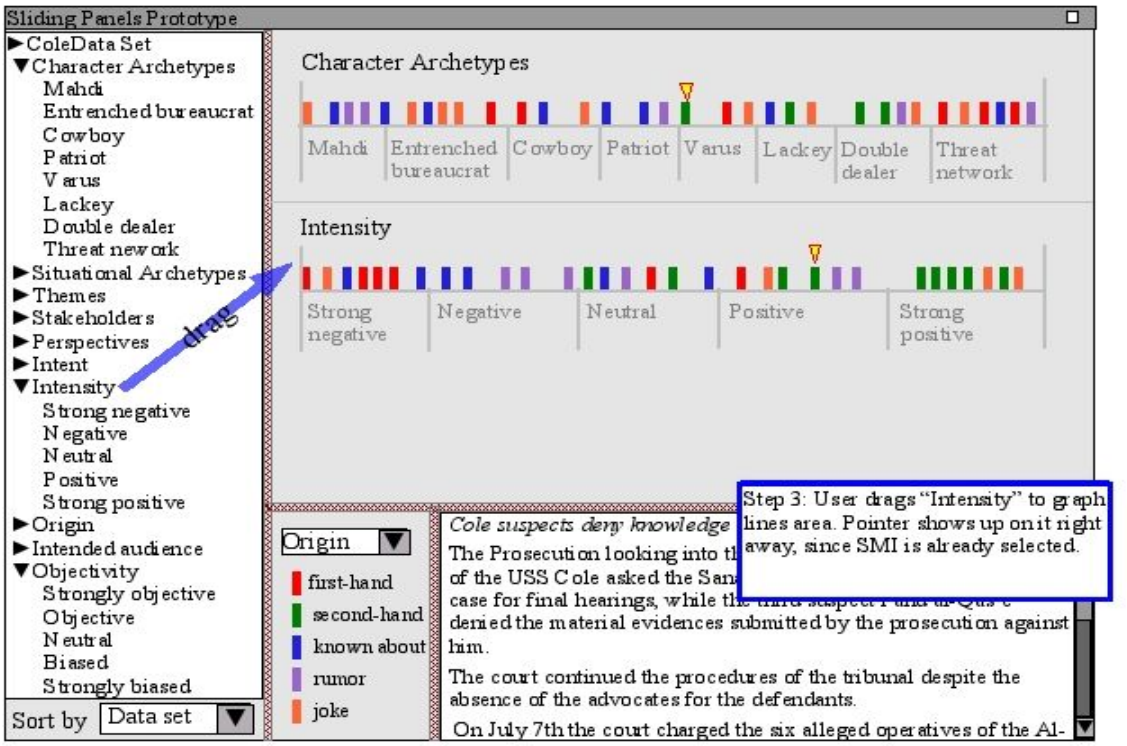
graph line and move it to expand any one area of the graph.

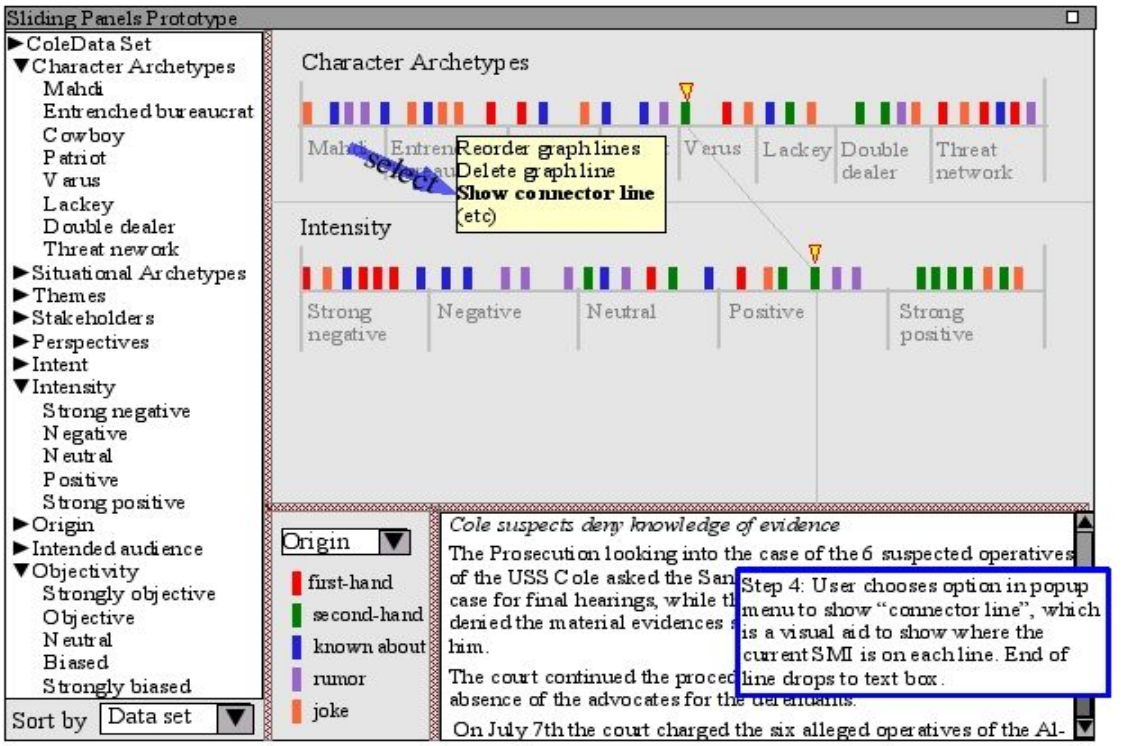
Mockup screens




Sliding Panels Prototype
▶ColeData Set
▼Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
▶Situational Archetypes
▶Themes
▶Stakeholders
▶Perspectives
▶Intent
▼Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
▶Origin
▶Intended audience
▼Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
drag
Character Archetypes
Mahdi
Entrenched bureaucrat
US Navy warned of attack
Videotape Allegedly Shows Links Between Bin Laden Group and Attack on U.S.S. Cole
Kuwait (EmergencyNet News) -- A videotape, allegedly used for recrutiment of extremists, has surfaced in Kuwait and was released to the media on Tuesday. Reportedly, the video tape draws several very
(choose)
This use-case scenario takes you through some hypothetical user actions.
Step 1: User drags whole set of character archetypes to graph lines area. Graph line appears with SMIs in it. No colors because no legend chosen yet. User hovers mouse over one item, then longer over another (not at the same time as here). No mouse click yet.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Stakeholders
Perspectives
Intent
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Origin
Intended audience
Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
click
drag
Origin
first-hand
second-hand
known about
rumor
joke
Cole suspects deny knowledge of evidence
The Prosecution looking into the case of the 6 suspected operatives of the USS Cole asked the Sana'a Criminal Court to uphold the case for final hearings, while the third suspect Fahd al-Qas'e denied the material evidences submitted by the prosecution against him.
The court continued the procedures of the tribunal despite the absence of the advocates for the defendants.
On July 7th the court charged the six alleged operatives of the Al-
Step 2: User drags "Origin" from the list to the legend box. SMIs now show what color they are based on that. User also clicks on a SMI bar to select that item. Its text shows up in the box below.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Stakeholders
Perspectives
Intent
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Origin
Intended audience
Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
drag
Origin
first-hand
second-hand
known about
rumor
joke
Cole suspects deny knowledge
The Prosecution looking into t
of the USS Cole asked the San
case for final hearings, while th
denied the material evidences submitted by the prosecution against him.
The court continued the procedures of the tribunal despite the absence of the advocates for the defendants.
On July 7th the court charged the six alleged operatives of the Al-
Step 3: User drags "Intensity" to graph lines area. Pointer shows up on it right away, since SMI is already selected.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
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Patriot
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Lackey
Double dealer
Threat network
Situational Archetypes
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Intent
Intensity
Strong negative
Negative
Neutral
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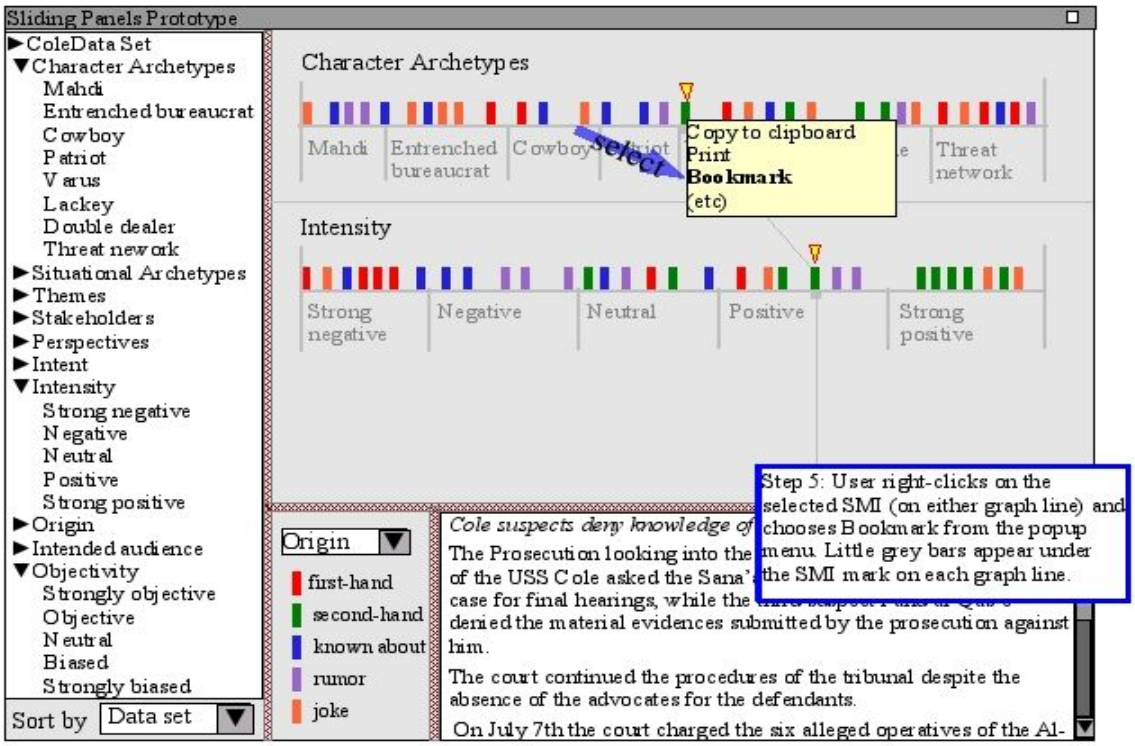
Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
Character Archetypes
Mahdi
Varus
Lackey
Double dealer
Threat network
select
Reorder graph lines
Delete graph line
Show connector line
(etc)
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Origin
first-hand
second-hand
known about
rumor
joke
Cole suspects deny knowledge of evidence
The Prosecution looking into the case of the 6 suspected operatives
of the USS Cole asked the San
case for final hearings, while t
denied the material evidences
him.
The court continued the proced
absence of the advocates for the defendants.
On July 7th the court charged the six alleged operatives of the Al-
Step 4: User chooses option in popup menu to show "connector line", which is a visual aid to show where the current SMI is on each line. End of line drops to text box.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
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Patriot
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Lackey
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Threat network
Situational Archetypes
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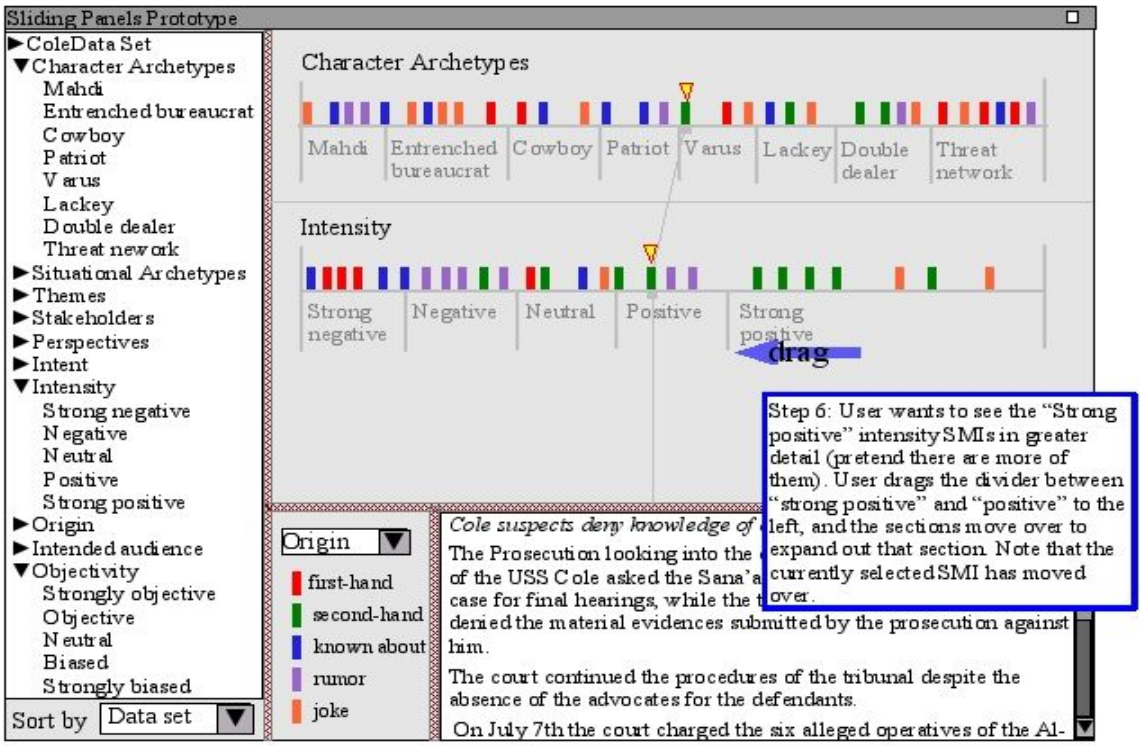
Intent
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Origin
Intended audience
Objectivity
Strongly objective
Objective
Neutral
Biased
Strongly biased
Sort by
Data set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Threat network
select
Copy to clipboard
Print
Bookmark
(etc)
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Origin
first-hand
second-hand
known about
rumor
joke
Cole suspects deny knowledge of
The Prosecution looking into the
of the USS Cole asked the Sana'
case for final hearings, while the
denied the material evidences submitted by the prosecution against
him.
The court continued the procedures of the tribunal despite the
absence of the advocates for the defendants.
On July 7th the court charged the six alleged operatives of the Al-
Step 5: User right-clicks on the selected SMI (on either graph line) and chooses Bookmark from the popup menu. Little grey bars appear under the SMI mark on each graph line.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
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Intent
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Origin
Intended audience
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Sort by
Data set
Character Archetypes
Mahdi
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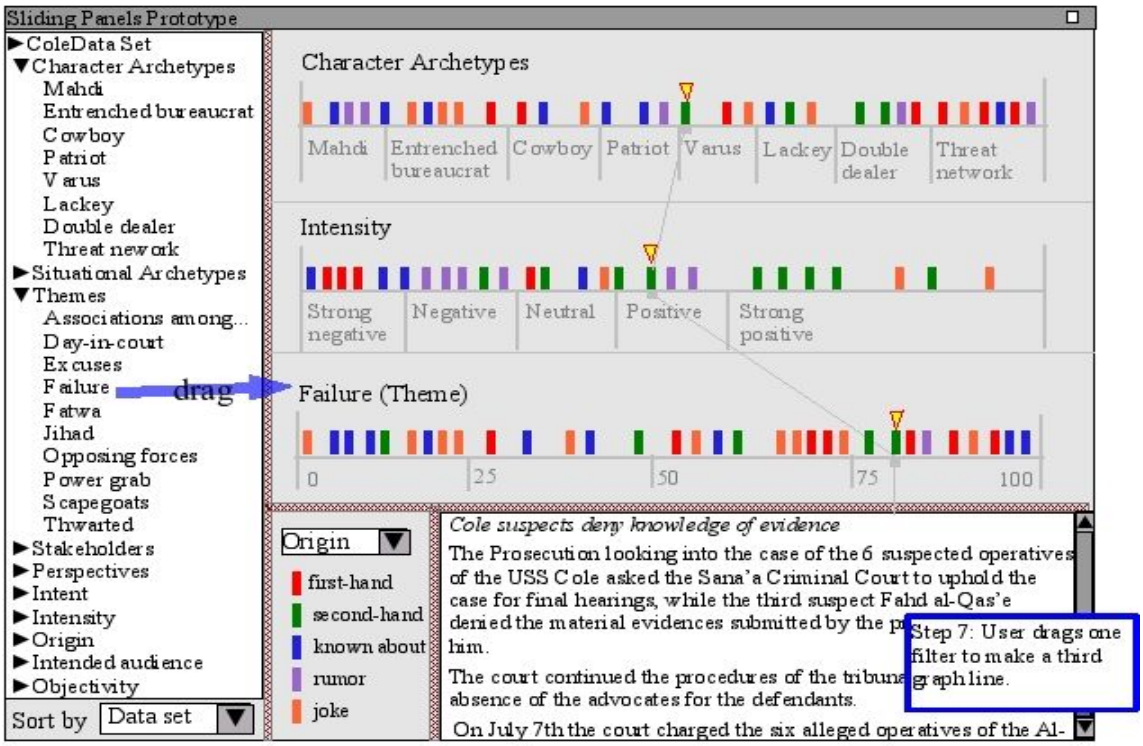
Lackey
Double dealer
Threat network
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
drag
Origin
first-hand
second-hand
known about
rumor
joke
Cole suspects deny knowledge of
The Prosecution looking into the
of the USS Cole asked the Sana'a
case for final hearings, while the t
denied the material evidences submitted by the prosecution against
him.
The court continued the procedures of the tribunal despite the
absence of the advocates for the defendants.
On July 7th the court charged the six alleged operatives of the Al-
Step 6: User wants to see the "Strong positive" intensity SMIs in greater detail (pretend there are more of them). User drags the divider between "strong positive" and "positive" to the left, and the sections move over to expand out that section. Note that the currently selected SMI has moved over.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
drag
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Failure (Theme)
0
25
50
75
100
Origin
first-hand
second-hand
known about
rumor
joke
Cole suspects deny knowledge of evidence
The Prosecution looking into the case of the 6 suspected operatives
of the USS Cole asked the Sana'a Criminal Court to uphold the
case for final hearings, while the third suspect Fahd al-Qas'e
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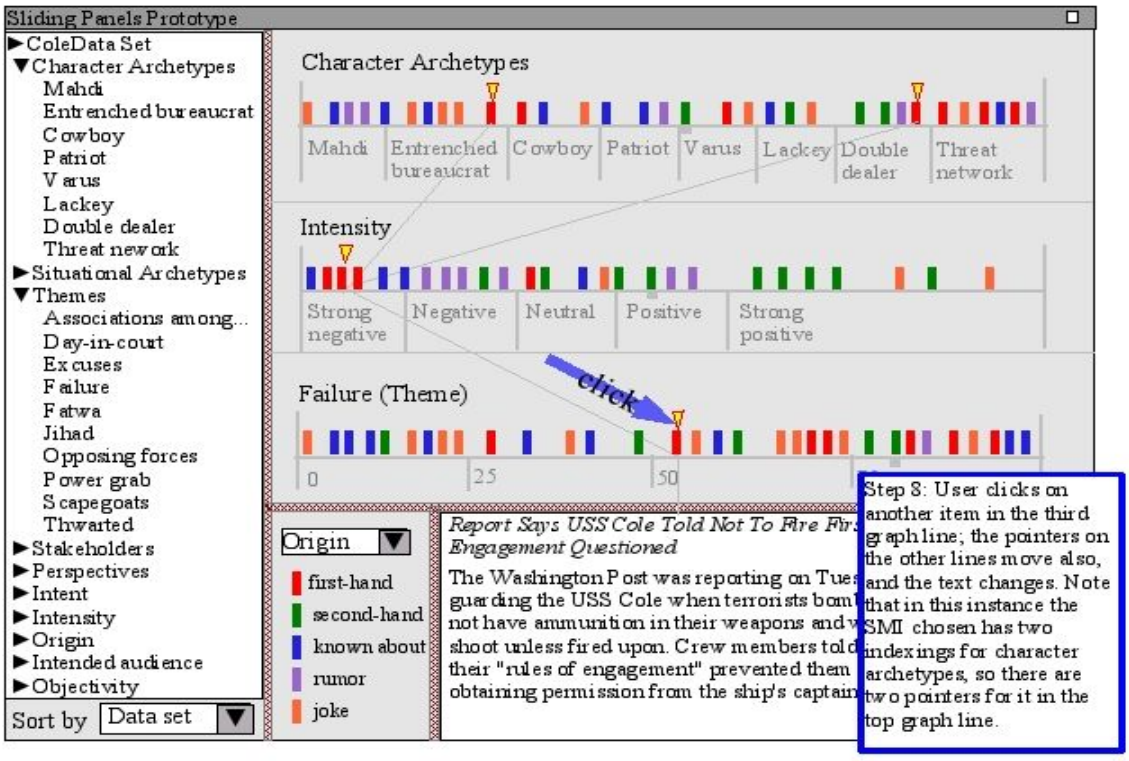
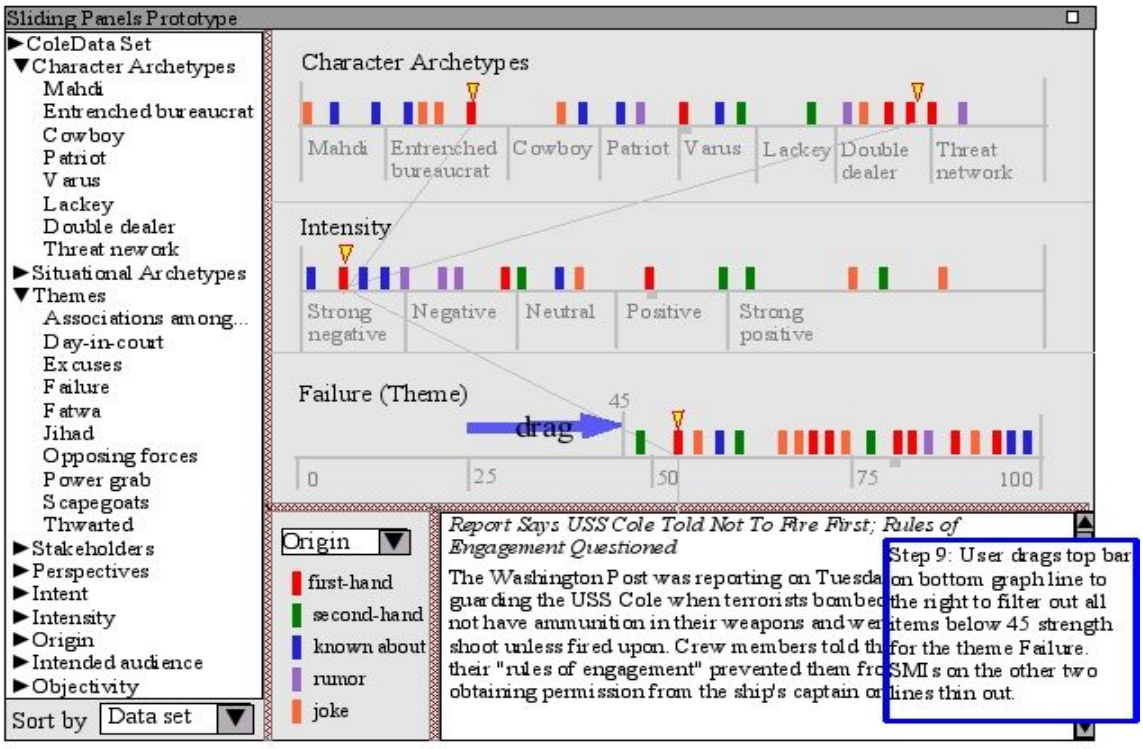
The court continued the procedures of the tribuna
absence of the advocates for the defendants.
On July 7th the court charged the six alleged operatives of the Al-
Step 7: User drags one filter to make a third graph line.


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Situational Archetypes
Themes
Associations among...
Day-in-court
Excuses
Failure
Fatwa
Jihad
Opposing forces
Power grab
Scapegoats
Thwarted
Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Failure (Theme)
click
0
25
50
Origin
first-hand
second-hand
known about
rumor
joke
Report Says USS Cole Told Not To Fire Firs
Engagement Questioned
The Washington Post was reporting on Tues
guarding the USS Cole when terrorists bom
not have ammunition in their weapons and w
shoot unless fired upon. Crew members told
their "rules of engagement" prevented them
obtaining permission from the ship's captain
Step 8: User clicks on another item in the third graph line; the pointers on the other lines move also, and the text changes. Note that in this instance the SMI chosen has two indexings for character archetypes, so there are two pointers for it in the top graph line.


Sliding Panels Prototype
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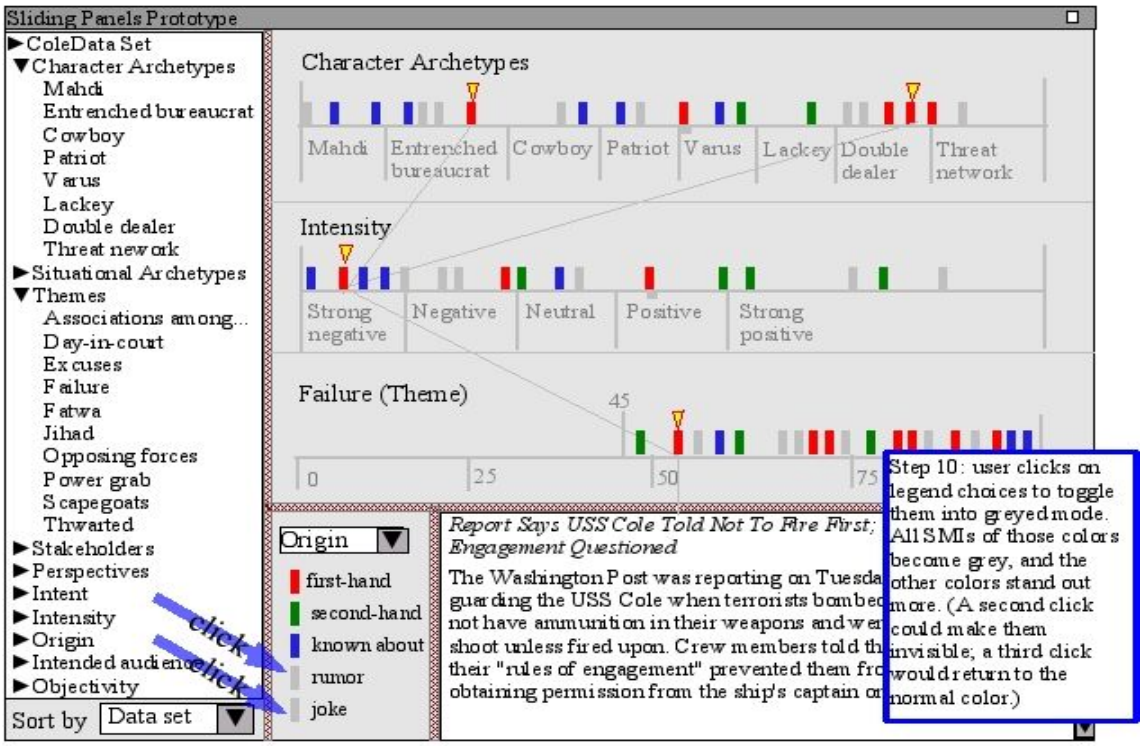
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
Character Archetypes
Mahdi
Entrenched bureaucrat
Cowboy
Patriot
Varus
Lackey
Double dealer
Threat network
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Failure (Theme)
45
drag
0
25
50
75
100
Origin
first-hand
second-hand
known about
rumor
joke
Report Says USS Cole Told Not To Fire First; Rules of
Engagement Questioned
The Washington Post was reporting on Tuesda
guarding the USS Cole when terrorists bombe
not have ammunition in their weapons and we
shoot unless fired upon. Crew members told th
their "rules of engagement" prevented them fr
obtaining permission from the ship's captain o
Step 9: User drags top bar on bottom graph line to the right to filter out all items below 45 strength for the theme Failure. SMIs on the other two lines thin out.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Intent
Intensity
Origin
Intended audience
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Patriot
Varus
Lackey
Double dealer
Threat network
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Failure (Theme)
45
0
25
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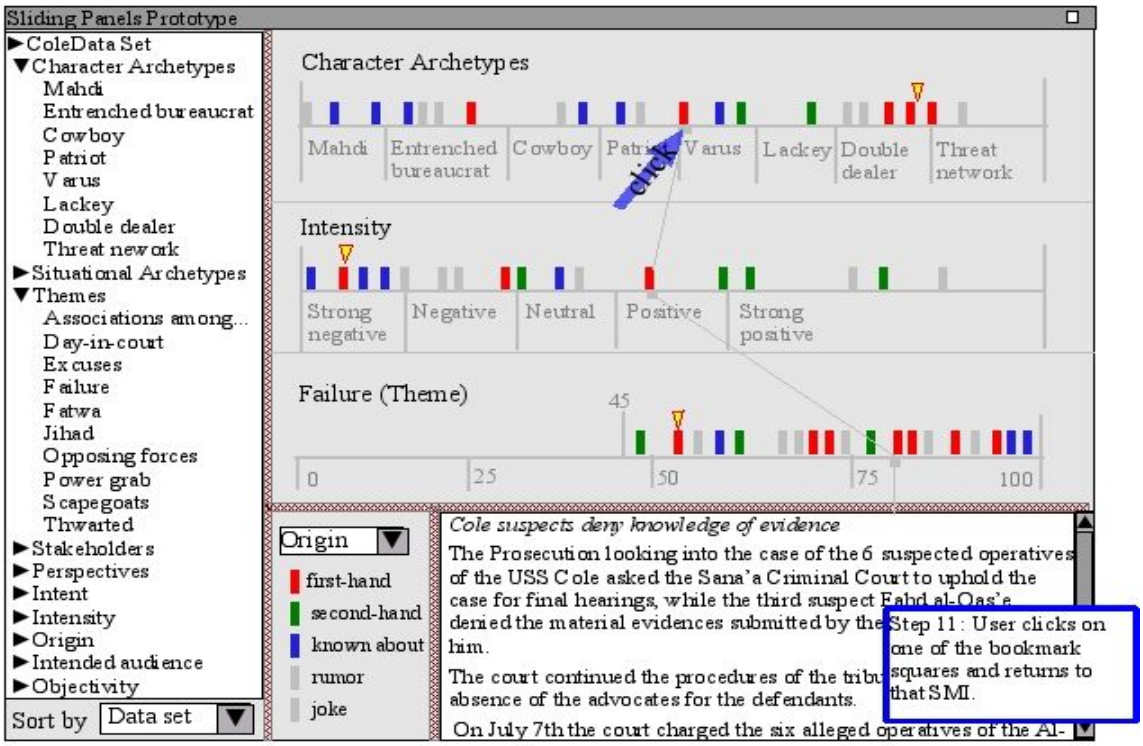
75
Origin
first-hand
second-hand
known about
rumor
joke
Report Says USS Cole Told Not To Fire First; Engagement Questioned
The Washington Post was reporting on Tuesda
guarding the USS Cole when terrorists bombed
not have ammunition in their weapons and wer
shoot unless fired upon. Crew members told th
their "rules of engagement" prevented them fr
obtaining permission from the ship's captain o
click
click
Step 10: user clicks on legend choices to toggle them into greyed mode. All SMIs of those colors become grey, and the other colors stand out more. (A second click could make them invisible; a third click would return to the normal color.)


Sliding Panels Prototype
ColeData Set
Character Archetypes
Mahdi
Entrenched bureaucrat
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Lackey
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Stakeholders
Perspectives
Intent
Intensity
Origin
Intended audience
Objectivity
Sort by
Data set
Character Archetypes
click
Intensity
Strong negative
Negative
Neutral
Positive
Strong positive
Failure (Theme)
45
0
25
50
75
100
Origin
first-hand
second-hand
known about
rumor
joke
Cole suspects deny knowledge of evidence
The Prosecution looking into the case of the 6 suspected operatives
of the USS Cole asked the Sana'a Criminal Court to uphold the
case for final hearings, while the third suspect
denied the material evidences submitted by the
him.
The court continued the procedures of the tribu
absence of the advocates for the defendants.
On July 7th the court charged the six alleged operatives of the Al-
Step 11: User clicks on one of the bookmark squares and returns to that SMI.

Why make this prototype?

When we saw the Glass engine we knew that it (or something inspired by it) would be perfect for HARP, because it is a wonderful way to explore a data set indexed by multiple variables in a way that lends itself to unexpected discovery. In effect, this approach allows the user to "slice" the data in many dimensions in rapid succession, thus traveling around in the data faster than by query or other method.

How does it address the scenarios of use?

This prototype supports all three scenarios, because surprise - coming onto something one had not expected and making connections one would not have made - is useful to all of the scenarios, where previous perceptions can be limiting. However, having said that, it is probably less useful for narrative reasoning, or analogy comparison, since it is harder to compare items here by juxtapositioning them than in other prototypes.

How does it address the requirements of the scenarios it addresses?

This prototype is high on compare/contrast but low on manipulate and drilling down.

How does it address the contexts of use?

This prototype will be almost entirely used for serendipitous encounter, though it does have a small part to play in the other contexts.

Jumping Indicators Prototype

Major changes from the mockup

Overlaid items

I had not realized while making the mockup that not only would one SMI show up in many places on the graph lines (as some of them are indexed to quite a few things), but quite a few SMIs might have the exact same values and thus would draw on top of each other. With only so much horizontal space in a "graph line", it is basically impossible to differentiate items that have the same or very similar values. For example, when your "strength" of connection to a filter goes from 0 to 100, and you have thousands of SMIs, the likelihood of having more than one item at any one spot in there (say 34, 51, 79) is very large. So the original idea that one "blip" would be one SMI was abandoned very quickly. One blip can be several SMIs, and one SMI can appear as several blips. That realization necessitated several changes.

1. The "current" SMI became a list of SMIs, and the user can select one of these to view its text. Sometimes there will only be one SMI per blip, but other times there could be two or three or eight or twenty.
2. The idea of the "connector line" between graph lines went away pretty quickly because it would actually be a whole mess of lines and would not provide any meaningful information.
3. There cannot be one sole pointer, because the "current" SMI can appear all over the place - including *all* the places every SMI in the currently selected *list* appears. So there are lots of tiny pointers in addition to the "main" pointer (where you just clicked), anywhere any of the

currently selected SMIs appears. For items linked in complex ways (including using shared attributes), there could be dozens of these little pointers showing.

4. The little bookmark marks that were to be under the graph lines would have been a mess given the multiple pointers; so it was obvious that would not work. Bookmarks can be saved and used, but they don't have visual indicators on the graph lines.

Other things

Tooltips (hints, things that appear when the mouse hovers over an item) dropped out right away. Not only was I unsatisfied with them from the previous "clusters" prototype, but it would be maddening to try to hold the mouse still over a tiny "blip", and besides, there might be any number of SMIs at that point, so what do you show?

I had originally thought that the only way to select another SMI would be to drag the pointer around. Within about two minutes of having implemented that, I realized that you need to be able to click directly on items and have the pointer jump to them. So you *can* drag the pointer, but I suspect people will rarely do that and will instead just move the mouse over to items and click on them "directly". To avoid frustration with trying to click exactly on a tiny blip (which I tried at first), the program selects the *closest* SMI to where you clicked.

The graying out of legend colors was not done, because I realized it is easy to do "manually" by simply changing any of the legend colors to gray.

I had forgot in making the mockup about "linked" representations, or, an SMI that is showing up under a filter not because it is indexed to that filter but because it is indexed to another filter that shares attributes with that filter. A blip representing an SMI that is included for that reason is shorter, based on the number of shared attributes divided by five (the arbitrary maximum). You can see this if you open at least two of the sample files, then set the "Linking Threshold" (Options menu) to 1 - loads and loads of linked blips will appear. I think this looks all right.

As with the "clusters" prototype, I decided to go with "empty" graph lines that the user fills by dragging things to them rather than just an empty space at the start. I think that is easier to understand.

Good things

Expanding a portion of the graph line is very cool. Often for a "family" of filters or a quality, you have several filters/values, and the blips are very close together. If you want to examine one of these sections of the line, it is very nice to be able to shove the other ones over while the section of interest spreads out. This ameliorates to some extent the "blips heaped on top of each other" problem.

The query, where you can "exclude" sections of any graph line and it depopulates all the lines, is even more useful. This makes the visualization not only an interesting serendipitous discovery method, but also a pretty powerful query engine. It can of course only do AND queries, because all "exclusions" are considered together, and of course you cannot exclude the middle of a graph line. But still it is very useful. Also, it is very easily grasped; just drag the border and you cut off some data. Nothing to explain, no query 'box" to fill in, etc.

The bookmarks are useful especially given the use of the visualization for rapid exploration. You

really do sometimes want to find a particular SMI again; and also, you can use the bookmarks to accumulate a set of SMIs you want to print or read later.

As with the "clusters" prototype, click and drag seems to be indispensable.

Issues and problems

The legend is almost a problem in this prototype. The colors are meaningless now in two ways: first, the old way in which one SMI can have more than one indexing and thus more than one color overlaid; and now, a new way in which the color on top is just the color of whatever SMI happened to land on top (if there were multiple SMIs at one spot). If the data has been reduced by querying and a mutually-exclusive index is chosen for the legend, it is useful. And it looks prettier than single-color blips. But its usefulness is not that great and it could even be misleading.

Things not done

The only thing I wanted to implement but didn't was that I wanted the user to be able to add new empty graph lines or remove some. It was a resizing headache and I left it out, just going with a stock number that can be reused. On a large screen that would be a problem, because you would have lots of space and not be able to use it. In a real version that would be fixed. Everything else that was in the mockup that is not in the prototype is not there because turned out to be a bad idea.

Open questions (originally in mockup report) reconsidered

How well will this scale? What happens if you have to place 10K little lines in a very small screen space? Will the user really be able to see the differences between these, or will they just form a dense impenetrable blob? [Here's an idea: the indexes list on the left-hand side could not just drag to size, but could "pop" in and out, like the message area in Mozilla mail, so the user could hide it quickly.]

> Actually I did implement that "pop" thing for the left-side indexing list (by menu), and it is helpful, but not overwhelmingly so (it's jarring and confusing to lose the list of indexes). Yes, the lines do form a dense impenetrable blob. There are a few helps for that. First, as suggested, the user can hide the left panel and thereby get more room for the blips to spread out. Second, the user can grow one section of the graph line and shrink others to spread out some items. Third, the user can exclude some items by cutting off another graph line. (Say there are too many items in the Character Archetypes graph line; the user can drag the "Intensity" quality to the space and exclude "Strong negative" and "Negative".) Finally, the user can just look through the list of items that come up when they click on one blip. However, I haven't tested it with thousands of items (just about 700). One problem with that is the space allocated for the selected items isn't large enough (it only wants to show two or three). That might need to be changed. I hate it taking up so much screen when there are *not* a lot of items to show. That needs to be tested and improved.

Won't it be confusing, all those things people can click on and drag? How will they know what they can move and what they can't? Won't there be a lot to learn? [One possibility is that they don't NEED to do some of the things, so it can be a kind of two-tier interface in terms of learning

it.]

> I don't think it's very confusing. There are really only three things you can do: click on a blip; move sections around; exclude portions. I don't think that's very hard to understand. In fact I think this is much less complex and more intuitive than the "clusters" prototype.

This mockup, unlike the others, doesn't combine symbols with colors but just has colors alone and one type of symbol. That's because the symbols have to be thin lines to fit in the small horizontal space. What to do about color-blind people then? [Note: I found a good resource online to deal with this - http://www.vischeck.com - software that simulates what your color scheme looks like to color-blind people.]

> I think this is resolved by the ability to change legend colors. Eventually the user should be able to save color sets. But see above problems with the legend - so I am not sure if this prototype should even *have* a legend.

If the SMIs are very very small to fit onto the lines, will it be possible to hover over them? Will people have that good control over the mouse to do that? (Especially older people sometimes have trouble being extremely exact with the mouse.) On the other hand, does this matter? Maybe the hover is a BAD thing for this prototype and shouldn't be there, because it will distract people from clicking quickly, which is more like what we want them to do.

> Yes, hover is bad for this prototype and I didn't even bother to implement it when I saw how impossible it would be to use.

Shouldn't there be a way to see lots of story TITLES at once, instead of one at a time, by hovering or clicking? People can read lots of titles at once, why can't they do that in this? This application is different from the Glass Engine in that people need to hear audio, but they can get a lot out of reading titles to SMIs. [The query should be dynamic, in the sense that people can read different titles (and texts) while holding down the mouse and dragging. So it's not the same as reading lots of titles in a list, but it can be quick. One change that might be necessary is that people might want to read the "current" title ABOVE the graph lines instead of below, so it's easier to see the impact of their changes. Not sure on that.]

> I think this is still a problem and maybe my design for where to put the name of the SMI is bad. I'm not totally happy with it. One possibility is to *not* put the text of the SMI on the window at all (freeing up a lot of space) and thereby have not only room for more graph lines but also room to have the SMI title(s) larger and more noticeable. That would have to be tested.

Won't it just be really confusing if SMIs can be in two places on one graph line (say if they have two values for Intent or something)? Doesn't that break the object-representation idea of one line for one SMI? [Well, yes, but I'm not sure there is anything we can do about that.]

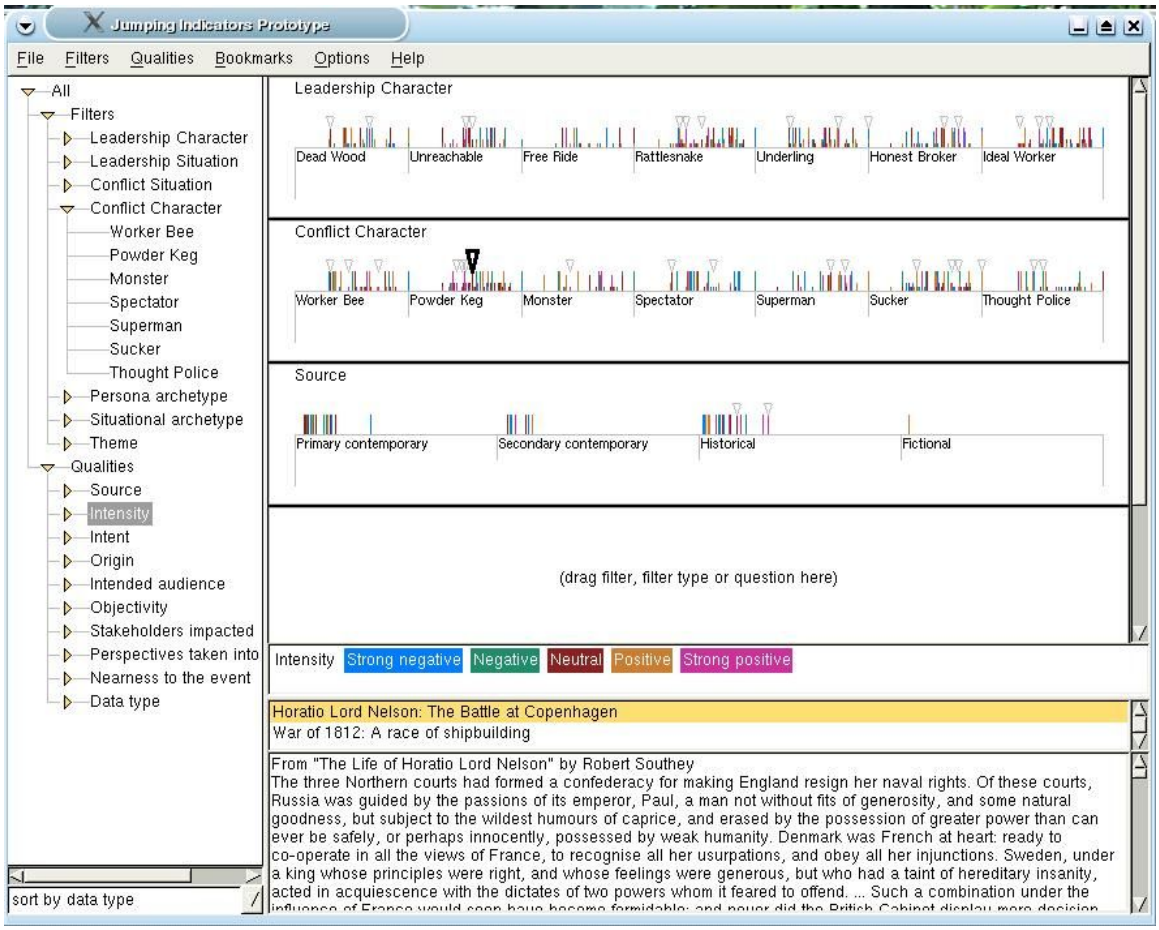
> Actually I don't think it's all that confusing with the multiple tiny pointers in place. If you just say "these are all the places where this SMI shows up", I think that is understandable.

New questions for testing

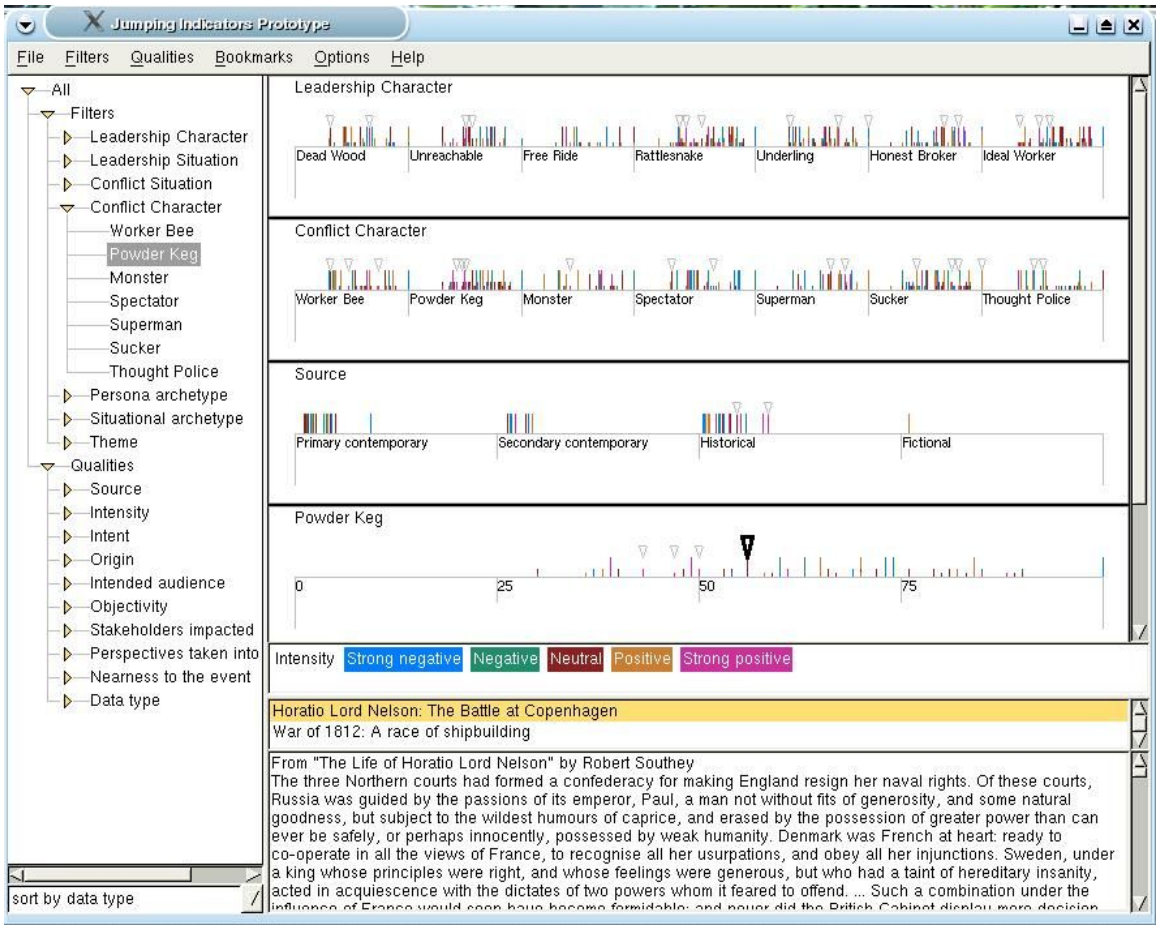
1. Is there a scale limit (number of items) above which this visualization is just not useful? If so, what can be done to work with/around that?

2. Should this visualization include the legend, given that there are so many problems with it being used meaningfully?
3. Should the text of the SMI be on the window? Should the title(s) of the selected SMI(s) be moved to somewhere else where they can be more noticeable? Or is the current design workable?

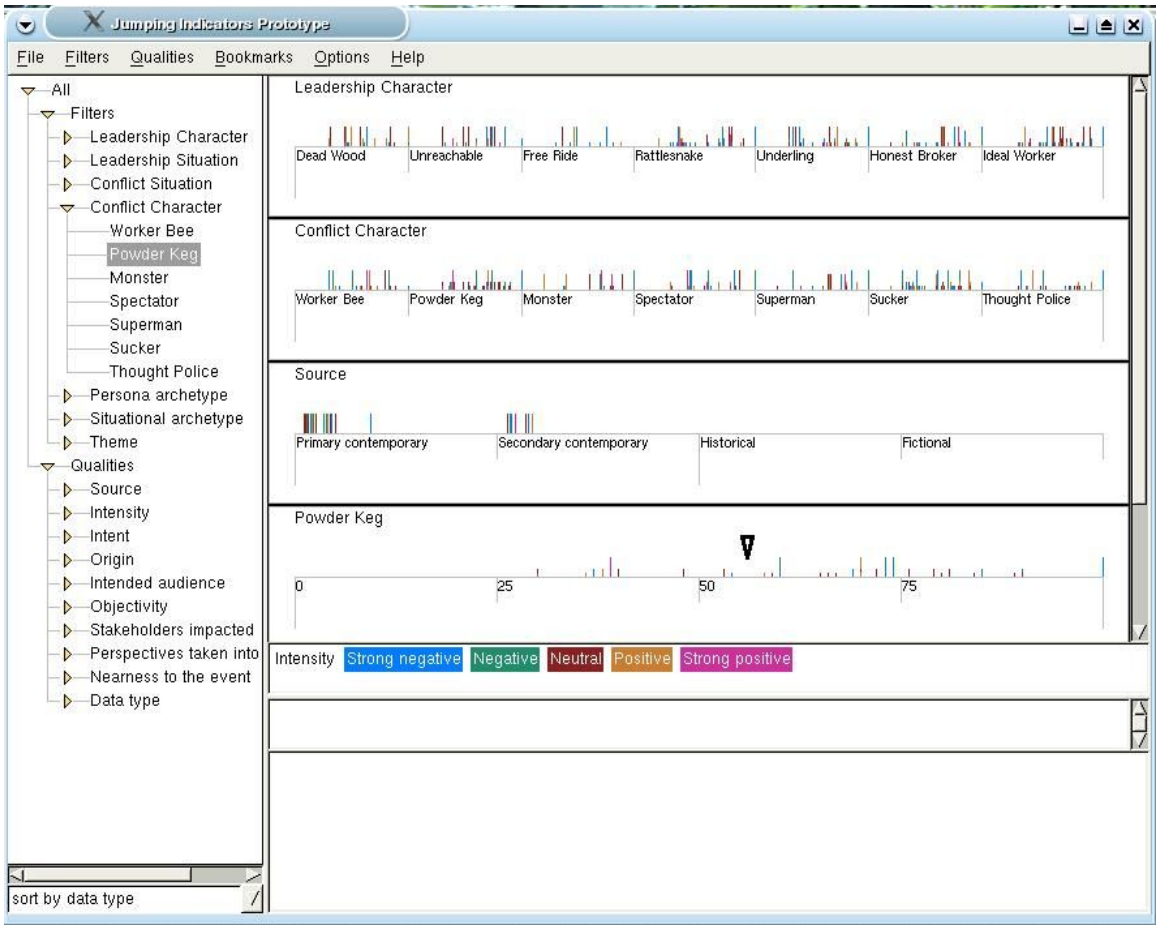
Prototype screen shots



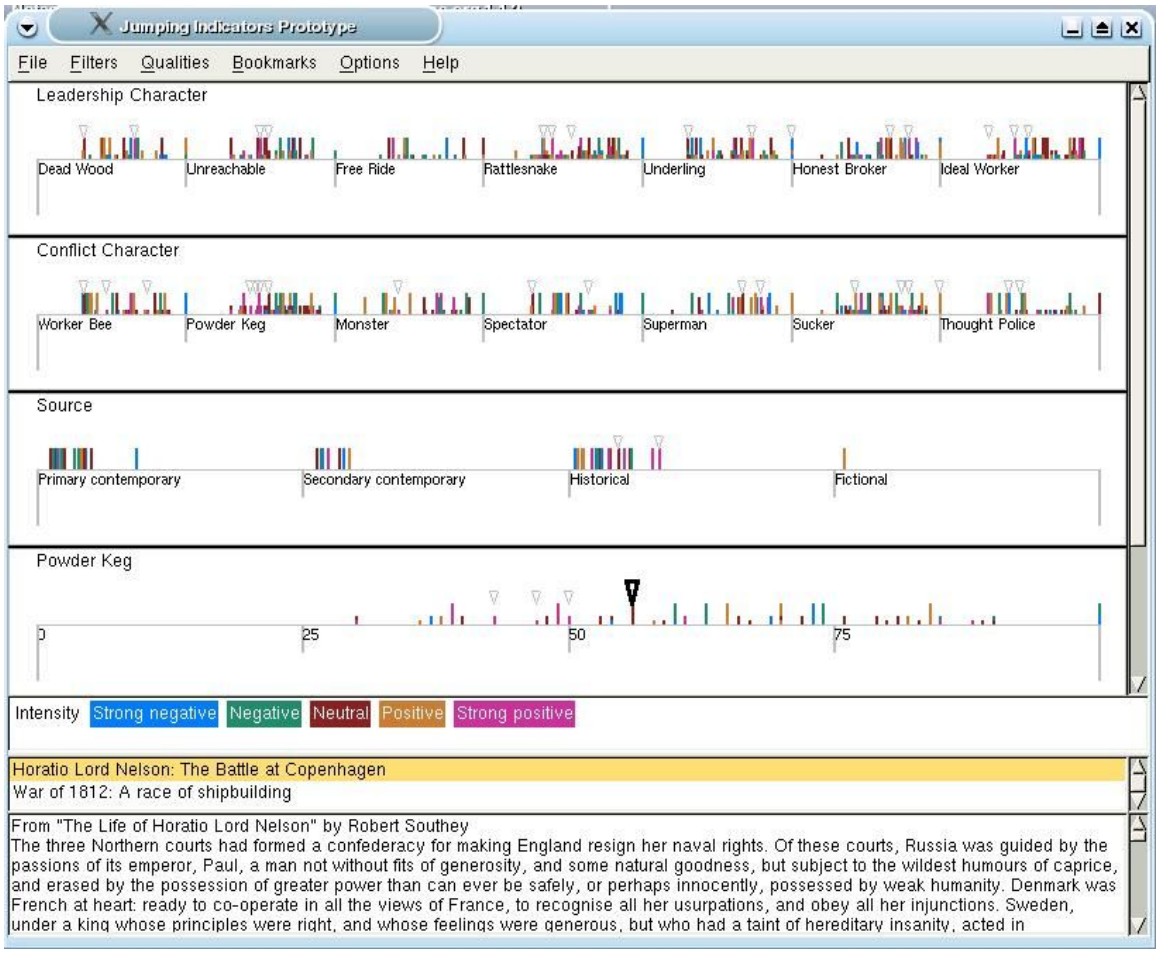
This screenshot shows all three sample data sets combined, with the two types of character archetypes and the Source quality drawn on graph lines. The Intensity quality is selected for the legend. The user has selected the "Battle at Copenhagen" SMI (out of the two SMIs at the pointer location) to read. By looking at the little gray pointers the user can see how the "Battle at Copenhagen" SMI, and the "Race of shipbuilding" SMI at the same spot, and SMIs linked to either of them through shared filter attributes, are indexed with regard to these particular filters and qualities. For example, the only character archetype these two SMIs are *not* linked to (that has no little gray triangles above it) is the "Free Ride" archetype. One might wonder what it is about "Free Ride" that makes it absent from these SMIs.



Here the user has noticed that the "Powder Keg" character archetype is particularly dense (including in linked items) and has decided to look at it by itself. The user has selected the same Copenhagen/Race SMI pair again, by clicking on one of the little gray pointers that show the two SMIs in the "Powder Keg" graph line.



Here the user has decided to exclude SMIs indexed with "Historical" and "Fictional" values for the "Source" quality and consider only contemporary sources. Note that the items indexed to the "Powder Keg" character archetype have depopulated considerably from the previous screen shot, and that the previously selected SMIs (Copenhagen/Race) have disappeared from the bottom of the window. Because the user is doing this in dynamic query, that is, while they are moving the exclusion line back and forth with the mouse, they can compare the results back and forth. The conclusion is that the "Powder Keg" archetype is more strongly represented in the historical SMIs than in contemporary ones. Not only are there more historical SMIs indexed to the "Powder Keg" archetype, but they are more strongly linked than the contemporary SMIs.



Finally the user has decided they want to think about the "Intensity" quality of the items indexed to the Powder Keg archetype. They are finding it hard to see the tiny little lines, so they set the "Draw Thicker Lines" option on. Now they can see that, interestingly, there appear to be more neutral and positive items indexed to the Powder Keg than negative items (as seen by the line colors). This is an unexpected result, so the user may decide to follow this pattern further, perhaps by excluding some sources again to see what Intensity values drop off; or by dragging the Intensity quality to a new graph line and excluding some of its values.

Command-line Application

Mockup

Description

This will be a very simple interface consisting only of a small set of commands and a "shell" program that the user can type into and see textual results in.

Why make this prototype?

Actually, I decided not to make this prototype because, on reflection, I realized that while it may be interesting in terms of query and agents and all, it is not, strictly speaking, about visualization. And actually, though it might seem like a quick exercise, supporting a command driven system can be quite involved - menu design for optimum memory recall, how to show the most information in the smallest (text) space, and so on. If there were infinite time it would be an interesting test, but it is much lower priority than the other possibilities.

Text Panels Application

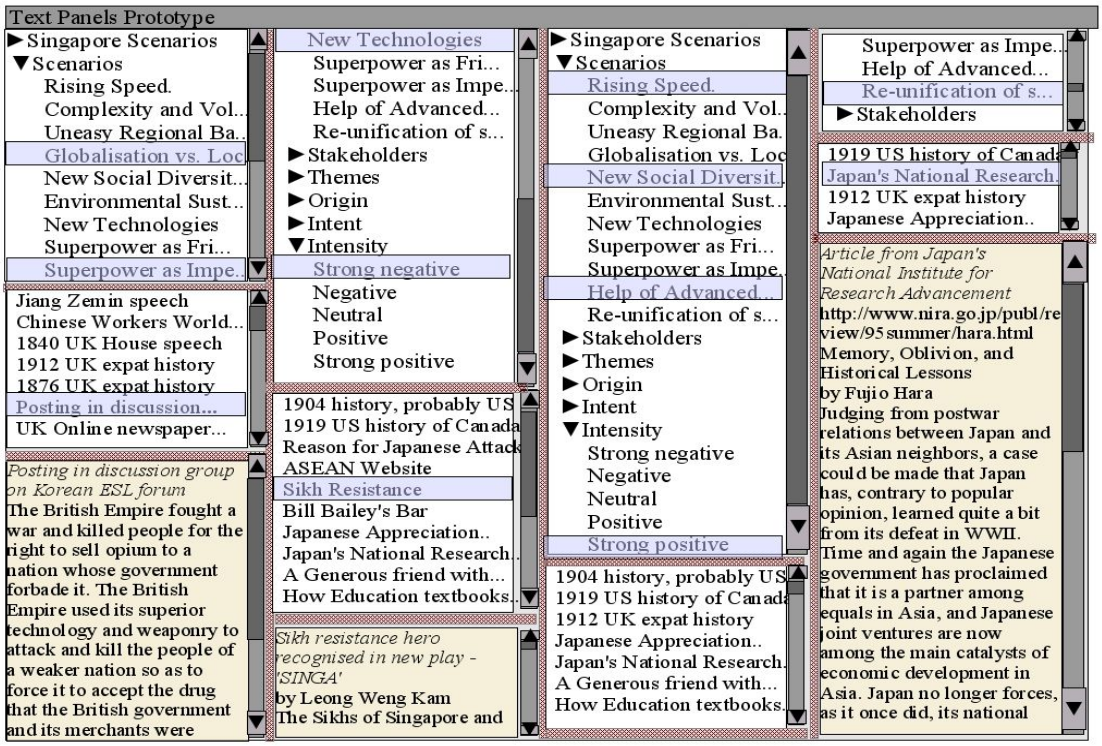
Mockup

Description

This is a sort of test of the simplest possible text-only system by which one can quickly browse around the database. There are any number of copies of one basic unit, which has three parts: a list of all available indexes, a list of SMIs resulting from the query posed by clicking on the list of indexes, and the text of one SMI resulting from a click on the list of SMIs.

To support OR queries, the user can optionally select multiple items (Ctrl-click) then choose "Add merged index" from a popup menu. This will add an EXTRA item to the indexings list, which is item A OR item B. They can then click on this as usual to AND it with other items. (This is similar to merging rows/columns in the Sliding Panels prototype.)

Mockup screens



Why make this prototype?

There are two reasons to make this prototype: 1) to see how well it will work to ignore all the fancy bells and whistles of the graphical prototypes and just present the information very simply and give the user the chance to query and juxtapose; and 2) to address the "dots" issue by removing all graphical components. The test will be to see what the graphical prototypes add that

this simpler prototype can't provide.

How does it address the scenarios of use?

It's not clear how well this prototype will support any of the scenarios. It may be too simple and not helpful enough; but then again it may clear away complexity and make it easier to experiment and explore.

How does it address the requirements of the scenarios it addresses?

This prototype is high on compare/contrast but low on manipulate and drilling down.

How does it address the contexts of use?

This prototype will be more useful for query than the others, since doing a query using this will be simpler. For serendipitous encounter it remains to be seen. For experiment, maybe. In general this prototype requires the user to keep more of the tools for what they are doing in their own mind, because it gives them less "support". The question is, is that bad or good?

Text Panels Prototype

Major changes from the mockup

There were no major changes between this prototype and its mockup; it was implemented almost exactly as envisioned. It was not very complicated. The one change was that I found it necessary to add a "query report" so that the user can see what has been selected in the tree list.

Good things

Juxtaposition works. It is quite useful to be able to set multiple queries alongside each other and compare the lists of items. One thing that you immediately want to be able to do (but that the prototype doesn't do) is name queries, save them, and recall them. You might even want to save sets of queries.

Another thing that is good about this prototype is that there is very little to explain. Here is a list of indexes; click on those; here are the items linked to those indexes; click on those to read them. The user still has to understand that the data has metadata indexes, but they don't really have to understand the difference between filters and qualities (as they do in the "clusters" prototype).

Issues and problems

I don't think this interface is very elegant or inspired, more like dogged. It is hard to move around in; things get cut off easily; it can be easy to lose one's place. It could do with some improving (though how I'm not sure).

I personally find this interface kind of boring compared to those of the other prototypes. It doesn't draw me in. I also think this is somewhat limited in terms of the types of comparisons that can be done and the kinds of patterns that can be followed.

There is a bug in the current version of the windowing system I'm using (wxPython) which means that when the user adds or removes an up-down panel, any *multiple* selections in the indexing list get lost (only the first selected item is retained). These things happen.

Things not done

The mockup was not very complicated, so it was easy to implement everything in it.

Open questions (originally in mockup report) reconsidered

Will having lots of juxtaposed panels be extremely useful, or just confusing? Will it really be helpful to look at lists side by side, or is that not useful at all? Would this be better off with just one panel?

> Definitely useful, definitely better than with just one panel. Though how useful this whole thing is remains to be seen.

What about when the list of SMIs resulting from the query is in the thousands? What is the point of showing it in a list then?

> Probably less useful then, but it is important to realize that people can only make sense of so many items at once, no matter where or how they are displayed. If there are thousands of items in the list, then people will probably make more complex queries until there are fewer items in the list to deal with.

What happens when the SMIs shown have bad titles, like "XHEDC15" and "5DGYIO"? Then where is the usefulness of showing the titles, and wouldn't you be better off with a scatter plot?

> In that case this prototype would be at a major loss. All of the prototypes would suffer if the SMIs had non-informative names, but this one would suffer the most. What you could do is, if the SMI name is determined to be uninformative (in some way - short, or no recognizable words), instead of the name the first few words from the SMI text could be shown.

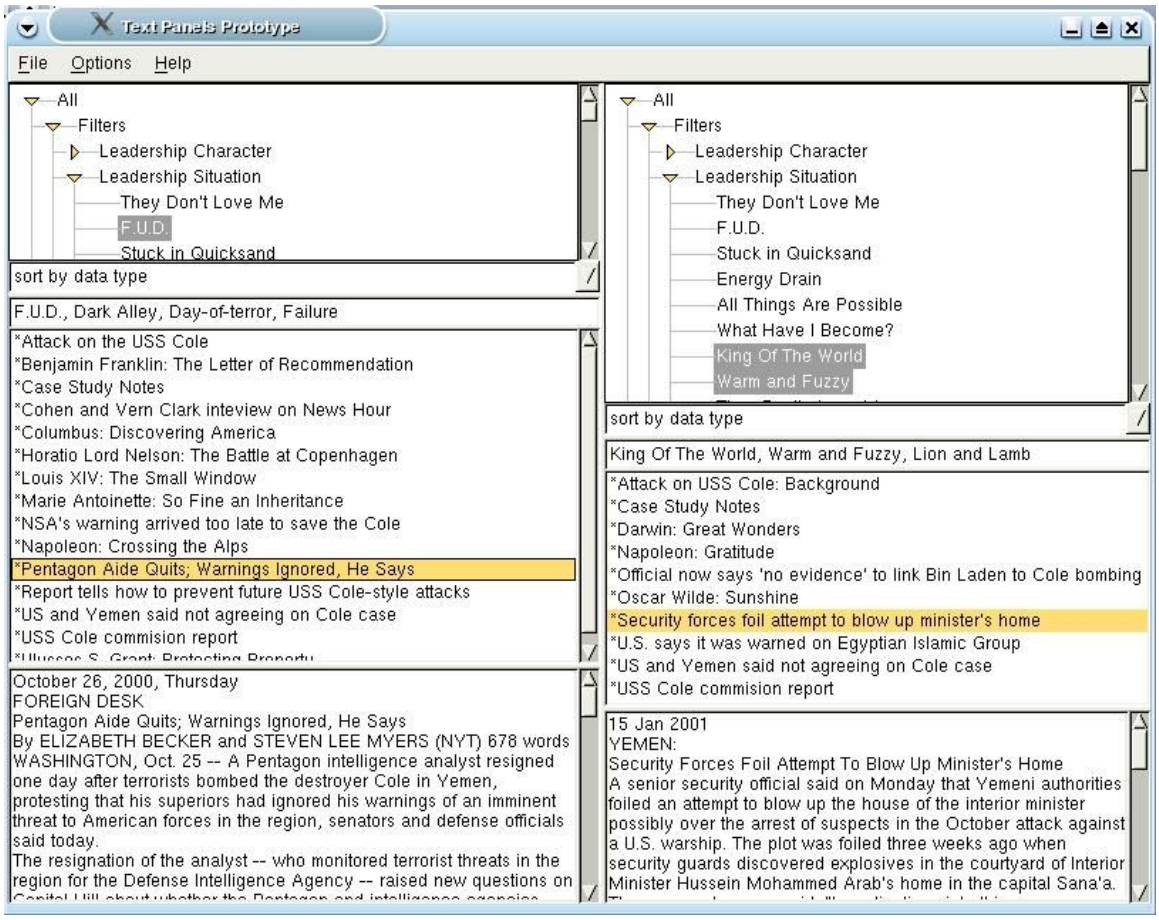
Why do you have to repeat the indexings list in each panel, taking up lots of space? Couldn't you just have one list and drag things to the panels, or some other way of selecting?

> As with the other prototypes, there is value in the list of indexes appearing permanent. In this case, I do think it is warranted to keep it in all of the up-down panels. The prototype includes an option (via the menu) of hiding all the indexing trees, so they are only looking at query results.

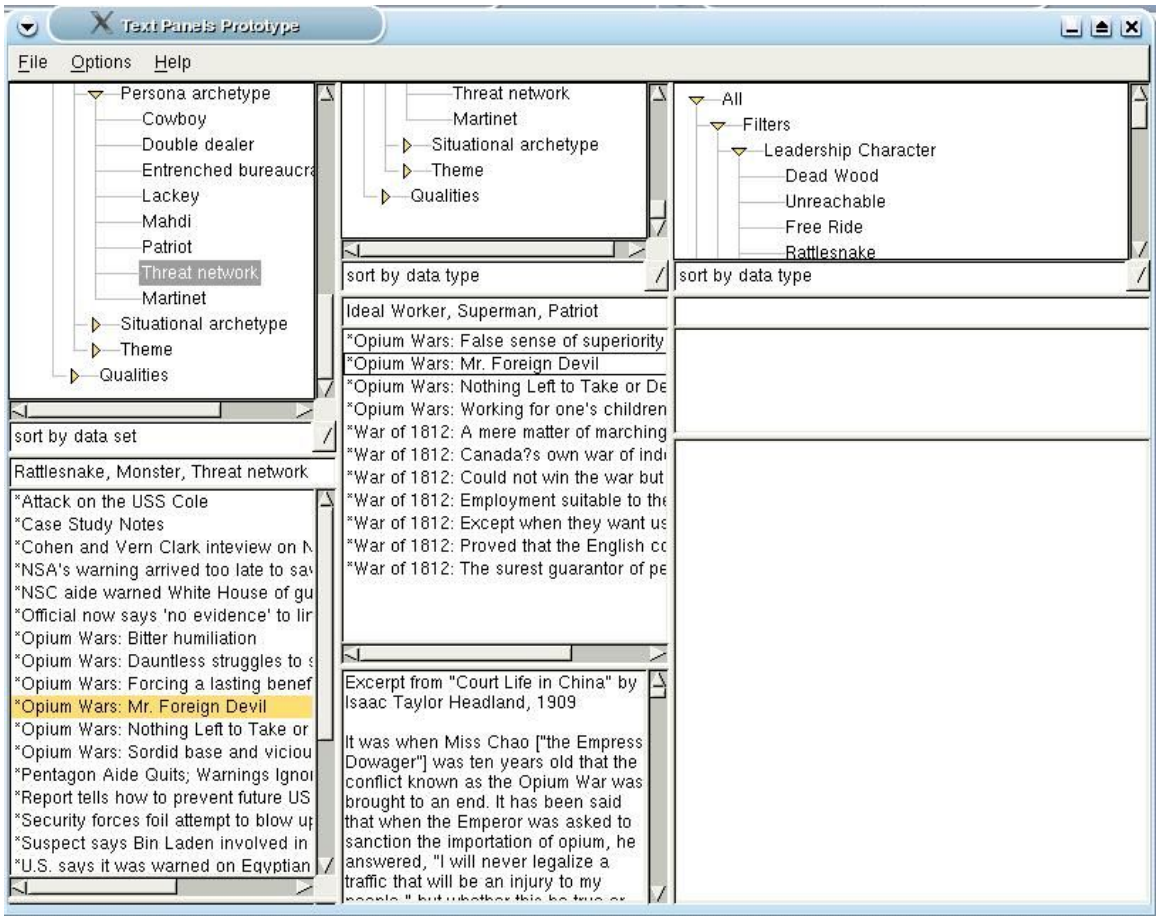
New questions for testing

1. Is this prototype useful enough to keep, or are the other prototypes so much better that this one should just be dropped?
2. Might people use this in ways we had not considered (and find it useful for reasons we had not considered), and might the absence of "dots" prove more appealing than it seems?
3. In what ways could this prototype be more user friendly?

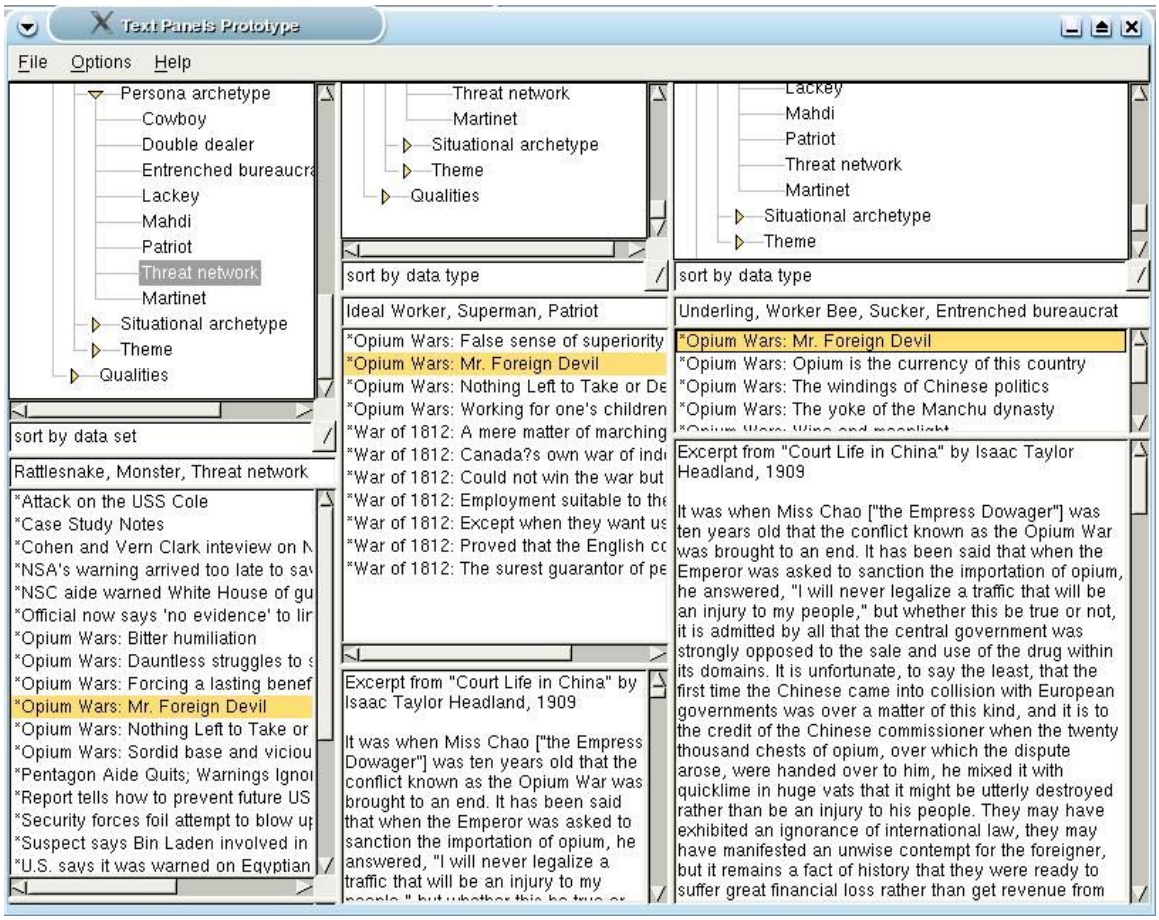
Prototype screen shots



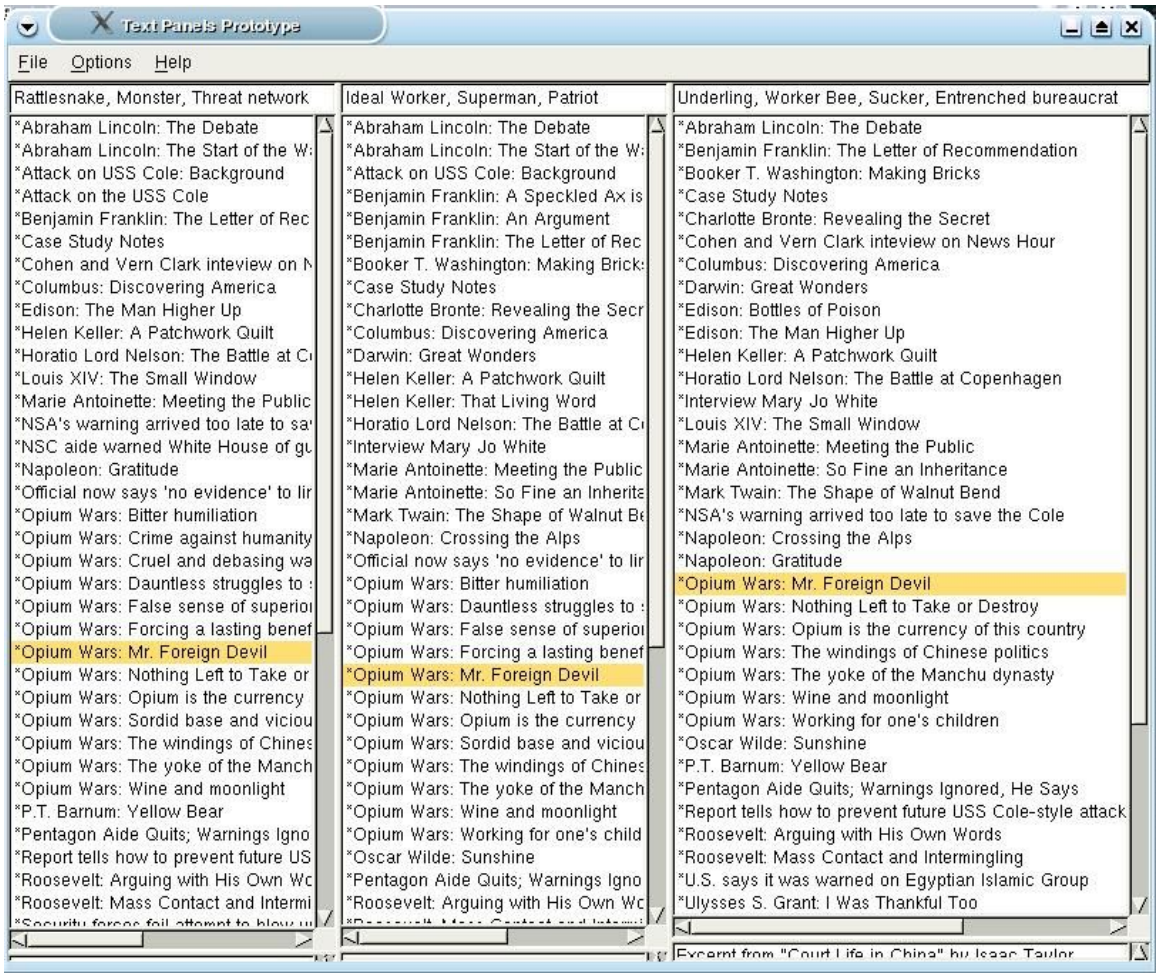
Here the user has made a simple two-part comparison by selecting situations seeming to do with danger (FUD, Dark Alley, Day-of-terror, Failure) alongside situations seeming to do with the absence of danger (King of the World, Warm and Fuzzy, Lion and Lamb). Interestingly, newspaper articles about the Cole bombing can be found in both sets. The user has selected one Cole article that is particularly alarming (analyst resigns with warnings of more problems to come) and one that is particularly reassuring (terrorist plot is thwarted before it can be carried out). In a sense those two articles are the extremes of expectations about intelligence and terrorism: we thwart all attempts and become impervious to plotting; or we institutionally ignore obvious dangers and are therefore incapable of improving the situation for the better.



Here the user has decided to compare some of the characters in the items. They have chosen the worst of the worst (Rattlesnake, Monster, Threat network) alongside the best of the best (Ideal Worker, Superman, Patriot). Interestingly, the same item (Mr. Foreign Devil) shows up in both lists. Sensing that this may be a "pivot story", or a narrative which contains multiple filters of interest and thus elucidates complex connections between filters, the user decides to explore further.



Here the user has chosen another group of character archetypes - the powerless (Underling, Worker Bee, Sucker, Entrenched bureaucrat). Again the Foreign Devil narrative appears. Now the user will probably read that narrative to discover why all three groups of archetypes appear in it, and what it can say about the relationships between those archetypes. The user might want to save that narrative as a particularly good one for explaining (literally or metaphorically) a complex situation in which all three groups of archetypes are present and interacting.



Finally, here the user has hidden the indexing trees so they can compare the three lists of items more carefully. For example, they can see that "Pentagon Aide Quits" is also listed in all three groups, so that might be another narrative worth considering as useful.

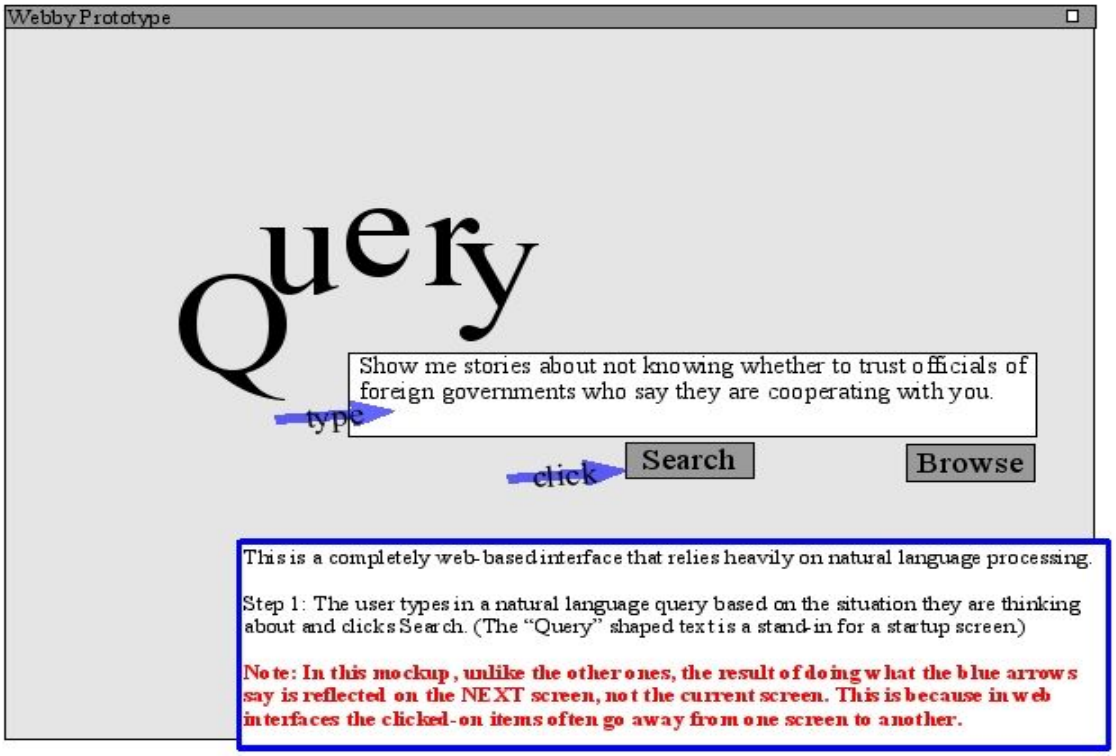
Web-like Application

Web-like Mockup

Description

This interface will limit itself to only text, via a web browser. It will start with a simple natural language query, which will be linked to filters in an extremely simple way (to test): through matches between words in the search query and attributes of filters (with stemming and synonym lookup). The prototype will present the user with search results, which the user can then examine and sort by various means. The user can also narrow the search by querying on qualities. They can also "slice" through the data by looking at all SMIs linked to particular filters or quality values; and they can "drill down" and look at information on filters and qualities.

Mockup Screens




Webby Prototype
Query
Home
Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you.
Search
Advanced search Options
Back
391 items found. Sorted by relevance. Sort by date, filter, location
Six Yemenis Reportedly Detained For Role In Cole Attack
Yemeni sources close to the investigation ... authorities have detained six Yemeni men ... no charges would be filed until the investigation was complete. reportedly told Yemeni investigators he received his orders...
and 26 similar linked to Mahdi, Double dealer, Excuses, Scapegoats
Investigators Seek Links To Bin Laden
...Freeh appealed in a joint statement for greater cooperation from the Yemenis in the investigation, because FBI agents have encountered the same problem...
and 83 similar linked to Tools of Power, Associations among players, Entrenched bureaucrat
US And Yemen Said Not Agreeing On Cole Case
Yemeni sources said on Saturday that Yemen and the United States disagree whether to try three suspects in the USS Cole bombing in absentia or wait to hold any trial until it is clear whether they have fled the country.
and 72 similar linked to Tools of Power, Excuses, Entrenched bureaucrat
Report Tells How To Prevent Future USS Cole-Style Attacks
...no specific intelligence warning of the attack before the Cole was hit, although anti-American elements had been reported in the area in past.
... great deal of attention was paid in the report to the idea of dedicated "for protection officers...
and 29 similar linked to Excuses, Entrenched bureaucrat
Your query was matched to these filters:
Mahdi (53 items)
Entrenched bureaucrat (98 items)
Double dealer (126 items)
Excuses (47 items)
Scapegoats (21 items)
Tools of Power (254 items)
Associations among players (39 items)
click
Step 2: The user is immediately presented with example result SMIs, with links to "similar" items that are linked to the same filters. Filters are chosen by similarity between the query and the attribute lists of filters. Highest in the list are items linked to the greatest number of filters pulled out by the query.
Next the user clicks on the "Entrenched bureaucrat" filter name.

Webby Prototype

Query Home | Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you. | Search | Advanced search Options | Back

click

Entrenched bureaucrat

Defined in Johannesburg Conference on January 3, 2005 by 28 analysts taking on the identity "Western educated African diplomats"

Attributes:

- Defensive
  - "Don't want to hear anything bad"
  - Also found in 12 other filters
  - Read example stories illustrating this attribute
- Rationalizing
  - "Always an explanation"
  - Also found in 32 other filters
  - Read example stories illustrating this attribute
- Too busy to care
  - "I have no time for your concerns"
  - Also found in 6 other filters
  - Read example stories illustrating this attribute
- Not my fault/problem
  - "Did I have responsibility for that?"
  - Also found in 29 other filters
  - Read example stories illustrating this attribute
- Follow procedure
  - "Listen Mister we have rules around here"
  - Also found in 8 other filters
  - Read example stories illustrating this attribute

Step 3: The user has clicked on the "Entrenched bureaucrat" link. The user can trace each attribute of the filter back to what other filters have it in common.

Next the user hits the "back" button to go back to the last page.

Webby Prototype

Query Home | Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you. | Search | Advanced search Options | Back

391 items found. Sorted by relevance. Sort by date, filter, location

Your query was matched to these filters:
Mahdi (53 items)
Entrenched bureaucrat (98 items)
Double dealer (126 items)
Excuses (47 items)
Scapegoats (21 items)
Tools of Power (254 items)
Associations among players (39 items)

Six Yemenis Reportedly Detained For Role In Cole Attack
Yemeni sources close to the investigation ... authorities have detained six Yemeni men ... no charges would be filed until the investigation was complete... reportedly told Yemeni investigators he received his orders...
and 26 similar linked to Mahdi, Double dealer, Excuses, Scapegoats

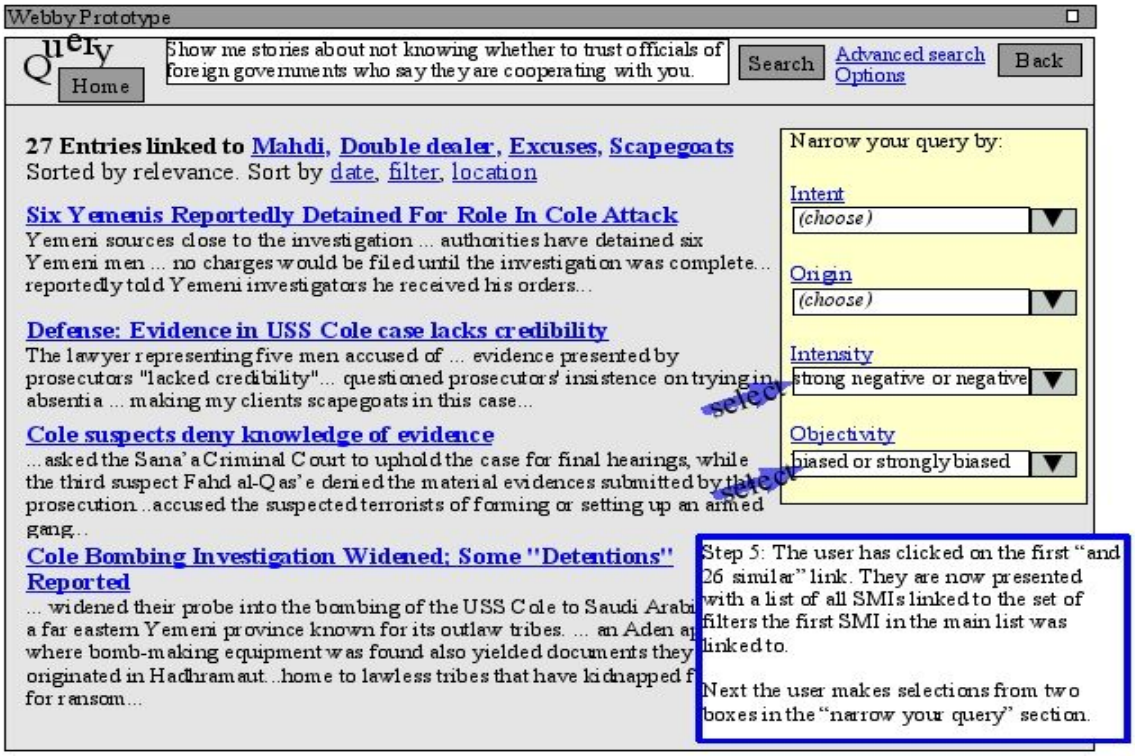
click

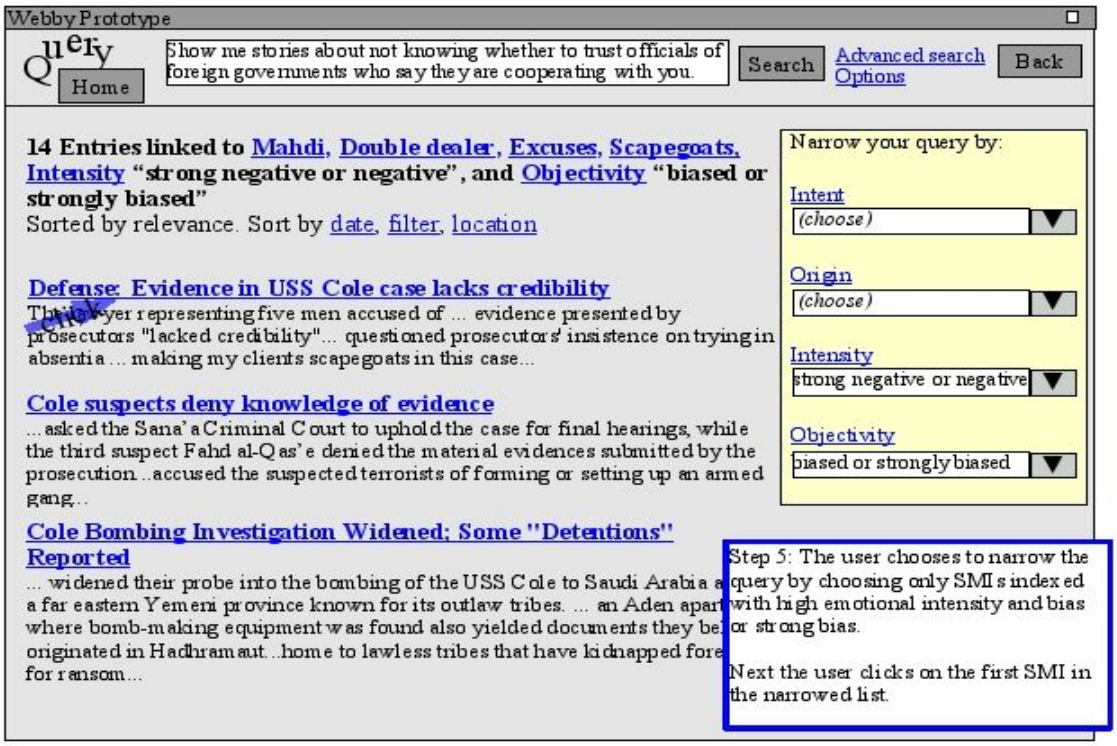
Investigators Seek Links To Bin Laden
...Freeh appealed in a joint statement for greater cooperation from the Yemenis in the investigation, because FBI agents have encountered the same problem...
and 83 similar linked to Tools of Power, Associations among players, Entrenched bureaucrat

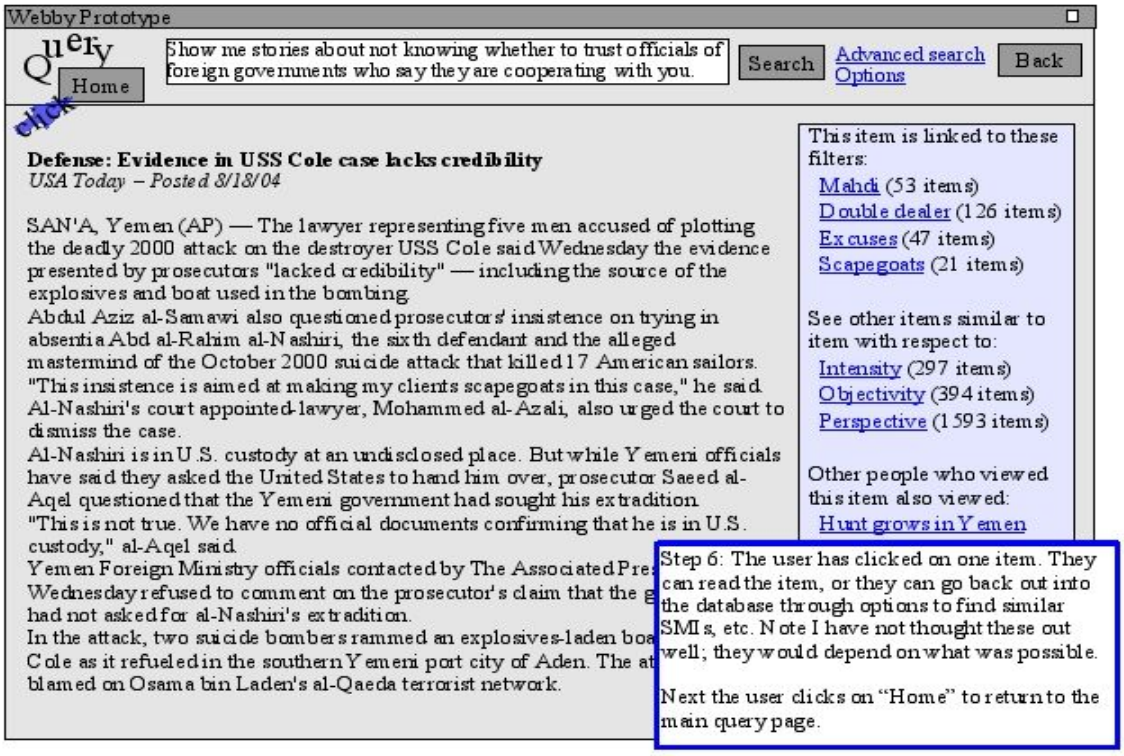
US And Yemen Said Not Agreeing On Cole Case
Yemeni sources said on Saturday that Yemen and the United States disagree on whether to try three suspects in the USS Cole bombing in absentia or wait to hold any trial until it is clear whether they have fled the country.
and 72 similar linked to Tools of Power, Excuses, Entrenched bureaucrat

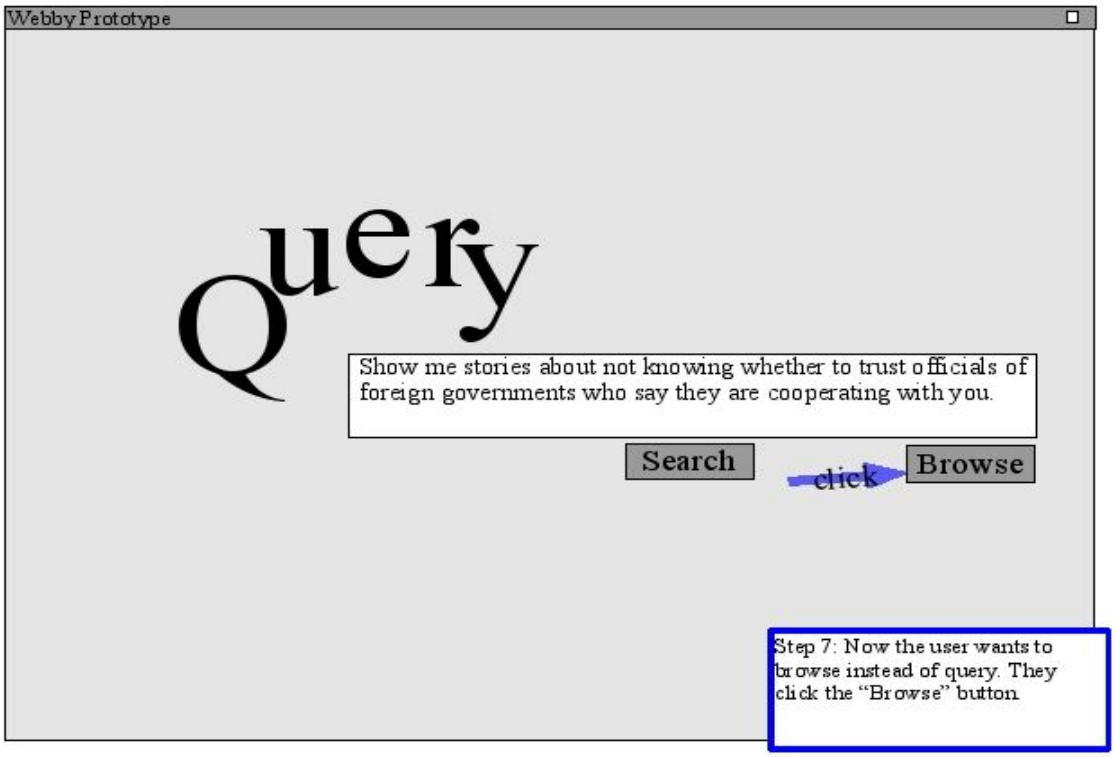
Report Tells How To Prevent Future USS Cole-Style Attacks
...no specific intelligence warning of the attack before the Cole was hit, although anti-American elements had been reported in the area in past.
... great deal of attention was paid in the report to the idea of dedicated "for protection officers...
and 29 similar linked to Excuses, Entrenched bureaucrat

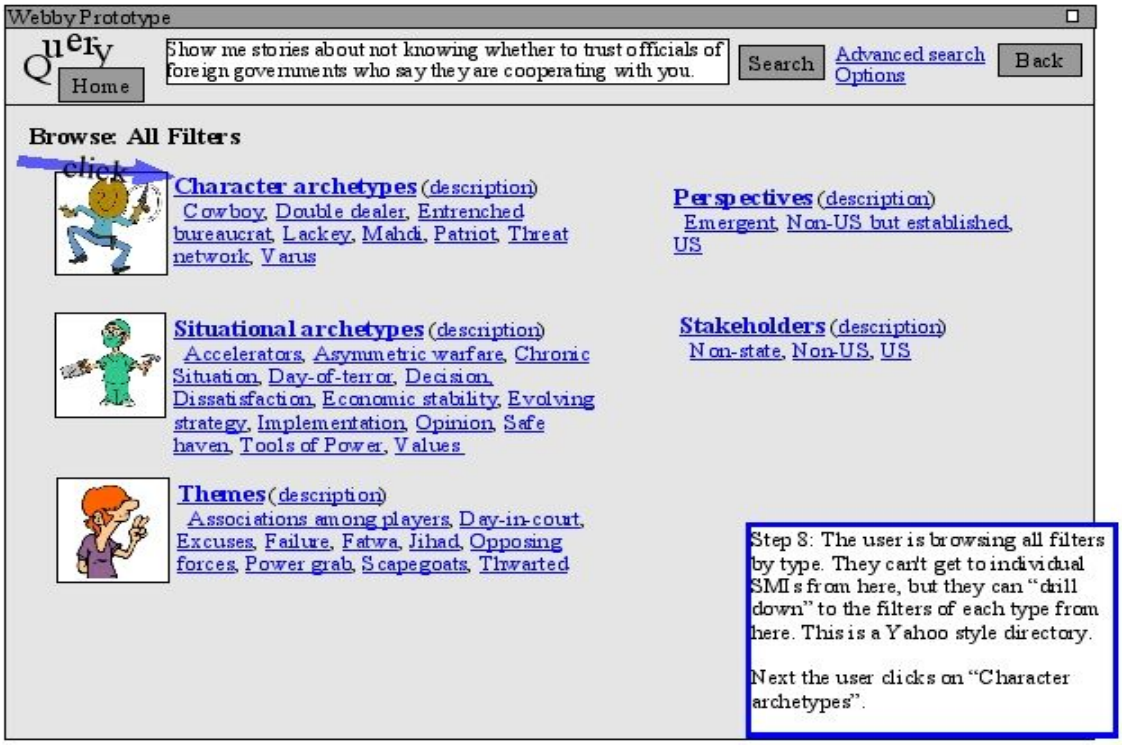
Step 4: Back at the main results page (nothing changed), the user clicks on the "and 26 similar" under the first item, which will bring up all items linked to the four filters shown there.

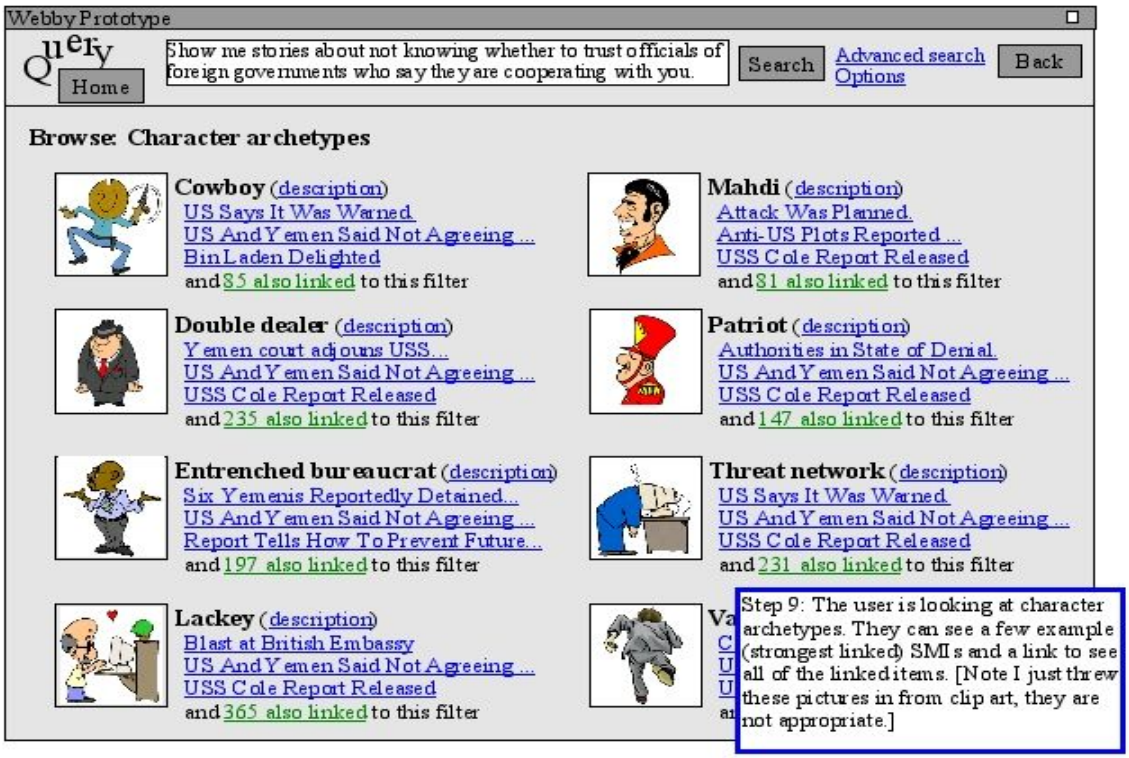

Webby Prototype
Query
Home
Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you.
Search
Advanced search
Options
Back
27 Entries linked to Mahdi, Double dealer, Excuses, Scapegoats
Sorted by relevance. Sort by date, filter, location
Six Yemenis Reportedly Detained For Role In Cole Attack
Yemeni sources close to the investigation ... authorities have detained six Yemeni men ... no charges would be filed until the investigation was complete... reportedly told Yemeni investigators he received his orders...
Defense: Evidence in USS Cole case lacks credibility
The lawyer representing five men accused of ... evidence presented by prosecutors "lacked credibility"... questioned prosecutors' insistence on trying in absentia ... making my clients scapegoats in this case...
Cole suspects deny knowledge of evidence
...asked the Sana'a Criminal Court to uphold the case for final hearings, while the third suspect Fahd al-Qas'e denied the material evidences submitted by the prosecution..accused the suspected terrorists of forming or setting up an armed gang...
Cole Bombing Investigation Widened; Some "Detentions" Reported
... widened their probe into the bombing of the USS Cole to Saudi Arabi
a far eastern Yemeni province known for its outlaw tribes. ... an Aden ap
where bomb-making equipment was found also yielded documents they
originated in Hadhramaut..home to lawless tribes that have kidnapped f
for ransom...
Narrow your query by:
Intent
(choose)
Origin
(choose)
Intensity
strong negative or negative
Objectivity
biased or strongly biased
select
select
Step 5: The user has clicked on the first "and 26 similar" link. They are now presented with a list of all SMIs linked to the set of filters the first SMI in the main list was linked to.
Next the user makes selections from two boxes in the "narrow your query" section.


Webby Prototype
Query
Home
Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you.
Search
Advanced search
Options
Back
14 Entries linked to Mahdi, Double dealer, Excuses, Scapegoats, Intensity "strong negative or negative", and Objectivity "biased or strongly biased"
Sorted by relevance. Sort by date, filter, location
Defense: Evidence in USS Cole case lacks credibility
The lawyer representing five men accused of ... evidence presented by prosecutors "lacked credibility"... questioned prosecutors' insistence on trying in absentia ... making my clients scapegoats in this case...
Cole suspects deny knowledge of evidence
...asked the Sana'a Criminal Court to uphold the case for final hearings, while the third suspect Fahd al-Qas'e denied the material evidences submitted by the prosecution..accused the suspected terrorists of forming or setting up an armed gang...
Cole Bombing Investigation Widened; Some "Detentions" Reported
... widened their probe into the bombing of the USS Cole to Saudi Arabia a
a far eastern Yemeni province known for its outlaw tribes. ... an Aden apart
where bomb-making equipment was found also yielded documents they be
originated in Hadhramaut..home to lawless tribes that have kidnapped fore
for ransom...
Narrow your query by:
Intent
(choose)
Origin
(choose)
Intensity
strong negative or negative
Objectivity
biased or strongly biased
click
Step 5: The user chooses to narrow the query by choosing only SMIs indexed with high emotional intensity and bias or strong bias.
Next the user clicks on the first SMI in the narrowed list.


Webby Prototype
Query
Home
click
Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you.
Search
Advanced search
Options
Back
Defense: Evidence in USS Cole case lacks credibility
USA Today – Posted 8/18/04
SAN'A, Yemen (AP) — The lawyer representing five men accused of plotting the deadly 2000 attack on the destroyer USS Cole said Wednesday the evidence presented by prosecutors "lacked credibility" — including the source of the explosives and boat used in the bombing.
Abdul Aziz al-Samawi also questioned prosecutors' insistence on trying in absentia Abd al-Rahim al-Nashiri, the sixth defendant and the alleged mastermind of the October 2000 suicide attack that killed 17 American sailors.
"This insistence is aimed at making my clients scapegoats in this case," he said.
Al-Nashiri's court appointed-lawyer, Mohammed al-Azali, also urged the court to dismiss the case.
Al-Nashiri is in U.S. custody at an undisclosed place. But while Yemeni officials have said they asked the United States to hand him over, prosecutor Saeed al-Aqel questioned that the Yemeni government had sought his extradition.
"This is not true. We have no official documents confirming that he is in U.S. custody," al-Aqel said.
Yemen Foreign Ministry officials contacted by The Associated Pres
Wednesday refused to comment on the prosecutor's claim that the g
had not asked for al-Nashiri's extradition.
In the attack, two suicide bombers rammed an explosives-laden boa
Cole as it refueled in the southern Yemeni port city of Aden. The at
blamed on Osama bin Laden's al-Qaeda terrorist network.
This item is linked to these filters:
Mahdi (53 items)
Double dealer (126 items)
Excuses (47 items)
Scapegoats (21 items)
See other items similar to item with respect to:
Intensity (297 items)
Objectivity (394 items)
Perspective (1593 items)
Other people who viewed this item also viewed:
Hunt grows in Yemen
Step 6: The user has clicked on one item. They can read the item, or they can go back out into the database through options to find similar SMIs, etc. Note I have not thought these out well; they would depend on what was possible.
Next the user clicks on "Home" to return to the main query page.


Webby Prototype
Query
Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you.
Search
click
Browse
Step 7: Now the user wants to browse instead of query. They click the "Browse" button.


Webby Prototype
Query
Home
Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you.
Search
Advanced search
Options
Back
Browse: All Filters
click
Character archetypes (description)
Cowboy, Double dealer, Entrenched bureaucrat, Lackey, Mahdi, Patriot, Threat network, Varus
Perspectives (description)
Emergent, Non-US but established, US
Situational archetypes (description)
Accelerators, Asymmetric warfare, Chronic Situation, Day-of-terror, Decision, Dissatisfaction, Economic stability, Evolving strategy, Implementation, Opinion, Safe haven, Tools of Power, Values
Stakeholders (description)
Non-state, Non-US, US
Themes (description)
Associations among players, Day-in-court, Excuses, Failure, Fatwa, Jihad, Opposing forces, Power grab, Scapegoats, Thwarted
Step 8: The user is browsing all filters by type. They can't get to individual SMIs from here, but they can "drill down" to the filters of each type from here. This is a Yahoo style directory.
Next the user clicks on "Character archetypes".


Webby Prototype
Query
Home
Show me stories about not knowing whether to trust officials of foreign governments who say they are cooperating with you.
Search
Advanced search
Options
Back
Browse: Character archetypes
Cowboy (description)
US Says It Was Warned
US And Yemen Said Not Agreeing ...
Bin Laden Delighted
and 85 also linked to this filter
Mahdi (description)
Attack Was Planned
Anti-US Plots Reported ...
USS Cole Report Released
and 81 also linked to this filter
Double dealer (description)
Yemen court adjourns USS...
US And Yemen Said Not Agreeing ...
USS Cole Report Released
and 235 also linked to this filter
Patriot (description)
Authorities in State of Denial
US And Yemen Said Not Agreeing ...
USS Cole Report Released
and 147 also linked to this filter
Entrenched bureaucrat (description)
Six Yemenis Reportedly Detained...
US And Yemen Said Not Agreeing ...
Report Tells How To Prevent Future...
and 197 also linked to this filter
Threat network (description)
US Says It Was Warned
US And Yemen Said Not Agreeing ...
USS Cole Report Released
and 231 also linked to this filter
Lackey (description)
Blast at British Embassy
US And Yemen Said Not Agreeing ...
USS Cole Report Released
and 365 also linked to this filter
Step 9: The user is looking at character archetypes. They can see a few example (strongest linked) SMIs and a link to see all of the linked items. [Note I just threw these pictures in from clip art, they are not appropriate.]

Why make this prototype?

The main impetus for this prototype is the statement by some analyst to Steve Sickels that he was sick of seeing "dots" in programs, and by Steve's opinion that many analysts want to deal mainly with text. Also, it is to test how web ideas can be used and how they might be received (for example, the concept of doing a natural language query and getting results one can peruse, however poorly the search does). And it is another text-only alternative to graphical prototypes. This prototype could, for example, have a very short learning curve because it builds on expectation of what types of systems people see on the web.

How does it address the scenarios of use?

It might be better for Narrative Reasoning than the other approaches, since the user will often have more context available than in the other prototypes (e.g., "starter" lists of SMIs with "more" links, instead of a bunch of dots). It might also be good for Us and Them, since it will be more obvious that one can examine the filters. The scenario that will suffer in this prototype will be the Detect Weak Signals one, for two reasons: (a) it will be difficult to do much experimentation, and (b) with so much data presented in such a small space, it will be easier for outliers to get lost. The natural-language query will probably not work very well, though that could conceivably be improved later. The ease of not having to learn how to navigate a system with lots of "dots" or "blobs" or "handles" or "grids" might swamp all other considerations (or not).

How does it address the requirements of the scenarios it addresses?

It should be better for drill down, because it will be more apparent that things can be looked into because they will have the look of links. Comparing and contrasting should be supported, but more in predefined ways than in open, fluid ways. Manipulating will not be well supported, because it will not be very easy to move things around when most of the screen is taken up with results.

How does it address the contexts of use?

In some ways this prototype is more broadly spread than the others, because people are used to having web pages make suggestions and propose things they might want to do. It is a more conversational type of interface. But there are so many options and few places to put them on a web page, so it may be difficult to give people all the tools and capabilities they would otherwise be able to do. It should be good for query, not very good for experiment, and very good for serendipitous encounter.

Web-like Prototype

Major changes from the mockup

The startup page incorporates the browse screen envisioned in the mockup, simply because there is no reason to show the user a mostly blank page. The user can search from any page including the startup page.

There is no sorting by "date, filter, location" in the query results pages, simply because the items are already sorted by filter and because date and location information is not there. This would be a good facility to add when and if that information was usually available (though beware, many

times there is only one date for a batch of items collected in parallel).

Let me describe how the search function works. It is painfully simple, and of course one would never accept it in a "real" program. The prototype takes the search text the user entered, breaks it up into words (things separated by spaces), and looks for matches (full or partial) between each word and each attribute of each filter in the loaded data sets. (Partial matches mean you can search on ridiculous things like "a" or "ly", but also you can search on "fear" and get "fearful", which is better than nothing at this point.) A list of matching filters is retrieved. Then the program combines the matching filters to produce all possible sets of those filters (ABC, AB, AC, BC, A, B, C). Because this could go on for a very long time and is exponentially increasing, the program arbitrarily caps the total number of matching filters at six (that should be user-specifiable; I just capped it based on a reasonable wait time). Then the program looks for SMIs that match each combination of filters, and any combination that has matching SMIs goes into the result list. The result list is sorted by the sum of matching attributes in each combination of filters. Thus, to some extent, saying that the search results are sorted by the "relevance" of the results has meaning.

The big limitation of this scheme, of course, is that the search text has to match the attribute texts *exactly*. It produces stupid things like getting the attribute "no energy" when one searches on "energy". One would of course use stemming and synonym lists and checking for negation and all that to make the search work correctly. However for this prototype we can do some hand waving about that since those things are well understood and it is just a matter of spending time on it.

Because the search is so primitive I added some sample searches (at the bottom of the startup screen) that work well with the sample files. One can also look at all the attributes and search on those. Of course, those searches are just as though the attribute was entered as a search text, meaning its words are searched on separately - which could yield poor results. I have not implemented a "quote multiple words" search exception to keep words together.

The mockup says that filter screens will link to "example stories illustrating this attribute" - that would have to be set up in the data. Instead I added some links to find SMIs in which the strength for the link to the filter is greater than 50% or 75%, which will probably be good example "stories" anyway.

I should also mention that I decided to implement this in a "fake" browser window so that I could embed it more easily in the "combined" prototypes window and also so that I could control the look and not have to deal with random browser interpretations of the HTML. One would not really do that in a real system; that was just for quick prototyping.

There is no advanced search or options, and the filters cannot show an image (could have done that easily, but have no sample images to show). I added a few things (show indexing for SMI; random SMI button). Otherwise everything in the prototype is as in the mockup.

Good things

This prototype is astoundingly simple to use. It is completely unlike any of the other prototypes in that you could probably put this in front of anyone (let's say with a little more explanatory text here and there, like "What is a filter") and they could immediately start clicking away. Anyone who knows how to use a computer knows how to use a web browser, and it is natural to just start

clicking on links. I found myself clicking happily around and around in circles, even though I knew exactly what I would see each time. There is something about the instant gratification of it, and also the lack of any required thought, that makes this prototype in some ways the most attractive.

Issues and problems

The main bad thing about this prototype is that the user is limited to what somebody thought they might like to do. If for example the user decides they want to see what SMIs are related to filters A and (B or C), they are not going to see that, unless "advanced search" was implemented (which would then take this away from being simple and mindless). But still, even if advanced search was implemented, it is hard to come up with and respond to every thing that the user might like to do in advance.

Another problem with this prototype is that there is no juxtaposition possible. The user can't get one result list, save it, then make another query and compare the two lists. Certainly that could be added, but again it would start becoming a more complex application that would be harder to learn. Possibly one could hide some of the more powerful aspects in a second tier that would not be easily accessed; say, "advanced search" could lead one to being able to save and compare search results.

However, I'm not sure these "bad" things are really all that bad. In the particular context of people wanting to play around with the data, this approach is very good. It's good for serendipitous discovery, as one can go round in circles clicking on things very fast and just see what comes up over and over again. In fact, I added the "Random" button after realizing how interesting it was to just click on random links here and there, without thinking, and see where it led me.

Things not done

As mentioned there are some things in the mockup which I didn't implement, such as advanced search (boolean?), options, a pretend nod to collaborative filtering ("Other people who viewed this item also viewed"), and filter images.

Open questions (originally in mockup report) reconsidered

Will this prototype be just too slow? If I have to click on three links and reload the page every time, whereas in a graphical prototype I could just drag something on top of something else, isn't that worse? [Maybe, but not if the dragging is not obvious and you have to remember it. Possibly this interface would be much better for improving the number of people who could use the system, but worse for improving the depth with which one user could plumb the system.]

> This is definitely not an application for someone wanting to "plumb the depths" of a set of data. However, in terms of slowness, this prototype feels pretty snappy, not slow at all. I tried it with a very large file (>700 items) and it actually felt fine (compared to the graphical ones which bogged down). People are used to looking at massive numbers of items, from search engines; and as long as they are split into "pages" people don't mind that there are hundreds of them. Besides, if you "narrow your query", the numbers shrink pretty fast. I think in terms of *actual time* spent doing things, yes, this prototype is slower than one in which you can drag lots of items around on the screen as little dots. But in

terms of *cognitive time*, that is, the user actually making sense of what is happening, this prototype is better - unless the user is very familiar with a "dots" system.

What if the natural language query is just too awful to use? What if people have high expectations about it that can't be met? Won't they just be frustrated and not want to use it?

> Yes, that is quite likely. However, people are very used to natural language queries now from search engines, and they are even used to the frustrations one finds. So, this is probably not as big a problem as you might think, especially if people can also browse the data. Also, I am doing some hand waving here in believing that the search could be much improved by using some industry-standard search technologies.

How will people know what kinds of questions to ask? What if they ask questions the system couldn't possibly answer? Don't they have to have some idea of what data is in the system before they can frame questions? [A list of "example questions" could be useful.]

> Well, in my example queries I went away from questions at all and just picked up actual terms from the attributes. I'm not sure how much people actually type whole questions into search engines anyway. Again, this is hand waving related to search technology.

What if the user puts in query after query and nothing comes up? Should the system then prompt them with some "available" attributes of filters? How is that different from browsing?

> I would think that if the user keeps getting nothing, the system could suggest turning on "fuzzy" matches or that sort of thing. All old hat in terms of web search development.

One problem with doing a web interface is that people will have high expectations for it. Will there be a lot of things that people will expect as "standard" for web sites that are harder to do in this setting? What might they be?

> I don't think that's a problem. Probably anything people can see on the web and expect can be done in this context.

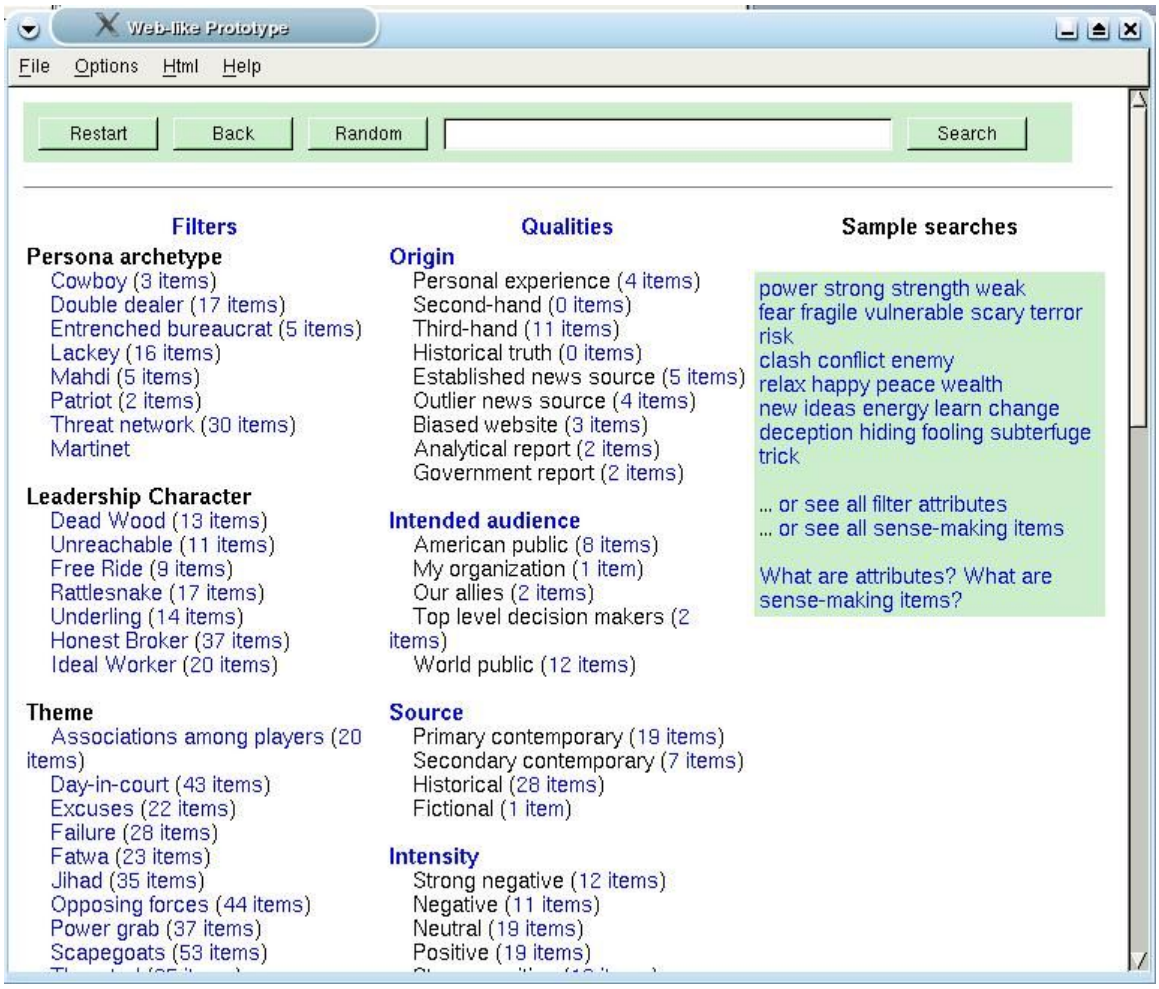
New questions for testing

1. What is the cutoff point for this prototype in terms of how much "depth" or "power" people want to have in exploring the system, say for exploring complex patterns in the data, or for detecting weak signals, before it can't cope? If a complete novice is at zero and a total "power user" is at 100, will a user with a "50" value find this application useful? More useful than the other prototypes? Or is the cutoff more like 25? Or 75? Or is it useful to all users?
2. If there is a cutoff, what can be done to increase it? What would make an HTML-based system useful to the most powerful of power users? Advanced search? What?
3. Is this prototype as transparent and easy to use as it appears to be? Will people be able to pick it up and use it right away? Or will they still get stuck?
4. Would there be some interesting and useful way in which this HTML prototype might be *combined* with one or more elements from the graphical prototypes? For example, might the user want to see a "graph line" of items, or a "cluster plot" of items, in response to a click on a link in a filter page? Would that increase the usefulness of this application or decrease it?
5. If the application was made more complex to help people use it for more complex exploration,

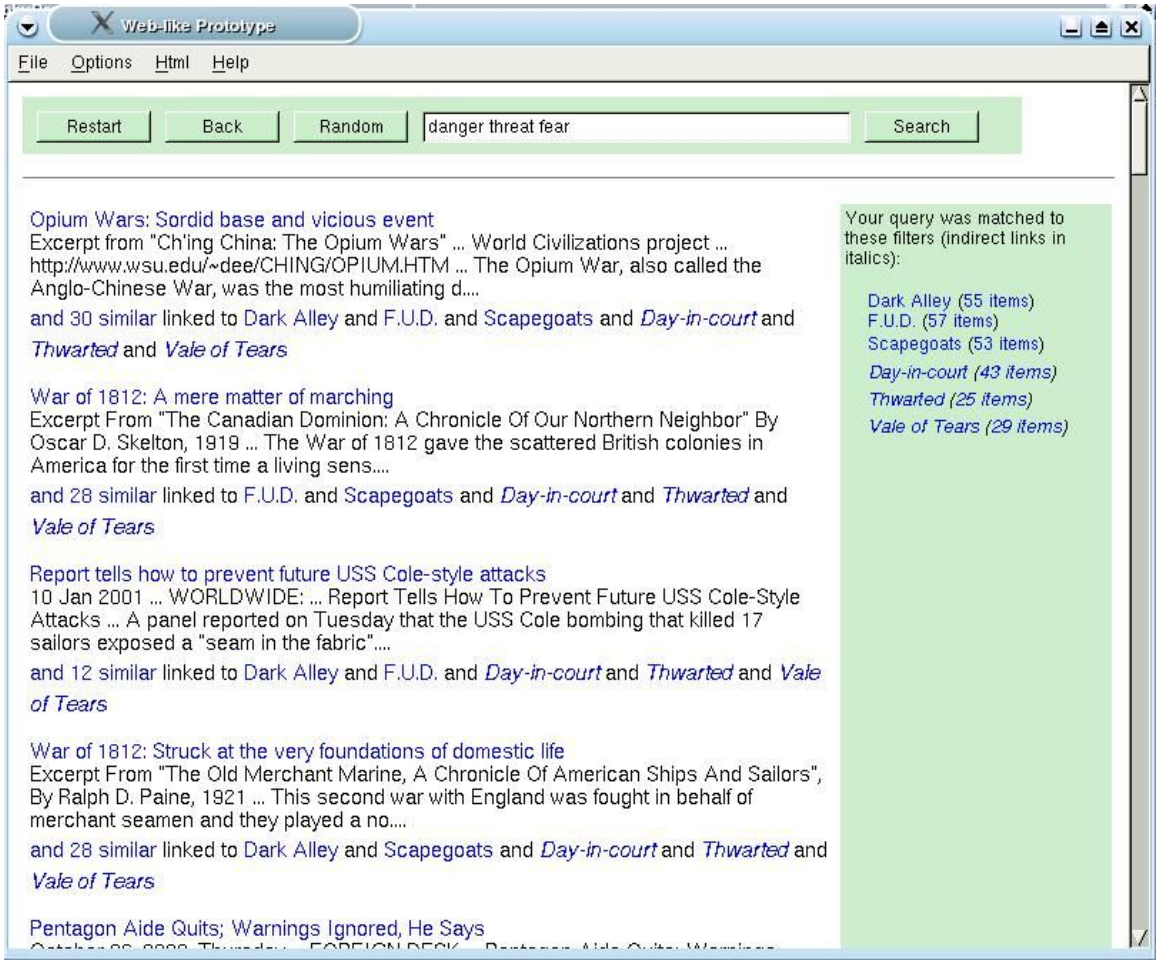
how could it remain accessible to the newest novices? Could it have hidden functions that only come out if one moves into "advanced" mode? (Although modes are generally frowned on.) Or what?

6. How successful can the search really be, if it were implemented using the state of the art in search technology? Is it good enough to meet the needs of users?
7. What would happen if you added community-type functionality to this prototype, like collaborative filtering and so on? How would that change it and improve it?

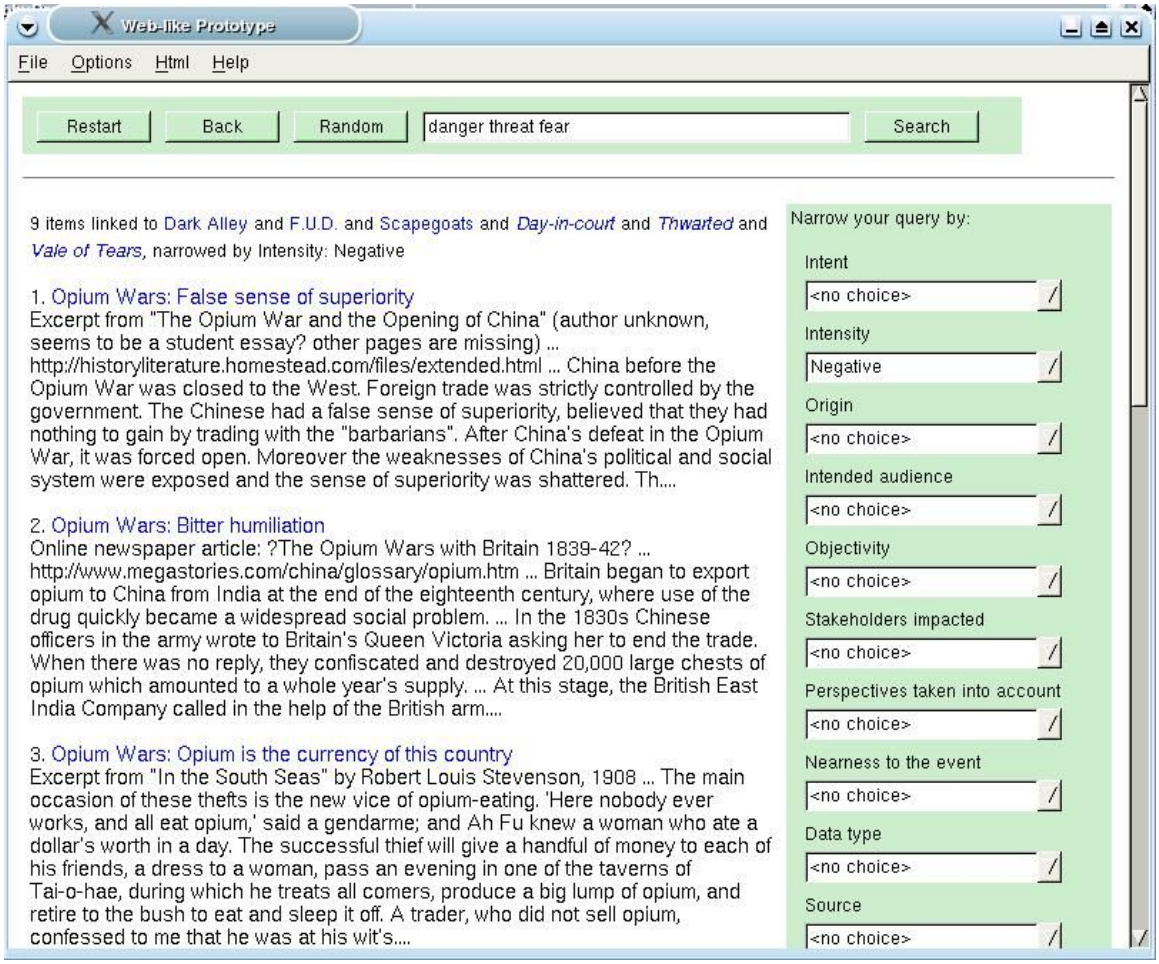
Prototype screen shots



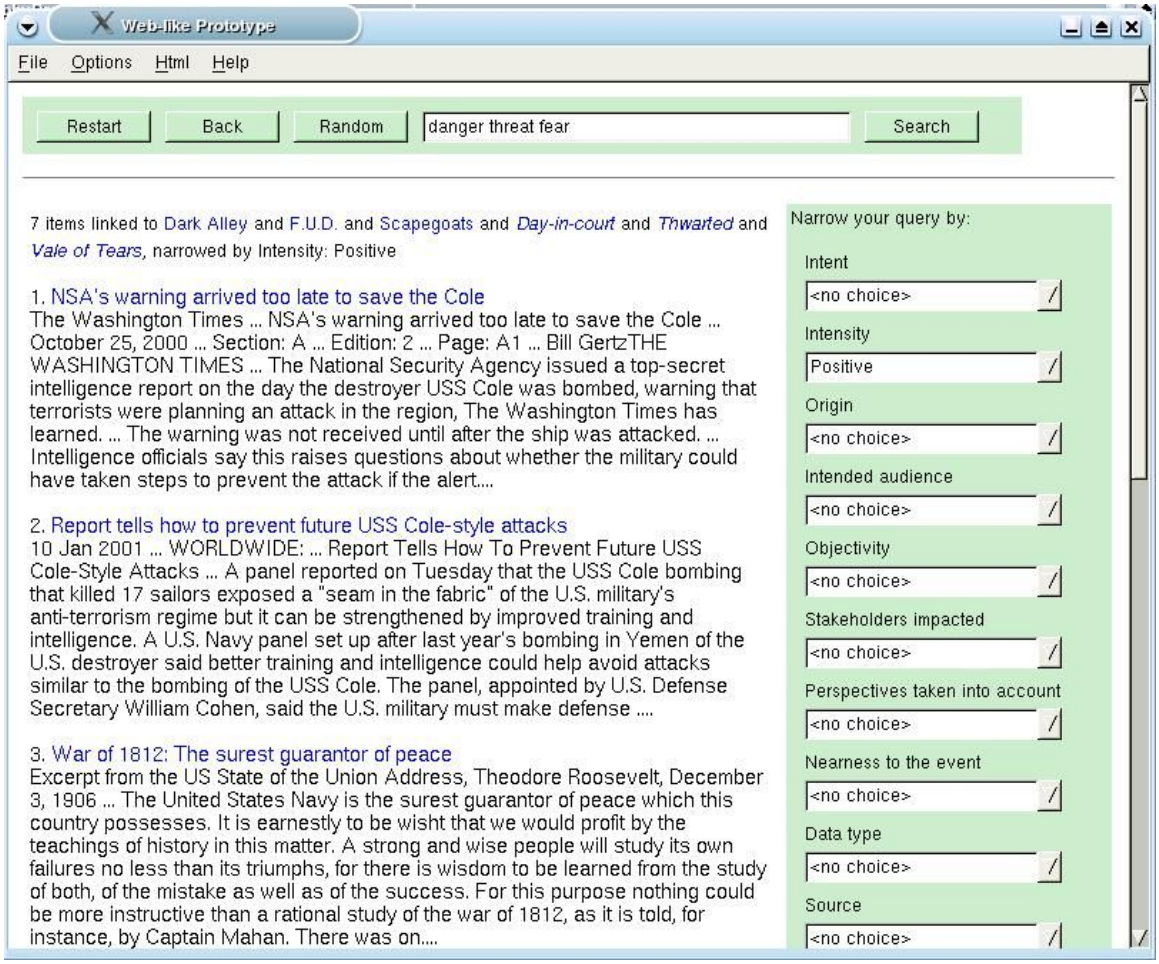
In this screenshot the user has just started the prototype with all three sample data files loaded. On the right are some sample searches.



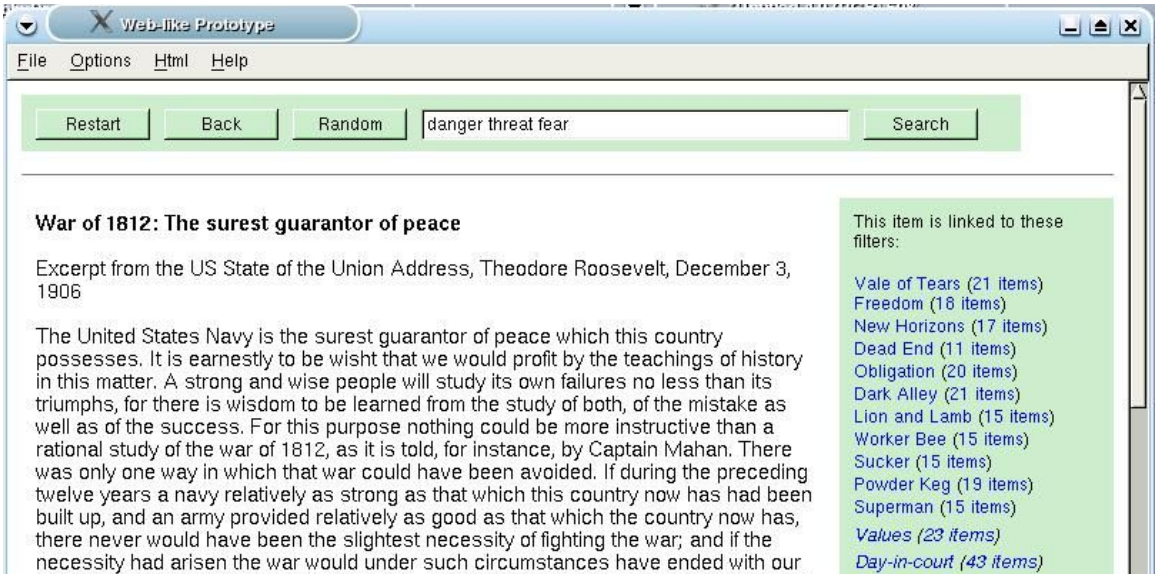
Here the user has entered "danger threat fear" into the search box and is looking at the search results. The results are shown in groups by which filters they are linked to. On the right hand side is a list of all the filters whose attributes contained (in some part) any of the words danger, threat, or fear.



The user has clicked on one group of results and is now looking at them. In addition the user has narrowed the result group by choosing to look at only items for which the "Intensity" quality has the value "Negative" (an obvious choice for danger, threat and fear).



Now, curious, the user has narrowed the results again but this time choosing "Positive" for the "Intensity" quality. You wouldn't think you would find positive items related to danger, threat and fear, so the user is interested to look at what these items are about.



Here (showing two pages) the user has looked at one item from the Cole data set and one from the historical conflicts data set. Both items seem to share a point of view that strength and preparedness can prevent attacks (and thereby avoid danger, threat and fear). In the Cole item the phrase "better training and intelligence could help avoid attacks" is similar to the phrase "If... a navy.. as strong as that which this country has had been built up... there never would have been the slightest necessity of fighting the war" in the 1812 piece. So both of these items are positive about defensive investment as a preventive to danger. The user might want to explore this pattern further by looking at the other five items in the list and by looking for other commonalities

between the items (and so on).

Section Three: Conclusions

Surprises and discoveries

Some proposed solutions turned out better than expected, and some turned out worse than expected.

Things that went better than expected

Click and drag

The idea of having empty containers and things that can be dragged into them to affect the screen display is an improvement over previous designs for narrative databases that involved a lot of choosing things from lists. It seems to make the interface snappier, more fun to use and less like a boring database. Also, I think it is easier to understand what will happen because of the proximity of the containers to the spaces that fill with items. Things seem more literal and less "please enter your input here". For example, in the Clusters in Space prototype the user drags filters directly from the list of filters to the space, at which point they take on a reality that they didn't have before, as items in a list. It's sort of like dragging the word "orange" from a shopping list and then finding yourself holding an orange. However, having said all that, that is just *my* reaction. Testing will reveal whether other people feel the same way about it. It is true that clicking and dragging is not as obvious a thing to do as choosing items from a list; but on the other hand, people are quite used to dragging things around in other software by now.

Items as items

In previous narrative database prototypes one did not look "directly" at narrative items but at summary statistics (bar graphs). In each of the five prototypes described in this report each item is shown as itself in some way (as a dot, as a label, as an item in a list); thus interacting with the items is direct and not at a remove. My feeling is that this makes the data more accessible, more "alive" than seeing summary information first. Summary information is of course important, but perhaps *it* should be seen at a remove.

Juxtaposition

We had previously used juxtaposition (of the little bar graphs) and so that is not exactly new; but we explored juxtaposition in more ways using these prototypes. I would say from these that it is probably not possible to overuse juxtaposition. Being able to look back and forth quickly between two similar things, and not have to choose one or the other and remember them in the interim, is valuable. Text Panels, Jumping Indicators and Sliding Panels all use juxtaposition centrally; the Web-like prototype uses it less, and Clusters in Space sort of does and doesn't use juxtaposition. Probably Clusters in Space would be improved if the user could have more than one cluster "space" to drag filters to. (That would almost required the zoom-out capacity I didn't implement for Clusters in Space).

Web links

I have to say I was amazed at how much I liked the Web-like prototype. I did it mainly as an exercise in inclusion, and I thought it would be boring and stupid. I now think it is possibly the

best prototype. It is actually quite enjoyable to stroll around clicking on links in it. Also, it's exciting to be able to say that there is one way that (probably) anyone would be able to interact with a large number of narratives that would require no previous explanation at all. More on that unexpected facility in the general conclusions section.

Dynamic query

Dynamic query turned out to be more useful than I expected. There is indeed (as Ben Shneiderman said originally) a huge difference between choosing something from a list, clicking a button, and waiting for a response, and sliding something back and forth and seeing the system respond *as you are still interacting with it*. It is much easier to make comparisons this way, even when you are not looking at juxtapositions in space, because the juxtapositions in time are so close (and so unlittered with actions you had to remember to do) that you can keep the different views in mind much better.

Things that did not go as well as expected

Dots

As soon as I got the first graphical prototype (Clusters in Space) working and saw dots, my reaction was "Ewww, you can't see anything." Then I replaced the dots with SMI titles, and I felt much better. Essentially I have come to the conclusion that the person who told Steve that they hated "dots" and didn't want to see them was right - within a particular set of situations. It really is amazing what the human eye can do with a field of texts scattered about - we can pull all sorts of meaning out of such a display in half a second. However, when you have an abundance of data (hundreds or thousands of items), you really do *need* the dots, because otherwise you cannot read what is there as the texts obscure each other. My conclusion was that all visualizations of SMIs need to give the user *both* title and dot options and make it easy to move back and forth between them. In Clusters in Space I made this a menu option; in Sliding Panels I moved the possibility of seeing SMI titles to a separate "zoom in" window, mainly because it would just be impossible to read any titles small enough to fit in the tiny graph boxes.

Hover-over hints

In reading the literature on visualization, much is made of "brushing" or "hints" or "tooltips" or whatever terms are used to describe the little windows that appear when you "hover" your mouse over an item on the screen. They are purported to be so very useful, and people put all sorts of vital information in them, like stock prices and so on. I had had this wonderful idea about "two stage brushing" where the user could get more and more information the longer they hovered. However, as soon as I had implemented hints in the Clusters in Space prototype, I found I didn't like them. They were sort of like the little paper clip in Microsoft Word, which I always turn off with some emotion: just plain annoying.

A big part of the problem with hints, I think, was that in this system we don't really have a lot of data to show to the user. For a sense-making item there are only three things to show, really: its title, its text, and its indexing. The SMI title doesn't tell you much, and often is what you are looking at on the screen anyway. SMI texts are always too long to show in a hint, and excerpting the first 100 or 500 characters often doesn't help much, because often the scene is just beginning to be set (all harrumphs and why-don't-we-get-started and all that). Perhaps if an auto-

summarizer was used to pull out the most intense or important sentences, that would be useful. And finally the SMI indexing is interesting to database maintainers and programmers, but to users of the database, seeing that information is like seeing the plumbing under the sink: they just want the water to run. In some ways the reason to make all of these prototypes and come up with nifty visualizations to *avoid* the user ever having to see any of the indexing. So basically the hint idea was not bad, but there was not really anything worth *putting* in the hint. If the database included things like video or pictures or indexings that were more interesting to the user, this might change. For example, I think putting a cartoon drawn of a filter in a hint for that filter would be very appropriate; however, I didn't implement that in these prototypes because I didn't have any cartoons to work with (and because it was triaged out).

Real estate

Another problem that besieged all of the prototypes was what I think is a perennial GUI problem: real estate. That is, where to put everything on the screen. I ended up in several cases opening up separate windows, which I never like to do because it distracts and confuses the user and changes the context in which they are viewing the information. It is possible that testing will reveal some better solutions to the real estate problems than I found. (It is also possible that in a few more years so many people will have larger monitors that these problems will decrease; but then, there are always laptops.)

Overlaying of SMIs

There turned out to be much larger issues than I had expected having to do with SMIs ending up at the same positions in 2D space. In each of the graphical prototypes there are problems with things ending up on top of each other. The legend was already problematic with non-exclusive quality values (of which any SMI might have more than one), but adding in SMIs sitting in the same spot makes the legend pretty much useless. With a limited amount of 2D screen space and an essentially unlimited amount of data, the overlaying issue is basically insoluble. One could certainly explore collision-avoidance algorithms, which I didn't for lack of time; but these could make the program slow and would not always succeed, especially if the user is looking at say hundreds of thousands of SMIs. I think probably the only solution to this problem is to be aware of it as a limitation of all graphical representations, to implement as much collision avoidance as is reasonable, and to try to reduce the number of SMIs in the 2D field by making queries as easy as possible (so people will do them). It also means that graphical representations should always be wedded to textual representations so that users can always get a list of what SMIs they are looking at, even if they cannot see them all as distinct items. The three graphical prototypes make these text-graphics combinations by giving the user ways to select all SMIs at a point or in an area - so if X is sitting on top of Y and I select X, I can see *textually* that I have selected both X and Y.

Representation issues

In this section I list various issues and questions that came up as I was reading the literature on representation and thinking about the tasks at hand. I first considered each one before making the mockups, and I have considered them again after the prototypes have been completed. Each is considered as to which (if any) of the prototypes will address the issue and how.

Familiarity

Is it better to use a representation people are already familiar with, like a graph or chart, which might be very quickly understood but which might seem boring or not very informative; or is it better to use a new representation people have to learn, which might have more power to represent once learned?
Pre-mockup resolution: The Clusters in Space prototype will be new and strange, as will the Jumping Indicators prototype. The Sliding Panels prototype, though the sliding aspect will be new, will incorporate a familiar grid of rows and columns. The text-based prototypes will be very familiar.
Post-prototype resolution: I think I am too close to these prototypes, because they all seem extremely familiar and easy to use to me. Testing will reveal how easily people take to each of these.

3D

Is 3D a nuisance in this case or does it have wonderful properties that we should be making use of?
Pre-mockup resolution: Not going to use 3D in these prototypes because of the time required and the probable low benefit. Can revisit later.
Post-prototype resolution: Did not implement any 3D. Probably worth trying it in future just in case it is more wonderful than expected (as other things have turned out to be), but not in a big way.

Filtering vs. reduction

Is it better to "reduce" the items shown while filtering (remove items that don't satisfy the filter) or "context maintain" by graying out the non-satisfying items?

Pre-mockup resolution: In prototypes that allow filtering - Sliding Panels (for miniplots only), Clusters in Space, Jumping Indicators - will provide user option to hide or "gray out" non-satisfying items. See which works better for each.

Post-prototype resolution: I didn't actually provide a "gray out" option, because I realized the legend could be used to do that. Also, I tried adding such a special option early on in developing the Clusters in Space prototype, and I found it was not very useful and that I had rather the SMIs that weren't selected go away instead. The gray-out option may be useful for smaller amounts of data, but one of the things you are trying to do with a query, when you have large data sets, is remove some of the clutter. So in retrospect I don't think the whole gray-out idea makes sense in this type of application.

Indirect vs. direct selection

Is it better to select items indirectly (by dynamic query sliders) or directly (by a bounding box, for example)?
Pre-mockup resolution: The Sliding Panels, Clusters in Space, and Jumping Indicators prototypes will support selection of items for viewing by bounding box selections.
Post-prototype resolution: Actually I think this point is moot, because selecting things by dynamic query *feels* very direct. I did try to implement as much "touch the object" manipulation

as possible, but there is only so much you can do with that. In general I tried to attach as much functionality to the represented objects as I could (popup menus, drag, etc) and I think that works well; but there are quite a few things the user will want to do which cannot be directly attached to any object visible on the screen.

Zoomable display

Would having a zoomable display add anything, or would it just a confusing distraction? (A zoomable display is one in which the user can "miniaturize" the current view in order to allow the visualization to cover more space than one screen can show.)
Pre-mockup resolution: In the Clusters in Space prototype, the user will be able to zoom in and out on the clusters display; we will see how beneficial it is.
Post-prototype resolution: I didn't implement this for lack of time. Having used the Clusters in Space prototype, I think it would add quite a bit to it to have that function, so that would be a must-try for any further development. I don't think it would be very useful for any of the other graphical prototypes, however, as they are already pretty small and making them smaller would make them basically invisible.

The "Dots" issue

How can the interface keep its learning curve very short, such that people will not have to learn and re-learn the interface to get anything out of it? (Or, conversely, would it be worth it to make people figure out "dots" if there was a big enough benefit to showing them?)

Pre-mockup resolution: Contrast the more complex, higher learning curve prototypes such as Clusters in Space and Sliding Panels with the less complex, more easily picked up Jumping Indicators prototype (which still has "dots") and the two text-only prototypes.

Post-prototype resolution: I will talk about this issue in the general conclusions as it is central. Essentially, I think all of the approaches are important, and they should be combined to provide both ease of use at the entry level and complex analytical capability at the expert level.

The "Numbers envy" issue

This issue refers to the tendency to want to show scatter plots when data is not continuous but in categories (for which items will only appear in certain spots, all on top of one another). Is it always better to always show items as items, even if you have to artificially produce a means to scatter them about? Or is it better to count items to produce numbers which can be graphed, etc? Or is it better to find some quantitative aspect of items you can "graph"? What is different in looking at items (say scattered around in some space) vs. blobs or bars or something that represent a number of items (and say the blob or bar's size is relative to the number of items)?
Pre-mockup resolution: The "items as numbers" element is somewhat incorporated into the Web-like Prototype, because the user can see how many items are in each category before they click to see lists of items.
Post-prototype resolution: This was indeed a problem in the two prototypes that used quality values (question answers) to scatter SMIs in space (Jumping Indicators and Sliding Panels). Having no continuous variable to use, I was forced to use an artificial one: the length of the SMI's text (as compared with other texts in the open data set). This produced the illusion of meaningful patterns without any actual meaning. I have some notes in the section on the Sliding

Panels prototype on how this might be improved by creating a continuous variable for quality values by counting how many times "indicator" words related to that value appear in the text. If there are in future more data associated with SMIs, like date and location of collection, there will be more meaningful continuous variables to fill in this spot. However, having said all that, I found there is value in having SMIs scattered around a space even if one is aware that one of the variables is nonsensical. Just seeing them in any pattern at all is somehow more fruitful to the mind than seeing them in a simple list; and of course the situation is not entirely dire since the strength index for filters is a meaningful variable.

Nominal data in ordinal space

This is another aspect of the "numbers envy" issue - How can you show scatterplots of items against axes that are not continuous (like 0-10) but are just categories (like happy vs. sad)? What can you do with the attraction that scatterplots and other graphs have? Is there a way to make graphs of items in discrete categories that has informative value?
Pre-mockup resolution: The Sliding Panels and Jumping Indicators prototypes will try substituting a quantitative measure whenever there is an expanse of space for which there are no distinctions. The user will have the option of changing what the quantitative measure is or whether the items are simply spaced equally. We will see what approach seems to be the most useful. (Note: I have decided against the "place randomly" option since that seems useless.)
Post-prototype resolution: The Jumping Indicators prototype has SMIs arrayed on axes that are separated into discrete section for non-continuous (nominal) variables, and I think it's quite understandable. The effect is somewhat like a table or a set of columns in a spreadsheet: the user doesn't expect the sections of the line to be related, but understands it is a technique to show all the sections together. Spacing the items "equally", as mentioned above, was not added, because as soon as I saw SMIs placed according to a variable (even if it was text length) I realize that spacing them out equally was not as useful or interesting. For the Sliding Panels prototype, I sidestepped this issue by only allowing quality values (like "Neutral") and not qualities (like "Intensity") to be placed on the graphs. In Clusters in Space I also avoided the issue by not allowing qualities or quality values to be placed in the continuous space. Testing will reveal whether these limitations are useful or too limiting.

The story titles issue

Given that people respond to good story titles (and pretending that it is easy to come up with them), how should they be used? Where do you put them? What do you do about the fact that they might take up too much space? What do you do about people trying to read thousands of them?
Pre-mockup resolution: Our approach to this issue is two-level brushing (first title, then more). It may be important to also experiment with ways the user can turn on titles showing without brushing (though that may just create a mess). It will probably be necessary to implement a collision avoidance algorithm to avoid having the titles sit on top of each other.
Post-prototype resolution: As mentioned previously the two-level brushing didn't work. Collision avoidance was not done due to lack of time but probably should be tried in future. It did turn out to be quite important to allow users to move back and forth between showing titles and showing "dots". However, as noted in the previous section, I am still not happy with any of the solutions to this issue.

The time and blogging issue

How should time be incorporated into the database?
Pre-mockup resolution: We are not really incorporating time into the system, but the user can select the date of addition to the database as a factor in all three graphical prototypes. We will experiment with the concept of making that a static display to see how it works out.
Post-prototype resolution: Actually the user can't select the date of addition to the database as a factor, mostly because I forgot to do that (and we had no such data to work with). This issue remains unexplored.

Other metaphors

How about a map as a physical model? How about a GIS map with layers that can be overlaid? What about the idea of a "family circle" of filters, and the relation to the mandala as a representation of reality and navigation device? Will these metaphors be explored?
Pre-mockup resolution: The map idea, or at least the use of spatial relationships, is represented in the Clusters in Space prototype. There is a nod to GIS overlays in both the Sliding Panels and the Clusters in Space prototypes. The "family circle" idea is somewhat represented in the Clusters in Space prototype when relations between filter attributes determines their placement. So these metaphors, while not being directly tested, are influencing the design. Whether we decide to test them more directly in the future is unknown.
Post-prototype resolution: Nothing more to add to this; to some extent now that the prototypes are real programs they become removed from metaphors and become real objects to be evaluated on their own merits. It is possible that revisiting these metaphors in future could improve representations further.

Natural representations for stories

The issue of what is the "native" or "natural" representation for a lot of stories.
Pre-mockup resolution: Exploring the different ways of looking at the data will help to resolve this, but it may just be an unresolvable problem. There may be no natural representation for stories.
Post-prototype resolution: There are two issues here: one is what the natural representation for stories is; and the other is what to do when you have narratives and non-narrative (say, opinions) mixed together in a database. Both of these issues remain unresolved (and would probably need some more literature reading to get new ideas on).

Filters as memberships and qualities as descriptions

This is the idea of the distinction between filters as memberships, things to which SMIs belong, versus qualities as descriptions of SMIs. This is the idea that the representations of these types of metadata should reflect that - filters being "entities" on the screen whereas qualities are more like optional information that can be added to existing representations.
Pre-mockup resolution: The Sliding Panels and Jumping Indicators prototypes allow the user to mix filters and qualities in the same space with no restrictions. The Clusters in Space prototype separates the manner of viewing these two types of metadata (filters in clusters, qualities in dynamic queries). We will see which of these is easier to use, and whether mixing the two types of metadata is useful or just confusing.

Post-prototype resolution: This is probably another issue on which I am too close to the system to be able to answer these questions. Personally I find it irritating that I cannot use qualities in the Clusters in Space prototype, and wonder if I should have allowed filters in the dynamic query boxes; but then I understand the difference between filters and qualities well. Testing (and close observation of users) will reveal whether this is a problem or not. We may even want to go to the extreme of not even showing users that there is a difference between filters and qualities. From the user's point of view, maybe the difference between these things doesn't matter. Are not they just things you can click on and drag around? Maybe only technical nerds care about the distinction. It is a perspective to consider.

Coalescent indexing

Will the coalescent indexing capability envisioned last year be involved in these prototypes? If so how will it affect the visualizations? How will it work?

Pre-mockup resolution: I didn't think about this while doing the mockups (the standard task was hard enough). When I prototyped this capacity before, I used a sort of "echo" visualization, where "similar" items (actually groups of items) were shown in lighter and lighter versions of the same color as the main items. To make space for that I divided up the space used to show groups of items. It actually becomes a little easier to do this when one symbol equals one SMI - you only need to show for each SMI whether it is a "main" item or a "similar" item (and how similar), and you don't need to make room for extra space. In each graphical prototype you could "dim" the item by reducing its saturation (the least similar items are closest to gray) or increasing its value (the least similar items are closest to white) without changing its hue. In the text prototypes it is easy enough to denote this by adding some asterisks or parentheses or something to the titles.

In order to incorporate coalescent indexing into the MNR prototypes I also need a data set that works for it, which means more time spent making the Cole data work for it. I do have the set I prepared last year, with two historical portions indexed to two different sets of emergent filters. It's a problem that the Cole data doesn't have attributes for its filters for the most part (since they are fake). I could fake out some attributes and then use all three data sets as a test of the system showing data from three sources at once. I think though that might take more time, it's a good test and should be done. I can also write the software to incorporate coalescent indexing from the start, instead of bolting it on later as I did before. I would say that any MNR prototypes should incorporate this even if it means fewer of them get made, because using data from many sources is a make or break issue for this work.

Post-prototype resolution: I did implement coalescent indexing in all the prototypes (and added sufficient attributes to the data to make it work), even though it took quite a bit more time. I definitely feel it was worth it, as I can hardly conceive of the narrative database as working without it. In each prototype I chose different means to show SMIs linked through coalescent indexing, thus:

- Web-like - linked SMIs and filters shown in italics; no degree of linking shown
- Text Panels - linked SMIs shown with asterisks; no degree of linking shown
- Jumping Indicators - linked SMIs shown as shorter bars; degree of linking determining height of bar
- Clusters in Space - linked SMIs shown the same as others (could be multiple connections to multiple filters, some linked and some direct), but distinguished during mouse down by gray

instead of black connector lines (no degree of linking in line colors); degree of linking used to degrade attraction strength to filters
- Sliding Panels - linked SMIs shown as empty instead of filled squares (no degree of linking in square colors); degree of linking used to degrade strength of attraction to filters (and thus placement in graph box)

Certainly these additional details complicate the displays and make them harder for users to make sense of. One could imagine hiding the differences at the user's option; the user might choose "don't show differences between direct and linked connections", or that might be the default and then users can select additional detail.

General conclusions

Having finished and played with all of these prototypes, I am now beginning to envision a system for exploration of large narrative databases which would combine them and take advantage of the ease/depth features of each. Here is what I would design if I were to take these prototypes to the next level. The user would start with a web-based system much like the Web-like prototype. The Jumping Indicators visualization, being the simplest and most self-explanatory of the three graphical prototypes, would be "built-in", in the sense that it would appear on web pages accompanying (not replacing) text renditions of the same thing: as a sort of side bar or top banner, as an optional interactive method of getting around and seeing things.

On many of the web pages the user would be able to click buttons or links to move into a more difficult and deeper Clusters in Space or Sliding Panels view of the current query or database. Thus the user would be "inside" the simpler layers of the system, and they would know this, and they would only arrive there after they had understood and mastered the simpler layers. This would be similar to how in word processors most of the users just type letters and print them, whereas other people can "descend" to the levels of macro creation, mail merge, managing book-length documents, and so on.

Of course, testing of these prototypes is required to determine whether and how each of the applications is received and understood and used and useful, and whether and how each can be used in any future system for manipulation and exploration of large narrative databases.

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