Jigsaw: Supporting Investigative Analysis through Interactive Visualization

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Figure 2.1. Notional model of sensemaking loop for intelligence analysis derived from CTA.

Pirolli & Card, ICIA ‘05
Pain Points

- Cost structure of scanning and selecting items for further attention
- Analysts’ span of attention for evidence and hypotheses
The Problem

• Assist investigative analysts in information foraging and sense-making given a multitude of documents/reports

• Help them discover plans and plots embedded throughout the documents, plots difficult to find by simply examining and reading the documents
An Exemplary Report

Report Date: 12 May, 2003 [From Fulton County PD].

A package of beef and a letter from "Animal Justice League" claiming that meat had been poisoned in 20 Los Angeles supermarkets was left at the Los Angeles Times, 1st Street offices. The paper also received a phone call taking credit for the action and stating, "We will take direct action against animal abuse in whatever form is necessary to stop the cruelty." A similar threat was made against a supermarket in Upsala in November. No poisoned meat was found at either supermarket.

What if there are thousands of these?
Our Focus

• Entities within the documents
  – Person, place, organization, phone number, date, license plate, etc.

• A plot/threat within the documents will involve a set of entities in coordination
Entity Identification

- Must identify and extract entities from plain text documents
  - Crucial for our work
- Not our main research focus – Collaborate with or use tools from others
Jigsaw

- Multiple visualizations of documents & entities (views)
- Views are highly interactive and connected
- User actions generate events that are transmitted to and (possibly) reflected in other views

“Putting the pieces together”
Connections

• Entities relate/connect to each other to make a larger “story”

• Simple definition:
  – Two entities are connected if they appear in a report together
The Need for Pixels
Console

JIGSAW
Blue Iguanodon

Color Legend:
- place
- organization
- person
- date
- money
- time

Search

Text search  Substring search
Los Angeles is now seeing some of the first impacts from radical animal rights activists groups. And this time, it isn't limited to fairly innocuous protests. A formerly unknown group calling itself the Animal Justice League smashed cash registers, broke windows and abducted "back room" animals from 3 different PetSmart stores around the city in a coordinated last night raid last night.

It is believed that the AJL activities were in response to PETA investigations accusing the chain of small animal abuses. According to the PETA web site: During an undercover investigation at the PetSmart store in Manchester, Connecticut, a store that has a Banfield Hospital right inside it and that PetSmart boasts of as having an "outstanding pet care team" and an "exceptional pet care record," PETA documented more than 100 small animals including hamsters, domestic rats, lizards, chinchillas, and birds deprived of effective veterinary care and slowly dying, out of customers' sight.

Faron Gardner, 32, of Los Angeles, is wanted by authorities in connection with the incident. The Animal Justice League (AJL) states in its website that this would not be the last revenge attack of its kind.

The activities of the AJL appear to be similar to those of other radical groups such as ELF and the Revolutionary Cells. Authorities consider these violent acts to mark a new chapter in eco-militancy in 2003 that included the vandalism of a Chiron executive's car and the trash of a biology lab at Louisiana State University last month.
List View

```
[Diagram showing connections between persons and organizations, listing names such as Arthur Swordane, Collie Carnes, Don Rabinowitz, Cathy Carnes, Lily, Luella Vedric, etc.]`
Graph View
Scatterplot View
Jigsaw Demo/Video

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Use tips - 1
Use tips - 2
Use tips - 3
What It Does & Does Not Provide

• Is not a “theme” view

• Is a visual index onto documents and entities

• Must read the reports!
Related Work

• GeoTime, TRIST, nSpace & SANDBOX: Oculus

• Analyst’s Notebook: i2

• KANI: PNNL

• WebTAS: ISS Inc.

• CorpusView & Entity Workspace: PARC
24
Contributions

- Individual view representations and interactions – focus on entity connections
- Advocacy/illustration of using multiple views and large screen space
- Relatively simple UI interactions
- Synthesis into a working system providing investigative analysis capabilities
### Future Work/Current Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>In progress</td>
<td>• Integrate entity analysis and dynamic updates</td>
</tr>
<tr>
<td>Much done</td>
<td>• Improve view representations &amp; interactions</td>
</tr>
<tr>
<td>Yes and more</td>
<td>• Other/more views?</td>
</tr>
<tr>
<td>Ongoing</td>
<td>• Better evidence marshalling and documentation support</td>
</tr>
<tr>
<td>Ongoing</td>
<td>• Evaluation and trials by analysts</td>
</tr>
<tr>
<td>Ongoing</td>
<td>• Other domains of data</td>
</tr>
</tbody>
</table>
Larger To-Do

- Visualize themes in collection
- Linguistic/Semantic analysis
- Visualizing uncertainty
- Collaboration
To Learn More

- Video is on DVD
- Visit
  - http://www.gvu.gatech.edu/ii/jigsaw
Acknowledgments

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• Supported by NSF IIS-0414667
End

- Thanks for your attention!
- Questions?