

# AVER: Argument Visualization for Evidential Reasoning

Susan van den Braak and Gerard Vreeswijk

Department of Information and Computing Sciences  
Utrecht University,  
The Netherlands

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# Overview

- 1 Context
  - Goal
  - Contribution
  - Current state of affairs
- 2 Description
  - Interface
  - Structure
  - Novel features
- 3 Future work



# Goals

- To develop and implement a software support system for crime investigations that allows investigators to express their reasoning about a case based on evidence
  - ① Construct and visualize arguments
  - ② Interpret, relate, and explain evidence



# Contribution

- 1 Argumentation schemes
- 2 Dialectical status assignment
- 3 Links between nodes and source documents



## Current tool

- A prototype of a generic, domain independent, web-based system for collaboratively constructing and visualizing arguments that may be used by crime investigators to structure their reasoning about evidence.



Exit case
Logged in as Susan van den Braak [Logout](#)

Case "zsdafsa"
Graph
Table
Arguments
Report
Schemes
Sources
Personal
Shared
Visits
Help

**Icon Hide**

data nodes

quotation nodes

inference nodes

hidden premises

schema

**Create**

■ Claim

● set

■ Claim

● set

□ Quote

○ Schm.

○ Schm.

○ Schm.

**Node "q11"** Attributes Evaluation Question Explanation Association Personal Shared

Title:  Change

Text:

[Delete](#) node "q11" (and connections between "q11" and other nodes)  
[Modify](#) connections between "q11" and other nodes

Type:

Polarity:

Dialectic status:

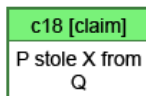
MSOE — Susan van den Braak
Sat Dec 2 14:45:16 UTC+0100 2006



# Elements

## Node types

- Data nodes



- Inference nodes



- Scheme nodes



# Elements

## Data nodes

### 1 Interpretation nodes

- PRO the main claim

|                        |
|------------------------|
| c14 [claim]            |
| P is a party concerned |

- CON the main claim

|               |
|---------------|
| c11 [claim]   |
| Q sold X to P |

### 2 Quotation nodes

- Neutral

|                   |
|-------------------|
| q10 [quote]       |
| P: Q sold X to me |





# Elements

## Interpretation vs. quotation nodes

- Interpretation nodes represent claims about a case

|                           |
|---------------------------|
| c14 [claim]               |
| P is a party<br>concerned |

- Quotation nodes represent uncontested information from outside the system (testimonies, reports)

|                      |
|----------------------|
| q10 [quote]          |
| P: Q sold X to<br>me |



# Elements

## Inference nodes

- Inference nodes represent links between nodes and justifications for those connections

q8 [inference]

q12 [inference]

q15 [rebuttal]

q23 [undercutter]



# Elements

## Inference nodes

- The polarities of the nodes that are connected determine the node type (support or attack)
  - Inference
  - Undercutter
  - Rebuttal



# Elements

## Scheme nodes

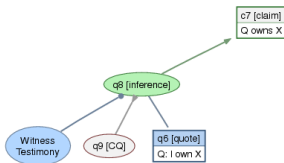
- Scheme nodes represent uncontestable schemes of inference and justifications for inference nodes



# Elements

## Schemes

- Represent predefined patterns of reasoning
  - 1 An inference
  - 2 Prerequisites for the inference
  - 3 Critical questions



# Features

## Scheme instantiation

- Expands existing data nodes by scheme instantiation
- Adds critical questions as latent undercutters

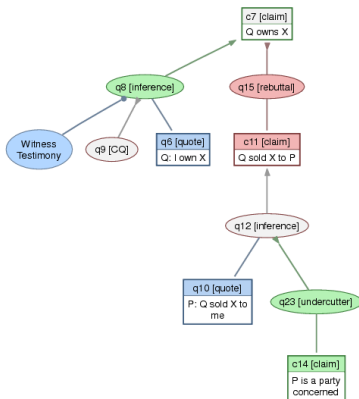
| Case "xzvkv"  |   |   |  | Graph   | Table | Arguments                      | Report   | Schemes | Sources                                  | Personal  | Shared | Visits                       | Help  |  |
|---|---|---|--|---|-------|--------------------------------|--|---------|--|---|--------|------------------------------|---|--|
| <input type="radio"/> Dundee                                  | A set that corresponds to the recent attempts at an exhaustive taxonomy of schemes at U. Dundee.    |   | <input type="radio"/> Grennan  | A set that corresponds to the schemes discussed by W. Grennan in his book <i>Informal Logic</i> (McGill-Queens U. Press, 1997). |       | <input type="radio"/> Perelman | A set that corresponds to most of the rhetorical patterns discussed by Perelman and Olbrechts-Tyteca in their book <i>The New Rhetoric</i> (Notre Dame Press, 1969). |         | <input checked="" type="radio"/> Pollock | A set that corresponds to reasoning patterns in J. L. Pollock's book <i>Cognitive Carpentry</i> (MIT Press, 1995). This is a concise set. |        | <input type="radio"/> Walton | A set that corresponds to the schemes proposed by D. N. Walton in his book <i>Argumentation Schemes for Presumptive Reasoning</i> (LEA, 1996). This set includes many common schemes. |  |
| Name  | Premises  | Conclusion  | Critical Questions   |   |       |                                |  |         |  |   |        |                              |   |  |
| <i>Perception</i>   | IF <input type="radio"/> Having a percept with content P,   | THEN <input type="radio"/> P                          | <input type="checkbox"/> Are the circumstances such that having a percept P is not a reliable indicator of P?  |   |       |                                |  |         |  |   |        |                              |   |  |
| <i>Memory</i>   | IF <input type="radio"/> Recalling P,   | THEN <input type="radio"/> P                          | <input type="checkbox"/> Does the agent who recalls P express doubt about P?<br><input type="checkbox"/> Is P not originally believed for other reasons?<br><input type="checkbox"/> Is P originally based on beliefs of which one is false? |   |       |                                |  |         |  |   |        |                              |   |  |
| <i>Statistical Syllogism</i>                                  | IF <input type="radio"/> c is an F, AND <input type="radio"/> F's are usually G's,                  | THEN <input type="radio"/> c is a G                   | <input type="checkbox"/> Is it the case that, 'c is also an H', and 'things that are also H are not usually G'?  |   |       |                                |  |         |  |   |        |                              |   |  |
| <i>Induction</i>  | IF <input type="radio"/> Most observed F's are G's,   | THEN <input type="radio"/> F's are usually G's        | The scheme " <i>Induction</i> " does not have critical questions.  |   |       |                                |  |         |  |   |        |                              |   |  |
| <i>Temporal persistence</i>                                   | IF <input type="radio"/> P is believed to be true at T1, AND <input type="radio"/> T1 is before T2, | THEN <input type="radio"/> P is true at a time T2     | <input type="checkbox"/> Is not-P true at some T3 between T1 and T2?   |   |       |                                |  |         |  |   |        |                              |   |  |
| <i>General Knowledge</i>                                      | IF <input type="radio"/> It is general knowledge that P,  | THEN <input type="radio"/> P                          | The scheme " <i>General Knowledge</i> " does not have critical questions.  |   |       |                                |  |         |  |   |        |                              |   |  |
| <input type="radio"/> Attach selected premise to current node | <i>Witness Testimony</i>  | IF <input checked="" type="radio"/> Witness W says P, | THEN <input type="radio"/> P   | <input type="checkbox"/> Is witness W truthful?   |       |                                |  |         |  |   |        |                              |   |  |



# Features

## Evaluation of the status of nodes

- Evaluate the status of the nodes based on their inferential connections



# Features

## Connection with original source files

- Adds new quotation nodes to the graph by text selection

Logged in as Susan van den Braak

Case **Graph** Table Arguments Report Schemes **Sources** Personal Shared Visits Help

| Title and partial contents     | Original | Quotable | Quotations | Posted by           | At                        | Change                 | Delete                 |
|--------------------------------|----------|----------|------------|---------------------|---------------------------|------------------------|------------------------|
| No title This is an example... |          |          | 1          | Susan van den Braak | Mon Dec 4th 2006 12:46:59 | <a href="#">change</a> | <a href="#">delete</a> |

New source document:

Actual file:  [Browse...](#)

Informative description of file:  [Upload](#)

Let op: in de Unix-versie van dit systeem is het om veiligheidsredenen(!) helaas nog niet mogelijk PDF documenten in te voeren. Tekst-documenten kunnen nog wel worden ingevoerd.

Logged in as Susan van den Braak

Case **Graph** Table Arguments Report Schemes **Sources** Personal Shared Visits Help

Source document "No title", Retrieved 04 Dec 2006 12:47:23.

1. "This is an example." (Susan van den Braak, 12:47:23, ago)

This is an example.





# Future work

- Extensions
  - Crime-related schemes
  - Functionality to represent stories and to relate stories to arguments
- Testing
  - Usability
  - Effectiveness

