REPRESENTING THE STRUCTURE OF A LEGAL ARGUMENT

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INTRODUCTION

The investigation described in this paper is part of a larger project to characterize and develop computational tools to help people formulate, record, and present arguments and rationale in diverse domains such as law, policy, and design where argumentation and decision-making are fundamental processes. To build such tools, it is necessary first to design a uniform representation for the structure of arguments; law has provided us with a good starting point for understanding this structure. Since arguments are important legal artifacts, law maintains a recorded institutional memory of them in forms such as casebooks, databases, and courtroom transcripts. This analysis is primarily concerned with the arguments that occur in two excerpts from Supreme Court oral argument transcripts; it is directed toward developing a system of semi-formal representations of the structure of these arguments in hypertext. A system of representations of argument structure, coupled with an understanding of the argumentation process, can be used to form the basis for tools for authoring, fault-detection, and other activities associated with formulating and presenting rationale.

To understand the practice of argumentation in the legal domain, we began with the question of how the reasoning in the two oral transcripts is organized. Most arguments are based on reasoning from data, either actual or hypothetical, and building up logical scenarios to test hypotheses; cases or rules of law form a justificatory background for this reasoning [Ashley and Rissland 1985]. But there is more to a legal argument than reasoning or logic. Justices and attorneys bring an interpretive context, argumentative and rhetorical strategies, and other more general models of the domain and the world to an oral argument. Exploring what this infrastructure consists of is central to our work on developing a system of representations.

Our strategy in this research has been to represent the reasoning as simple interconnected hypertext [1] microargument structures, and use these microargument structures as primitives to tease out a more complex system of organizing structures. Hypertext provides a good basis for performing this type of exploration [Marshall 1987]; NoteCards [2], a hypertext idea processing system [Halasz et al. 1987], has been used extensively in this investigation. The NoteCards Guided Tour package [3] [Trigg 1988] has also been used as a basis for sequential and spatial organization of complex arguments.

ANALYTIC FRAMEWORK

We have proposed a general analytic framework,[4] illustrated in Figure 1. According to this view, arguments are composed of multiple interacting structures that are closely intertwined in discourse but can be distinguished for purposes of analysis. In this framework, the foundations of an argument are its logical and pragmatic structures. A full account of the logical structure requires representations of low-level inferences and reasoning as well as of the domain-specific situation models and argument models that, together with argument goals, give rise to and constrain the reasoning. As our framework suggests, reasoning and other types of logical structure can be represented separately (but not independently). The pragmatic structure is essentially a hierarchy of argument goals and methods and strategies for achieving them. Taken together, the logical and pragmatic structures carry the semantic burden of the argument, but they are insufficient for describing a written argument or an oral presentation. Presentational strategies must be applied to come up with the presentational structure, the form the audience encounters.

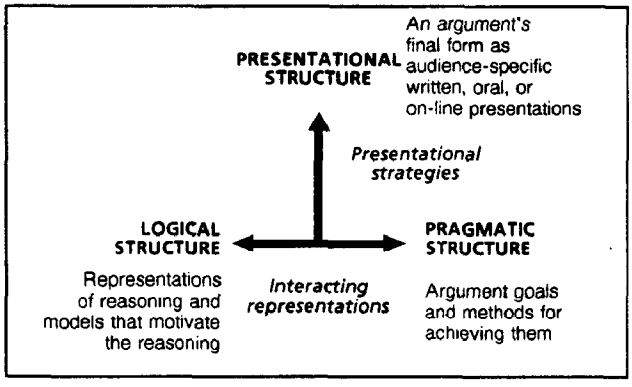

Figure 1. Analytic framework

As our representational starting point, we used Toulmin's formalism for logical structure [Toulmin 1958]. According to his scheme, a *datum* is some fact or observation about the situation under discussion that leads to some further observation or fact, the *claim*. The relation between the two is characterized by a rule of inference, a *warrant*, that serves to link the information set forth in the datum and claim. A *backing* supports the warrant with some knowledge structure from the argument's domain. A Toulmin argument structure may also include various kinds of qualifications of the claim (*qualifiers*) and allow for exceptions (*rebuttals*). The categories provided by this structure are useful for expressing portions of argument logic.

Toulmin also suggests an argument layout, shown in Figure 2. The representation that we developed in NoteCards preserves most of the fundamental characteristics of Toulmin's argument layout as a specialized hypertext structure. [5]

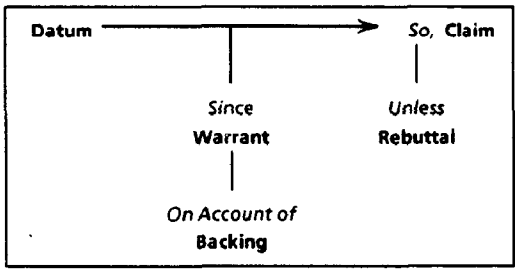

Figure 2. A Toulmin structure

The process by which this representation was developed and how it was constrained by NoteCards is discussed in [Marshall 1987]. Lowe suggests another way of implementing Toulmin structures to support cooperative work in his Synview hypertext system [Lowe 1985]. One key assumption in our work is that a graphic representation of argument structure may be a significant aid in enhancing the comprehension of its content. See [Smolensky et al. 1987], [Karapin and Alker 1985], and [Conklin and Begeman 1988] for additional perspectives on the value of argument structure.

LOOKING FOR PRAGMATIC STRUCTURE: AN ANALYSIS OF *PEOPLE V. CARNEY*

Having proposed an analytic framework and a computer-supported representation of the logical microstructure of an argument, we encoded an excerpt from the oral transcript for the case *People v. Carney* as on-line renditions of Toulmin structures. Next, we developed a system of representations to organize this low-level reasoning by capturing what we refer to in our framework as pragmatic structure. A variety of organizing techniques have been applied to build up an argument infrastructure. Parts of this process were informed by the case text when it was necessary for understanding interpretive context and background information; however the goal was to only represent the portion of the argument included in the transcript.

The case *People v. Carney*. The first example of argumentation is from *People v. Carney*, a 1983 California Supreme Court case. The major issue presented is whether the warrantless search of the defendant's motor home was justified by the so-called "automobile exception" or "protective sweep exception" to the Fourth Amendment requirement and the right established by Article I, section 13 of the California Constitution. The oral argument excerpts that we analyzed use hypothetical facts and situations to test a new version of a legal theory.

The arguments in *People v. Carney* can be divided along two lines of thought. In one, because a motor home has an inherent quality of mobility it is subject to the automobile exception. This reasoning is justified in previous rulings by a desire to preserve evidence from the loss or destruction that is made possible by a vehicle's mobility; police efficiency is thus promoted. In the second line of thought, because a motor home can function as a home it has a reasonable expectation of privacy and thus cannot be searched without a judicial warrant, as guaranteed by past interpretations of the Fourth Amendment and other precedent-setting decisions.

***People v. Carney* as Toulmin structures.** Let us examine how a segment of the oral argument has been encoded as Toulmin structures. The following utterance is taken from the oral transcript:

> "If the vehicle has wheels on it, I think that makes it mobile and it would be subject to the exception... That would provide a bright line. But I am looking for a little bit more beyond just wheels. We are looking for self-locomotion, self-propelling."

The first sentence explicitly proposes a warrant to define mobility, "Vehicles with wheels are mobile." Figure 3 shows the resulting Toulmin structure. Two more must be inferred from our knowledge of the case: "Mobile vehicles [can be classified as automobiles]," and "[Automobiles] are excepted from the 4th Amendment warrant requirement." The implicit portion of both warrants has been enclosed by square brackets. The last sentence proposes a substitution for the first warrant and implies that it is part of the same chain of reasoning, "Self-propelling vehicles are mobile."

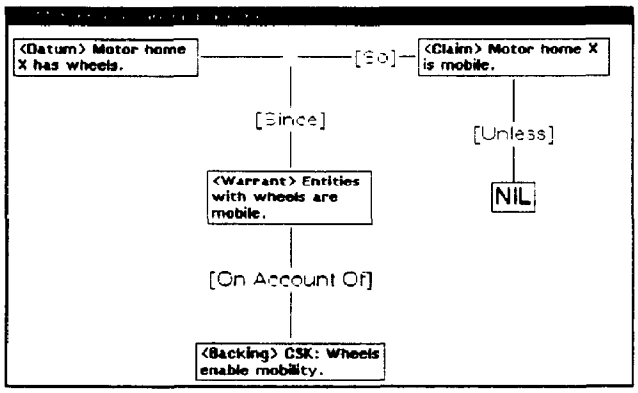

Figure 3. Text encoded as a Toulmin structure

Data here are also largely implicit, and because they do not refer to specific individuals to test the definitional rule, they are represented by us as instantiable variables as in "Motor home X has wheels." Hypothetical data and claims are represented similarly. For example, the above warrant defining mobility in terms of having wheels is tested with a hypothetical datum about a trailer, "Trailer T has wheels."

Backings have been inferred or identified for all of the Toulmin structures resulting from this analysis. If a specific case is being cited, the backing may be stated explicitly and encoding it is simply a matter of connecting it with the appropriate microargument. We expect this kind of case-based argumentation in legal reasoning [Levi 1948]. For example, in the oral transcript, the attorney for the defendant says, "The example we always rely on is the trunk in the Chadwick case, for instance." The phrase "rely on" and the explicit mention of a case singles out the statement as a backing. The next question by one of the justices tells us with what argument to associate it: "Well, but would you say this mobile home was closer to an automobile than to a trunk?" Using the previously described tactic for generating data and warrants, we arrive at the instantiated Toulmin microargument structure shown in Figure 4.

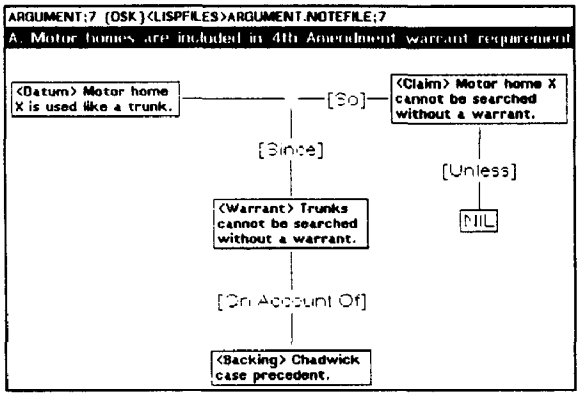

Figure 4. Associating a backing with a micro-argument.

However, backing is often far more difficult to obtain than this example would lead one to believe. In the oral transcript, direct statements of backing are rare, probably because both the attorneys and the justices have a common store of knowledge, a domain model which includes not only knowledge of the cases, but a sense of the intent of the law and shared commonsense knowledge. In the written opinion, more of the backings for microarguments are explicitly presented. This difference is probably connected with the change in audience and goal of the argumentation.

Designing a system of representations. To design a system of representations, we took the results of the encoding process, more than sixty Toulmin structures, and investigated ways of organizing them so they could be interpreted by a reader. Three main types of organization are introduced by this system of representations: (1) chaining together simple inferences from evidence to conclusion, making intermediate inferences explicit and identifying the tactical roles of counterexamples; (2) relating chains of inferences to goals by making reasoning strategies (and evaluations of their outcomes) explicit; and (3) providing a framework for comparing and evaluating lines of reasoning relative to a set of argument goals, serving both to distinguish effective lines of reasoning and to represent paradigm shifts (changes in justificatory basis and goal). One of these three types of organization, reasoning chains, is discussed below.

Representing reasoning chains and hypothetical counterexamples. One important way of organizing Toulmin structures is by how they fit together in an inferential chain. This chain signifies a path from the lowest level datum to a fundamental claim of the case. For example "Motor home X has wheels" is the lowest level datum in a chain of datum-claim-warrant structures that lead to the principal claim that "Motor home X is excepted from the Fourth Amendment warrant requirement." Figure 5 shows a browser of the inferential chain, or "proof," that vehicles with wheels should be excepted from the Fourth Amendment warrant requirement. The NoteCards browser, a node-link graph showing how cards are related, can be used to show these logical interconnection between microarguments. Since the representational scheme has been designed such that elements are shared between microarguments, there is computational support for building this graph. It has, however, been carefully constrained so that the Toulmin layout is preserved.

Representing argument interconnections has another purpose; it helps isolate local argumentation tactics such as a "proof and refutation" style dialectic common to legal argumentation (as well as in other

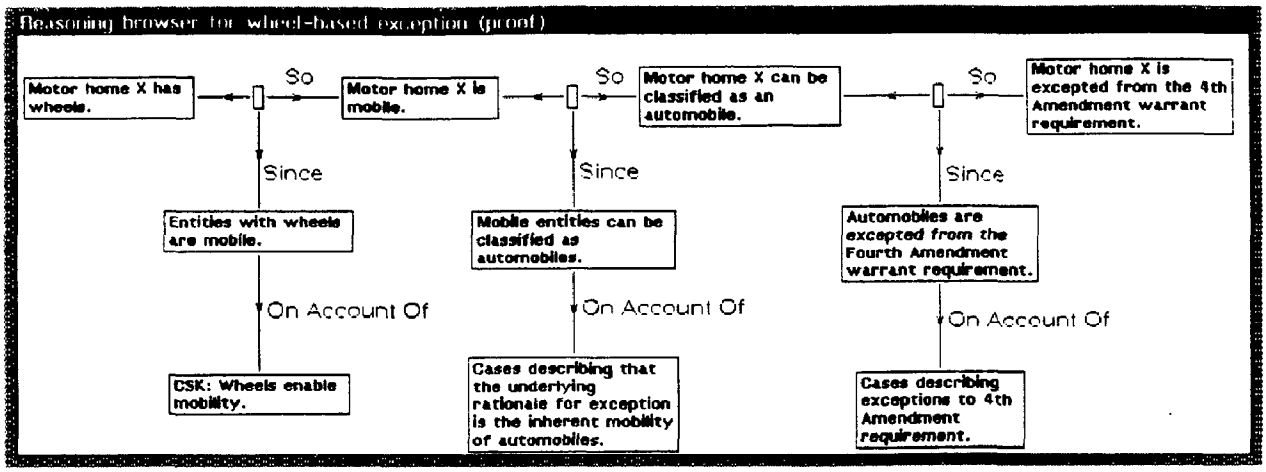

Figure 5. Logical interconnections between microarguments

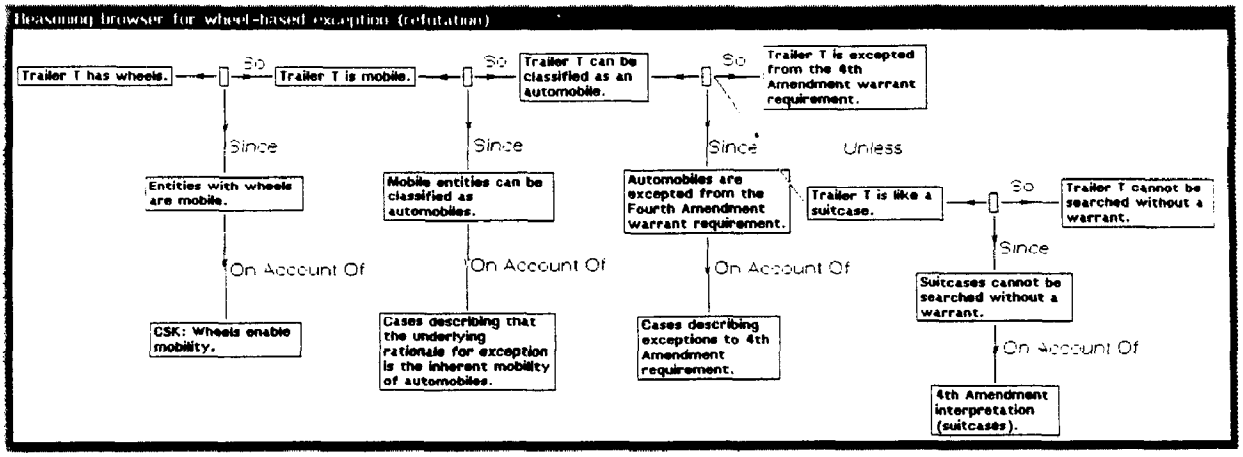

Figure 6. Refutation using a counterexample

example-driven fields) [Rissland 1984a]. The proof shown in Figure 5 has a corresponding refutation that applies the same line of reasoning to a counterexample and, by seeking the argument goal, shows that an invalid logical conclusion is reached. Thus, the local argument must be rejected and another introduced. Figure 6 illustrates the refutation of the reasoning shown in Figure 5.

FORMULATION V. PRESENTATION: AN ANALYSIS OF *TENNESSEE V. GARNER*

The analysis of *People v. Carney* suggests several directions to be pursued. First it suggests that we perform additional analyses of arguments to more fully understand the role that Toulmin structures will play in future work. Are they useful as an argument analysis tool? Are they a suitable basis for formulating or presenting arguments? Does the microargument structure provide any artifacts that might be useful in less formal ways? For example, it is clear that stating an argument's backing uncovers many implicit assumptions; is there a less formal, coarser-grained way of teasing out this same information? Second, we can envision a framework for interacting with structured arguments; this framework would show how a hypertext system can be tailored to support argument formulation, organization, and presentation. At this phase of our research, information about these activities is still sketchy - it must be inferred from a partial record of oral argument and the oral argument's relationship to the "product," the written opinion and dissenting opinion for the case.

The case *Tennessee v. Garner*. *Tennessee v. Garner* is a second Fourth Amendment case; it concerns the constitutionality of a Tennessee policy that allows police to use deadly force in the apprehension of a fleeing felon. In this particular instance, Garner, a fifteen-year-old suspect had been shot and killed by a policeman while fleeing over a back fence from the scene of a burglary. He had allegedly taken a purse containing ten dollars from the house he had broken into. Garner's father appealed the case to the Supreme Court with the idea that his son's Fourth Amendment rights had been violated. The Court held that Tennessee's law was indeed unconstitutional when applied to an unarmed, nonviolent fleeing felon; in order for deadly force to be used to prevent the escape of a criminal, the officer must have probable cause to believe that the suspect poses "a significant threat of death or serious physical injury to the officer or others."

The main issue explored in the oral argument concerns when it is reasonable to use deadly force to prevent the escape of a fleeing felon. The concept of *dangerousness* quickly enters the picture, and much of the subsequent argumentation is devoted to establishing what makes a fleeing felon dangerous. A situation where the fleeing felon has already killed someone is certainly at one end of the spectrum; an escaping white-collar criminal is at the other. But there is substantial middle ground to explore - for example, what about a felon who is *potentially dangerous to society*, a saboteur or spy? Are burglars (and by implication, certain other classes of felons) *inherently dangerous*? If a burglar is *armed*, does the officer know that he's dangerous? Or must there be additional evidence - the burglar is *armed and reaching for his weapon*? Is a *violent* felon inherently dangerous? What if his violence is only directed toward property? What about felons whose actions are *dangerous to the community*, such as drunk drivers? It seems that each hypothetical that introduces a variant on the situation produces a new rebuttal condition to tag the revised warrant, "It is reasonable to use deadly force to stop a dangerous fleeing felon."

Analysis method. We conducted the analysis of the oral transcript of *Tennessee v. Garner* in a slightly different manner than *People v. Carney*: (1) The transcript was segmented as described below; (2) Interpretive information used to encode each segment was recorded into a templated card structure and screen layout; (3) Toulmin structures were constructed and laid out on the screen to capture each segment's logic; (4) A Guided Tour was created of the Tabletops resulting from (2) and (3); (5) The results of step 4 were reorganized into an on-line presentational structure using a second Guided Tour.

Segmentation of the transcript was performed on the basis of obvious divisions in the line of reasoning used by the argument, or changes in the roles of the speakers in promoting specific judicial or argumentative goals. This process resulted in nine divisions, some more distinct than others; for example, a shift in attorneys marked a fairly distinct division.

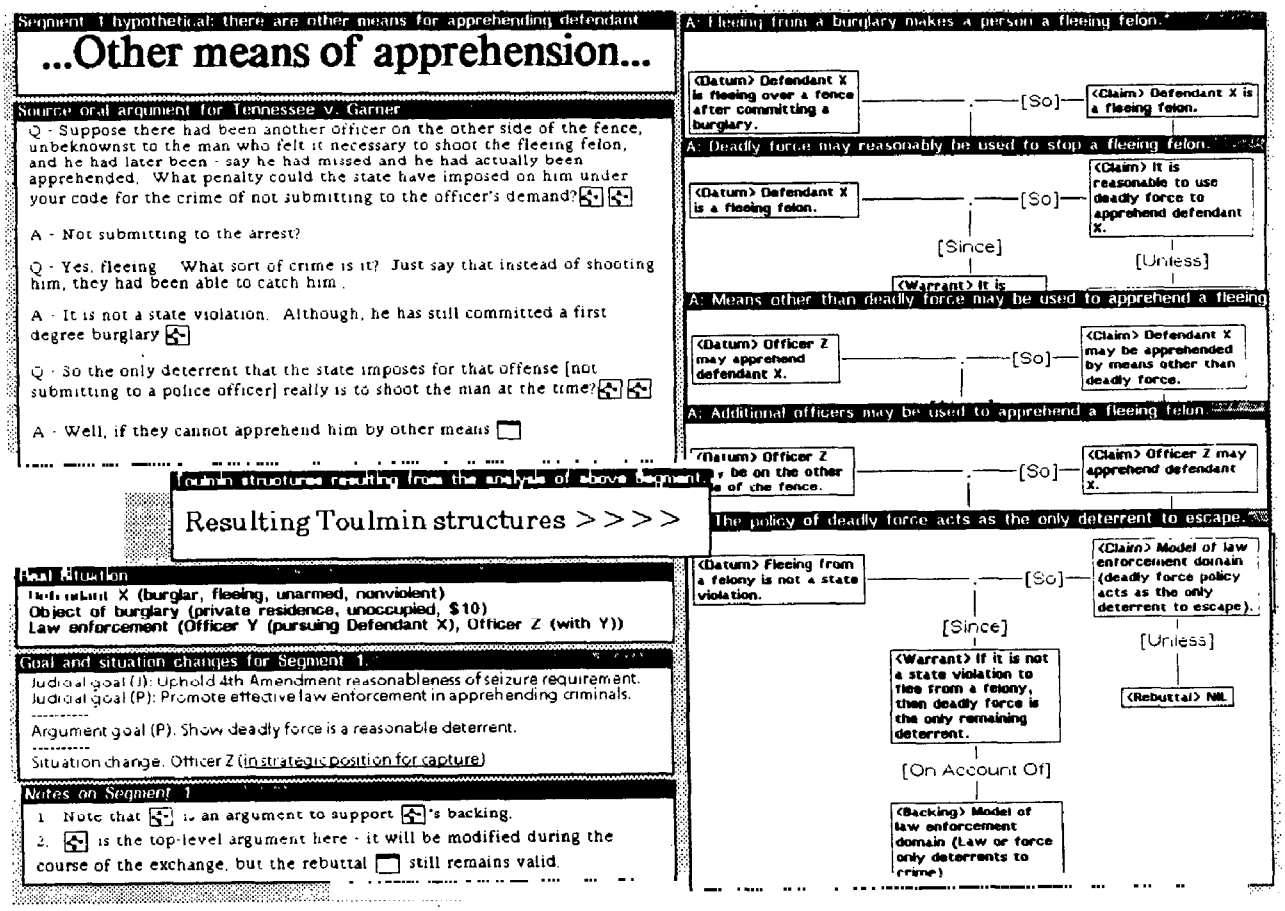

Figure 7. Analysis tabletop.

Next, interpretive information was recorded; we have found that this type of contextual or pragmatic structure provides a basis for encoding and subsequently understanding the logical structure of an argument. This information includes inferred argumentative and judicial goals, a description of the situation, and notes about any assumptions made and the source of rebuttals. In this analysis, a set of five cards contains the interpretive information for each segment. See the left side of Figure 7 for an example of the type of interpretive information that was recorded. The first card summarizes, in just a few words, the issue under discussion in the segment. The second card shows the text of the oral transcript for the segment under analysis. A third card, constant throughout the analysis, holds a description of the real situation of the case. We recorded the goals of each of the speakers in a given segment in the fourth card along with a description of how the hypothetical situation deviated from the real situation of the case. A fifth card maintains the encoding notes. Taken all together, these five cards form the "left half" of a Tabletop card - that is, they are laid out in a consistent format on the left side of the screen.

Against a background of this interpretive information, we encoded the Toulmin structures representing the reasoning of each segment of the *Tennessee v. Garner* oral transcript. Again, refer to Figure 7 for an example of one of these Tabletops. In contrast to the analysis of *People v. Carney*, where we used browsers, screen layout was used to show (roughly) how the individual microarguments fit together. This layout appears on the right side of the Tabletop where the corresponding interpretive information appears on the left.

The ten Tabletops resulting from this analysis were organized into a sequential Guided Tour, forming a record of the analytic process, and more speculatively, the argument formulation process. This tour was subsequently modified to reflect some additional ideas about argumentation tools and on-line presentation conventions.

A second Guided Tour was then created, with more of an emphasis on how this argument can be organized for presentation. First, it structures the main arguments and rebuttals in a form that shows how the concepts of the case evolve. Second, it tries to connect them with the corresponding text from the written opinion and its dissent; this loose association gives the reader a glimpse of how the logical and pragmatic structure of the argument is manifested in its final presentational form. Figure 8 shows an early stop from this tour. It includes the original form of the argument (see the Toulmin structure top center), the argument as modified by this case (the lower left Toulmin structure), and the argument as backed by the common-law rule (the lower right Toulmin structure). The argument structures have been annotated with the corresponding case text.

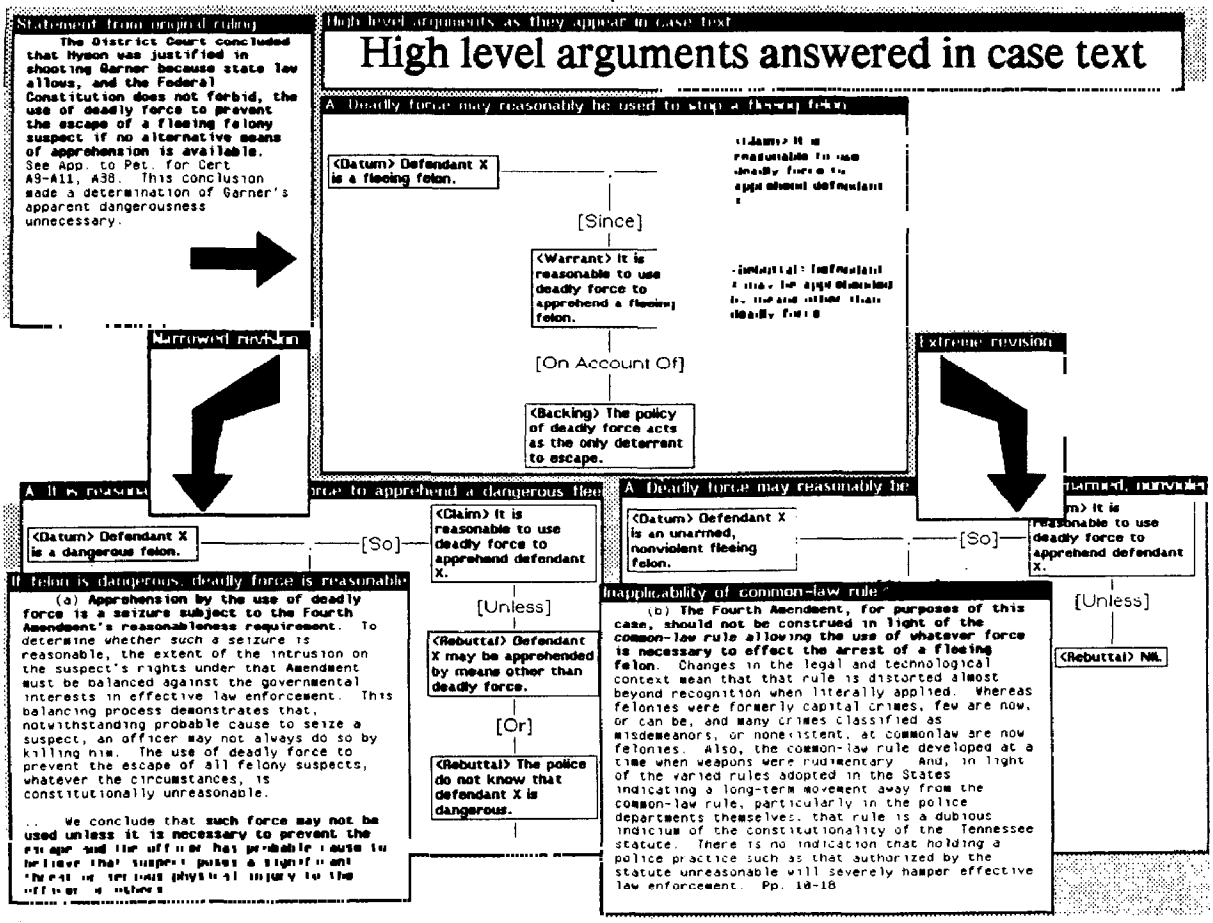

Figure 8. Tabletop of high-level Toulmin structures annotated by case text.

CONCLUSIONS AND FUTURE DIRECTIONS

What does this work suggest about the essential elements of a tool to support the formulation, organization, and presentation of arguments? First, it suggests that we need a system of representations that captures reasoning and allows it to be structured by interpretive information. Toulmin structures and our current system of representations to organize reasoning are a good start. Toulmin structures can also function as the input to reasoning analysis mechanisms such as assumption-based truth maintenance systems [de Kleer 1986]. Second, we need a solid understanding of the formulation process. It seems to be important to tease out pragmatic information like goals (in this case overall judicial goals and more localized argument-related goals) and to have a model of the situation from which to generate hypothetical data and scenarios. Third, we need to support the reformulation or organizing phase of producing an argument - arguers need the ability to explore alternate paths through the reasoning. Finally, we need to examine various presentational vehicles for structured arguments - how are arguments understood, and how can they be rendered more compelling in on-line presentations.

As our legal analysis examples show, specialized Guided Tours combined with other collaborative technologies and automated reasoning mechanisms may be a viable starting point for developing such tools. As these tools are being developed, we can pursue two avenues of investigation: (1) understanding argumentation as a process; and (2) refining these tools to better support the process. We expect the results will help us produce useful tools in a variety of domains that rely on the construction and presentation of a persuasive argument.

ACKNOWLEDGEMENTS

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NOTES

1. According to Jeff Conklin, "The concept of hypertext is quite simple: Windows on the screen are associated with objects in a database, and links are provided between these objects, both graphically (as labelled tokens) and in the database (as pointers)." For a more complete explication of hypertext, see [Conklin 87]; however, this abstract can be understood without concern for how hypertext has provided us with an analytic vehicle.

2. NoteCards implements hypertext using "cards" as the database objects. Links between cards are represented as boxed icons on the screen. When selected with a mouse click, links cause the card at the other end of the link to be brought to the screen. Figures 3, 4, 5, and 6 all show cards containing link icons. Figures 7 and 8 show whole screens.

3. The NoteCards Guided Tour package is a mechanism by which the author of a hypertext network can create a pathway (or pathways) through her network to present it, on-line, to a reader. A NoteCards user may also use Guided Tours to organize a complex information space for herself, as well as for an eventual audience. Figures 7 and 8 are screenfuls of cards (called Tabletops) from two different tours.

4. The analytic framework discussed in this section was developed in conjunction with Susan Newman.

5. See [Trigg et al.1987] for a discussion of tailorability in NoteCards. Tailorability, in this context, means that users can add new functionality to the system to adapt it to the needs of an application. Peggy Irish implemented Toulmin cards in the NoteCards Programmer's Interface.

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