Replacing Inference-Rule Heuristics with Defeasible Class-inclusion Transitivity for Ensuring A Structurally Correct Inference In Court

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One of the major litigation challenges of an attorney is to present strong and structurally correct (e.g., valid or well-formed) lines of reasoning to the court. While judicial determinations of strength (i.e., probative weight or force) can be largely subjective and a matter of degree, a determination of structural correctness is an objective determination. It is a yes or no decision. Despite its objective and bivalent nature, however, making such determinations can be difficult for the court. For this reason, attorneys need to make this determination as easy as possible. This need is consistent with the relevance theory principle of maximizing the cognitive effect and minimizing the cognitive effort (Black & Hunter, 2009).

One difficulty in making this judicial determination arises when the line of reasoning presented by an attorney does not make clearly evident the connections between each of the premises offered and the claim or conclusion at issue. This can occur, for example, when there are implicit missing premises that are necessary for the structural correctness of the line of reasoning (i.e., enthymemes). But, even if all of the necessary premises are explicitly stated by the attorney, a jumbled semantic word or sentence order of the premises can obscure the structural correctness of the line of reasoning by conflicting with a reader's typical expectations of where words or grammatical constructions should appear (Gopen, 2004).

Another difficulty can be created by an attorney's use of a structurally correct argument form that is unfamiliar to the judge. For example, many argument schemes (Gordon & Walton, 2009), which are now being more fully developed in scholarly literature, would likely be unfamiliar to the court. Without knowing the correct design of the argument structure, the question of structural correctness may not be easily answered by the court.

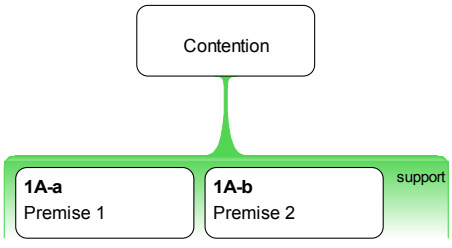

Figure 1

The typical visual grammar of link and node argument mapping, such as used with Rationale™ software (www.austhink.com), is a step in the right direction. (Figure 1). Separating the contention and reasoning premises into separate boxes that are structured into an argument form can be very helpful in clarifying the line of reasoning. Yet, further scaffolding is needed to guarantee a structural correct argument.

What would resolve the question of structural correctness completely would be a single universal argument form that is generalizable to all judicial inferential contexts, uses a familiar

mode of inference, does not permit through its structural rigor missing necessary premises or an obscuring word order, and makes all of the logical connections readily apparent to the court. Such an argument form exists. And it can be understood as a simple algebraic equation for defeasible class-inclusion transitivity (DCIT) (Laronge, 2009).

This equation is related to Sommers term-functor logic (TFL) (Sommers & Englebretsen, 2000). With TFL, any type of non-defeasible logic argument (e.g. categorical, relational, etc.) can be translated into a set of linked premises and a contention. Each is constructed as categorical statements with a complex subject phrase and a complex predicate phrase(s). And these phrases can be organized as an algebraic equation (DCIT) which ensures structural correctness .

contention — linked premise 1 — linked premise 2 — linked premise 3 — linked premise 4 — linked premise 5 — linked premise n

$$(A/Z) = (A/B)(B/C)(C/D)(D/E)(E/n)(n/Z)$$

Each letter represents a complete complex phrase, whether in the subject or predicate position of a single premise contained within the parentheses. The numerator position is for a complete complex subject of a premise and the denominator position is for the complete complex predicate of a premise. The string of transitively linked premises can be two or more that follow this pattern in which each "middle" complex phrase is canceled.

One essential difference from an Aristotelian syllogism is that rather than a single word Aristotelian term as the "middle term(s)," any complete syntactically complex subject or predicate phrase is used as the linking element that joins the premises. This structure can work, to some extent, with Rationale™. (See Figure 2)

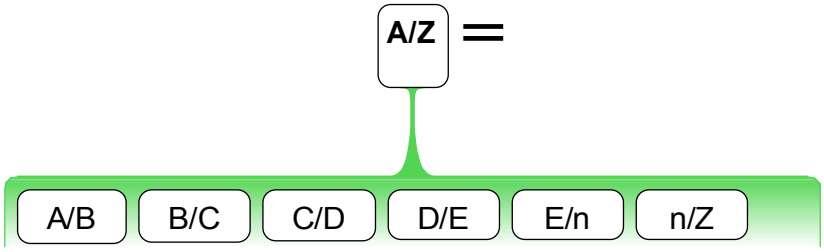

Figure 2

The following hypothetical illustrates this DCIT argument pattern using as a contention: "The boy was lawfully detained." Within each of the boxes, the division line (i.e., /) shows the division between the subject phrase and the predicate phrase (Figure 3).

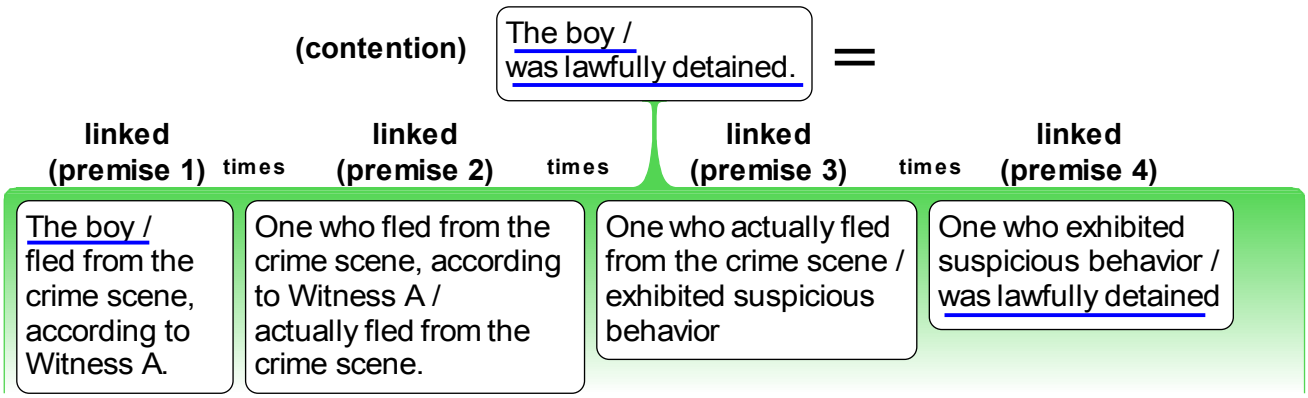

Figure 3

Just as in an algebraic equation, through the multiplication of the premises, the subject and predicate phrases that link the premises in the line of reasoning cancel each other and drop away.

A final refinement to the DCIT algebraic equation is needed, however, to fully accommodate typical argumentation in litigation. Arguments in litigation are very often of a defeasible nature. Therefore, the algebraic equation must allow adding conditional statements. For example, in Figure 3, the amount of probative weight that can be supported by premise 2 depends upon other premises (i.e., non-transitive assumptions). The degree to which a witness statement can be accepted as true depends upon, among others, the following factors:

1. The witness was in a position to know.
2. The witness was unbiased.
3. The witness had the requisite capacity.

In a factual context as reflected in Figure 3, these factors would be called ancillary evidence. Some of these ancillary factors are necessary for the contention to have any degree of acceptability. For example, if Witness A was not in a position to know, then premise 2 would be false and the line of reasoning would fail. On the other hand, if Witness A was not unbiased, the line of reasoning could still carry some probative weight since premise 2 might still have some degree of likelihood. Factor 2 would not be necessary, but it would be supportive. Its degree of acceptability would effect the acceptability of the contention, but its total lack of acceptability would not completely defeat the contention. Figure 4 illustrates how these ancillary factors can be represented in the previous example using Rationale™.

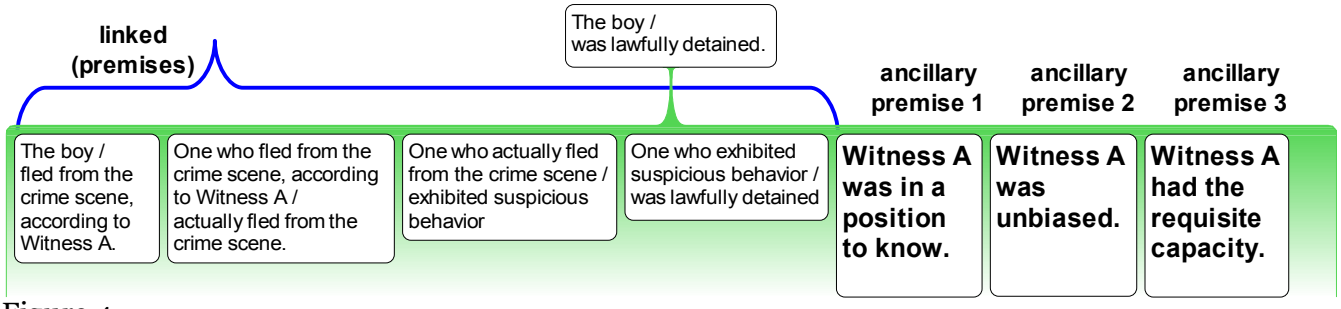

Figure 4

In legal arguments, ancillary premises are also typically present when constructing arguments that depend upon elements of a law, such as a criminal statute. For example, the crime of robbery requires that each of the following four elements be proven beyond a reasonable doubt:

1. The property was taken or carried away.
2. The property belonged to another.
3. The property was taken by force.
4. The intent was to permanently deprive the owner.

Figure 5 depicts how the contention of guilt for the crime of robbery might be supported.

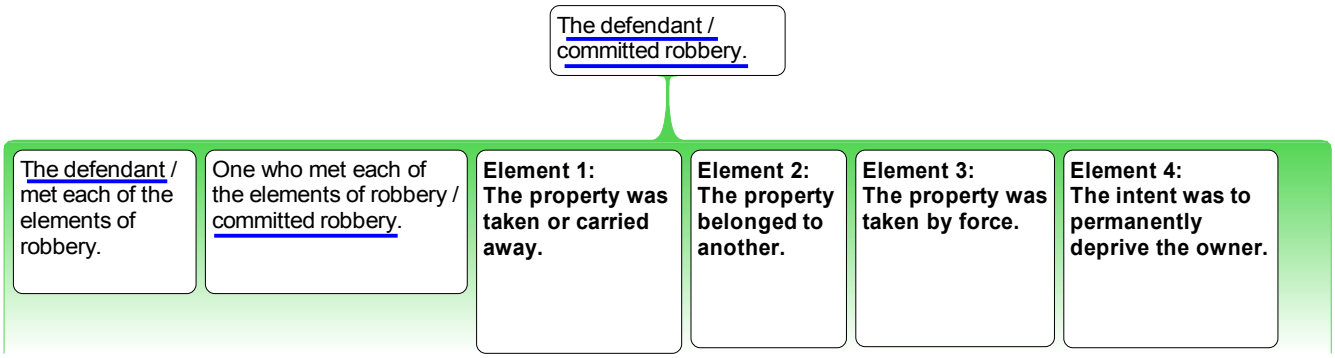

Figure 5

This DCIT argument form supplants the need for rough heuristic rules of structural correctness such as the "Rabbit Rule" and the "Holding Hands Rule" (Rider & Thomason, 2008) which when applied together form the "No Danglers Rule" http://austhink.com/reason/tutorials/Tutorial_2/9_No_Danglers/no_danglers.htm). These heuristics, when followed, can increase the likelihood that structural correctness has been achieved. But their use, unlike DCIT, does not guarantee a structurally correct argument form. This is because they are based on an incomplete model of a structurally correct argument. This incompleteness may partially account for why "Lots" of Argument Mapping Practice (i.e., L.A.M.P.) (Rider & Thomason, 2008) is needed when using these heuristics as guides. (see also: Davies, 2009)

The "Rabbit Rule" states "that any significant term or concept which appears in the contention must also appear in one of the premises" (http://austhink.com/reason/tutorials/Tutorial_2/6_Rabbit_Rule/rabbit_rule.htm). Figures 6, 7, and 8 are examples used to illustrate its application in the Rationale™ tutorial.

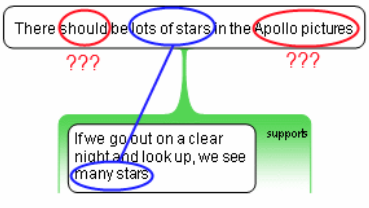

Figure 6

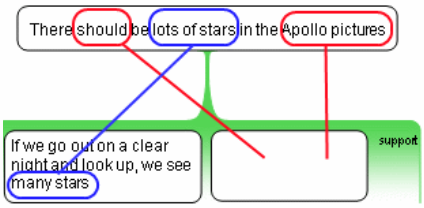

Figure 7

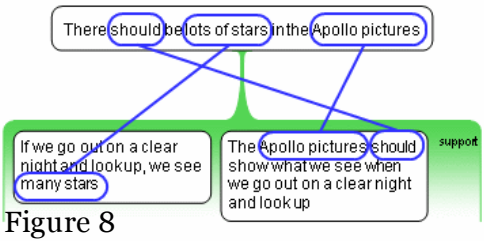

Figure 8

This tutorial example of the "Rabbit Rule" circles in red and blue those terms or concepts considered significant by the reviewer. This example illustrates one of the weaknesses of the rule. The user must first decide what is meant by the words "term" or "concept." For example, is the word "term" meant to be limited to a single word Aristotelian term as used in deductive logic? And what is a "concept?

Next the user needs to decide whether the term or concept is "significant." Oddly, for example, the verb "be" was not considered significant in the contention in the above example. Such abstractions within a rule are "significant" obstacles to a determination of structural correctness that must be objective.

The "Rabbit Rule" does point, however, in the right direction. It attempts to account for, even if roughly defined as "term" or "concept," the necessary presence of the complete subject phrase and predicate phrase of the contention within a structurally correct line of reasoning. (see Figure 9)

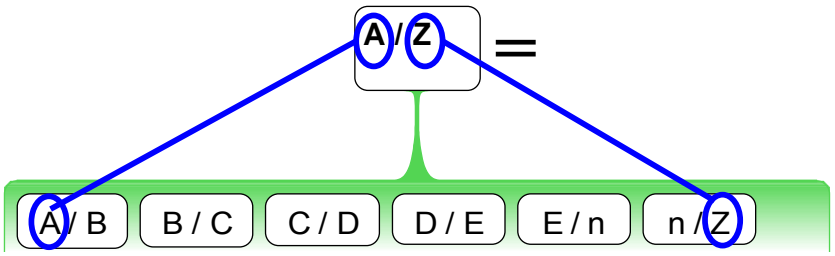

Figure 9

As Figure 9 illustrates, the complex phrases in the contention must be in the corresponding position of subject and predicate within premises within the line of reasoning in order to have a structurally correct argument.

The remaining rough heuristic discussed is called the "Holding Hands Rule." It states that every significant term or concept within one premise that is not contained within the contention must have a match within another premise within the line of reasoning. http://austhink.com/reason/tutorials/Tutorial_2/8_Holding_Hands/holding_hands.htm. Figure 10 illustrates its application in the Rationale™ tutorial.

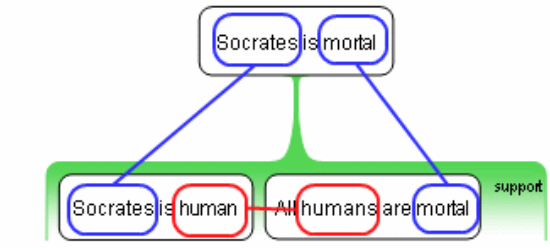

Figure 10

Figure 10 treats the "terms" as single word Aristotelian terms. For example, the rule ignores the verbs in this example. Such a limited definition of "terms" limits the applicability of

this rule. The "Holding Hands Rule," like the "Rabbit Rule," does point, however, in the right direction for a structural correct argument as demonstrated in the DCIT argument form. (see Figure 11).

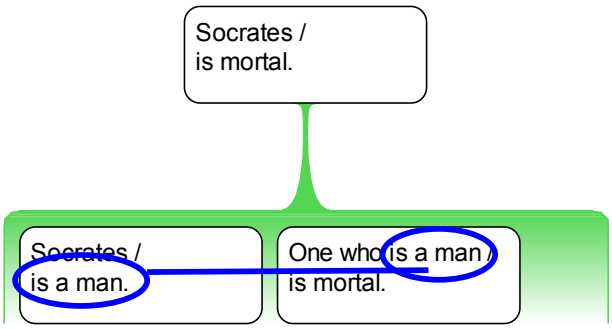

Figure 11

A DCIT template (Figure 13) can provide an easy-to-use template that is completed prior to constructing the Rationale™ argument map. The linked premises are divided into their complex subject and predicate phrases. The template relies upon a simple protocol that ensures a structural correct argument:

1. The subject phrase of linked premise 1 is the same as the subject phrase of the contention.
2. The complex predicate phrase in any premise is used as the complex subject phrase in the following premise.
3. The predicate phrase of the last transitively linked premise is the same as the complex predicate phrase of the contention.

Alongside the transitive linked premises, the ancillary premises column shows which ancillary premises are connected with any of the transitively linked premises.

The DCIT template below is applied to the following argument that is drawn from the Rationale™ tutorial (see Figure 12). Figure 12 is intended to demonstrate a structurally correct argument in the tutorial. Yet the significant term "be" in the contention is not found in one of the premises which results in a violation of the "Rabbit Rule." And the significant term "show" in premise 2 is not found in premise 1 which results in a violation of the "Holding Hands Rule." These unintended violations within the Rationale™ tutorial demonstrate the difficulty in applying these rules. Further, the lack of a predictable word order obscures the argument structure making a determination of structural correctness difficult.

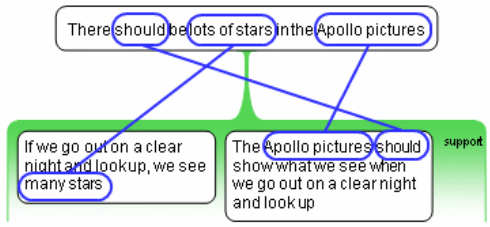

Figure 12

		TRANSITIVELY LINKED PREMISES			*ancillary premises*
1	**START**	**The Apollo pictures...**	**...**should show what we see when we go out on a clear night and look up.	*1*	*Things appear the same in space as they do through the atmosphere.*
2	Any (who/that)	should show what we see when we go out on a clear night and look up**...**	**...should show lots of stars.**	*2*	
3	Any (who/that)			*3*	
4	Any (who/that)			*4*	
5	Any (who/that)			*5*	
		CONCLUSION			
	So...	**the Apollo pictures...**	**...should show lots of stars.**		

Figure 13

Figures 14 and 15 illustrate the difference in a Rationale™ argument map that follows the DCIT argument rule compared to the Rationale™ argument map used as the ORIGINAL model of structural correctness in the Rationale™ tutorial. (http://www.austhink.org/reason/tutorials/Tutorial_2/7_Using_Rabbit/using_rabbit.htm)

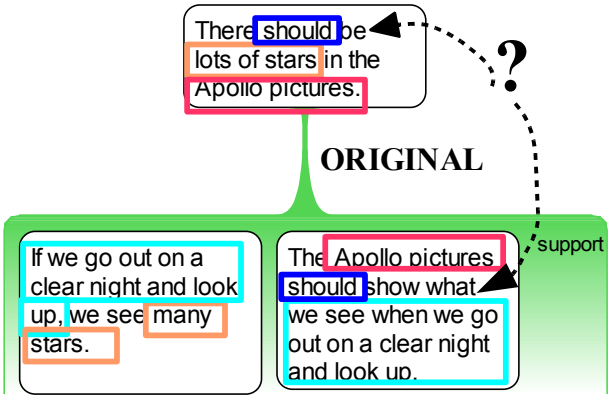

Figure 14

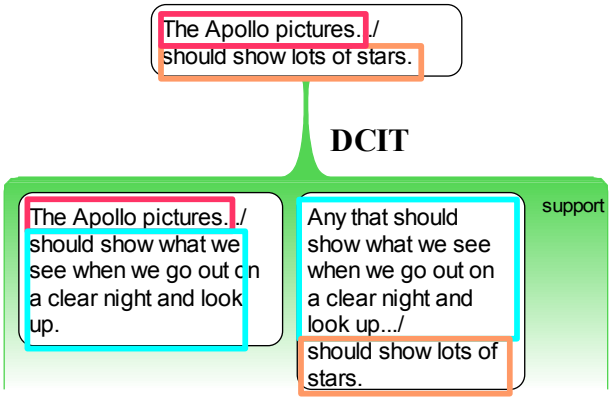

Figure 15

As previously discussed, the rough heuristics are based on an incomplete model of a structurally correct argument. This lack becomes most evident, perhaps, when an enthymeme is missing linked premises as well as ancillary premises. The lack of either type of premise can result in an enthymeme and the need to deconstruct it. The following legal case provides a helpful example of the problem of presenting enthymemes (e.g. missing either linked or ancillary premises) in an inference in court.

Chesterfield Assoc. v. Edison Township, 13 N.J., Tax 195 (1993) involved the valuation of 95 townhouses using the sales comparison appraisal approach. The court discussed a gap in the linked premises as well as the existence of missing ancillary premises in the argument presented by an expert witness.

> The first adjustment suggested by plaintiff's expert to the stipulated values, was to account for the difference in physical condition of the 95 townhouses as compared to the sale properties that formed the basis for the parties' stipulated values by the sales comparison approach. According to the plaintiff's expert, the stipulated values should be reduced by 10% to reflect the fact that the subject townhouses were occupied by tenants rather than by owners. Apparently, it was the expert's opinion that owners take better care of their homes than do tenants.
>
> There are a number of reasons why plaintiff fails to sustain its burden of proof on this issue. First, there is nothing in the record to demonstrate that all of the 45 comparable sales utilized were not also affected by existing tenancies. Plaintiff's appraiser seems to be assuming that all of the comparable sales properties were not previously occupied by tenants, but there is nothing in the record to support this assumption. There is no evidence at all on this point. Absent proof in this regard, there is no factual basis for an adjustment.

Figures 16 and 17 illustrate the difference between the enthymeme presented by the expert witness and the complete structurally correct argument needed by the court.

		PREMISES			ANCILLARY PREMISES
1	**START**	**The subject townhouses ...**	...were occupied by tenants rather than by owners.	*1*	
2	Any (who/that)			*2*	
3	Any (who/that)			*3*	
		CONCLUSION			
	So...	**the stipulated values...**	**...should be reduced by 10%.**		

Figure 16

		TRANSITIVELY LINKED PREMISES			ANCILLARY PREMISES
1	**START**	**The stipulated values of the subject townhouses...**	...were based on being occupied by tenants rather than by owners.	*1*	
2	Any (who/that)	...were based on being occupied by tenants rather than by owners...	**...should be reduced by 10 %.**	*2*	***Owners take better care of their homes than tenants. The comparable sales properties were not previously occupied by tenants.***
3	Any (who/that)			*3*	
		CONCLUSION			
	So...	**the stipulated values of the subject townhouses...**	**...should be reduced by 10%.**		

Figure 17

The court also found that the inference leap to conclude a precise 10% reduction unsupported.

In conclusion, a court often needs to make a determination of structural correctness in a short amount of time. This can occur, for example, when the court rules from the bench on the relevancy of an item of evidence (Laronge, 2009). By structuring an argument in a familiar defeasible class-inclusive transitivity inference mode, the court can easily recognize the fact of structural correctness. To the contrary, the use of rough inference-rule heuristics and semi-formality will not meet this need.

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