

Using Argumentation Schemes for Argument Extraction: A Bottom-Up Method

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Abstract

This paper surveys the state-of-the-art of argumentation schemes used as argument extraction techniques in computational semantics, and uses examples to show how a series of connected problems needs to be solved in order to move these techniques forward to computational implementation. Some of the schemes considered are argument from expert opinion, practical reasoning, argument from negative consequences, fear appeal arguments, argument from commitment, argument from inconsistent commitments, and the circumstantial *ad hominem* argument. The paper shows how schemes need to be formed into clusters of sub-schemes to work toward a classification system of schemes from the bottom up, and how identification conditions for each scheme can be helpful for argument extraction.

Applying argumentation schemes to argument mining in natural language discourse has turned out to exhibit a variety of problems, especially in borderline cases where there is disagreement about how to identify a particular argument as fitting one scheme or another. These problems, however, appear to be solvable. To move the research efforts on argument extraction using argumentation schemes ahead, some useful resources are presented in this paper, as well as some first steps on how to solve these problems. The paper begins with survey of the literature, and an identification of the most significant problems confronted by the existing research, by introducing the key schemes in an expository way, and by using examples of standard difficulties in determining whether an argument found in text can properly be said to fit one or more of the schemes. One example is the difficulty of deciding whether a given argument in a natural language text is a personal attack argument (*ad hominem* argument) or merely an instance of argument from inconsistent commitments (Walton, 1998). Another example is that of the fear appeal argument scheme, which is a species of argument from negative consequences and closely related to the scheme for argument from threat.

It is shown in the paper how argument extraction is closely related to the project of argument scheme classification, and how it would be very useful for setting up projects of argument mining to have a classification system showing how one scheme can precisely be classified as a subspecies of another scheme that it is closely related to. The traditional way of classifying argumentation schemes has been to take a top-down approach that lays down some broad, general categories of types of arguments (deductive, inductive, source-based, and so forth) and work downward from there (Walton, Reed and Macagno, 2008, chapter 10). This paper takes a bottom-up approach that begins with some examples at the ground level of cases where two schemes seem to apply to the same real example of an argument found in a text, leading to a difficulty of determining which scheme fits the argument. The idea is that working from the bottom up, we can identify clusters of schemes that fit together with each other, and then at the next step upward, we can see how these clusters can be fitted together. Eventually, once enough of these clusters are fitted together into larger groups, we can see how what we have matches the various top-down scheme classification systems that have been proposed, or not.

Section 1 introduces the reader to the subject of how argumentation schemes are modeled in computational argumentation systems in a format that includes a set of critical questions matching each scheme, using the examples of the scheme for argument from expert opinion. Section 2 shows how the Carneades Argumentation System deals with the critical questions matching this scheme. Section 3 offers a brief survey on recent work on using argumentation schemes for argument mining. Sections 4, 5, 6 and 7 uses examples of how one scheme can be classified as a sub-scheme of another to illustrate why the work of classifying schemes has encountered some significant problems. The example presented in section 5 fits a scheme for argument from inconsistent commitments, and in section 4 it is shown how this scheme is a sub-scheme of another one called the scheme for argument from commitment. In section 6 both schemes are classified as parts of a more complex scheme called the scheme for the circumstantial *ad hominem* argument. In section 6 an example of argument from negative consequences is presented, and in section 7 it is shown how this scheme is closely related to the schemes for practical reasoning and argument from values. Section 8 presents guides to help coders extract arguments using 25 of the most important schemes for natural language argument extraction. Section 9 provides some general conclusions of the paper.

1. Introduction to Argumentation Schemes and Critical Questions

Argumentation schemes represent stereotypical patterns of reasoning used in everyday conversational argumentation, as well as in a variety of other contexts as well, including forensic debating, legal argumentation, scientific inquiry and deliberations that aim at a decision on what to do in given circumstances. Historically, the study of them has evolved from so-called topics (argument places) of Aristotle. Hastings (1963), Perelman and Olbrechts-Tyteca (1969), Kienpointner (1986), Walton (1996), Grennan (1997) and Walton, Reed and Macagno (2008) have identified and studied many schemes. Each scheme has a distinctive set of premises and a distinctive conclusion, and schemes represent form of reasoning we are familiar with in everyday thinking and arguing. Schemes represent ways of drawing an inference to a conclusion based on the way we as thinkers and agents can normally expect a familiar situation to go, based on our shared and repeated experiences, subject to exceptions. Schemes are comparable to the deductive forms of reasoning identified in logic, and some deductive forms of reasoning like *modus ponens* could be classified as schemes, but the schemes of most interest for the study of legal argumentation and everyday conversational argumentation (excepting these deductive ones) are non-monotonic. You can try to treat them as deductively valid forms of argument, but that does not turn out to be a useful way to model them. Schemes could also be taken to include the inductive forms of reasoning used in probability and statistics, but many the schemes of central interest are arguably not modeled in a useful way by trying to attach numbers as evidential weights to their premises and conclusions, because that can lead to erroneous results, paradoxes and even fallacies. As we will show, starting with the scheme for argument from expert opinion, evaluating an argument fitting a scheme is best carried out by using a basic set of critical questions matching each scheme, and then judging how well each question has been answered.

The scheme representing argument from expert opinion was formulated in (Walton, 1997, 210) as having two premises and a conclusion. Source *E* is an autonomous agent of a kind that can possess knowledge in some field or subject domain. The knowledge domain is a database represented by the variable *F* (for field of knowledge) that contains a set of propositions, *A*, *B*, *C*, . . . , or *A*₁, *A*₂, *A*_n, if we run out of letters.

MAJOR PREMISE: Source E is an expert in field F containing proposition A .

MINOR PREMISE: E asserts that proposition A (in field F) is true (false).

CONCLUSION: A may plausibly be taken to be true (false).

An argument from expert opinion is best evaluated in a dialogue framework with stages and protocols of the kind employed in the Carneades Argumentation System. In this framework a respondent) can ask critical questions at appropriate moves to test an argument put forward at a previous move in a dialogue. Carneades is a computational model of argumentation (Gordon, 2010) that defines mathematical properties of arguments, models the structure and applicability of arguments, and uses argumentation schemes to construct and evaluate arguments. Carneades has been implemented using a functional programming language, an argument mapping tool currently freely available to users at the site <http://carneades.github.com/>

There are six basic critical questions matching the appeal to expert opinion (Walton, 1997, 223). They are the following, but these are not the only critical questions that can be asked. Asking any one of these questions can lead to the asking of more specialized sub-questions, and to back-and-forth argumentation in the form of a dialogue governed by protocols (rules) for each move.

CQ₁: *Expertise Question*: How knowledgeable is E as an expert source?

CQ₂: *Field Question*: Is E an expert in the field F that A is in?

CQ₃: *Opinion Question*: What did E assert that implies A ?

CQ₄: *Trustworthiness Question*: Is E personally reliable as a source?

CQ₅: *Consistency Question*: Is A consistent with what other experts assert?

CQ₆: *Evidence Question*: Is E 's assertion based on evidence?

CQ₁ refers to the expert's level of mastery of the field F . CQ₄ refers to the expert's ethical trustworthiness as a source. For example, if the expert has a history of lying, or is biased, the expert's trustworthiness as a source is thrown into doubt. We need to note here that there can be sub-questions to critical questions. For example, the bias critical question, 'Is E biased?' is a sub-question of the trustworthiness critical question.

2. Using the Carneades Argumentation System to Model Schemes and Critical Questions

Argumentation schemes have been employed in argument visualization tools that enable a user to work with schemes to analyze and evaluate argumentation found in natural language discourse (Reed and Walton, 2003; Walton, Reed and Macagno, 2008). One widely used tool of this sort is Araucaria (Reed and Rowe, 2005). Another tool, currently under development, is the argument mapping method of the Carneades Argumentation System (Gordon, 2010). Carneades has been implemented using a functional programming language, and has a graphical user interface currently under development as an Open Source software project freely available to users at the site <http://carneades.github.com/>.

The current version of Carneades (10.0) models the structure and applicability of arguments, the acceptability of statements, and applies proof standards to manage the distribution of the burden of proof in argumentation. The initial work has built a working prototype of an argument mapping tool, comparable to the Araucaria system (Reed and Rowe, 2005), and other systems surveyed by Scheuer, et al., (2010).

Carneades represents a sequence of arguments as a chain of reasoning where the root of the tree is the ultimate conclusion to be proved and the leaves of the tree represent premises and conclusions in the subarguments that make up the tree. A tree is a type of bipartite directed

argument graph consisting of statement nodes and argument notes connected by edges that join the nodes according to the formal definition of an argument graph. Carneades distinguishes between pro and con argument nodes in an argument tree.

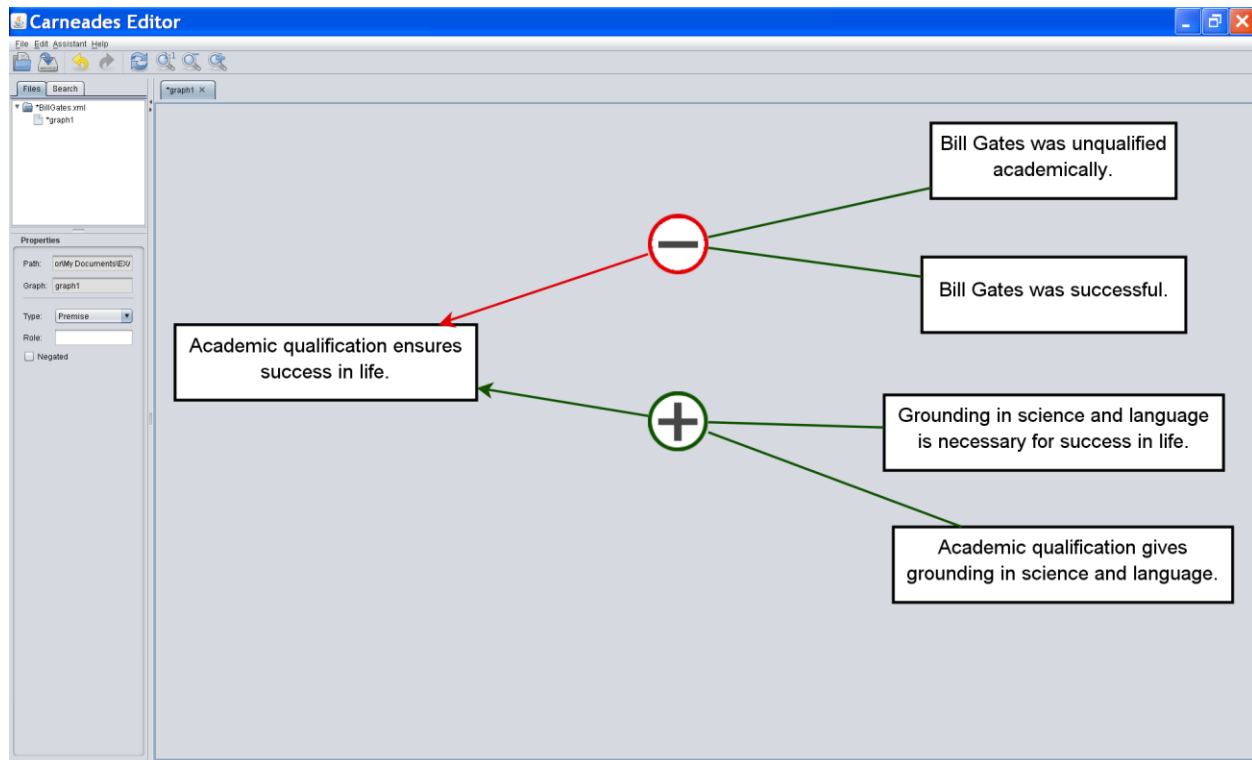


Figure 1: How an Argument is Visualized on the Screen in Carneades

The example shown in figure 1 gives the reader an idea of how the user interface shows a typical argument on the computer screen. The argument at the bottom is a pro-argument that supports the ultimate conclusion that academic qualification ensures success in life. This argument presents a reason to accept the conclusion. The argument at the top is a con argument that presents a reason not to accept the conclusion. The part of the screen shown at the left is a menu used to input information to build the argument map shown at the right. Acceptance or rejection of propositions can be inserted into this menu, as well as argumentation schemes. In the earlier versions of this software, Carneades argument graphs were acyclic. Later versions overcame this limitation by mapping Carneades argument frameworks to abstract argument frameworks such as the ASPIC+ system of Prakken (van Gijzel and Prakken, 2012).

Each argument represents a step from a set of premises to a conclusion. A step is an instance of an argumentation scheme. The argumentation scheme is inserted into an argument node that represents an inference step. L is a higher-order language containing sets of predicate symbols, function symbols, constants, and a set of operators for recursively constructing terms and propositions from these symbols, V is a set of variables ranging over both formulas and terms. An *argumentation scheme* is a tuple $\langle P, E, A, c \rangle$ where $P \in L$ are its *premises*, $E \in L$ are its *exceptions*, A are its *assumptions* and $c \in L$ is its *conclusion*. As described in (Gordon, Prakken, and Walton 2007, 884), exceptions and assumptions model the critical questions of argumentation schemes. They differ in how they distribute the burden of proof when a critical

question matching an argumentation scheme is asked in a dialogue exchange of arguments. Carneades frames a proposition corresponding to the critical question so that the proposition can be represented as an additional premise of the argumentation scheme. This procedure has the advantage that it can eliminate the use of questions, since questions cannot be inserted into an argument map in the same straightforward way that propositions are.

One way an argument from expert opinion commonly fails is that the source is an expert, but not an expert in the right field. For example, Einstein was an expert in physics, but was often treated as an expert on matters of politics and religion, and logic textbooks cite this sort of example as an instance of the fallacy of appeal to authority. So the field question demands an answer. If the critical questioner asks in reply to an argument from expert opinion what the field of the expert is, the argument defaults unless the proponent can specify a field. However, the situation with the trustworthiness question is different. If the critical questioner asks whether the expert is an ethically trustworthy and reliable source, the proponent can reply, "Of course he is trustworthy, he is after all an expert". In this case the burden of proof is on the critical questioner to provide some evidence that the expert is not trustworthy, in order to make the argument from expert opinion default.

In order to solve this problem, the early version of the Carneades Argumentation System classified the premises representing critical questions matching an argumentation scheme into three categories: ordinary premises, assumptions and exceptions. The ordinary premises are the ones stated explicitly in the argumentation scheme. The assumptions are additional premises that are assumed to hold in the same manner that the ordinary premises do. In other words, if questioned they have to be proved, or supported by evidence, but they stand as acceptable when stated. The exceptions are assumed not to hold. An exception can be illustrated by the Tweety argument: Birds fly; Tweety is a bird; therefore Tweety flies. To defeat this argument an exception has to be proven. For example, evidence might be given that Tweety is a penguin. This instance is an exception to the generalization that birds generally fly.

Using this approach the original version of the Carneades Argumentation System arrived at a decision on how to treat each of the premises for the scheme of argument from expert opinion. The two assumptions that the expert is trustworthy and that what she says is consistent with what other experts say, are assumed to be false until new evidence comes in to show that they are true. The two assumptions that the expert is credible and that what she says is based on evidence, are assumed to be true. The assumptions that the expert really is an expert, she is an expert in the right field, that she asserts the claim in question, and that the claim is in the subject domain in which she is an expert, are all assumed to be true. This outcome can be summed up as follows.

Premise: *E* is an expert.

Premise: *E* asserts that *A*.

Premise: *A* is within *F*.

Assumption: It is assumed to be true that *E* is a knowledgeable expert.

Assumption: It is assumed to be true that what *E* says is based on evidence in field *F*.

Exception: *E* is not trustworthy.

Exception: What *E* asserts is not consistent with what other experts in field *F* say.

Conclusion: *A* may plausibly be taken to be true.

Carneades modeled only the trustworthiness question and the consistency questions as exceptions. To deal with the other schemes to fit them into the Carneades Argumentation System in a way so that they can be analyzed and evaluated as arguments within that system, decisions

have to be made on how to treat the premises of any given scheme as ordinary premises, assumptions or exceptions. An example is shown in figure 2.

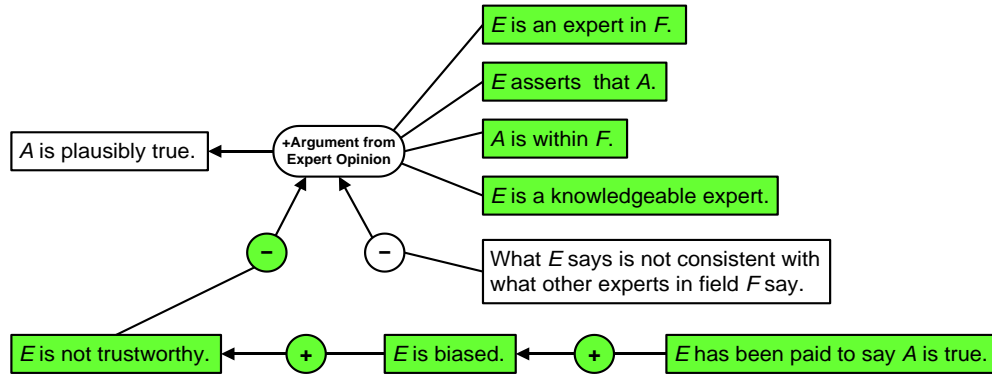


Figure 2: A Critical Question Modeled as an Undercutter in Carneades

In the latest version of Carneades, exceptions are modeled as undercutters, that is, as counter-arguments that directly attack and defeat a given argument fitting a scheme only if evidence to back up the counterargument is given. An illustration is given in figure 2.

Let's assume that the four premises (all of which are either ordinary premises or assumptions) shown at the top right of figure 2 are accepted. To show these propositions have been accepted, each of the text boxes containing each of them has been shaded in green. All else being equal, that would mean that Carneades will accept the conclusion that *A* is plausibly true. But we haven't considered the exceptions yet. Now let's look at the first exception, the proposition that what *E* says is not consistent with what other experts in field *F* say. It is shown in figure 2 as an undercutter, so it could defeat the argument from expert opinion if that proposition is backed up by evidence. But as indicated in figure 2, it is not backed up by any evidence. So it is shown in a box with a white background, indicating it has not been accepted. Now let's look at the other exception, the proposition that *E* is not trustworthy, shown at the bottom of figure 2. What we see here is that the claim is made that *E* is biased, and this claim supports the proposition that *E* is not trustworthy. The bias critical question is a sub-question of the trustworthiness critical question. In this instance the proposition claiming that *E* is biased is supported by some evidence, namely the proposition that *E* has been paid to say that *A* is true. Once the premise at the bottom right has been accepted, the conclusion that *E* is biased is automatically shown by Carneades as accepted. Once that proposition has been accepted, Carneades automatically shows the next proposition, stating that *E* is not trustworthy, as accepted. The whole argument shown at the bottom panel now undercuts the argument from expert opinion. Therefore, according to the way Carneades treats exception critical questions as undercutters, the argument from expert opinion in this case is defeated by the asking of the critical question, because the trustworthiness question is an undercutter that has been backed up by evidence. Because the argument from expert opinion has been undercut, its node is shown in white, and therefore the conclusion that *A* is plausibly true is also shown in white, indicating that it is not accepted.

3. Basic Research on Argument Mining in Computational Semantics

Moens, Mochales Palau, Boiy and Reed (2007) worked on methods for automatically classifying arguments in legal texts in order to make it possible to search for types of arguments in a text fitting a scheme. They used indicators of rhetorical structure expressed by conjunctions and certain kinds of adverb groups (2007, 226). They identified arguments using words, sequences of words, and modal auxiliary verbs. This work has been further applied to legal texts by Mochales-Palau and Moens (2007). Their corpus contained thirty documents containing legal decisions in the database of cases from the European Court of Human Rights. The texts were independently marked up by three parties. The documents they used were divided up into sections with headings that contained clear indicators of which part of the document would be likely to contain an argument. Ten of the documents reviews were used to create a grammar, and the remaining twenty were used to test the adequacy of the grammar. The linguistic analysis used rhetorical markers like ‘however’ and, ‘therefore’. It identified the conclusion of an argument using phrases including, ‘it follows that’, ‘in conclusion’, and so forth. It identified premises by using phrases like “in the view of the factfinder”.

Mochales and Moens (2011) based their work on argumentation schemes that represent stereotypical patterns of human reasoning that are generally defeasible, (Mochales and Moens (2011, 5). In this study, they used the Araucaria corpus as well as the set of documents they extracted from legal texts of the European Court of Human Rights. They used corpus annotators to identify the different arguments of each document in a process that took more than a year and included three readers and a judge to solve disagreements.

A detailed survey of the literature on argument mining of texts of legal cases can be found in (Wyner et al., 2010). They offer a very clear explanation of how context-free grammars are used in argument mining of legal cases. A context-free grammar is composed of a finite set with a special start symbol, a finite set of production rules and a terminal symbol. (Wyner et al., 2010, 67) give an example of a rule stating that a noun phrase can be composed of either a proper noun or a determiner followed by a nominal, which can be one or more nouns. To see how this kind of rule can be applied to argument mining, consider the grammatical rule stating that if x_i is a premise and x_j starts with the word ‘however’, then x_j is a premise (Wyner et al., 2010, 68).

One aspect that they comment on is the identification of enthymemes, arguments with missing and inferred premises and conclusions. In their comment (2010, 75), they write that enthymemes present a very significant issue, and they add that it is unclear yet how text mining can address this issue. Wei Feng and Hirst (2011, 987) consider reconstructing the enthymemes in an argument as the ultimate goal of their research on argument mining. They see this goal as fundamental because determining unstated assumptions “is an integral part of understanding, supporting, or attacking an entire argument”.

Wei Feng and Hirst (2011) used arguments in the Araucaria database, an online repository of arguments that contains 660 manually annotated arguments collected from newspaper articles, court cases, and similar sources of natural language argumentation. They used this database as a starting point for research aimed at developing tools for building an argument mining technology. They used the 65 argumentation schemes from (Walton, Reed and Macagno, 2008) as the basis for their study. However they emphasized five schemes found to be the most commonly used ones in their data: argument from example, argument from cause to effect, practical reasoning, argument from consequences and argument from verbal classification (Wei Feng and Hirst, 2011, 988). The number of occurrences of these most common five schemes constituted 61% of the kinds of arguments identified in their database (988).

Wei Feng and Hirst, 2011, 990 used selected cue phrases and verbal patterns they took to be indicative of each scheme, represented by keywords and phrases found to be characteristic of a particular scheme. For example, they identified 28 keywords and phrases associated with the scheme for practical reasoning, including ‘want’, ‘aim’, ‘objective’, and modal verbs like ‘should’, ‘must’ and ‘need’ (991). What Wei Feng and Hirst, 2011, 992 call “sentiment orientation” is taken to be a good indicator for the scheme for arguments from positive and negative consequences. As will be explained carefully below, there is a close connection between arguments from positive and negative consequences and arguments from positive and negative values.

4. Research on Classifying Schemes to Natural Language Discourse

Rahwan et al. (2011) have constructed a description logic ontology for annotating arguments based on the Argument Interchange Format (AIF). They (2011, 41) cited the set of schemes in (Walton, 1996) as the one that has been most influential in computing. They noted that the premises in some simpler schemes are also contained in some more complex schemes. For example (2011, 49), they show how the scheme for argument from negative consequences is a more general scheme into which the scheme for fear appeal argument below fits as a special subtype. The version of the argumentation scheme for the fear appeal arguments is taken with minor modifications from (Walton Reed and Macagno, 2008, 333-334). *D* is taken to represent some particular outcome that is dangerous to the agent *a*, or otherwise perceived by *a* as fearful, so that *a* may be presumed to be willing to go to great lengths to avoid it.

PREMISE 1: If you agent *a* do not bring about *A*, then *D* will occur.

PREMISE 2: *D* is very bad for you.

PREMISE 3: Therefore, you ought to stop *D* if possible.

PREMISE 4: But the only way for you to stop *D* is bring about *A*.

CONCLUSION: Therefore, you ought to bring about *A*.

In this form of argument, failure to bring about *A* is claimed to have negative consequences of an especially fearful sort for *a*. Essentially the fear appeal argument is a species of argument from negative consequences, because it is claiming that agent *a*’s failure to bring about a particular action will result in negative consequences for *a*. On this basis, the fear appeal argument scheme can be classified as a sub-scheme of the scheme for argument from negative consequences.

The fear appeal type of argument is formulated in a different way in (Walton, 2000, 143), but in that version it also seems to be a species of argument from negative consequences.

PREMISE 1: If you (the respondent) bring about *A*, then *B* will occur.

PREMISE 2: *B* is a very bad outcome, from your (the respondent’s) point of view.

PREMISE 3: *B* is such a bad outcome that it is likely to evoke fear in you (the respondent).

CONCLUSION: Therefore, you (the respondent) should not bring about *A*.

The problem with representing the fear appeal argument as cited in (Walton, 2000, 143), is whether premise 3 should make reference to the fear of the respondent, or whether the outcome could be described as one that is so bad or aversive for the respondent that he can be expected to be moved to take steps to avoid it.

The classification of some arguments related to fear appeal arguments shown in figure 3 is a simplified version of the fuller classification system of argument types proposed in (Walton, 2000, 174). Fear appeal arguments, and especially threat appeal arguments closely related to

them, have long been known to be of importance in logic and rhetoric as devices of persuasion that are associated with fallacies and illegitimate argumentation moves.

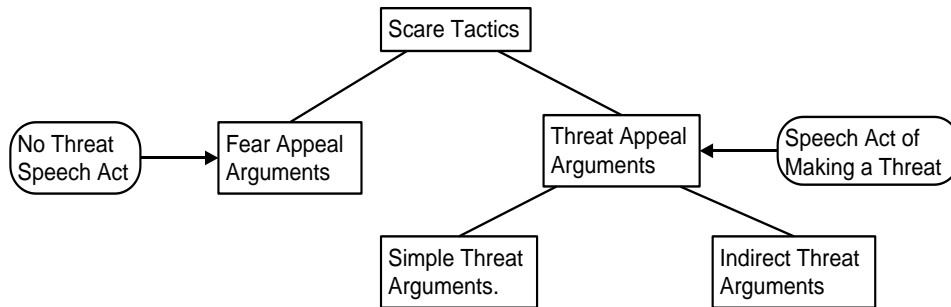


Figure 3: Simplified Classification of Fear Appeal Arguments

In (Walton, 2000, chapter 6) it is shown in a detailed way using many examples of these kinds of arguments drawn from natural language discourse how broad distinction can be drawn between fear appeal arguments and threat appeal arguments. Fear appeal arguments are specifically defined as arguments that do not use a threat to appeal to fear. Threats are identified in the natural language text of discourse using a set of requirements for the presence of the speech act of making a threat. It is this speech act that enables an argument analyst to distinguish between these two kinds of arguments in specific cases. Simple threat arguments occurred in cases where the proponent makes a direct threat to carry out some action that will be highly negative to the respondent if the respondent does not comply. Indirect threat arguments are based on implicature (Grice, 1975). For example, a gangster might say to a shop owner that if the shop owner does not pay protection money to him, terrible things will happen to her, including the burning down of her shop. He warns her that this is a very dangerous neighborhood and that many shops have recently been burned down by dangerous criminals. On the surface the speech act is a warning, but indirectly, under the surface, it is clear to both parties that the proponent is making a threat.

In the system of Bex and Reed (2011), schemes are sorted into three broad categories called schemes of inference, schemes of conflict, and schemes of preference. Inference schemes are used to build arguments, whereas conflict schemes are used to provide counterarguments. Schemes of inference are based on a conditional generalization that supports an inference enabling a conclusion to be drawn. Conflict schemes represent cases in which one argument is used to attack or defeat another argument to which it has been opposed (Bex and Reed, 2011,11). Preference schemes are used to decide which arguments to accept when a choice needs to be made on an ordering of preferences that can be attributed to an audience. Bex and Reed (2011,16) offer the example of the value of promoting equality being preferred to the value of promoting enterprise as the basis of making a decision whether to lower or raise taxes. In making a decision on what to do in a particular set of circumstances, this ordering of values could be used as a basis for drawing the conclusion that the better choice of action is to lower taxes.

In a recent study of argumentation schemes in political argumentation Hansen and Walton (2013) used schemes to classify kinds of arguments put forward by candidates in a provincial election in Ontario. One aim of the study was to find out which kinds of arguments are most commonly used in election campaigns by finding arguments matching a given list of schemes and trying to identify any new kinds of arguments not found on this list. The list, basically

representing the schemes found in the textbook (Walton, 2006), consisted of the following fourteen schemes and a category of ‘none of the above’. 256 arguments were classified, including 95 that could not be classified under the fourteen types of schemes represented on the list. The number of arguments collected under each scheme is indicated on the following list behind the name of the scheme.

1. Argument from position to know (8), 2. argument from expert opinion (4), 3. argument from popular opinion (10), 4. argument from commitment (9), 5. argument from ignorance (0), 6. circumstantial *ad hominem* argument (8), 7. abusive *ad hominem* argument (13), 8. argument from correlation to cause (1), 9. argument from positive consequences (27), 10. argument from negative consequences (47), 11. slippery slope argument (0), 12. argument from analogy (9), 13. argument from sign (21), 14. argument from (verbal) classification (3) 15. can’t classify (95).

Argument from negative consequences was the most common scheme found (representing 29.2% of the arguments). The basic findings can be found in (Hansen and Walton, 2013). The six participants in the study tried to classify each argument collected as fitting one or another of these schemes. After it was found that 37.1% of the arguments collected did not fit any of the fourteen schemes, the original list was supplemented with some other schemes (e.g., the practical reasoning scheme), and two new schemes were proposed. One was a scheme for the argument from fairness (justice). This kind of argument was used when an opponent’s argument or policy was criticized as unfair. The other was called the argument from misplaced priorities, identified in cases where one party accused the other of basing its position or argument on a set of priorities that is the reverse of the proper ordering of these priorities.

In addition to searching the database for schemes, the project also classified the arguments according to the “dialectical role” of the argument. When an argument was used to support a claim put forward by its proponent, the argument was said to have a *positive* dialectical role. When an argument was put forward to be critical of an opponent’s position or proposal, but was only indirectly making a criticism of the opponent, it was said to have a *critical* dialectical role. An argument put forward for the purpose of criticizing the proponent of a position was said to have a *personal* dialectical role. For example, an attack on an opponent’s character would be classified as an argument that has a personal dialectical role. An argument used to reply to misinterpretation of previous argument, or to reply to an accusation, was classified as having a *defensive* dialectical role.

One of the problems encountered by the group was that it appeared difficult to distinguish between cases of argument from inconsistent commitments and cases of the circumstantial *ad hominem* argument. In many cases, as one might easily imagine, one party frequently argued that the other party has gone on record as being committed to a particular action or policy, but is also committed, for example by actions carried out in the past, to the opposite action or policy. This form of argument often took the form of the allegation, “They do not practice what they preach; therefore their argument must be wrong”. But, as one can also easily imagine, this form of argument is commonly connected to a personal attack argument through the allegation that since the opponent does not practice what he preaches, he must be hypocritical, and therefore is not trustworthy. In some cases, there is a fine line between argument from inconsistent commitments and using that form of argument to attack one’s opponent personally.

5. Arguments from Inconsistent Commitments

Two versions of the scheme for argument from commitment were given in (Walton, Reed and Macagno, 2008, 335). The reason for having two versions can best be explained through the use of an example from (Walton, 2006, 117).

Version 1

COMMITMENT EVIDENCE PREMISE: In this case it was shown that *a* is committed to proposition *A*, according to the evidence of what he said or did.

LINKAGE OF COMMITMENTS PREMISE: Generally when an arguer is committed to *A*, it can be inferred that he is also committed to *B*.

CONCLUSION: In this case, *a* is committed to *B*.

Version 2

MAJOR PREMISE: If arguer *a* has committed herself to proposition *A*, at some point in a dialogue, then it may be inferred that she is also committed to proposition *B*, should the question of whether *B* is true become an issue later in the dialogue.

MINOR PREMISE: Arguer *a* has committed herself to proposition *A* at some point in a dialogue.

CONCLUSION: At some later point in the dialogue, where the issue of *B* arises, arguer *a* may be said to be committed to proposition *B*.

Critical questions

CQ1: What evidence in the case supports the claim that *a* is committed to *A*, and does it include contrary evidence, indicating that *a* might not be committed to *A*?

CQ2: Is there room for questioning whether there is an exception in this case to the general rule that commitment to *A* implies commitment to *B*?

Argument from Inconsistent Commitment, a species of argument from commitment, has the following argumentation scheme (Walton, 1998, 252).

INITIAL COMMITMENT PREMISE: *a* has claimed or indicated that he is committed to proposition *A* (generally, or in virtue of what he said in the past).

OPPOSED COMMITMENT PREMISE: other evidence in this particular case shows that *a* is not really committed to *A*.

CONCLUSION: *a*'s commitments are inconsistent.

Argument from inconsistent commitment is also a defeasible form of argument that can be cast into doubt by asking critical questions that delve into the textual details of the given case to judge whether the alleged inconsistency or can be proved to be real, based on the arguer's commitments. For even if the arguer being attacked admits there really is an inconsistency of the alleged sort in his commitment set, he might still be able explain how the conflict can be dealt with and resolved. He may have simply changed his mind on the basis of new evidence he was not previously aware of.

In this example, the Liberal leader, Dalton McGuinty, attacked conservative opponent Tim Hudak (National Post, 07/09/2011), using an argument from inconsistent commitments.

What concerns me is that in his heart of hearts, he was committed to the same kind of policy, through his own private members' bill a year ago. Now he's done a complete reversal, jettisoned his principles and abandoned his values in an effort to play some kind of small politics.

McGuinty is replying to some previous argument of Hudak, and arguing against it, basically by saying that Hudak was committed to the same kind of policy as the one represented by the argument he is attacking now. What we have then is an allegation that Hudak was committed to some particular policy in the past, as shown by some evidence of his private members' bill year ago. The argument goes from there to saying that his new argument is a "complete reversal" of his previous position. So this argument could be called the reversal example. The conclusion of McGuinty's argument is that Hudak's commitments are inconsistent. So far then, the argument fits the argumentation scheme for argument from inconsistent commitment and may be classified as a clear case of argument from inconsistent commitment. The structure of this argument is shown using the Carneades argument map in figure 4.

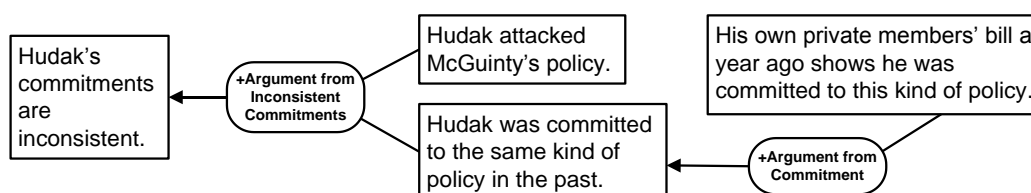


Figure 4: Use of Argument from Inconsistent Commitment in the Reversal Example

The relationship between argument from inconsistent commitments and argument from commitment is shown in figure 4. At the left part of figure 4, we see how argument from inconsistent commitments is used as a pro argument to support the conclusion that Hudak's commitments are inconsistent. And then if we look to the right side of the diagram, we see how one premise of the argument from inconsistent commitments is supported by an argument from commitment.

However, McGuinty takes it a step further. He goes on to make the additional claim that Hudak has "jettisoned his principles and abandoned his values in an effort to play some kind of small politics". This additional part of the argument could be claimed to be an instance of the scheme for the circumstantial type of *ad hominem* argument. The reason for classifying it this way is that the wording suggests that McGuinty is arguing that Hudak's credibility as a sincere person who believes in his own argument has been put into question by the alleged finding that he advocates an argument but is personally committed to the opposite of the conclusion of the argument. Therefore we could say that there is some textual evidence in this example at least suggesting that the argument could properly be classified as an instance of the circumstantial *ad hominem* argumentation scheme.

6. Scheme for the Circumstantial *Ad Hominem* Argument

The problem we now have to confront is that there are several different types of *ad hominem* arguments. The basic scheme for the *ad hominem* is that for the direct type (Walton, 1998, 249).

PREMISE: *a* is a person of bad character.

CONCLUSION: *a*'s argument should not be accepted.

The proponent *a* attacks the respondent's argument by arguing that he is a person of bad character and for that reason his argument should be rejected. The basis of this kind of attack is the assumption a person's argument should depend on his ethical character, especially for honesty and trustworthiness to tell the truth. This simple type of argument is often called the abusive *ad hominem* argument in logic textbooks, a negative term suggesting that all *ad hominem* arguments are fallacious. In fact, they are often reasonable, as in a case where the trustworthiness of a witness is attacked during cross-examination in court.

The circumstantial *ad hominem* argument combines the scheme for the direct *ad hominem* argument with the scheme for argument from inconsistent commitment. What follows is the argumentation scheme for the circumstantial *ad hominem* argument (Walton, 1998, 253).

ARGUMENT PREMISE: *a* advocates argument α , which has proposition *A* as its conclusion.

INCONSISTENT COMMITMENT PREMISE: *a* is personally committed to the opposite (negation) of *A*, as shown by commitments expressed in her/his personal actions or personal circumstances expressing such commitments.

CREDIBILITY QUESTIONING PREMISE: *a*'s credibility as a sincere person who believes in his own argument has been put into question (by the two premises above).

CONCLUSION: The plausibility *a*'s argument α is decreased or destroyed.

It is important here to distinguish between an argument from inconsistent commitment that is not an *ad hominem* argument and one that is. Only the latter should properly be classified as an *ad hominem* argument, according to the analysis defended at some length in (Walton, 1998).

Throughout the long history of the subject (Walton, 1998, 106-111) *argumentum ad hominem* has often been assumed to be identical to argument from inconsistent commitment. However, according to (Walton, 1998) all *ad hominem* arguments, including the circumstantial type, should be classified as species of personal attack arguments. This classification rests on the assumption that all genuine *ad hominem* arguments should contain an attack on the arguer's ethical character. In the scheme for the circumstantial *ad hominem* argument above, the requirement of the credibility questioning premise makes the scheme meet this requirement.

Another example is the circumstantial *ad hominem* argument, which has one premise to the effect that the arguer being attacked is committed to an inconsistency. Thus a part of the circumstantial *ad hominem* scheme is an argument from inconsistent commitments, a type of argument that has its own distinctive scheme. Because the circumstantial *ad hominem* scheme depends on the scheme for argument for inconsistent commitments in this way, we can say that the former scheme is a species of the latter.

This relationship between the two schemes can be illustrated by the reversal example, as shown by the Carneades argument map in figure 5. Along the top of figure 5 the exclusive use of argument from inconsistent commitments is represented. But then using the conclusion of the argument, the proposition that Hudak's commitments are inconsistent, as a premise, the circumstantial *ad hominem* argument is generated by a Gricean inference. This inference is shown at the bottom of the argument map in figure 5. In this argument (the proposition that Hudak's credibility as a sincere arguer who believes in his own argument has been put into question) is shown in a text box having a broken line as a border. This notation indicates that the proposition is an implicit premise, one that has not been explicitly stated by the arguer. It is used as a premise of a circumstantial *ad hominem* argument, as indicated in figure 5.

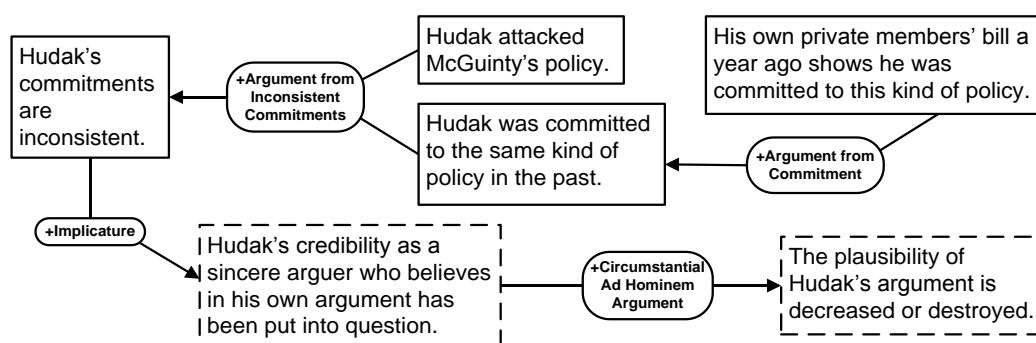


Figure 5: Implicature in the Circumstantial Ad Hominem Argument in the Reversal Example

The problem illustrated by the reversal example is that McGuinty does not actually state that Hudak is a bad person. That is, he does not come right out and state that his inconsistent position shows that he has some ethical character defect. What he says does come fairly close to making that claim though, by innuendo, or what is called Gricean implicature. By saying that Hudak “has jettisoned his principles and abandoned his values”, and playing “small politics”, McGuinty is suggesting that Hudak is not a man of principle, does not stick to his values, and is just trying to get elected rather than saying what he honestly thinks. These suggestions come close to the allegation that Hudak is a hypocrite, someone who does not practice what he preaches. So in this example, and in many like it, we are on a razor’s edge between argument from inconsistent commitments and the circumstantial *ad hominem* argument.

7. Arguments from Negative Consequences

In this example (Toronto Globe and Mail 07/09/2011), McGuinty used argument from negative consequences to argue against a previous argument put forward by Mr. Hudak.

Mr. McGuinty said that under Mr. Hudak, . . . , the province would return to the chaos of life under the Tories [Conservatives] in the 1990s, when schools, hospitals and municipalities were hit with deep funding cuts.

Let’s call this case the chaos of life example. This argument fits the argumentation scheme for argument from negative consequences. The premise is the statement that if the voters select Mr. Hudak, bad consequences of this action will come about. The argument also gives some evidence of the likelihood that such bad consequences will come about, citing a return to the chaos of life that supposedly took place under a previous conservative administration when “schools, hospitals and municipalities were hit with deep funding cuts”. Thus it is fair to conclude that this example is a clear instance of argument from negative consequences.

But some analysts might also want to contend that this example, in addition to being an argument from negative consequences, can also be classified as a fear appeal argument. The reason for taking this viewpoint is that the consequences cited, including chaos of life, and funding cuts to schools hospitals and municipalities, are ones that a lot of people might quite reasonably be fearful about. These negative consequences could be classified as especially fearful for many of those voters in the target audience. For example, they would include job losses. Since these are very bad consequences for the audience to whom the argument was

directed, there would seem to be some grounds for interpreting this argument as one that falls into the category of a fear appeal argument.

Some lessons about how schemes are related can be learned by examining how one of the most commonly occurring schemes, argument from negative consequences, fits in with the schemes for practical reasoning, argument from values, and the scheme for the fear appeal type of argument. In the scheme for practical reasoning, one of the premises cites an agent's goal, and the other premise is the agent's knowing that there is an action available that is a means to carry out the goal. If *A* is the agent's goal, and bringing about action *B* is the means to carry out the goal then the conclusion is that the agent should bring about *B*. In the formulation of the scheme for practical reasoning below, the first-person pronoun 'I' represents a rational agent who has goals, some knowledge of its circumstances, and some awareness of the consequences of its actions (Walton, Reed and Macagno, 2008, 323).

MAJOR PREMISE: I have a goal *G*.

MINOR PREMISE: Carrying out this action *A* is a means to realize *G*.

CONCLUSION: Therefore, I ought (practically speaking) to carry out this action *A*.

There are six basic questions matching the scheme for practical reasoning (Walton, Reed and Macagno, 2008, 324).

CQ1: Are there alternative means of realizing *A*, other than *B*? [*Alternative Means Question*]

CQ2: Is *B* an acceptable (or the best) alternative? [*Acceptable/Best Option Question*]

CQ3: Is it possible for agent *a* to do *B*? [*Possibility Question*]

CQ4: Are there negative side effects of *a*'s bringing about *B* that ought to be considered? [*Negative Side Effects Question*]

CQ5: Does *a* have the goals other than *A*, which have the potential to conflict with *a*'s realizing *A*? [*Conflicting Goals Question*]

Asking the negative side effects critical question casts an argument based on practical reasoning into doubt if the questioner can cite a negative consequence of bringing about *A*. However, instead of merely asking this critical question, a critic could argue that there will be negative consequences of the action based on a premise citing such a negative outcome. This type of response is more than merely asking a question. It is to put forward a counter-argument. There is an argumentation scheme representing this form of argument called argument from negative consequences. It also has a positive form (Walton, Reed and Macagno, 2008, 332), where *A* represents a state that could be brought about by an agent. This scheme is called argument from positive consequences.

PREMISE: If *A* is brought about, good consequences might occur.

CONCLUSION: Therefore *A* should be brought about.

The other form is called argument from negative consequences.

PREMISE: If *A* is brought about, then bad consequences might occur.

CONCLUSION: *A* should not be brought about.

An instance of either form of argument from consequences can be stronger or weaker, depending on how good or bad the stated consequences are, and how likely they are to occur. So we see then that practical reasoning is closely related to both argument from positive consequences and argument from negative consequences. As an intelligent agent moves forward through a given set of circumstances making decisions on which actions to take in order to realize its goals, the agent has the capability to perceive the positive and negative consequences of the actions it has taken. This capability gives an intelligent agent of this sort the additional capability of feedback -

as it moves along engaging in practical reasoning can avoid actions that might have negative consequences and move to carrying out actions that look likely to have positive consequences.

It has often been noted that practical reasoning is limited if it is viewed as a purely instrumental kind of argumentation that does not take values into account. We can also see that arguments from consequences are based on the capability of an agent to take values into account when moving forward and making decisions on how to act in its environment. Therefore, in addition to the purely instrumental basic scheme for practical reasoning above, there also needs to be a value-based variant (Greenwood et al., 2003). The scheme for argument from positive value (Walton, Reed and Macagno, 2008, 321) takes the following form.

PREMISE 1: Value *V* is *positive* as judged by agent *a*.

PREMISE 2: If *V* is *positive*, it is a reason for *a* to commit to goal *G*.

CONCLUSION: *V* is a reason for agent *a* to commit to goal *G*.

The scheme for argument from negative value (Walton, Reed and Macagno, 2008, 321) takes the following form.

PREMISE 1: Value *V* is *negative* as judged by agent *a*.

PREMISE 2: If *V* is *negative*, it is a reason for retracting commitment to goal *G*.

CONCLUSION: *V* is a reason for agent *a* to retract commitment to goal *G*.

Hence value-based practical reasoning can be classified as a composite scheme that combines argument from values with practical reasoning. Argument from consequences can also be classified as a composite scheme that combines argument from values with practical reasoning. These two relationships are essential connections between schemes, whereas there is also a different kind of connection between practical reasoning and argument from negative consequences. Typically, argument from negative consequences is a kind of attack argument that is opposed to practical reasoning, especially value-based practical reasoning.

Arguments from positive or negative consequences are always based on the scheme for value-based argumentation, but in some instances the connection between them is indirect. In the chaos of life example, the explicit use of argument from consequences is backed up by the additional claim that the province will return to the chaos of life under the Tories, as shown in figure 6. But this claim in turn is backed up by the use of argument from negative value. However, the assumptions on which the argument from negative value is based as its premises are both implicit, as indicated by the broken lines around the text boxes of the two premises shown at the bottom of figure 6.

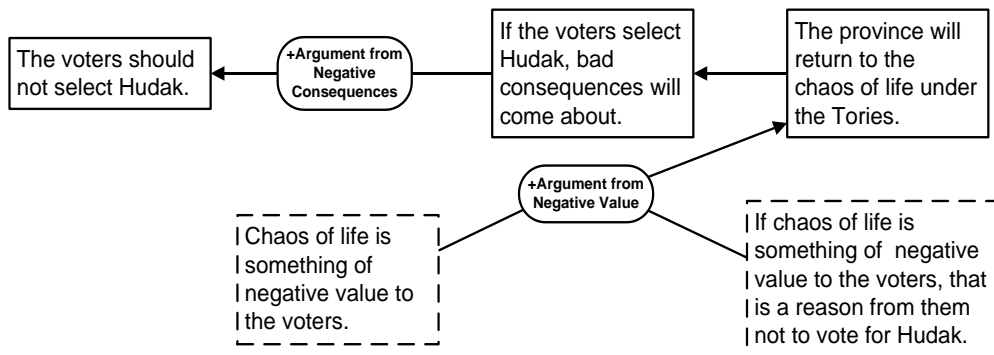


Figure 6: Argument Map of the Chaos of Life Example

Here we have the same kind of problem encountered in the reversal example, where the use of an argument fitting one argumentation scheme backs up another argument fitting another scheme, but where one of the arguments is explicitly given while the other is only implicit.

8. Identification Conditions for Schemes

Research of the kind carried out in CRRAR at the University of Windsor (described in section 4), is using human coders to identify arguments in newspaper articles during elections. This research is continuing, and it has found not only that some particular schemes are especially useful for this purpose, but also that it is necessary to supply the coders with systematic guidance that they can apply to help them identify each scheme. The guidance needs to take the form of dialectical requirements that characterize the kind of situation in which the specific type of argument is put forward as an argument. For this purpose, a set of identity conditions has been tentatively formulated that provides the coders with the set of requirements that each given argument found in the text discourse must meet in order to be properly said to fit a particular argumentation scheme. How to use these identity conditions, and the details of how to formulate them, are matters that are still subject to investigation. Nevertheless, the author has drawn up a set of 25 argumentation schemes, along with a set of identity conditions for each scheme. These may prove useful for those engaging in research on projects of argument extraction from natural language discourse to supplement the resources surveyed in the paper.

To try to make these twenty-five schemes useful for this purpose, and to make them fit together as a set, the notation used in the previous literature on schemes has been modified. All of the schemes except for three are taken from (Walton, 2006, chapter 3) have some changes, mainly to produce a consistent notation that may be easier to use. There is one another exception. The practical reasoning scheme is taken from (Walton, 2006, chapter 8). For the reader's convenience, the page numbers where the original schemes can be found in (Walton, 2006) have been inserted beside the name of each scheme that came from that source.

The new notation is as follows. The variables A, B, C, \dots , stand for propositions, or in some instances we use A_1, A_2, \dots, A_n . The variables a, b, c, \dots , stand for arguers (agents). The variables Arg_i, \dots, Arg_n stand for arguments. The variables E_1, E_2, \dots , stand for events. The variables x, y, \dots , stand for individual objects. The variables F and G stand for properties that individuals can have. Actions are represented by the circumlocution 'agent a brings about A ' where A is the state of affairs brought about, represented as a proposition. For example the action 'Bob killed Ed' is represented as 'Bob brought it about that Ed is dead'. Cases are represented as C_1, C_2 , and so forth. The variable ϕ stands for a policy. The variable ψ stands for a position, defined as a set of an arguer's commitments that hang together into a coherent whole.

Under each scheme a set of conditions is presented for identifying a given argument as matching that scheme. These identification conditions are in some instances requirements that an argument must meet in order to fit a scheme, but in other instances they represent characteristics that are more typical than mandatory. In other words, they try to help the user who is attempting to match a given argument to a scheme by describing the typical sort of situation in which this particular type of argument is used for some purpose in a discussion. In one or two cases, where it might be a problem for the user to identify this kind of argument, an example has been added.

1) ARGUMENT FROM POSITION TO KNOW (85)

a is in a position to know whether *A* is true (or false).
a asserts that *A* is true.
 Therefore *A* is plausibly true.

Identification Conditions: (1) proposition *A* is subject to doubt and the arguer is looking around for some reason to support the claim that there is some evidence to think that *A* is plausibly true, (2) the arguer has some reason to think that source *a* has access to evidence on whether *A* is true or not, and (3) the source *a* is not an expert.

2) ARGUMENT FROM EXPERT OPINION (87)

E is an expert in field *F*.
A is in *F*.
E asserts that *A* is true.
 Therefore *A* is plausibly true.

Identification Conditions: (1) proposition *A* is subject to doubt and the arguer is looking around for some reason to support the claim that there is some evidence to think that *A* is plausibly true, (2) the arguer has some reason to think that agent *a* has access to evidence on whether *A* is true or not, and (3) his reason for (2) is that *E* is an expert who has special training.

3) ARGUMENT FROM GENERAL ACCEPTANCE (91)

A is generally accepted as true.
 If *A* is generally accepted as true, then there is a presumption in favor of *A*.
 Therefore *A* is plausibly true.

Identification Conditions: (1) there is insufficient evidence to be able to objectively prove whether *A* is true or not, based on the knowledge that the arguer has, and (2) there is no expert opinion evidence available to prove whether *A* is true or not, but (3) there is widespread acceptance among peer group or a general population, evidenced by their views or actions, that suggests that they accept that *A* is true.

4) ARGUMENT FROM COMMITMENT (117)

a is committed to *A* according to what *a* said or did.
 Generally, when someone is committed to *A* then they are also committed to *B*.
 Therefore *a* is committed to *B*.

Identification Conditions: (1) the arguer has gone on record as making statements that commit him to some identifiable position on an issue being discussed. For example, he might have gone on record as stating that Lenin and Trotsky are his political role models. (2) This statement, or set of statements, implies some other proposition *B* that is currently being disputed. For example, the discussion might be one about communism, and these statements may strongly suggest that the arguer who made them is a communist, or at least holds a communist political viewpoint.

5) ARGUMENT FROM LACK OF KNOWLEDGE (322)

Proposition *A* is not known to be true (false).

If *A* were true (false), *A* would be known to be true (false).

Therefore *A* is false (true).

Identification Conditions: (1) there has to be some knowledge about *A*, but not enough to prove or disprove *A*, (2) there is enough knowledge so that if *A* were true, then it would be known to be true (3). By default then, since *A* is not known to be true, it can be assumed to be false. For example, suppose we want to know whether there is a direct connection between Detroit and Lugano, and we look at the listing of all flights at the airport monitor in Detroit. We see that no flight is listed between these two cities. We conclude that there is no direct flight between them.

6) ARGUMENT FROM INCONSISTENT COMMITMENTS

a advocates argument Arg_i with *A* as its conclusion.

a's commitments, actions or circumstances show that *a* is committed to not-*A*.

Therefore *a*'s commitments are inconsistent.

7) DIRECT AD HOMINEM ARGUMENTS (123)

a advocates argument Arg_i with *A* as its conclusion.

a is a person of bad character.

a's credibility is put into question by his bad character.

Therefore *a*'s argument Arg_i should not be accepted.

Identification Conditions: there has to be (1) not only an attack on the arguer's character, but (2) this attack has to be used to discredit the arguer's credibility, (3) in order to try to defeat his argument.

8) CIRCUMSTANTIAL AD HOMINEM ARGUMENT (125)

a advocates argument Arg_i with *A* as its conclusion.

a's commitments, actions or circumstances show that *a* is committed to not-*A*.

This inconsistency shows that *a* is a person of bad character.

a's credibility is put into question by the above.

Therefore *a*'s argument Arg_i should not be accepted.

Identification Conditions: there has to be (1) an attack on the arguer's character, but (2) this attack has to be based on an alleged inconsistency among the arguer's commitments and (3) has to be used to discredit the arguer's credibility, (4) and has to be put forward to try to defeat his argument. A highly typical key phrase enabling the identification of many instances of the circumstantial *ad hominem* argument is the expression, 'He does not practice what he preaches' (or some equivalent). The circumstantial *ad hominem* argument is a species of argument from inconsistent commitments.

9) ARGUMENT FROM CORRELATION TO CAUSE (101)

There is a positive correlation between events E_1 and E_2 .
Therefore E_1 causes E_2 .

Identification Conditions: (1) It is in question whether E_1 causes E_2 and (2) the claim that E_1 happened and then E_2 happened (or that this occurred a number of times) is taken as evidence that E_1 caused E_2 .

10) ARGUMENT FROM POSITIVE CONSEQUENCES (106)

If A is brought about, good consequences will occur.
Therefore A should be brought about.

Identification Conditions: (1) A decision about an action, or a proposal for action, is being considered, and (2) pro and con arguments need to be weighed.

11) ARGUMENT FROM NEGATIVE CONSEQUENCES (106)

If A is brought about, bad consequences will occur.
Therefore A should not be brought about.

Identification Conditions: (1) A decision about an action, or a proposal for action, is being considered, and (2) pro and con arguments need to be weighed.

Classifying consequences as good or bad depends on values. Values are thought of as supporting goals (Greenwood et al., 2003). For example, it may be that Alice is enlisting in the army because of her value of patriotism. If a politician knows that Alice has patriotism as a value, he could appeal to this value in arguing persuasively to Alice that she should commit to helping his party win the election.

12) ARGUMENT FROM POSITIVE VALUE (Walton, Reed and Macagno, 2008, 321).

Value V is positive as judged by agent a .
If V is positive, it is a reason for a to commit to goal G or policy.
 V is a reason for a to commit to goal G or policy.

Identification Conditions: (1) The audience to whom the argument is addressed is thought by the arguer to hold a particular value, and (2) appeal to this value is used by the arguer as a means of securing the commitment of the audience to some goal or policy he advocates.

13) ARGUMENT FROM NEGATIVE VALUE (Walton, Reed and Macagno, 2008, 321).

Value V is negative as judged by agent A .
If V is negative, it is a reason for retracting commitment to goal G .
 V is a reason for retracting commitment to goal G .

Identification Conditions: (1) The audience to whom the argument is addressed is thought by the arguer to hold a particular value, and (2) appeal to this value is used by the arguer as a means of removing the commitment of the audience to some goal or policy he advocates.

Argument from values is closely related to arguments from positive and negative consequences. Arguments from positive consequences are species of argument from positive value, and arguments from negative consequences are species of argument from negative value. Argument from values is also closely related to the scheme for practical reasoning.

The simplest form of practical reasoning is called practical inference. Below is the scheme for practical inference (Walton, Reed and Macagno, 2008, 323). In this formulation of the scheme, an agent, represented by the first-person singular pronoun 'I', is deliberating on what to do.

I have a goal G .

Carrying out this action A is a means to realize G .

Therefore, I ought (practically speaking) to carry out this action A .

We can represent this scheme in our new notation as follows.

14) PRACTICAL REASONING

Agent a has goal G

Bringing about A is a means to realize G

So a should bring about A

Identification Conditions: (1) A decision about an action, or a proposal for action, is being considered, (2) pro and con arguments need to be weighed, and (3) an agent is advocating going ahead to carry out a particular action, or policy for action, based on a goal that has been expressed by the agent, or can be attributed to the agent.

This simplest form of practical reasoning is purely instrumental, but there is also an important variant called value-based practical reasoning where goals are based on values (Greenwood et al., 2003).

15) VALUE-BASED PRACTICAL REASONING

Agent a has goal G .

Bringing about A is a means to realize G .

Realizing goal G will promote some value V shared by a and the audience.

So a should bring about A .

Identification Conditions: (1) A decision about an action, or a proposal for action, is being considered, (2) pro and con arguments need to be weighed, (3) an agent is advocating going ahead to carry out a particular action, or policy for action, based on a goal that has been expressed by the agent, or can be attributed to the agent, and (4) the goal is held to be based on values shared by the agent and the audience to whom the argument is directed.

16) SLIPPERY SLOPE ARGUMENT (107)

Bringing about A_1 is up for consideration as a proposal.

Bringing about the first step A_1 will lead by a sequence to the next step, A_2 , and so forth to A_n

There is no well-defined point in the sequence A_1, A_2, \dots, A_n where you can stop it.

A_n is a highly undesirable (dangerous) outcome.

Therefore A_1 should not be brought about.

Identification Conditions: (1) A decision about an action, or a proposal for action, is being considered, (2) pro and con arguments need to be weighed, (3) there is concern about long-term future consequences the action that has been proposed, (4) there is a gradual sequence from some consequences of others that makes up a lengthy chain of steps, and (5) there is general agreement that some outcomes are very dangerous or otherwise extremely worthy of avoidance.

17) ARGUMENT FROM ANALOGY (96)

Generally C_1 (the source case) is similar to C_2 (the target case).

A is true in C_1

Therefore A is true in C_2

Identification Conditions: (1) There is a database representing a set of source cases that have been decided, (2) there is common knowledge of one case with a particular outcome, so that (3) a comparable outcome is argued for in the target case.

18) ARGUMENT FROM SIGN (113)

A is true in this situation.

B is generally indicated as true when its sign A , is true.

Therefore B is true in this situation

Identification Conditions: Either (1) there is a commonly known sequence of pairs of events such that one can normally be expected to happen after another, or (2) there is a best explanation from a given set of facts which forms the basis of the conjecture that this explanation can be drawn as a conclusion on the basis of an intelligent guess. An example of (1) would be the argument that dark clouds are a sign of rain. An example of (2) would be argument Jane has recently found that she has red spots on her skin, therefore Jane has the measles.

19) ARGUMENT FROM VERBAL CLASSIFICATION (129)

x has property F .

Whatever has F can be classified as having property G .

Therefore x has G .

Identification Conditions: (1) An attempt is being made to classify some particular object under an existing verbal classification, and (2) there will be logical consequences drawn from the

classification once it has been made. For example, if something has property of bringing in bringing in oxygen by gills it can be classified as a fish. This object has the property of bringing in oxygen by gills. So this object is a fish.

20) ARGUMENT FROM RULE

If carrying out types of actions including bringing about A is an established rule applying to a , then a must bring about A .

Carrying out types of actions including bringing about A is an established rule applying to a .
Therefore a must bring about A .

Identification Conditions: (1) there is a situation where a decision needs to be made about whether a must bring about A , (2) a expresses doubt whether he needs to bring about A , and (3) a general rule is applied and directed towards the conclusion that a must bring about A .

The simplest form of practical reasoning is called practical inference. Below is the scheme for practical inference (Walton, Reed and Macagno, 2008, 323). In this formulation of the scheme, an agent, represented by the first-person singular pronoun 'I', is deliberating on what to do.

I have a goal G .

Carrying out this action A is a means to realize G .

Therefore, I ought (practically speaking) to carry out this action A .

We can represent this scheme in our new notation as follows.

21) ARGUMENT FROM FAIRNESS

Agents a and b are of the same kind.

Policy ϕ treats a and b equally.

If policy ϕ treats a and b equally, then ϕ is fair.

If ϕ is fair, then ϕ should be carried out.

Therefore ϕ should be carried out.

Identification Conditions: (1) a policy has been put forward that is in place or is being considered, (2) several agents are involved, in the simplest case two, and (3) the argument from fairness is being used to support this policy claiming that it treats the agents equally.

22) ARGUMENT FROM UNFAIRNESS

Agents a and b are of the same kind.

Policy ϕ treats a and b unequally.

If policy ϕ treats a and b unequally, then ϕ is unfair.

If ϕ is unfair, then ϕ should not be carried out.

Therefore ϕ should not be carried out.

Identification Conditions: (1) a policy has been put forward that is in place or is being considered, (2) several agents are involved, in the simplest case two, and (3) the argument from unfairness is an attack on this policy claiming that it does not treat the agents equally.

23) ARGUMENT FROM MISPLACED PRIORITIES

There is a prior argument Arg_i (or position ψ) that shows evidence of a values priority ranking $P_2 > P_1$.

The ordering of the priorities in Arg_i (or ψ) should be that $P_1 > P_2$.

Therefore Arg_i (or ψ) shows misplaced priorities.

Therefore Arg_i (or ψ) should be rejected.

Identification Conditions: it can be assumed (1) that there is an ordering of priority among values, (2) that this ordering of priorities shared by the participants in the argumentation (the protagonists and the audience), and (3) that a particular argument or position that can be attributed to one of the participants is based on a set of priorities that does not fit the accepted ordering.

An example of the sunk costs argument is that of the PhD student who has worked on her thesis for five years, but despairs of graduating and thinks of applying to law school instead. In her deliberations she might look at one side by arguing that she can graduate from law school in a definite time of three years. But on the other side she might argue that she has already sunk so much time and work into her thesis work that she should keep working on it.

The sunk costs argument is based on a notion of revising commitment over time. The argumentation scheme for the argument from sunk costs can be represented as follows, where t_1 and t_2 are temporal variables. B is an alternative outcome to A , meaning that a can bring about A or B but not both. The notation $t_2 > t_1$ means that t_2 is later than t_1 .

24) SUNK COSTS ARGUMENT

a confronts a choice at t_2 between bringing about A or B .

At t_2 a is precommitted to A because of having committed herself to at t_1 , where $t_2 > t_1$.

a should choose A .

Argument from sunk costs is a species of argument from commitment and closely related to argument from negative consequences. But since it is about goals and choices between actions, it is also a species of practical reasoning. In the example, the agent's finishing her thesis is her goal. As the means to finish her thesis, she needs to keep working on it. By practical reasoning then, she draws the conclusion that she should keep working on her thesis. However, the negative consequences are the costs in time and effort of continuing to work on something that may not be going well and so the goal may never be achieved, or if so, the costs may outweigh what is achieved. As this example shows, the sunk costs argument makes sense once it is fitted into the scheme for practical reasoning along with these other schemes. These schemes form a cluster, and further research is needed to model precisely how they fit together.

Identification Conditions: (1) The arguer commits herself to an action at time t_1 , represented as statement A, (2) at a later time t_2 , she is confronted with the decision of whether to carry out this precommitment to A or not, (3) the reason offered in favor of A is the prior commitment to A.

9. Conclusions

In this paper it has been shown how there are four resources that can be used to help work on argument mining using schemes move forward. The first is that the identification conditions formulating requirements for an argument to fit a particular scheme can help a coder to see whether a particular argument fits a scheme. Applying an identification condition is particularly helpful in borderline cases where a given argument might be held to fit one scheme by some coders and a different scheme by other coders. It was suggested in section 8 that to solve these problems the dialectical nature of schemes can be more explicitly recognized by providing, along with each scheme, a set of necessary conditions for an argument in natural language to be fitted to a particular scheme. One can get some clues from the list provided in section 8, and from the incidental discussions and comments given with each scheme and its identity conditions, about how certain schemes are related to others. By this means, some progress has been made in starting the bottom-up research effort of moving toward a classification of schemes by seeing which of the schemes on the list of twenty-five can be fitted as sub-schemes of related schemes on the same list. Clearly, however, there are many loose ends remaining on questions of how each scheme is precisely related to its neighboring schemes. The prior parts of the paper went into more depth on the problems of bottom-up research by fitting some individual schemes together using specific examples of problem cases.

The first type of example studied was that of the scheme for the fear appeal argument, shown to be a species of argument from negative consequences. For an argument in a particular case to be properly classified as a fear appeal type of argument, there must be two parties involved. One party, the proponent of the fear appeal argument, tries to persuade the respondent party to take some course of action by arguing that not taking this course of action will lead to some negative consequences that the proponent thinks the respondent thinks are particularly fearful for him. The problem is whether to classify threat appeal arguments as species of fear appeal arguments, but it was argued that the two schemes need to be thought of as distinct types of arguments because in the fear appeal argument there is no speech act of making a threat essentially involved in the argument. The formulation this typical problem gives guidance on how to tackle the numerous problems of classification suggested by the listing of schemes in section 8.

The second type of example studied in the earlier parts of the paper was that of the circumstantial *ad hominem* argument, and its relationship to argument from inconsistent commitments. It was shown why some bit of text in natural language should not necessarily be classified as an *ad hominem* argument simply because it is a personal attack on some individual. To be an *ad hominem* argument, it has to meet specific criteria. There have to be two parties taking part in a dialogue in which one of the parties has put forward an argument and the other party has attacked that argument by means of attacking the character of the one who put forward the argument. In general, it was proposed in the paper that a dialectical set of requirements of this kind needs to be formulated for each scheme in order to help the coder who is supposed to be identifying arguments in natural language text to judge whether the given argument should properly be taken to be an instance of a particular scheme.

The second resource is the general classification system for schemes. Once specific criteria are set forth for the identification of each argumentation scheme, then some resources are in place for moving forward with work on a classification system for schemes. The first step in this direction has been taken by the provisional identity conditions provided for the list of the twenty-five schemes. The third resource is the use of indicator words, and the other evidential devices used in argument mining technology and computational semantics, to indicate the presence of an argument and to indicate a particular scheme that might fit the argument. The fourth resource is the use of the device of implicature (Grice, 1975) to deal with borderline cases of the kind studied in this paper. This fourth resource is connected to an important notion in logic, that of the enthymeme, an argument having unstated premises or an unstated conclusion. The traditional example is the argument ‘Socrates is a man, therefore Socrates is mortal’, which has the proposition ‘All men are mortal’ as an implicit premise. It would be extremely helpful to argumentation studies if we could build some computational device to help systematically identify implicit premises and conclusions in arguments, but this task has been shown to be much more difficult than it might initially seem to be (Walton and Reed, 2005). What is required is some systematic method of marshaling the textual evidence in a case to provide a basis for determining whether an arguer may justifiably be judged to be committed to a particular proposition. The task of dealing with commitment attribution problems of this sort is related to a traditional fallacy called straw man fallacy, said to occur where a proponent misrepresents a commitment attributed to an opponent, for example by exaggerating it and making it appear to be more extreme it really is, and then uses this exaggerated (straw man) version to refute the opponent’s argument (Walton, 2006, 119).

The problems studied in relation to the first three resources are relatively easy to solve, or at least to see how to move forward on, compared to the less tractable problems posed by trying to deal with enthymemes. An arguer’s commitment is normally determined by examining the corpus of his or her previous argumentation in the dialogue, as far as we have this textual evidence available. So for example, if an arguer has explicitly advocated the acceptance of proposition A, that can be taken as textual evidence that she has asserted A and therefore that she is committed to A. The basis of this inference is the speech act of assertion, which has the following dialogue protocol: if an arguer asserts A then she is committed to A. However in some cases, the evidence for attributing commitment to an arguer is indirect and contextual. The example given in the paper was that of an indirect threat, where the proponent takes pains to avoid making an explicit threat, but nevertheless puts forward an argument from negative consequences that is clearly meant to be a threat to the respondent. In such case, the argument ought properly to be classified as a threat appeal argument, and not merely as an argument from negative consequences. This may be a proper classification even though the proponent strenuously later denies that he was making a threat. This problem takes us into the more general problem of indirect speech acts.

The relative difficulty of the problem of indirect speech acts suggests that it may be prudent to build methods of extracting and classifying arguments in a text at two levels. At a surface level of analysis, an argument is identified and classified only by the explicit textual evidence of its premises and conclusion. At a deeper implicit level, indirect speech acts are taken into account so that a premise or conclusion may be suggested by Gricean implicature (Grice, 1975). Because of the additional difficulties inherent in doing work at the deeper level, some of those working on computational semantics for argument extraction and classification may want to set this level aside or even avoid it altogether. It is a more long-term goal. On the other hand, even

the few examples we have studied in this paper strongly suggest that in at least some highly significant instances, how you classify an argument needs to depend on implicatures. In the end then, computational semantics cannot avoid this difficult problem altogether.

References

- Bex, F. J. and Reed, C. (2011) Schemes of Inference, Conflict, and Preference in a Computational Model of Argument, *Studies in Logic, Grammar and Rhetoric* 23(36), 39-58. May 11, 2012 at <http://www.computing.dundee.ac.uk/staff/florisbex/Papers/slgr11-sch.pdf>
- Feng Wei, V. and Hirst, G. (2011). Classifying Arguments by Scheme. *Proceedings of the 49th Annual Meeting of the Association for Computational Linguistics*, 987-996. Available May 11, 2012 at: <http://ftp.cs.toronto.edu/pub/gh/Feng+Hirst-2011.pdf>
- Gordon, T. F. (2010). The Carneades Argumentation Support System, *Dialectics, Dialogue and Argumentation*, ed. C. Reed and C. W. Tindale. London: College Publications.
- Gordon, Thomas F., Henry Prakken, and Douglas Walton. 2007. The Carneades Model of Argument and Burden of Proof, *Artificial Intelligence* 171: 875–96.
- Greenwood, K. Bench-Capon, T. and McBurney, P. (2003): Towards a Computational Account of Persuasion in Law. In G. Sartor (editor): *Proceedings of the Ninth International Conference on AI and Law* (ICAIL 2003), Edinburgh, Scotland, pp. 22-31. New York: ACM Press.
- Grennan, W. (1997). *Informal Logic*. Kingston: McGill-Queen's University Press.
- Grice, H. P. (1975). Logic and Conversation, *The Logic of Grammar*, eds. D. Davidson and G. Harman. Encino, California: Dickenson, 64-75.
- Hansen, H. V. and Walton, D. (2013). Argument Kinds and Argument Roles in the Ontario Provincial Election, *Journal of Argumentation in Context*, 2(2), 226-258.
- Hastings, A. C. (1963). *A Reformulation of the Modes of Reasoning in Argumentation*, Evanston, Illinois: Ph.D. Dissertation.
- Kienpointner, M. (1992). *Alltagslogik: Struktur und Funktion von Argumentationsmustern*. Stuttgart: Fromman-Holzboog.
- Mochales, R. and Moens, M.-F. (2011). Argumentation Mining, *Artificial Intelligence and Law*, 19 (1), 1-22.
- Mochales-Palau, R. and Moens, M-F. (2007). Study on Sentence Relations in the Automatic Detection of Argumentation in Legal Cases, *Legal Knowledge and Information Systems: JURIX 2007, The Twentieth International Conference*, ed. A. R. Lodder and L. Mommers. Amsterdam: IOS Press, 89-98.

- Moen, M.-F., Mochales Palau, R., Boiy, E. and Reed, C. (2007). Automatic Detection of Arguments in Legal Texts, *Proceedings of the International Conference on AI and Law (ICAIL 2007)*. Stanford: California, 225-230.
- Perelman, C. and Olbrechts-Tyteca, L. (1969). *The New Rhetoric: A Treatise on Argumentation*. Notre Dame: University of Notre Dame Press.
- Prakken, H. (2010). On the Nature of Argument Schemes. *Dialectics, Dialogue and Argumentation*, ed. Reed, C. and Tindale, C. W. London: College Publications, 167-185.
- Rahwan, I., Banihashemi, B., Reed, C., Walton, D. and Abdallah, S. (2011). Representing and Classifying Arguments on the Semantic Web, *The Knowledge Engineering Review*, 26(4), 487-511.
- Reed, C. and Walton, D. (2003). Diagramming, Argumentation Schemes and Critical Questions, *Anyone Who Has a View: Theoretical Contributions to the Study of Argumentation*, ed. F. H. van Eemeren, J. A. Blair, C. A. Willard and A. Snoek Henkemans. Dordrecht: Kluwer, 195-211.
- Reed, C. and Rowe, G. (2005). *Araucaria, Version 3.1*. Available free at <http://www.computing.dundee.ac.uk/staff/creed/araucaria/>.
- Scheuer, O., Loll, F., Pinkwart, N. and McLaren, B. M. (2010). Computer-supported Argumentation: A Review of the State of the Art, *Computer-Supported Collaborative Learning*, 5 (1), 43–102.
- Van Gijzel, B. and Prakken, H. (2012). Relating Carneades with Abstract Argumentation via the ASPIC+ Framework for Structured Argumentation. *Argument and Computation* 3(1): 21-47.
- Walton, D. (1996). *Argumentation Schemes for Presumptive Reasoning*. Erlbaum: Mahwah, NJ.
- Walton, D. (1997). *Appeal to Expert Opinion*. University Park, Pa: Penn State Press.
- Walton, D. (1998). *Ad Hominem Arguments*. Tuscaloosa: University of Alabama Press.
- Walton, D. (2000). *Scare Tactics: Arguments that Appeal to Fear and Threats*. Dordrecht: Kluwer.
- Walton, D. (2006). *Fundamentals of Critical Argumentation*. Cambridge: Cambridge University Press.
- Walton, D. (2010). Similarity, Precedent and Argument from Analogy, *Artificial Intelligence and Law*, 18 (3), 217-246
- Walton, D. (2011). Argument Mining by Applying Argumentation Schemes, *Studies in Logic*, 4(1), 38-64.

Walton, D. and Reed, C. (2005). Argumentation Schemes and Enthymemes, *Synthese*, 145, 339-370.

Walton, D., Reed, C. and Macagno, F. (2008). *Argumentation Schemes*, Cambridge, Cambridge University Press.

Wyner, A., Mochales Palau, R., Moens, F. and Milward, D. (2010). Approaches to Text Mining from Legal Cases. E. Francesconi et al. (Eds.), *Semantic Processing of Legal Texts*, LNAI 6036, Springer-Verlag: Berlin, 60-79.