BUILDING A SYSTEM FOR FINDING OBJECTIONS TO AN ARGUMENT

Abstract

This paper addresses the role that argumentation schemes and argument visualization software tools can play in helping to find and counter objections to a given argument one is confronted with. Based on extensive analysis of features of the argumentation in these two examples, a practical four-step method of finding objections to an argument is set out. The study also applies the Carneades Argumentation System to the task of finding objections to an argument, and shows how this system has some capabilities that are especially useful.

0. Introduction

This paper uses two examples to show how argumentation schemes and argument visualization tools can be applied to the task of assisting an arguer to find objections to an argument. There are various reasons an arguer might find automated help useful with this kind of task. For example, a lawyer might want to be prepared to answer some of the most serious rebuttals that could be posed by the opposing side even before he is confronted with one or more of these attacks during the trial itself. An instructor in a critical thinking course might want to improve a student's essay writing skills by teaching him how to anticipate objections to an argument, and to respond to these objections, as part of the argumentation in her essay. A marketing firm launching an advertising or sales campaign might want to lay out an argumentation strategy that responds to serious objections or doubts that the target audience would be most likely to have. Someone getting to ready to make a proposal in a business meeting might want to be aware of, or even have answers ready for, rebuttals or critical questions that are likely to be raised against her proposal.

The problem of finding objections to an argument might not be thought to require the application of automated argumentation tools to help find a good objection or counter-argument to respond to a previous argument one has been confronted with. It might seem initially that most of us already do this very well in an intuitive way, and that therefore there is no need for any automated procedure or diagrammatic method for searching through a database of arguments that one might use as rebuttals and choosing the most applicable one. An opponent can sometimes think of many clever and unusual ways to attack an argument, and it appears unlikely that all of these ways could be identified by any systematic method. However, it is shown in this paper how applying an automated argumentation system can be useful as a preliminary step to help an arguer in the task of finding objections to an argument by enabling him to find flaws in the argument that can be corrected. It is shown how the four-step practical method of the paper fits into the Carneades research program of building automated argument assistants.

One reason for using argument diagrams is that the additional mental demands of diagram creation may lead to more rigorous and well-conceived arguments, because strengths and weaknesses are easier to see (Kirschner et al., 2003). Scheuer et al. (2010) have provided a survey of software tools designed to support argumentation and to help teach argument skills. It is shown in this paper why the Carneades Argumentation System

provides the best theoretical framework for building a computational system for finding objections to an argument. This system and its argument visualization tool are easily available at no cost, it supports argumentation schemes, and it has special capabilities (explained in section 8) that enable it to deal most effectively with the two examples analyzed in this paper. One feature shown to be most valuable is the capability of representing the critical questions matching an argumentation scheme as different kinds of premises on an argument diagram. Using the Carneades argument visualization tool for constructing argument diagrams, a four-step practical method of anticipating objections to an argument is set out as a systematic procedure, and it is shown how the Carneades Argument System provides a formal and computational framework for the future project of implementing the four-step practical method in the system as an automated argument assistant.

1. Definition of Terms

The terms ‘refutation’ and ‘objection’ are sometimes used interchangeably with the term ‘rebuttal’. The term ‘rebuttal’ is most often associated with Toulmin’s use of it in his book, *The Uses of Argument* (1958). Toulmin distinguished the following components of an argument: the data (premises), the conclusion, the warrant, the backing and the rebuttal (Hitchcock and Verheij, 2006). However, Verheij (2008, 20) has shown that ‘rebuttal’ is an ambiguous term in Toulmin’s usage. Govier (1999, 229) considers an objection to be something raised against a prior argument. She classified five types of objections (231), including attacks against the arguer, and arguments against the arguer’s personal characteristics (or circumstances). Krabbe (2007, 55-57) listed seven ways an opponent can raise an objection to a proponent’s expressed argument, including personal attack as a common kind of critical reaction that provides a means of defense against unreasonable moves by one’s opponent.

The following provisional tree of definitions is proposed in (Walton, 2009). Objection is the widest category, including procedural objections. An objection does not have to be an argument. A rebuttal is a species of objection, and is defined as an argument directed against another argument to show that the first argument is questionable, or that it is not supported by the evidence, or that the evidence shows it is untenable. A rebuttal can attack a premise of the original argument, it can attack the conclusion, or it can act as an undercutter that attacks the inference from the premises to the conclusion. A refutation is defined as a species of rebuttal that is a knock-down counter-argument showing that the original argument has to be given up. Objections of irrelevance and the asking of critical questions in response to the original argument are taken to be borderline cases in (Walton, 2009) requiring further study. One reason given is that asking a critical question to an argument should not be classified as a rebuttal or refutation. It is added however that this part of the classification is controversial, and that the definitions offered above are meant to be defeasible. They are not meant to be essential definitions of the kind that are meant to be fixed for all time. They merely give us starting points as hypotheses so that the investigation in the paper can follow a clear and consistent path and reduce the terminological quibbles that have hampered this kind of study in the past.

To sum up, in this paper, a refutation is defined as a successful rebuttal, an opposed argument that is useful for refuting the argument it was aimed at. A rebuttal is

specifically an argument directed at another argument, but there are other kinds of objections that might not fit into this category. A rebuttal is defined as a species of objection. Hence objection is taken to be a wide notion that includes both rebuttal and refutation.

Proleptic argumentation refers to the anticipation and answering of an objection or opposed argument before one's opponent has actually put it forward (Walton, 2008). The word 'prolepsis' which derives from the Greek word *prolambanein* (to anticipate) has four meanings in conversational English. The first is a figure of speech in which a future event is referred to before it happens, e.g. "If you tell the cops, you're a dead man". The second is the use of a word in anticipation of the circumstances that would make it applicable, e.g. in the sentence 'They drained the lake dry', the term 'dry' only applies after the lake has been drained. The third is a technical usage in ancient philosophy of the Stoics to indicate a preconception. The fourth meaning is that of the anticipation and answering of an objection to an argument before one's opponent has put it forward. It is this fourth meaning that we have in mind in this paper, but we will define it in a narrower sense taken to be useful for argumentation studies. Proleptic argumentation, in this technical sense, will be taken to refer to an argument that already contains a reply to some potential objection that might undermine or attack it, or at least raise doubts about the acceptability of the argument, even before the objection has been stated.

The expression 'proleptic argumentation', defined in this special way, we will argue in this paper, is a dialectical notion. That is, it requires a structure in which pro and contra argumentation is being put forward two parties, each of whom has a role as proponent or respondent in a goal- directed framework in which both follow the general Gricean conversational rule to make contributions that will help to move the conversation along towards its common goal. Such a dialogue is a sequence of moves $m_1, m_2, \ldots, m_n$ where the two speech partners take turns. The key to grasping the dialectical structure of proleptic argumentation is that the normal order in which the proponent always makes move m_x and the respondent makes move m_{x+1} is violated. In proleptic argumentation, the proponent inserts a proleptic twist by making her own argument move but at the same usurping the respondent's role by anticipating and countering his counter-move in advance. She is getting two moves for the price of one, so to speak. This twist is tricky, and can certainly be a source of misunderstandings and errors, but in principle is legitimate in everyday conversational argumentation. It might not be allowed in some contexts, for example in a court of law, but such moves are generally permissible in everyday conversational argumentation, as the examples below will show. The problem addressed in this paper is how to refine the technique using tools and concepts of current argumentation theory so that it could be part of a more general method of anticipating, finding and countering objections.

Four methods of proleptic argumentation have already been identified in (Walton, 2008). The first method is to fit the argument you are putting forward to an argumentation scheme that will enable you to identify the basic weak points that an opponent could use to attack the argument using the set of critical questions matching the scheme. The second method is from the literature on argumentation showing that some schemes are opposed to others. As an example, six standard counter-arguments to use when confronted with a slippery slope argument have been identified (Walton 1992, 259-264). The first is to argue that the negative consequences claimed to follow arguably

don't follow. The second is to argue that events in the future are uncertain. The third is to modify the goal to reduce or eliminate the negative consequences. The fourth is to argue that there are positive consequences that counterbalance the supposed danger of the bad outcome claimed in the slippery slope argument. The fifth is to opt for an alternative means of achieving the goal that reduces the danger claimed. The sixth is to argue that not taking the action at issue would have negative consequences and perhaps even be a worse danger. The literature on argumentation schemes (Walton, Reed and Macagno, 2008) and fallacies provides a handy supply of resources to apply this method. The third method is based on the concept of commitment from the work on formal dialogue structures (Walton and Krabbe, 1995). As each party makes a move, propositions are inserted into or retracted from his commitment set, providing a database that can help the proleptic arguer to see how to attack his counter-arguments, even before she puts them forward in the dialogue. The fourth method is to practice your argument on an intellectual opponent who is opposed to your standpoint in order to see what kinds of objections she makes. The fourth method may be the best one, but the problem is that it requires time and a willing and capable argumentation partner to implement it.

2. Two Examples

The basis of the method that will be built in this paper is to fit the argument you are putting forward to an applicable argumentation scheme that will enable identification of the premises and conclusion of the argument and categorize it as belonging to a certain type. Once the argumentation scheme has been identified, the basic weak points that an opponent could use to attack the argument are pinpointed by the set of critical questions matching the argumentation scheme. For example, suppose you are arguing that your respondent should take a certain medication to solve a health problem that she has. The argumentation scheme in such a case is that for practical reasoning. When you put forward an argument based on practical reasoning you are arguing to your respondent as follows: you have a goal, or want to solve a problem; this action I am proposing will help you to attain that goal, or will solve the problem; therefore you should carry out this action. This simplest form of practical reasoning is called practical inference. Below is the scheme for practical inference (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: I ought (practically speaking) to carry out this action *A*.

Many arguments for health products fit this scheme. For example, an ad for a medication for diabetes (*Newseek*, Nov. 26, 2007, 25) has the headline: "ACTOS has been shown to lower blood sugar without increasing their risk of having a heart attack or stroke". The argumentation in this ad presents ACTOS as a way for the reader who has type 2 diabetes to solve the problem of lowering his or her blood sugar. It says: you have the goal of lowering your blood sugar; taking ACTOS is a means to realize this goal; therefore you should take ACTOS. Hence the argumentation in this ad fits the scheme for practical inference. The ad also responds to critical questions.

Once you have identified the scheme by examining the list of critical questions matching the scheme, you can identify which basic objections are likely to be brought

forward against your argument. Below is the set of critical questions matching the scheme for practical inference (Walton, Reed and Macagno, 2008, 323).

CQ_1: What other goals do I have that should be considered that might conflict with *G*?

CQ_2: What alternative actions to my bringing about *A* that would also bring about *G* should be considered?

CQ_3: Among bringing about *A* and these alternative actions, which is arguably the most efficient?

CQ_4: What grounds are there for arguing that it is practically possible for me to bring about *A*?

CQ_5: What consequences of my bringing about *A* should also be taken into account?

The last critical question, CQ_5, is very often called the side effects question. It concerns potential negative consequences of a proposed course of actions.[1] In this instance, one of the side effects of taking this particular medication would be to increase the risk of having a heart attack or stroke. To anticipate the possibility of the reader raising this critical question, the argumentation in the ad states that the medication can lower blood sugar without the risk of either of these possible side effects. Because it anticipates these objections and responds to them during the argument itself, this ad is an excellent example of proleptic argumentation (the anticipation and answering of an objection or opposed argument before one's opponent has actually put it forward).

The following example has been reconstructed from a *Newsweek* article on health matters (Kalb, 2008) to represent a common kind of argument on the issue of physicians giving advice about nutrition and diet to their patients, where it may be suspected by the patient that the physician is not following his own advice.

> You have an appointment with your doctor for a discussion following your physical examination. The doctor tells your cholesterol and blood pressure readings are higher than normal. He tells you that you are overweight, that being overweight is unhealthy, and that therefore you should take up a program of exercising, diet and weight loss. He counsels you on how to eat more nutritious meals. He gives you a lecture on exercise and healthy nutrition. However, you observe that he appears to be quite overweight himself, and you recall that you had seen him yesterday evening eating corn dogs and fried dough at the beach.

In such a case, a certain typical kind of worry would normally occur to the patient who is in this situation as described. He is concerned whether the physician is giving good advice. He thinks that possibly the advice being given might help to correct his own problem of being someone overweight, as indicated by his cholesterol and blood pressure readings. On the other hand, there are two observations the patient has made: (1) the physician appears to be quite overweight, and (2) the physician was observed eating corn dogs and fried dough at the beach. These observations appear to be problematic for the patient, because he sees them as being somehow at odds the advice that the physician is giving it to him. It appears that the physician is not following his own advice.

The physician tells the patient that his goal should be to reduce weight. The reason he gives why the patient should adopt the goal is that being overweight is unhealthy for him. The argument he uses to back up this claim is evidence that the patient's cholesterol and blood pressure readings are higher than normal. Using practical reasoning the physician puts forward the argument to the patient that the means he should adopt to reduce weight

[1] For this reason it is closely connected to another scheme called argument from negative consequences.

is to take up a program of weight loss. The conclusion of this practical inference is the statement that the patient should take up a program of weight loss. The sequence of practical reasoning continues with an additional premise stating that part of the weight loss program is to eat nutritious meals. This is the conclusion drawn from the practical reasoning, the statement that constitutes the doctor's advice to the patient. Looking at it purely as a sequence of practical reasoning, the doctor's argumentation seems highly reasonable. If indeed the patient's cholesterol and blood pressure are higher than normal, the doctor's conclusion that he should do something about his weight problem by eating nutritious meals is good practical reasoning based on relevant evidence. In itself, it is a good argument, but looking at it from another viewpoint, the patient's reaction also seems reasonable.

The doctor tells the patient that he should take up a program of exercising, diet and weight loss. The basic structure on which this argument is built is the argumentation scheme for argument from expert opinion. The doctor is an expert. He is giving the patient advice to carry out some action. Hence the conclusion is that he should carry out this action, based on the doctor's expert opinion as a trained physician. The relevant argumentation scheme for argument from expert opinion (Walton, Macagno and Reed, 2008, 310) is presented below.

MAJOR PREMISE: Source *E* is an expert in subject domain *S* containing proposition *A*.
MINOR PREMISE: *E* asserts that proposition *A* is true (false)
CONCLUSION: *A* is true (false)

But you have some critical questions. The facts you observe are that the doctor appears to be quite overweight and that he was seen eating corn dogs and fried dough at the beach. These observations suggest a critical question. If the doctor is not following his own advice, how personally reliable is he as a source for expert opinion? Below are the standard critical questions matching the scheme for argument from expert opinion

CQ_1: *Expertise Question*. How credible is *E* as an expert source?
CQ_2: *Field Question*. Is *E* an expert in the field that *A* is in?
CQ_3: *Opinion Question*. What did *E* assert that implies *A*?
CQ_4: *Trustworthiness Question.* Is *E* personally reliable as a source?
CQ_5: *Consistency Question.* Is *A* consistent with what other experts assert?
CQ_6: *Backup Evidence Question.* Is *E*'s assertion based on evidence?

The key question from the list above is the trustworthiness question (CQ_4).

Based on the two premises that the doctor is overweight and that the doctor himself is not eating nutritious meals, the patient draws the conclusion that the doctor is not following his own advice. As evidence for the premise that the doctor himself is not eating nutritious meals, the patient cites his observations of the doctor eating corn dogs at the beach. The patient's reaction to the doctor can be seen as a kind of counter argument that results in the patient's drawing a conclusion to have some doubts about the sincerity of the physician's advice. This amounts to the following argument. The doctor tells me that I should take up a program of exercising, diet and weight loss. He is telling me to eat more nutritious meals, as part of his advice. But it can be inferred from my two observations about his actions that he himself is not eating nutritious meals. So judging from his appearance of being overweight, it would appear implausible that the doctor himself has taken up a successful program of exercising, diet and weight loss. If he can't follow his advice when he is in a situation that is evidently similar to mine, this may be

evidence that his advice is insincere. The patient may not doubt the worthiness of the doctor's argument as a sequence of practical reasoning based on medical evidence. The patient's doubts concern the believability of the doctor's argument in light of his apparently contrary actions.

The overweight doctor example is an intriguing argument, when you start to reflect on how the numerous patients confronting this sort of situation might react in different ways. One reaction might be to scoff at the inconsistency, reject the doctor's advice as hypocritical, and discount it altogether. This could be a fallacious reaction, as the doctor could be giving perfectly good advice, based on the best scientific data currently available on medical problems caused by dietary fat and clogged arteries. On the other hand, questioning the doctor's sincerity, his reliability as an expert, and even his personal knowledge of the facts of the problem, can be quite legitimate responses to the argument. According to a survey of physicians published in the *Nutrition Journal*, as reported by Kalb (2008, 17), many doctors still don't know that olive oil and canola are "good" fats. These statistics show that while on the whole, doctors in North America are healthier than their patients, 44% of male doctors are overweight and 6% are obese. Hence the kind of situation depicted in the overweight doctor example might not be all that uncommon for patients, given the scope of the current problems with diabetes, heart disease and cancer that appear to be arising from poor health habits. A legitimate reaction might be for the patient confronting a situation in the overweight doctor type of example to question whether, even though the doctor may be giving good advice, he really knows what he is talking about. The question here is about personal knowledge concerning the relevant scientific findings about exercising, diet, weight loss and diseases.

The kind of inconsistency that the patient perceives as attributable to the doctor's argument in this example is not logical inconsistency, but a kind of practical inconsistency. It appears that the doctor is not practicing what he preaches. It is assumed here that actions can imply commitments, and that the commitments implied by an action can be inconsistent with other commitments an agent already has in his commitment store. In the literature on argumentation, this kind of action-derived inconsistency can be explained as a set of inconsistent commitments in a deliberation dialogue in which two agents are trying to decide what to do (Walton, 1997). For example, if the one agent is giving advice in the form of a proposal for action to the other on matters that affect both, but the first agent shows in his own actions that he is not following this advice himself, this can pose a problem for the second agent. The finding of a practical inconsistency between another party's argument and his personal actions can suggest skeptical doubts about the sincerity of the other party in maintaining his own argument.

The general situation in the overweight doctor case is this. An arguer advocates a certain claim or position, but then judging by his own personal circumstances, the way he is acting runs contrary to this position or claim. When such a practical inconsistency can be found in relation to an argument put forward in a given case, it means that the argument is open to a certain characteristic type of rebuttal called argument from inconsistent commitment. The argumentation scheme for this type of argument is closely related to the scheme for practical reasoning.

3. Two Additional Argumentation Schemes

Next we need to take a look at the scheme for argument from inconsistent commitment (Walton, 2006, 120).

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.

This scheme appears to fit the overweight doctor example, because the evidence cited in the patient's observations suggest that even though the doctor has claimed that he is committed to weight loss, other evidence in the case shows that he appears not to be personally committed to his own weight loss. The conclusion drawn is that the doctors set of commitments are inconsistent.

Now the question is how this argumentation scheme could be used somehow to indicate a plausible rebuttal that the doctor's argument might be open to. To begin to answer this question, we observe that there is a second set of critical questions that can be used to attack the weak points in any argument from inconsistent commitment. The following set of critical questions matching this scheme (Walton, 2006, 121).

CQ_1: What is the evidence supposedly showing that *a* is committed to *A*?

CQ_2: What further evidence is alleged to show that *a* is not committed to *A*?

CQ_3: How does the evidence from premise 1 and premise 2 prove that there is a conflict of commitments?

The problem is that this argumentation scheme and its matching set of critical questions take us only so far in suggesting how the patient might attack or rebut the overweight doctor's argument by some systematic means. The evidence from the premises of the scheme certainly does suggest the conclusion that there is a conflict of commitments. But what, in turn, can we infer from that hypothesis?

To take the argument further, we need to observe that what the inconsistency of commitments suggests to the patient is that the doctor is not personally following his own advice. This inference, in turn, suggests that the doctor may be insincere, hypocritical, or exhibit some kind of failure of trustworthiness that suggests he is not a reliable source. After all, if he's not following his own advice, the question is raised whether he sincerely believes himself in the worthiness of this advice. These remarks about the trustworthiness of the ethical character of the doctor lead us to another argumentation scheme, based on the argument from inconsistent commitment, the circumstantial *ad hominem* argument. The scheme representing this form of argument is given below (Walton, 2006, 125-126)

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.

Applying this scheme to the overweight doctor case, we see that in addition to the argument premise and the inconsistent commitment premise, there is a third premise that applies to the case. The applicability of these two premises to the case indicates that the

doctor's credibility as a sincere person who believes in his own argument has been put into question. The conclusion drawn is that the plausibility of the doctor's argument about nutrition and weight loss is decreased or destroyed. Critical questions for the circumstantial *ad hominem* argument are given below.

CQ_1: Is there a pair of commitments that can be identified, shown by evidence to be commitments of *a*, and taken to show that *a* is practically inconsistent?

CQ_2: Once the practical inconsistency is identified that is the focus of the attack, could it be resolved or explained by further dialogue, thus preserving the consistency of the arguer's commitments in the dialogue, or showing that *a*'s inconsistent commitment does not support the claim that *a* lacks credibility?

CQ_3: Is character an issue in the dialogue, and more specifically, does *a*'s argument depend on his/her credibility?

CQ_4: Is the conclusion the weaker claim that *a*'s credibility is open to question or the stronger claim that the conclusion of α is false?

These argumentation schemes are defeasible, meaning they represent arguments that can be defeated as new information comes into any case that might provide counter-evidence. Moreover, each scheme has a list of critical questions that guide a critic who needs to find potential weak points in the argument that could be the basis for objections or counterattacks. Moreover, since the arguments and their appropriate argumentation schemes can be represented on an argument diagram, the question is raised whether representing a given argument with an argument diagram could be a useful first step in anticipating and finding objections to the argument. These argumentation systems are conventionally used to diagram the structure of an existing argument found in a text of discourse. However, as noted by Buckingham Shum et al. (1997), the mental demands of diagram creation may not only lead to better arguments, but also make it easier to see the weaknesses in arguments (Buckingham Shum et al., 1997), and this could be a way to find objections to them.

4. The Carneades Argumentation System

Carneades is an argument mapping application, with a graphical user interface, and a software library for building applications supporting various argumentation tasks (Gordon, 2005).[2] Carneades provides tools supporting a variety of argumentation tasks, including argument visualization, argument evaluation, proof standards, distributions of burden of proof, argument construction from defeasible rules, precedent cases, ontologies and testimonial evidence, and finally, argument interchange in XML (Gordon, Prakken and Walton, 2007). Any number of schemes may be used together, making Carneades an open architecture for reasoning in which several parties can share data and reason together to solve a problem. Carneades is the first argument mapping tool with an integrated inference engine for inventing arguments from knowledge-bases.

Carneades can use heuristic strategies to search a space of arguments induced by argumentation schemes (Gordon, 2010). Argumentation schemes in the Carneades model

[2] The graphical user interface of Carneades is being developed as an open source technology that is available as freeware from this site: http://carneades.github.com/

function as heuristic search procedures that apply statements from a data base to find arguments pro or con a claim at issue. The arguments that turn up in the resulting stream are alternative ways that can be used to prove the claim. Carneades provides an integrated dialectical framework enabling a variety of legal argumentation schemes, such as argument from expert opinion and practical reasoning to be used together in a comprehensive system supporting argument construction and evaluation.

If we look back to the argumentation scheme for practical reasoning presented in section 1, we see that there are five critical questions matching this scheme. The fifth critical question asks what consequences of bringing about the action in question should be taken into account. As noted, this question often concerns potential negative consequences of the proposed course of action, and then it is called the side effects question. Carneades models critical questions by classifying premises of an argumentation scheme into three subtypes, ordinary premises, assumptions and exceptions (Gordon and Walton, 2006). The ordinary premises are the ones explicitly stated in the scheme. For example, in the scheme for practical inference, the two ordinary premises are the major premise that I have a goal and the minor premise that carrying out the action in question is a means to realize the goal. The ordinary premises must be proved to hold. Assumptions are additional premises that hold without proof until they have been questioned, after which they must be proven in the same as ordinary premises. They are assumed to be acceptable unless called into question. Exceptions are modeled as premises that hold unless they are proven with evidence to back them up. An argument can be undercut by proving one of its exceptions.

Assumptions and exceptions can be classified as proleptic premises, because they anticipate an objection made in the form of asking a critical question, and they respond to this objection in advance by setting a premise in place that, if true, would rebut the objection. Assumptions and exceptions are two different ways of adding a premise in proleptic argument that anticipate a potential objection to the argument by anticipating a critical question (Gordon, Prakken and Walton, 2007). But the assumption premise does this in a different way from the exception premise. The assumption premise is an additional kind of assumption that, when added to the set of ordinary premises in a scheme, makes the argument even more plausible by building in an anticipation of a possible objection. It works like an extra premise that takes a critical question into account. The exception premise anticipates another kind of objection that does not detract from the plausibility of the simple form of the argument until it has been backed up with some evidence that supports it. Because it anticipates the possibility of this kind of objection it supports the simple form of the argument and makes it stronger.

The way each type of premise is used in a given argument is different because they respond to different ways of attacking an argument. One way is to cast doubt on an ordinary premise by making an objection to it, by questioning whether it is true, or even posing a counter argument against it. Another way is to make an objection by asking a critical question that does not deny any of the ordinary premises, but casts other supplementary parts of the argument into doubt in a way that would weaken the argument if asked. Thus assumptions and exceptions both represent kinds of premises that are additional to the simple form of the argument, and that are inherently proleptic in nature. The two other kinds of premises represent ways of anticipating a critical question matching the argumentation scheme for the argument. The first way is to put forward an

assumption as an additional premise. In the case of an argument from expert opinion, the statement that the expert is credible as an expert source is an assumption, and the statement that the expert's assertion is based on evidence is also an assumption. The second way is to put forward an exception as an additional premise. In the case of an argument from expert opinion, the statement that the expert is personally reliable as a source is an exception. The statement that what the expert says is consistent with what other experts say is also an exception.

5. Analyzing the ACTOS Example Using Carneades

How Carneades can be used to represent some features of the argumentation in the ACTOS example can be indicated by examining the argument map shown in figure 1. Each premise and conclusion in the sequence of argumentation is shown as a proposition in a text box. The nodes represent the arguments. A pro argument is represented by a node with a plus sign inside it. A contra argument is represented by a node with a minus sign inside it. An explicit premise or conclusion is shown inside a white box. An implicit premise or conclusion is shown inside a darkened box. This argument is an instance of an enthymeme, an argument with an unstated premise or conclusion that needs to be articulated and inserted before the argument can be properly analyzed (Reed and Walton, 2005). Information about the argumentation scheme fitting the argument is shown as contained in the node. For example in figure 1 the argumentation scheme for practical reasoning is indicated, as well as the one for argument from negative consequences.

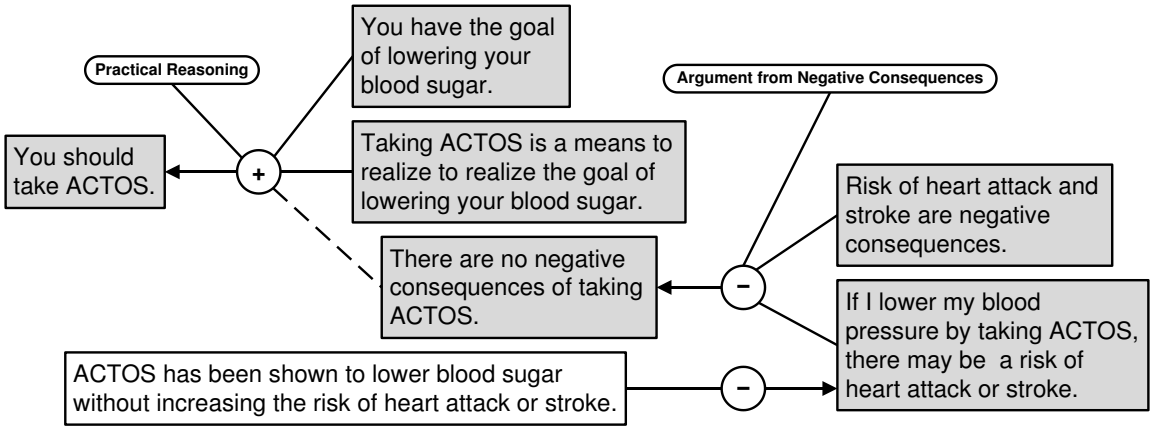

Figure 1: Carneades Argument Map of the ACTOS Example

In the representation of the argument shown in figure 1, the implicit conclusion that you should take ACTOS appears in the text box at the left. The node with the + in it represents a linked argument structure in which the three premises shown just to the right of the node support the conclusion. To say that the argument is linked means that all the premises work together to support the conclusion. In this instance, the linkage is provided by the scheme for practical reasoning. The premise at the top states a goal, the goal of lowering blood sugar. The premise in the middle states a means to the goal, namely taking ACTOS. The premise at the bottom is an exception, indicated by the broken line (going from the text box in which the proposition that there are no negative consequences

of taking ACTOS appears) to the conclusion. This means that the practical reasoning scheme along with the first two premises supports the conclusion that you should take ACTOS unless the exception applies that there are negative consequences of taking ACTOS. In this particular instance however, as shown by the two premises in the two darkened text boxes to the right, the exception is supported by evidence. As we can see on the argument map, the premise that there are no negative consequences of taking ACTOS is attacked by a contra argument that there are such negative consequences. The scheme applicable to this argument is the one for argument from negative consequences.

The especially interesting thing about this particular argument is that this contra argument is attacked by another contra argument presenting evidence that these negative consequences do not occur with ACTOS. This evidence is presented in the text box in which we find the proposition that ACTOS has been shown to lower blood sugar without increasing the risk of heart attack or stroke. So here we have a structure of argumentation that could be described as a refutation of a refutation.

This approach throws new light on the relationship between critical questions and premises. It is of interest generally for the theory of argumentation, and has implications for all argumentation schemes. It is also of practical interest, because it shows how critical questions can be differentiated with respect to how the shift in the burden of proof works in relation to different kinds of premises. It is also of practical interest because it gives us a method of representing critical questions as premises of an argument that can be visualized on an argument diagram. It therefore shows us how argument diagrams can be more systematically used to visualize the structure of rebuttal argumentation.

Carneades can help a user to search for new arguments to support his claim or attack a competing argument that might refute the claim. Carneades has a database from which premises can be drawn and an information service that continually supplements the database by providing new information. For example, suppose I want to build a stronger argument that will attack and possibly even defeat an opposed argument. Carneades has an argument assistant that can be used for this purpose (Ballnat and Gordon, 2010).The argument assistant answers the question ‘What should be my next goal?’, where a goal is a position (a set of statements) that an arguer can work on next by looking for arguments that support the proposition he wants to prove. Carneades looks for the best position by searching through all the statements and arguments in the argument graph in order to provide a basis for selecting which one should the arguer should choose to work on next.

6. Analyzing the Overweight Doctor Example

The argumentation in the overweight doctor example is shown in figure 2. You can see the structure of the argument from expert opinion has a linked argument at the top, based on the argumentation scheme for argument from expert opinion and the explicit premise that the doctor tells me that I should eat nutritious meals. The premises that the doctor is an expert in medicine and advice on nutrition falls into the field of medicine are marked as implicit premises by the shading inside the two text boxes.

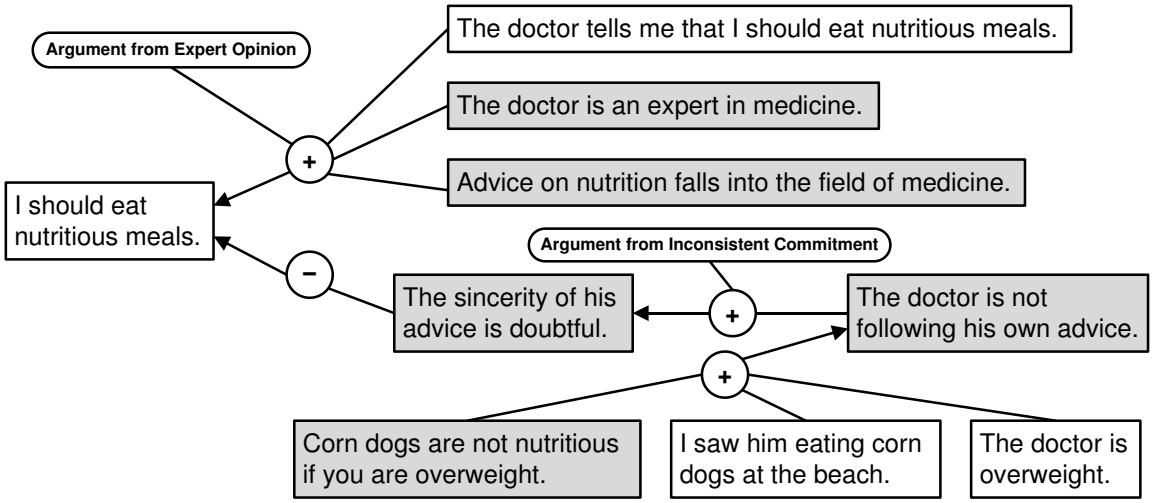

Figure 2: The Overweight Doctor Example Visualized with Carneades

The Carneades argument map shown in figure 2 shows, broadly speaking, two arguments opposed to each other. The one at the top is an argument from expert opinion with two implicit premises used to support the conclusion that I should eat nutritious meals. This is the pro-argument. Represented at the bottom part of the diagram is the contra argument, based on the argumentation scheme for argument from inconsistent commitments.

The explicit premises for this argument are shown in the white boxes at the bottom of figure 2. These are the statements (1) that the doctor is overweight and (2) that I saw him eating corn dogs at the beach. These specific premises are connected to the ultimate conclusion that I should eat nutritious meals by the sequence of argumentation with three implicit premises that have to be inserted. Once we assume that corn dogs are not nutritious if you are overweight, the conclusion that the doctor is not following his own advice follows. There is no particular argumentation scheme in virtue of which these three premises are connected to this conclusion. However once the conclusion that the doctor is not following his own advice has been derived from these premises, we can use it to derive the further conclusion that the sincerity of the doctor's advice is doubtful, using the argumentation scheme for argument from inconsistent commitments. This line of argumentation, taken altogether, represents a contra argument undermining support for the conclusion that I should eat nutritious meals. Exactly why this contra argument works to undermine the prior argument from expert opinion has still not been made explicit by figure 2. In order to analyze the argumentation more fully in this case we have to see better how the argument from inconsistent commitments is being used to attack the argument from expert opinion.

The diagram presented in figure 2 represent only the first part of an analysis of the kind required to show how the *ad hominem* argumentation scheme and its critical questions fit the overweight doctor argument. What needs to be done is not only to take the two propositions that the doctor appears to be quite overweight and that he was observed eating corn dogs and fried dough at the beach, and use these as premises to show that there exists an inconsistency between what the doctor tells his patient to do and what he is doing himself in his own personal practices. We need to also carry out the task

of showing how the circumstantial *ad hominem* argument in the overweight doctor example can be analyzed.

The thrust of the circumstantial *ad hominem* argument is to use the inconsistency that can be attributed to the arguer by the evidence presented in the case to attack the arguer's personal reliability as a source. Pointing out the inconsistency by using the argumentation scheme for argument from inconsistent commitments is the first step. The second step is to use this inconsistency to challenge the arguer's credibility as a sincere person who believes in his own argument. As shown in figure 3, this attack is used to raise the critical question of whether the arguer is a trustworthy source. The implication drawn from the inconsistency is that the arguer may be a hypocrite, or otherwise be a person who is lacking in some ethical character quality of the kind required to make him a trustworthy source.

As shown in figure 3, the patient's observation that he saw the overweight doctor eating corn dogs at the beach is used to derive the conclusion that the doctor does not eat nutritious meals, based on the additional implicit premise that corn dogs are not nutritious meals. Now how the argument proceeds is to take the premise already used in the argument from expert opinion, the statement that the doctor tells me that I should eat nutritious meals, and use that in conjunction with the previously derived conclusion that the doctor does not eat nutritious meals.

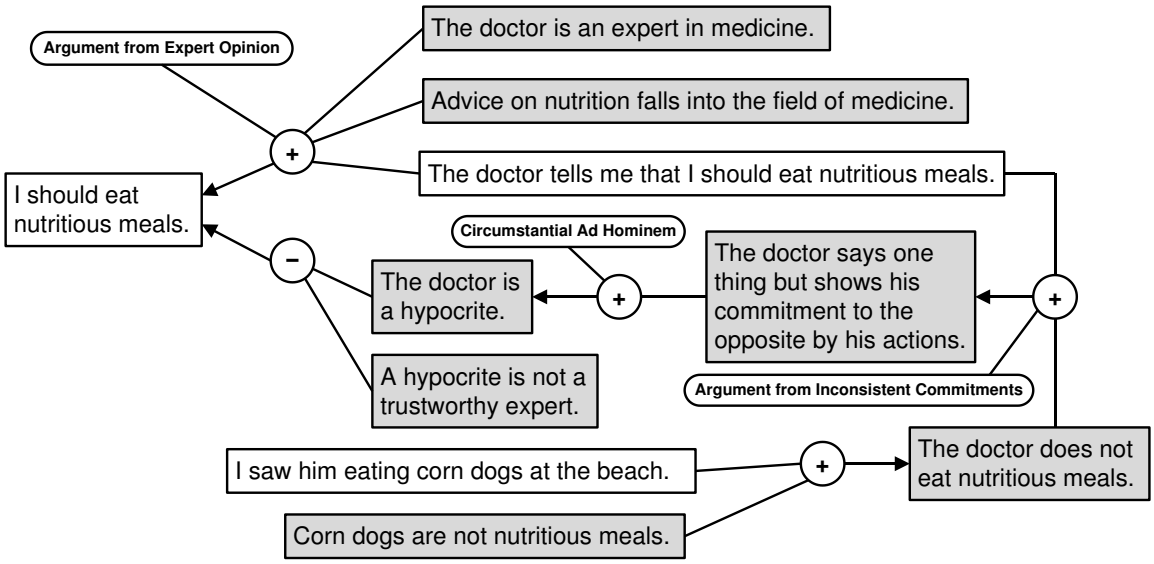

Figure 3: The Circumstantial *Ad Hominem* Argument in the Overweight Doctor Example

These two premises are used together to form an argument from inconsistent commitments that leads to the conclusion that the doctor says one thing, but shows his commitment to the opposite by his actions.[3]

[3] Note here that, unlike the other Carneades diagrams in this paper, this diagram as the unusual feature that the same premise is used to support two different conclusions. Normally Carneades argument diagrams have a tree structure in which there are no circles, or other sequences of argumentation that are closed rather than branching only in one direction. This feature is allowed by Carneades, in instances like the one shown in figure 3, even though generally, Carneades argument diagrams take the form of a tree structure.

Next what figure 3 shows this is how this argument from inconsistent commitments is used as the basis of an *ad hominem* argument to generate the conclusion that the doctor is a hypocrite. As shown in figure 3, the structure of this argument fits the scheme for the circumstantial *ad hominem*. This form of argument is an extension of the argument from inconsistent commitment in which the set of inconsistent commitments is used to draw the conclusion that the arguer's character (*ethos*) can be attacked by making an allegation of hypocrisy. The additional assumption is that a hypocrite is not a trustworthy source because the hypocrite does not really believe what he is saying, and is therefore insincere. This kind of allegation undercuts the assumption contained in the argument from expert opinion that the source should be trustworthy. Recall that the Carneades argumentation system treats the trustworthiness critical question as an exception, meaning that evidence has to be given to support in order to refute the argument from expert opinion. In this instance however, the allegation of untrustworthiness because of hypocrisy, supported by the evidence of the doctor's having been seen eating corn dogs at the beach, is analyzed as a separate contra argument in its own right, a circumstantial *ad hominem* argument.

7. Evaluation of the Argument

What has been shown by this analysis is that there is a connection between the doctor's original argument that the patient should eat nutritious meals and the patient's reaction to this argument by attacking it with a circumstantial *ad hominem* argument. However, there is still more to be done in order to properly analyze and evaluate the argument, for as has been shown (Walton, 1998, 6-11), circumstantial *ad hominem* arguments of this sort are tricky. They can sometimes be fallacious, but also partly reasonable. The problem is that the patient should not react too quickly to entirely reject the doctor's argument based on the doubts raised by his perception of the doctor eating corn dogs at the beach. The reason is that perhaps it is true that the doctor is a hypocrite, and that could be a reason for having reservations about the sincerity of the doctor's advice, but still, the doctor's argument might be a good one for the patient to pay attention to. The doctor based his argument on the clinical observation that the patient's cholesterol and blood pressure readings are higher than normal, and also on the assumption that the patient is overweight. These could be very good grounds for advising the patient to take up a program of weight loss that includes eating nutritious meals. This could be a very good argument, and the patient could be very wise to pay attention to it, instead of rejecting it as a fallacious *ad hominem* attack for the reason that the doctor does not appear to be following his own advice.

For these reasons, we still have more work to do. It has to be shown that the doctor's argument, taken in itself and apart from the circumstantial *ad hominem* argument used to attack it, can be analyzed as a reasonable argument assuming that the evidence supporting it is true and accurate. The problem is how Carneades can be used to represent the argumentation in this reasonable core of the argument, apart from the arguments from inconsistent commitments and hypocrisy used to cast doubt on it.

To carry out this task, we can analyze the doctor's argument, or at least the core of it, as a chain of argumentation based on the scheme for practical reasoning. Such an analysis is presented in figure 4 as a Carneades argument map.

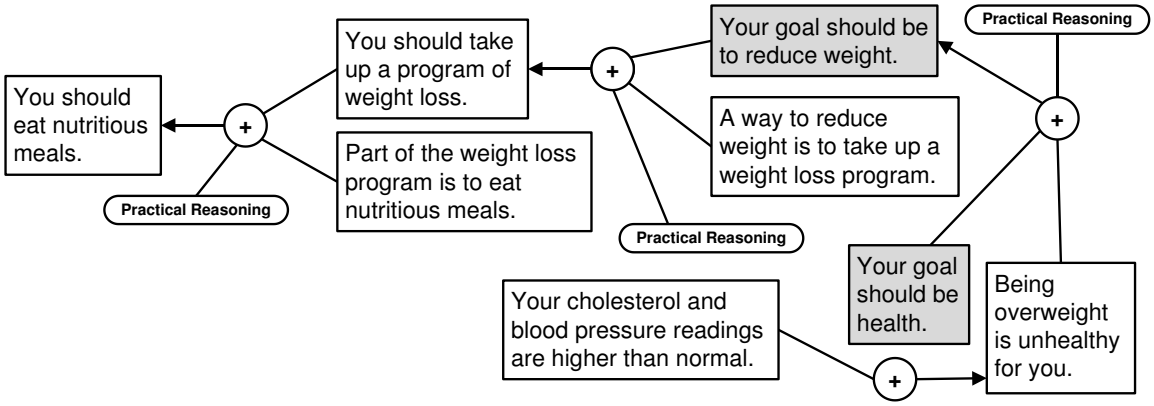

Figure 4: Core of the Overweight Doctor Argument

By inserting the two implicit premises that the patient's goal should be health, and that the patient's other goal should be to reduce weight, the chain of argumentation representing the doctor's argument can be shown as based on three applications of scheme for practical reasoning. Notice that figures 2 and 3 show the reasoning of the patient, whereas figure 4 shows the doctor's reasoning. There has been a shift in perspective because in the reasoning shown in figure 4, the patient reconstructs the doctor's internal reasoning by a process of rational reconstruction of that reasoning. This process is one of abductive reasoning in which the patient uses practical reasoning to reconstruct the doctor's argumentation. This sequence of argumentation, as shown in figure 4, appears to be inherently reasonable. Thus we can properly evaluate the argument as being inherently reasonable, because it is based on practical reasoning supported by the evidence provided by the doctor's clinical observations and diagnosis.

When we put figures 2, 3 and 4 together, what we see is that even though objectively considered, the physician's argument is reasonable as a chain of practical reasoning, nevertheless looking at the argument as a whole, and considering the doctor-patient relationship, there are other factors that need to be taken into account. The main one of these is that the patient needs to treat the doctor's argument as an instance of argument from expert opinion. The typical problem in such a case is that the patient is not an expert himself, and is not therefore qualified to evaluate the clinical evidence on which the sequence of practical reasoning used by the doctor to arrive at his conclusion is based. Therefore, it can be reasonable for the patient to try to intelligently question the physician's advice by asking questions, or even perhaps by going for a second opinion from another physician if that seems called for. For these reasons, it is not inappropriate for the patient to take the doctor's trustworthiness into account. In general, it is reasonable for a person trying to evaluate an argument from expert opinion to take critical questions into account, including the trustworthiness critical question.

In the case of the overweight doctor, two schemes represent the doctor's argument in the way it is perceived by the patient, practical reasoning and argument from expert opinion. Other schemes are involved as well, as shown in figure 5.

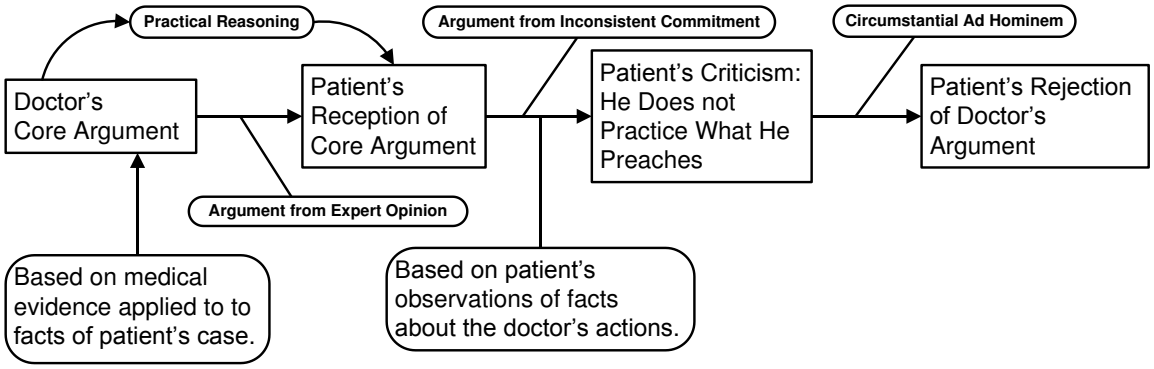

Figure 5: Filtering of Practical Reasoning through Argument from Expert Opinion

Doctor-patient communication in medical treatment is based on the assumption that the doctor can offer advice in a form that is comprehensible to the patient, so that the patient can understand the nature of the treatment being recommended. In this case, the patient has the capability of understanding the doctor's core argument because both parties share practical reasoning as common knowledge about the way things work. However, the doctor has medical knowledge that the patient lacks, and also the doctor has diagnostic skills that can apply this knowledge to the patient's individual case. The doctor's advice is supposed to be based on medical evidence applicable to the facts of the patient's case. Therefore the patient cannot arrive at an informed and intelligent decision about whether to take the doctor's advice unless he treats it as an argument from expert opinion. Thus there is a kind of filter from the doctor's core argument to the patient's reception of it. That filter is the argument from expert opinion.

So as we see, as the argumentation is represented in figure 5, the doctor bases his argument on evidence that is internal to his reasoning as a medical expert. The patient receives this argument is an argument from expert opinion, and his evaluation of it, as shown in figure 5, is based on evidence that is external to the reasoning of the doctor. The patient's reasoning on whether to accept or reject the doctor's advice is based on additional external observations of facts about the doctor's actions. By this means the patient finds a point of criticism: the doctor does not practice what he preaches. Using this argument from inconsistent commitment as his basis, the patient then draws another inference using the circumstantial ad hominem argument. Thus figure 5 draws together the sequence of argumentation shown individually in figures 2, 3 and 4.

What has been shown to that the example is a subtle one containing several different strands of interwoven argumentation linking practical reasoning to argument from inconsistent commitments through the connecting thread of argument from expert opinion.

8. Conclusions and Suggestion for Further Research

Based on the study of the two examples in this paper, a systematic method for anticipating, finding and countering objections to an argument before these objections have actually been raised by an opponent, can now be set out. First we set out a four-step method of anticipating objections to an argument. The first step is to analyze the structure of the argument using the standard argumentation method of breaking it down into a set

of premises and conclusions (propositions) that are chained together into a sequence of argumentation aimed at proving a particular proposition designated as the ultimate conclusion to be proved. As part of a method for carrying out this task of analysis, it is useful to build a rigorous and well conceived visual representation of the network of argumentation in the case. As illustrated by the examples treated in this paper, an excellent way to do this is to construct a standard argument diagram of the kind now widely used in argumentation studies. Hence the second step is to construct an argument diagram representing the structure of your own argument. The third step is to identify any argumentation schemes on the diagram. The fourth step is to scan over the list of critical questions matching the scheme for the argument and ask which of them poses the most plausible objection in the given circumstances.

This four-step method of anticipating objections by itself is a helpful procedure that could be used to teach students of critical thinking, or advocates who are trying to present a case, to think of possible objections. There are three limitations to the method. First, if there are no argumentation schemes that fit the example you are presenting, this method is no help. However, as the literature on argumentation schemes builds up a better knowledge of them, the method will become more and more powerful. Second, knowing which of the critical questions poses the most powerful rebuttal of your argument may be hard to judge. However, even though you do not apply any systematic method of evaluation to the argument, you will very likely have a good intuitive idea about which of the questions is most applicable. Third, how to apply the method to an actual case may admit of complications. In this paper we have shown what some of these complications are by applying the method to two examples.

Next we address the problem of finding objections. The fifth step takes place once you have identified a critical question that appears to probe into a weak spot in the argument. What you need to do then is to build on the doubt raised by that critical question to see if you can develop the question into a counter-argument. Standard argumentation tools are used for this purpose. The basic method of argumentation is to take a particular proposition as the central claim to be proved or disproved, and build a network of pro-arguments that support the thesis, as well as a network of con arguments that attack the thesis. When using this model of argument for proleptic purposes of trying to find objections to your own argument, the sixth step is to play devil's advocate by trying to think of the strongest counter arguments that might be used to attack your argument.

Finally we address the problem of countering objections. Once you have anticipated and found the objections, you have to use the same argumentation tools to find objections to these objections. It was shown in figure 1, where we used Carneades to analyze the structure of the argumentation in the ACTOS example, how an argument diagram can be used to represent a refutation of a refutation. This is essentially the step that is needed in order for an arguer to counter an objection to his argument before that objection has even been made by the opponent in a dialogue.

The two examples have explained how argumentation schemes and argumentation visualization tools are parts of this method that is useful for anticipating, finding and countering objections to an argument. The method is a helpful way of suggesting some standard kinds of objections to a known type of argument that can be applied to the particular argument one is confronted with. In the analysis of the overweight doctor example, it was shown how the method works by fitting together four argumentation

schemes, practical reasoning, argument from expert opinion, argument from inconsistent commitment and the circumstantial *ad hominem* argument, in a connected sequence of argumentation.

In Carneades, several distinctive kinds of objections to a given argument can be distinguished. You can attack the ordinary premises, the assumptions, the exceptions, the applicability of the argumentation scheme joining the premises to the conclusion, or the conclusion itself. Carneades has a unique way of identifying the logical form of an argument matching a scheme like argument from expert opinion. In addition to the ordinary premises that are identified in the scheme itself, assumptions and exceptions are additional premises that represent critical questions. Some critical questions, merely by being asked, defeat an argument from expert opinion. For example if the critical questioner asks whether the expert's assumption is based on evidence, the argument from expert opinion put forward by the proponent will be defeated unless he provides an answer to this question. On the other hand, consider the trustworthiness question. Suppose the critical questioner asks whether the expert is personally reliable as a source, that is, whether the expert is trustworthy as someone who can be relied on to tell the truth. The proponent of the argument from expert opinion, when confronted with this question, can simply reply, "Of course he is trustworthy; if you think he is not trustworthy let's have some evidence to back up this allegation". The problem here is one of burden of proof. Should the proponent have the burden of proof to reply to this critical question posed by the respondent, or must it be the case that the respondent should have to back up the question with some evidence before it can defeat the argument? We see here that the matching of the critical questions to the argumentation scheme needs to take place in a dialogue format where there is a shifting back and forth from one side to the other of a burden of proof.

Carneades handles this problem by distinguishing between assumptions and exceptions. The proponent has the burden of proof to support an assumption with evidence when it is challenged by the other side. The respondent has a burden of proof to back up an exception with evidence from the information available in a case before that exception defeats the proponent's argument. Assumptions and exceptions are additional premises that when added to the set of ordinary premises in a scheme, make the argument even more plausible by building in anticipation of a possible objection. What is revealed by this insight is that these additional implicit premises, made explicit in the Carneades system, are very close to proleptic argumentation. For these reasons, Carneades is the best developed argument vizualization tool for argumentation to find and counter objections to an argument. As noted at the beginning (Scheuer et al., 2010), however, there are many other computer-based argumentation systems and argument visualization tools currently available that could be used. Some nonmonotonic logics, like Nute's defeasible logic, provide languages for defeasible inference rules, and hence could be extended to represent argumentation schemes. Arguments could be found to counter objections by using inference engines for these logics. However, Carneades has other capabilities that make it a unique platform for building a system for finding objections to an argument. Carneades is not simply an argument visualization tool. The Carneades argumentation system is a formal model that has been implemented as a working computational system that can be applied to both argument evaluation and argument construction.

Carneades has built-in capability for argument construction. It is a dynamic model of argumentation that is specially designed to model defeasible argumentation by having a knowledge base that is continually being added to by new information that is coming into a case. Carneades provides a number of automated argument assistants for helping users with various argumentation tasks, including a *find arguments* assistant for constructing arguments from argumentation schemes and facts in a knowledge base. These capabilities for argument invention, fully explained with examples in (Walton and Gordon 2012), make Carneades a natural platform for building an automated system for finding objections to an argument. A project for future research is to build the four step method of anticipating objections set out in this paper into the Carneades Argumentation System so the method, along with its computational implementation, can be used as an automated argument assistant for finding objections to an argument. However, readers of this paper can apply the four-step method of anticipating objections to an argument without using Carneades' automated assistants to help do the job.

At the beginning of the paper, some of the practical motivations for studying this problem were indicated, including its uses in improving writing skills, in laying out strategies in advertising campaigns, and in putting forward proposals in business ventures. In this paper we have put forward a systematic method for anticipating, finding and countering objections to an argument. A question for further research is whether this method can be implemented in a dialectical theory of proleptic argumentation that can model the general logical structure of the method. Since the Carneades Argumentation System already has the capability for argument construction, and is a formal and computational model of argumentation, it could be used to provide a dialectical theory of proleptic argumentation. That is another topic for future research. Yet another topic for further research is to apply the method of proleptic argumentation to more examples drawn from everyday conversational argumentation, and from special contexts of use like legal argumentation and scientific argumentation.

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