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Profiles of Dialogue for Amphiboly

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Article abstract

Amphiboly has been widely recognized, starting from the time of Aristotle, as an informal fallacy arising from grammatical ambiguity. This paper applies the profiles of dialogue tool to the fallacy of amphiboly, providing a five-step evidence-based procedure whereby a syntactically ambiguous sentence uttered in a natural language text can be evaluated as committing a fallacy of amphiboly (or not). A user applies the tool to a natural language text by comparing a descriptive graph, representing how the argumentation actually went, to a normative graph, representing how the argumentation should ideally have proceeded.

Syntactic Parsers and Profiles of Dialogue Applied to the Fallacy of Amphiboly[1]

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Abstract: Amphiboly has been recognized from the time of Aristotle as an informal fallacy arising from grammatical ambiguity, but the current informal logic textbooks disagree on how to define it. Two natural language tools, automated grammatical parsers and profiles of dialogue, are used in this paper to build an algorithm that can be used to identify, analyze, and evaluate claimed instances of the fallacy of amphiboly. The profiles tool compares a descriptive graph representing how the argumentation actually went to a normative graph representing how the argumentation should ideally have proceeded.

Résumé: L'amphibole a été reconnue depuis l'époque d'Aristote comme une erreur non formelle résultant d'une ambiguïté grammaticale, mais les manuels de logique non formelle actuels ne sont pas d'accord sur la façon de la définir. Deux outils de langage naturel, des analyseurs grammaticaux automatisés et des profils de dialogue, sont utilisés dans cet article pour construire un algorithme qui peut être utilisé pour identifier, analyser et évaluer les cas qu'on croit illustrer l'erreur de l'amphibole. L'outil de profils compare un graphique descriptif du déroulement réel de l'argumentation, à un graphique normatif, représentant la manière dont l'argumentation aurait idéalement dû se dérouler.

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[1] This paper was accepted for publication shortly before Professor Walton's untimely death in January 2020. It includes the extensive revisions he had made in response to the referees' comments on the version originally submitted.

1. Introduction

Amphiboly was standardly treated as a major informal fallacy in medieval logic texts in a tradition that continues today in the current logic textbooks. Aristotle recognized amphiboly as one of his thirteen fallacies. In his *On Sophistical Refutations* (1928, 165b27), he defined amphiboly as a fallacy dependent on language that arises from ambiguity in the grammatical structure of a sentence. But there is deep disagreement in the informal logic textbooks and the recent literature on amphiboly on how to define the fallacy. It was suggested by Walton (1996, p. 105-114) that many of the fundamental differences in these accounts may stem from different ways they understand and define the notion of a fallacy. Some treat a fallacy as an error or blunder, while others see it as the use of a sophistical tactic to try to get the best of a speech partner through verbal deception or trickery.

Following the pragmatic theory of fallacy (Walton 1995), two species of fallacy were distinguished. The error of reasoning type is committed by an erroneous use of a heuristic to jump too hastily to a conclusion. The sophistical tactics type is committed in cases where an argument is used as a tactic or ploy to get the best of a speech partner unfairly. The pragmatic theory finds its roots in the Aristotelian conception of a fallacy as a sophistical refutation but treats each example as a case that needs to be analyzed individually and determined by examining the textual evidence to judge whether the argument is fallacious or reasonable.

The dialogue framework required to support the pragmatic theory of fallacy is built on the presumption that an argument needs to be analyzed and evaluated within a dialogue setting from which evidence can be drawn about how the argument was used for some purpose. A dialogue has individual goals for each participant but also collective (shared) goals that apply to all participants. A fallacy of the sophistical tactics type needs to be seen as more than simply a violation of a rule of reasonable dialogue. It is a deceptive tactic of argumentation.

An advantage of the pragmatic approach taken to the fallacy of amphiboly in this paper is that it combines the use of automated syntactic parsers with the profiles of dialogue technique. Proceeding by this approach, applying both tools is used to model both kinds of

failures of rational argumentation, tailoring the analysis to the de-
tails of the given text of discourse in a specific case in a way that
permits an analyst to sort out, by using evidence, whether an alle-
gation that somebody has committed the fallacy of amphiboly is
justified or not. An automated grammatical parser is a program that
can take as input a sentence found in natural language text and pro-
duce a graphic structure (a tree) as an output that visually displays
the grammatical structure of the sentence. Probabilistic parsers use
linguistic corpora as datasets compiled from hand-parsed sentences
to yield the most probable analysis of an input sentence.[2] In some
instances, the parser will produce more than one tree, indicating that
the sentence is ambiguous. But it is contentious whether ambiguous
sentences in a natural language sentence are instances where a fal-
lacy of ambiguity has been committed. In many instances, a syntac-
tical ambiguity may be a harmless error, or even a joke, for example,
made to be ambiguous intentionally, and may not even be an argu-
ment (or a part of one). For these reasons, the fallacy of amphiboly
has posed a deep problem for a consistent fallacy theory.

   This paper will take some necessary steps toward solving this
deep problem by applying automated grammatical parsers and pro-
files of dialogue to four examples where the fallacy of amphiboly
has been alleged to have been committed. The latter tool is a dialec-
tical technique that has been applied to other fallacies (Krabbe
1992). A pair of profiles of dialogue is composed of two graph
structures (argument diagrams), each of which represents a con-
nected sequence of dialogue moves in which an argument is put for-
ward by one side and responded to by the other side. Each graph
represents a connected sequence of dialogue moves (speech acts)
which can include strategic maneuvering, especially in a persuasion
dialogue (van Eemeren et al. 2008). In this paper, it will be shown
how the two graphs, one normative and one empirical, can be used
to compare two connected sequences of dialogue moves to judge
whether and how the actual sequence deviates from the normative
one. Since this tool works by comparing two graphs, it is called the
profiles tool (with an 's' on the end of the word profile).

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[2] The best known automated parser is the Stanford Parser: https://nlp.stan-
ford.edu/software/lex-parser.shtml

An example analyzed by the profiles tool in this paper can be used to introduce the fallacy. In this example, an attendant at a roulette wheel in an amusement park offered spectators "ten bets for a dollar." The spectators took this to mean that they will get ten bets, each of which will individually cost ten cents (a tenth of a dollar). But once the first best was made and the attendant got the dollar, he explained that the offer meant "ten bets for a dollar each." What is wrong here? This paper will show that the fallacy of amphiboly has been committed when the grammatical ambiguity of a sentence is exploited as a tricky argument tactic to deceive the audience to whom the argument was directed. The paper will show how this tactic works and how to defend against it.

An earlier theory of amphiboly worked out in Walton (1996, chapter 3) was not refined by the advantageous method of using the profiles tool. However, Krabbe (1999) applied the profiles tool to the fallacy of equivocation—a fallacy very closely related to amphiboly. This paper extends Krabbe's findings by applying an extended version of the profiles tool to a series of realistic examples of the fallacy of amphiboly found in logic textbooks and other sources. The profiles tool has already been applied to some other informal fallacies (Krabbe 1992, 1999, 2002; Koszowy and Walton 2017; Walton 2015; Walton and Macagno 2016), but this is the first time that it has been specifically applied to the fallacy of amphiboly (to the author's knowledge).

Section 2 shows how literature on the fallacy of amphiboly in the textbooks and other sources is divided on the issue of whether this fallacy is committed by any syntactically ambiguous sentence or whether the syntactic ambiguity needs to occur specifically as part of an argument. Section 3 provides four main examples, three of them from logic textbooks. Section 4 defines the key notion of syntactic (grammatical) ambiguity using an example to show the grammatical structure of an ambiguous sentence using an automated syntactic parser.

Syntactic ambiguity is an enormously important problem in law, most notably in syntactically ambiguous contracts, sometimes even caused by the presence or absence of a comma, and in statutory interpretation. Statutes framed by a lawmaking body become law and are then tested by the courts, which often have to deal with

ambiguous statutes. What happens in such cases is that in a trial, when an arguably ambiguous statute is attempted to be applied to a case at issue, the lawyer for one side will argue for one interpretation while the lawyer for the other side will argue for the opposite interpretation (Walton, Sartor, and Macagno 2016). Such arguments are resolved by using so-called canons of interpretation, rules which can help by referring to evidence derived from the known purpose of the document, the context of the document in which the statute was framed, or other closely related legal documents.

The legal literature on syntactic ambiguity in legal interpretations of documents generally assumes that having arguments on both sides is normal, whereas much of the literature on informal logic on fallacies, especially in the logic textbooks and on the Internet, tend to presume that a syntactic ambiguity in a premise or conclusion of an argument commits this fallacy (Copi et al. 2011). For these reasons, the topic of syntactic ambiguity in law has to be beyond the scope of this paper; even though all four examples analyzed concern financial transactions. The three textbook examples are about: misrepresentation of an item put up for sale in an advertisement; charges of misrepresentation in making an offer to take a bet; and a clause in a will containing a syntactically ambiguous proposition that leads to a conflict between parties contesting the will. They are all about financial transactions such as contracts, offers in advertising or wills.

There are three reasons why these particular examples were chosen as suitable for this paper. First, they represent realistic, ordinary examples of the kind that one often encounters in everyday life. Second, although all of them are problems that potentially have legal aspects, they are not legal examples of problematic syntactic ambiguity of the kind studied in law, such as in statute interpretation (Walton et al. 2016). One of them was a real pizza commercial. The other three were examples of the fallacy of amphiboly used in informal logic textbooks.

Third, the three textbook examples were specifically designed to help students to understand why it is justifiable to classify the arguments in them as informal fallacies. It is particularly this fourth reason that makes them interesting for the purpose of this paper because the paper tries to grasp why it is that writers of informal logic

textbooks and other teachers of informal logic techniques apply the concept of fallacy specifically to instances of natural language text that are supposed to represent paradigms of the fallacy of amphiboly. For sure we can find examples of syntactic and semantic ambiguity so complex and clever that even experienced analysts of natural language argumentation, or lawyers, law professors and judges (in the case of legal argumentation) will have hotly contested disputes about how the natural language texts should be disambiguated. Such examples would not be helpful for the purposes of this paper, even though it is the ultimate aim of paper to build linguistic tools to contend with such disputes. For presently we are just at square one, where we are trying to figure out why syntactic ambiguities in everyday conversational argumentation can sometimes be classified under the conceptual heading of amphiboly, where amphiboly can be clearly defined as some type of fallacy or error.

Section 5 explains how the profiles of dialogue tool works. Sections 6, 7 and 8 apply the parsing and profiles tools to the four examples. Section 8 shows how combining the automatic parser tool with the profiles of dialogue tool works in testing any example of a natural language sentence for amphiboly. It is illustrated by the way of solving the problem of amphiboly in the four examples in sections 6, 7 and 8.

Section 9 explains generally how the profiles tool should be used to map a dialogue into a pair of graphs to apply the textual and contextual evidence showing how the ambiguity was used, as part of an argument that can be evaluated using the given textual evidence. Section 10 provides some reasons why syntactical ambiguity of a sentence should not be regarded as sufficient prove an allegation that the speaker of has committed a fallacy of amphiboly. An algorithm is constructed in section 10 that can test any example to see if the argumentation in it contains an instance of amphiboly. A visual outline of how the algorithm should be applied from a user's point of view, showing how each of its steps is connected to the others based on how it was informally applied to the four examples analysed in the paper, is presented in figure 7 of section 10.

2. Amphiboly as a fallacy

According to Hamblin (1970, p. 18) neither the sophistical tactic type nor the error of reasoning type of fallacy occurred among the several of the standard examples of amphiboly given in the logic textbooks he surveyed, and he questioned whether any of them could be called genuine instances of a fallacy. The main reason he gave is that many of the examples of syntactically ambiguous sentences offered did not appear to be arguments at all, and even if some kind of argument could be implicitly derived from them, there was little evidence that any of them could be used to persuade anyone fallaciously to accept the conclusion.

A survey covering how the informal logic textbooks define, illustrate and analyse the fallacy of amphiboly (Walton 1996, pp. 78-104) supported Hamblin's conjecture. Many of the examples in this broader survey of the logic textbook accounts are merely syntactically ambiguous sentences, with no indication given how they are supposed to be arguments, or parts of some argument, or are misleading or persuasive enough to deceive a moderately attentive arguer. Some of the examples given by other textbooks are merely syntactical ambiguous sentences that are amusing. Many of the older logic textbooks simply equate amphiboly with multiple meaning due to the grammatical structure of a sentence. For example, Latta and MacBeath (1956) flatly define amphiboly "as an ambiguity due to the structure of a sentence" (p. 377).

Other textbooks, such as Rescher (1964, p. 75), define amphiboly as a fallacy in such a way that any instance of amphiboly must be an argument or must occur in an argument. According to Copi and Cohen (2005) "the fallacy of amphiboly occurs when one is arguing from premises whose formulations are ambiguous because of their grammatical construction" (p. 156). More precisely, they define the fallacy of amphiboly as "a fallacy in which a loose or awkward combination of words can be interpreted more than one way; the argument contains a premise based on one interpretation while the conclusion relies on a different interpretation" (p. 156). See also (Copi *et al*. 2011, p. 142). According to the widely used textbook by Hurley and Watson (2018), "the fallacy of amphiboly occurs when the arguer misinterprets an ambiguous statement and then draws a conclusion based on this faulty interpretation" (p. 174).

Hurley and Watson (p. 174) add that the ambiguity usually arises from a mistake in grammar or punctuation, such as a missing comma or dangling modifier. These definitions of the fallacy explicitly require that the occurrence of the fallacy of amphiboly must occur in an argument. In Wikipedia[3] we find: "Syntactic ambiguity, also called amphiboly or amphibology, is a situation where a sentence may be interpreted in more than one way due to ambiguous sentence structure." In the *Oxford Dictionary* definition given on the Internet,[4] we find "amphibology" defined as "A phrase or sentence that is grammatically ambiguous, such as 'She sees more of her children than her husband.'" One can easily find quite a few Internet sources that give lists of amusing examples of ambiguous sentences where it is questionable whether or how the sentence is an argument or contains an argument. These accounts are inconsistent with the ones in the logic textbooks requiring an argument with premises and conclusions in it.

Here are two examples from a list of comparable examples of the fallacy of amphiboly offered by RationalWiki.[5] The first one is: "Last night I caught a prowler in my pyjamas." In this instance, there are three possible interpretations. The first interpretation is that I was wearing my pajamas when I caught the prowler. The second is that I caught the prowler, who was wearing my pajamas. There is even a possible third interpretation stating that I caught the prowler while I was wearing my pajamas and the prowler was inside my pajamas. The first one makes the most sense and is therefore probably the most plausible one for most native speakers of English. In the absence of the comma, the third interpretation is probably pretty hard for most people to figure out, and it is therefore most likely the least plausible of the three. But because it is humorous and puzzling to figure out, it does come to mind when one thinks about the example in relation to trying to find different interpretations once one is aware of the ambiguity. The second example is: "I am opposed to taxes which slow economic growth." In this instance there are two possible interpretations. The first is that I am opposed to taxes of the kind that slow economic growth. Second is that I am

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[3] https://en.wikipedia.org/wiki/Syntactic_ambiguity
[4] https://en.oxforddictionaries.com/definition/amphibology)
[5] https://rationalwiki.org/wiki/Fallacy_of_amphiboly

opposed to taxes generally because they slow economic growth. The mere insertion of a comma after the word taxes would clearly indicate the second interpretation. Without the comma, the first interpretation is the more plausible and natural one.

Engel (1989) presented many humorous examples of syntactically ambiguous sentences of the kind that he classifies as committing the fallacy of amphiboly, such as this sign on a roadhouse: "Clean and Decent Dancing Every Night Except Sunday" (p. 347). He asked how these examples of syntactically ambiguous sentences can properly be considered fallacies since they merely appear to be jokes, or sentences that are humorous because of their ambiguity and do not even meet the requirement of being arguments (Engel 1989, p. 347).

Engel provided an answer to this question. He argued that most of the arguments we use in ordinary language are enthymemes, incompletely stated arguments that have implicit premises or implicit conclusions that need to be added in. So, for example, he argued that the clean and decent dancing example is a kind of argument. On his theory, what the ambiguous sign says can be paraphrased as follows: "There is clean and decent dancing in this establishment every night except Sunday. If today is Sunday, no performance will take place" (Engel 1989, p. 348).

It is hard to know what to take from this, but it looks like Engel considered the first sentence to state the premise and the second one the conclusion of the argument conveyed by the sign. But that cannot be right. The first sentence is the ambiguous one that appears on the sign, while the second sentence is the conclusion that the reader of the sign is meant to draw, based on the interpretation evidently intended by the sign writer. Engel noted that ambiguous sentences of this kind are a frequent cause of error, because an unintended interpretation of the ambiguous sentence can be misleading. He therefore adopted the view that syntactically ambiguous sentences of this kind, because they can lead to confusion and are a frequent cause of error, should properly be treated as informal fallacies in the informal logic textbooks.

So at this point we have a conflict of opinions and uncertainty posed by the treatments of the fallacy in the logic textbooks and popular sources on the following three issues: (1) whether a genuine

instance of the fallacy of amphiboly needs to be an argument, (2) whether the argument can be an enthymeme, i.e., whether it needs to be extracted as an argument by a process of textual interpretation from the given text of the case, and (3) what kind of logic or precise method of drawing inferences the extraction procedure is based on.

One aspect of Engel's approach to the fallacy of amphiboly that may be worrisome to some logicians is that it appears to be based on some kind of extraction procedure akin to Gricean implicature, a form of inference that is pragmatic, meaning that it depends on the context in which a sentence is uttered as a response to previous speech acts in a coherent conversation (Macagno 2018). A good example to illustrate implicature is the one from Grice (1975):

> A: Smith doesn't seem to have a girlfriend these days.
> B: He has been paying a lot of visits to New York lately (p. 51).

The speech act performed by B is merely a statement, as opposed to being in the form of an argument with premises and a conclusion, but it can also be analyzed as a premise used to implicate the conclusion that Smith has, or may have, a girlfriend in New York. Whether such a statement can be drawn by implicature as a conclusion depends on general pragmatic principles called conversational maxims by Grice. The overarching general principle (Grice 1975, p. 45) is the so-called cooperative principle: make your conversational contribution such as is required at the stage at which it occurs by the accepted purpose of the talk exchange in which you are engaged. If a conclusion is not drawn by logical implication, but by conversational implicature, extracting it depends on the conversational purpose of the dialogue the speakers are engaging in.

In the cases of the examples of syntactically ambiguous sentences cited by Engel, the problem, or at least an interesting thing about the examples, is that two interpretations are possible. Both interpretations are extracted by implicature. The funny one is a deliberately unnatural extraction. In the case of the clean and decent dancing example, the intended interpretation is most likely that the establishment will be closed on Sunday, whereas a provocative interpretation that could also be drawn by Gricean implicature is that there will be dancing on Sunday night, but it will be a kind of dancing that is not clean and decent. So while it is possible to derive the

one conclusion or the other by an inference from the syntactically ambiguous sentence that is presented, and therefore inference or argument of a certain sort seems to be involved, it is unclear whether or how a fallacy has been committed. Admittedly, cases of syntactically ambiguous sentences such as Engel's examples could be confusing, and the confusions could lead to errors or wrong decisions, but it still remains unclear precisely how an argument can be extracted from such examples by some procedure such as Gricean implicature (Grice 1975; Macagno 2018).

The examples discussed so far are moderately interesting, partly because there is a certain amusement value in them, but one is left wondering whether amphiboly is a serious fallacy worth pursuing as a logical problem that can really cause significant trouble in realistic argumentation. To pursue this line of thought, we next consider four examples that strongly suggest and illustrate how and why amphiboly is indeed a serious problem of this kind.

3. The four examples

Three of the examples are from the logic textbooks and the fourth is from a real commercial advertisement. These four examples were chosen specifically because they represent fallacies that are serious problems of a kind that have significant financial and social consequences in our daily lives and practical activities, and are simple enough for us to work with in this kind of paper. Real cases of amphiboly with significant financial consequences at stake in law and in business transactions can be highly complex, involving a disputed mass of evidence and argumentation on both sides (Walton, Sartor and Macagno 2016).

The first two examples are from a logic textbook (Michalos 1969). We will call the first one the Ford example.

> "For sale: 1964 Ford with automatic transmission, radio, heater, power brakes, power steering, and windshield wipers in good condition." When you inspect the car, you find that the windshield wipers are the only accessories that are in good condition. When you charge the vendor with misrepresentation, he replies, "You misread the ad. Read it again" (p. 366).

In advertisements of this sort, some sort of argument is being put forward. The vendor who published the ad was sending his message in order to try to get potential buyers to respond appropriately, for example by contacting the vendor. The assertion made in the message made the claim that the various features of the car cited are in good condition. This could be the premise, I suppose. In the example, a reader of the ad inspected the car and found that none of the features were in good condition except for one. This evidence shows that the claim made in the ad was faulty. The fault apparently resides in the falsehood of one interpretation of the ambiguous sentence used to make the claim. Moreover, more elements of argumentation are present. When the potential buyer found that the wipers were the only accessories in good condition, he charged the vendor with misrepresentation. So here we have some sort of argument, but it is in the form of a dialogue. First, the vendor made a claim and then the potential buyer responded by making a charge. Moreover, the dialogue even goes beyond that point. The vendor responded by charging the potential buyer with misreading the ad. So, in this case, some sort of argumentation is involved, but it is not very clear how to identify the premises and conclusion of the argument.

Let us call the next one, also from Michalos (1969) the roulette example.

> The attendant at a roulette wheel in an amusement park offered some naive spectators "ten bets for a dollar." Since this sounded like a bargain, the spectators gave him the dollar. After the first bet was made and lost, they began to make a second. But the attendant insisted that they had misunderstood him. "Ten bets for a dollar," he explained "meant ten bets for a dollar each" (p. 366).

The structure of the argument in this example is similar to the one in the Ford example. An offer was made, but it was ambiguous, and some spectators chose the more plausible meaning, the one that was to their financial advantage. However, when they went to make their second bets, the attendant insisted on the meaning that was to his advantage. The problem is similar to the one encountered in the previous example. There is definitely an argument involved, but it seems more like an argumentative dialogue exchange than an identifiable premises and conclusion structure. But in both cases, there is some kind of tricky strategy of persuasion being used by the first

party in the dialogue to get the best of his speech partner unfairly. This is characteristic of a fallacy.

In both these cases, you would have to be quite naive to be taken in by the pitch. But they indicate how amphiboly could be a serious fallacy in a more subtle case of business negotiation, say, where a legal contract is full of complex terminology and sentence structures. There are examples that can be found in legal cases of statutory interpretation, and interpretation of laws generally (Twining and Miers 2010; Walton, Sartor and Macagno 2016). But at this point we need to begin with some comparatively simple examples that can help us to identify the main features of amphiboly in natural language argumentation.

Hurley and Watson (2018) used an example to show that cases of amphiboly can cause serious problems with contracts and wills, because an ambiguous sentence in the document can lead to two different conclusions. The following example is used to illustrate the problem. Let's call it the Cadillac example.

> Mr. James signed a contract that reads, "In exchange for painting my house, I promise to pay David $5000 and give him my new Cadillac only if he finishes the job by May 1." Therefore, since David did not finish until May 10, it follows that he gets neither the $5000 nor the Cadillac (p. 175).

The problem, according to Hurley and Watson (p. 175), is that the conclusion actually drawn by Mr. James in the text of the quoted example favors his side, but David will argue for the other side. He will argue that he is entitled to the $5000 because the requirement that he finishes painting the house by May 1 affects only the Cadillac. The problem is that the ambiguous wording of the contractual agreement makes it very difficult, or perhaps even impossible, to resolve the conflict between the two opposed claims based on the wording of the contract as written. So, we can see that there could be good grounds for classifying examples of this sort as instances where the fallacy of amphiboly has been committed. The ambiguous wording hinders the argumentation from going ahead towards its goal of solving the problem of formulating a workable agreement stipulating the clauses of the contract in a manner that fairly distributes the costs and benefits.

As with the first two examples, there definitely is argumentation involved because there is a conflict between two opposed claims, and the ambiguous wording of the contract is an obstacle to the resolution of the conflict. But as with the other examples, the standard approach of finding the premises and conclusion of the argument is not helpful. It is a question of how to disambiguate the wording of the contract.

The fourth example, taken from a commercial advertisement, has been previously discussed in the literature (Walton 1996, pp. 117-118), but in this paper it is presented in a simplified form as a good example. In this case, pizza outlets were making a pizza offer using the expression "two for one special price," but they were found to be charging more for two pizzas than the regular price of one. Once this practice was pointed out by newspapers, the outlets were warned that they must comply with the law called the Competition Act. A simplified version of this case called the pizza example will be modeled below using the profiles of dialogue tool.

4. Syntactical ambiguity

Before we confront the task of drawing a workable distinction between amphiboly and syntactic ambiguity, we need to have some precise idea of what syntactic ambiguity is and how it can be detected in natural language discourse.

Consider the syntactically ambiguous sentence "He ate the cookies on the couch". It could mean that he was sitting on the couch when he ate the cookies, or it could mean he ate the cookies that were on the couch (as opposed, for example, to those that were on the table). The usual way to disambiguate these meanings is to use some form of punctuation, such as brackets. To represent the first interpretation, we could use the following bracketed sentence: "he [ate the cookies on the couch]."[6] This interpretation indicates that he ate the cookies while sitting on the couch. To represent the

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[6] It can also be argued that "he [ate [the cookies] on the couch]" makes more sense of it. On this interpretation, the brackets are taken to show that "he" (or perhaps, "ate") are in the same level of bracketing as "on the couch", while "the cookies" are at a different level. For simplicity this interpretation is not considered.

second interpretation, we could use this contrasting sentence: "he ate [the cookies on the couch]." Another way to disambiguate between the meanings of the two sentences would be to use a graph structure, an inverted tree of the kind familiar in linguistics and especially widely used in computational linguistics. There are automated grammatical parsers available on the Internet that take as input a natural language sentence and produce as output a tree, with parts of speech tagged, that visually displays the grammatical structure of the sentence. One of these is called the Stanford Parser,[7] but there are others (such as Freeling[8]) available. The Stanford Parser uses probability calculations to produce a graph that represents the most natural interpretation of an ambiguous sentence. So, if you put an ambiguous sentence into the Parser, it will produce the most likely interpretation of the sentence. It does this by comparing probability values for the appearance of a word with a given part of speech preceded by some other word.

This way of disambiguating between the two meanings of the sentence in the cookies example produces an inverted tree where all the parts of speech in the sentence are visualized as nodes of the tree. For example, this type of parser will produce a syntactic tree more or less like the one shown in figure 1, an analysis that corresponds with the first bracketed sentence displaying the ambiguity in the cookies example above, using the part of speech tags listed in the Penn Treebank Project.[9] This list indicates the part of speech tags referred to in figure 1: S (sentence), NP (noun phrase), VP (verb phrase), PP (prepositional phrase), PRP (personal pronoun), VBD (verb, past tense), IN (prepositional or subordinating conjunction), DT (determiner), NNS (noun, plural), and NN (noun, singular mass).

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[7]Available at http://nlp.stanford.edu:8080/parser
[8]A demo of FreeLing 4.0 is available here:
http://nlp.lsi.upc.edu/freeling/demo/demo.php
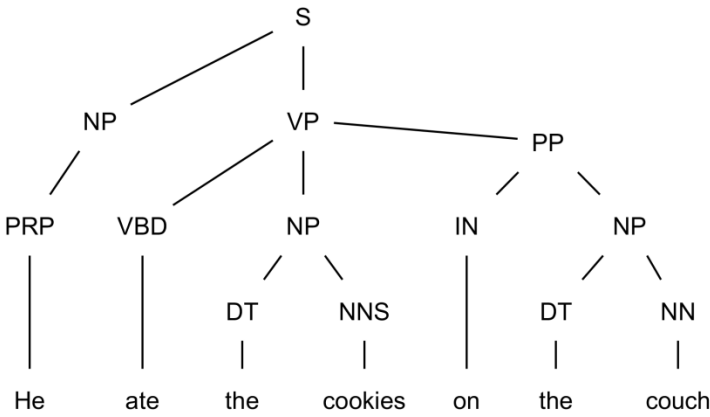[9]https://www.ling.upenn.edu/courses/Fall_2003/ling001/penn_tree-bank_pos.html

Figure 1: First syntactic tree for the cookies example

Figure 2 is a syntactic tree representing the other meaning for the cookies example indicated by the second bracketed sentence above. Here, WDT refers to a "Wh-determiner" according to the Penn Treebank Project list.
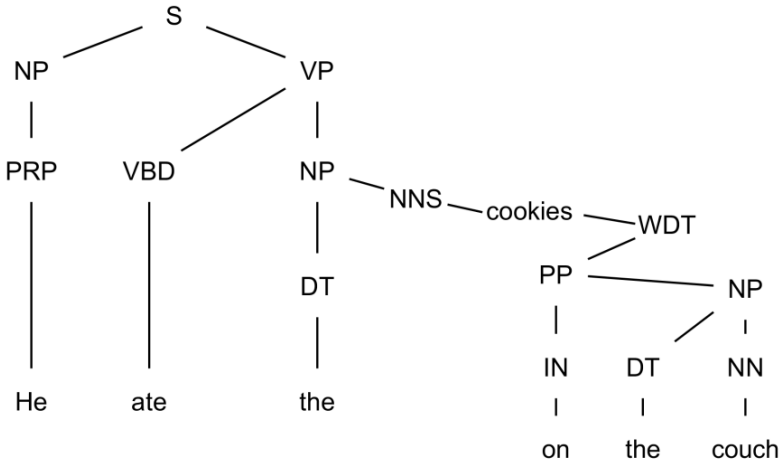

Figure 2: Second syntactic tree for the cookies example

Which one would be the more expected or plausible interpretation of the original sentence—the tree of figure 1 or the tree of figure 2—is not information given to the user. But it could be obtained if one had access to the data about the probable frequencies of both meanings.

There is some possibility that automated syntactic parsing devices, of the kind currently being used in artificial intelligence and computational linguistics, could be further developed in order to recognize structural ambiguity in a natural language sentence and disambiguate the sentence by producing as output a pair of trees of the kind shown in figure 2.

At the present time, it is the native speaker of language who has to recognize the ambiguity in a natural language sentence in order to provide the first step in the general sequence representing the structure of the profiles tool. However, if automated tools such as the Stanford Parser and FreeLing could be further developed so that they could be useful to recognize ambiguity, devices of this sort could be very useful for extending the profiles technique.

Church and Patil (1982) showed that syntactic ambiguity is far more pervasive in natural language sentences than one might be inclined initially to think. They used combinatorial methods to show how hundreds of syntactic parse trees can be constructed for certain kinds of sentences that are common in English. They indicate why this is so by starting with a very simple example (Church and Patil 1982, p. 140) using the following English comparative sentence:

(S1) Put the block in the box on the table.

Using the brackets method, they showed that the sentence has two interpretations shown below.

(Int1) Put the block [in the box on the table].
(Int2) Put the [block in the box] on the table.

To see how such syntactic ambiguities can expand combinatorially, they consider adding a third prepositional phrase 'in the kitchen,' resulting in five additional interpretations.

(Int 3) Put the block [in the box on the table] in the kitchen.
(Int 4) Put the block [in the box [on the table in the kitchen]].
(Int 5) Put [[the block in the box] on the table] in the kitchen.

(Int 6) Put [the block [in the box on the table]] in the kitchen.
(Int 7) Put [the block in the box] [on the table in the kitchen].

Once a fourth prepositional phrase is added, the list expands to fourteen trees, and the list can be further expanded when other prepositional phrases are added in. But that is not the end of it. Even more complex combinatorial expansions are shown to be possible in some other kinds of examples that they considered. What such examples suggest, once they are put through a syntactic parser, is that there tend to be multiple interpretations of even relatively simple English sentences, meaning that with more complex sentences, choices between interpretations might have to be made on a basis of some interpretations being more plausible than others.

Now we have some idea of what syntactic ambiguity is, and we can appreciate how some devices, such as bracketing or parsing tools, can be used to explain the difference between two or more meanings of a syntactically ambiguous sentence. Next, we have to ask whether and how using such a sentence in argumentation amounts to committing the fallacy of amphiboly. Should we say that the speaker committed the fallacy of amphiboly merely by uttering such a syntactically ambiguous sentence? Or should there be more to the fallacy than that?

5. Profiles of dialogue

In order to study these, and similar examples of amphiboly, it will turn out that something called a profile of dialogue is a useful tool. A profile of dialogue can be described as a relatively short sequence of moves (speech acts such as questions and replies) in a dialogue that presents normative structure, showing how a sequence of argumentative exchanges in a real argument in a text should proceed according to the rules for the more comprehensive type of dialogue of which the argument is part (Walton 1989; Krabbe 1992; Walton and Krabbe 1995; van Eemeren et al. 2008; van Eemeren 2010). A profile of dialogue abstractly represents a turn-taking sequence of speech acts including both the putting forward of an argument and the response to it by the party to whom the argument was directed. Profiles of dialogue were described by Krabbe (1992) as "tree-shaped descriptions of sequences of dialectic that display the

various ways a reasonable dialogue could proceed" (p. 277). The profile of dialogue used as a tool for solving problems associated with informal fallacies originated from its application in Walton (1989, pp. 37-38) to the fallacy of many questions. An attraction of the profile method is that can be used to assist an argument evaluator to model the textual evidence in a given case "without having to go through all the technical preliminaries for the complete definition of a dialogue system" (Krabbe 1992, p. 277).

Krabbe (1995) and Walton (1999) applied the profiles of dialogue to the task of evaluating arguments from ignorance. Such arguments are often associated with the fallacy of *argumentum ad ignorantiam*, but they are also often called arguments from negative evidence, a form of argumentation that is not necessarily fallacious and can be quite reasonable in science and law (Walton 1999). Profiles were used in (van Eemeren et al. 2008 and Walton 2015) to model shifts in a burden of proof and presumptions arising from them. To show how his theory of dealing with instances where the fallacy of equivocation is found or suspected, Krabbe (2002, p. 164) built a general graph structure taking the form of a tree that is meant to represent part of a normative profile of dialogue that can be applied to such cases. This particular application of the profile tool will turn out to be important below.

A *graph* is mathematically defined as a pair (V, E), where E is a subset of the two-element subsets of V (Harary 1972, p. 9). V is a set of points and E is a set of lines joining the points. For example, on an argument diagram, the points represent propositions, such as premises or conclusions of an argument, and the lines can be taken to represent inferences from a set of premises to a conclusion (Freeman 1991). An argument diagram is a *directed graph* if every pair of its elements (V, E) is an ordered pair. So, for example, an argument diagram has arrows representing the direction of an inference from one proposition to another. A *path* is a sequence of points v_0, v_1, . . . v_n and the path is *a cycle* if $v_0 = v_n$ (Harary 1972, p. 13). A *tree* is a graph that contains no cycles. A typical argument diagram is a graph. Examples of profiles of dialogue are given in figures 4, 5, and 8.

The profile tool was modified and extended in Walton (2015) by using a pair of graphs. The descriptive graph represents how a

dialogue sequence actually went in the example chosen for analysis. The normative graph represents an analysis of how the sequence should ideally proceed, according to the protocols (rules) for this type of dialogue. In this new version of the technique, the descriptive graph is mapped into the normative graph, enabling a comparison to be made between the two graphs. The aim of this new approach is to get beyond the old idea of the fallacy as a "gotcha" move, and instead look at cases where a fallacious argument is reconfigured as a fault that can be corrected or otherwise dealt with in some helpful way. In this approach, the normative graph is used to diagnose the fault in the sequence displayed in the descriptive graph, enabling an appropriate fix to be made. This new version of the of the profile method can be called the profiles method (with the s on the end), making clear that two profiles are involved.

For the purpose of analyzing the fallacy of amphiboly, this paper utilizes the profiles method of the kind presented in Walton (2015). In this method, the application of the profiles tool always begins with a dialogue sequence: an orderly sequence of moves between two or more participants where they take turns using speech acts, such as those for asking questions; putting forward arguments; and so forth. This dialogue is then mapped into a pair of graphs: a normative graph and a descriptive graph. Some inkling of how this method works can be given by considering the simple example of eating the cookies on the couch, which is not, at least necessarily, an instance of the fallacy of amphiboly, but it certainly illustrates a kind of case where there could be an erroneous interpretation because of the ambiguity. In our subsequent analysis of the fallacy of amphiboly and our treatment of ambiguity generally, I will take a pragmatic approach, specifically one in which the context of dialogue needs to be taken into account when addressing any example where it is suspected that a fallacy has been committed.

Walton and Macagno (2016) applied the profiles tool to problematic examples of arguments associated with failures of relevance, especially one where there is an issue of whether an *ignoratio elenchi* fallacy has been committed. Koszowy and Walton (2017) applied the profile tool to particular examples of arguments from expert opinion associated with the *ad verecundiam* fallacy, the fallacy of incorrect appeal to authority. Krabbe (2002) applied the

profile of dialogue tool to an example of the fallacy of equivocation. This particular application is especially important for studying amphiboly, so next we will explain how it works.

Adopting this dialectical view of fallacies takes us beyond the view that for there to be a fallacy there must be an argument with an identifiable set of premises and conclusions, so that the fallacy can only be located in the inferential link between these premises and the conclusion. According to this dialectical approach, an argument can be seen as a kind of verbal exchange between two or more parties, and that the fallacy can reside in how one move follows another in the dialogue. In a case where there may be reason to think that the fallacy of amphiboly has been committed, two or more interpretations of the given sentence pose the issue. The two sides will then put forward their arguments. The dialogue needs to be evaluated by using a formal model of dialogue and examining speech acts put forward by each side. This approach fits well with Engels' treatment of amphiboly described in section 2. For, as required by that approach, if a conclusion is not drawn by logical implication but by conversational implicature, extracting it depends on the goal of the dialogue that the speakers are engaging in.

6. The pizza example

The syntactic ambiguity in the sentence 'I offer you two pizzas for five dollars' can be explained by using brackets to distinguish between the two meanings as follows. First meaning: I offer you [two pizzas for five dollars]. This means five dollars for both. Second meaning: I offer you two pizzas [for five dollars]. This means five dollars each. These two interpretations at least represent what are probably the two most common possible meanings of the sentence. This could be tested empirically but we make no attempt to do that.

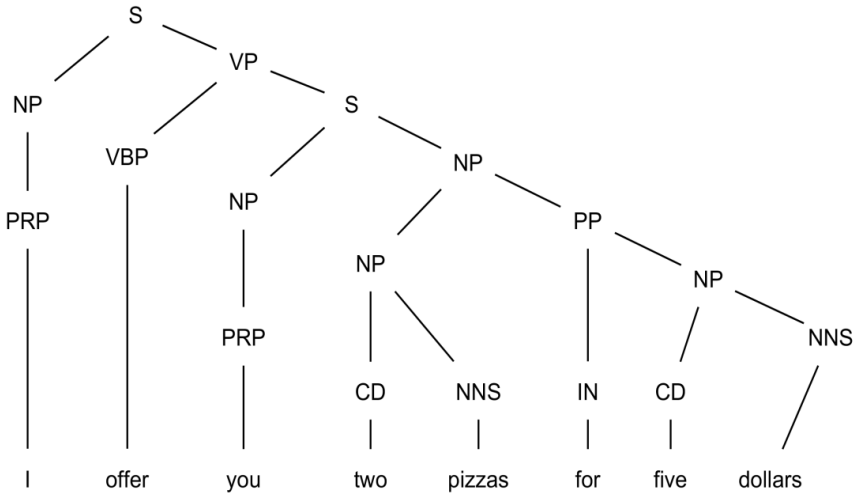When this sentence was inserted into the Stanford Parser, the output produced was figure 3.

Figure 3: Stanford Parser tree for the pizza example

To remind the reader of the notation, the letter S stands for the natural language sentence at the root of the tree, NP stands for noun phrase, VP stands for verb phrase, PRP stands for personal pronoun, VBP stands for a non-third person singular present verb, CD stands for a cardinal number, NNS stands for a plural noun, and IN stands for a preposition or subordinating conjunction.

This syntactic interpretation represents the first meaning: five dollars for both. The Stanford Parser selects the most plausible interpretation, using statistical probability values from its grammar. That would suggest that the more plausible interpretation is the first meaning. From a rhetorical point of view, that would suggest that the pizza buyers would be attracted by an ad that seems to offer them two pizzas for the single price of five dollars. So, when they go to the pizza outlet, or have the pizzas delivered to their residence, and get a bill for ten dollars, they are not going to be too happy. At that point, the dispute might ensue, but we have no information on that.

Let's extend the example a bit further hypothetically. Suppose the pizza delivery person arrives at the customer's door and presents a bill for ten dollars along with the two pizzas. The customer replies, "But you said two pizzas for five dollars," whereupon the pizza

delivery person replies, "Yes. Here they are. Pay me the ten dollars." In this extended version of the example, we have a small dialogue between the customer and the pizza delivery person. The customer, naturally enough, interprets the offer as being expressed by the first meaning, whereas the pizza delivery person insists on interpreting the offer as being expressed by the second meaning. Here we have a problem caused by the syntactic ambiguity of the offer, and therefore it looks like what we might have here is a genuine instance of the fallacy of amphiboly. Next, let us apply the profiles tool to the example to see how it could model this phenomenon.
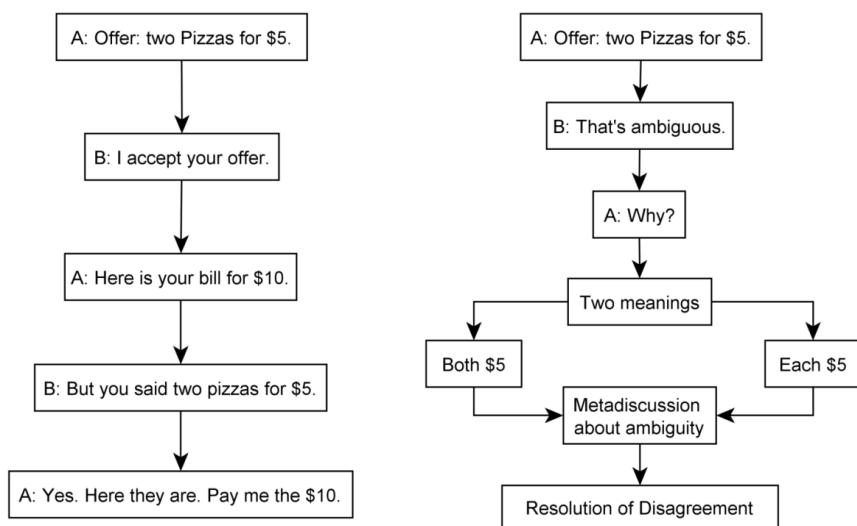

Figure 4: The Profiles Tool applied to the pizza example

In figure 4, the profiles tool has been applied to the pizza example. The graph on the left is a schematic representation of the essential sequence of moves in the dialogue as the two parties take turns making moves. The graph on the left, called a descriptive graph, represents a segment of the real dialogue that took place from the textual evidence interpreted in a given example or case. The graph on the right, called a normative graph, indicates how the dialogue should have ideally taken place in order to cope with the fallacy of amphiboly committed in the left graph. Notice that in the graph on the left, no mention is even made of any attempt to disambiguate

the pizza vendor's offer, as distinguished in the bracket notation be-low. The customer persists with her interpretation of the contested sentence while the pizza delivery person persists with his.

The essence of the problem can now be identified by comparing the two graphs and observing that the whole middle section of the normative graph shown on the right is missing in the graph on the left. The original offer suggests a natural interpretation but contains an ambiguity that leaves the way open for another interpretation to be brought forward later. The problem about a fallacy of amphiboly being committed then arises after the pizza vendor insists on an ob-viously unnatural interpretation. Once the sequence reaches the bot-tom rectangle on the left side of figure 4, it appears that the customer has no choice but to pay the ten dollars given his acceptance of the pizza vendor's offer as shown in the second from top rectangular node in the graph on the left. What should have happened ideally, as shown on the graph at the right, is that the customer should have identified the ambiguity, and explained it by showing that either of the two meanings could have been intended. In a dialogue (either with the vendor or in court), the customer could then have argued that since the sentence containing the initial offer by the pizza ven-dor can be taken as having either meaning, he, the customer, is not bound to accept the interpretation put forward by pizza delivery per-son. Instead she should have the option of paying in accord with either interpretation. This means that she can select a payment of five dollars if she wishes and is not bound to pay ten dollars.

Whether this outcome would have really occurred in this case, or in any other real case, is not dictated purely by the normative model. If the two participants failed to reach agreement on which is the correct interpretation of the ambiguous sentence, the case might have to be taken to third-party arbitration in a dispute resolution procedure. This would mean a further extension of the example in which each party puts forward its arguments that attack the argu-ments of the other side. Then, building a larger graph representing the totality of the pro and con argumentation would be needed to determine whether a fallacy of amphiboly has been committed by one side or the other and where the fallacy was committed.

7. The roulette example

The argumentation in the roulette example is essentially similar to that in the pizza example, except that the part of the pizza example that was merely hypothetical is actually realized in the roulette example. In the latter example, the text tells us that when the attendant offered ten bets for a dollar, the spectators paid him the dollar because this sounded like a bargain.
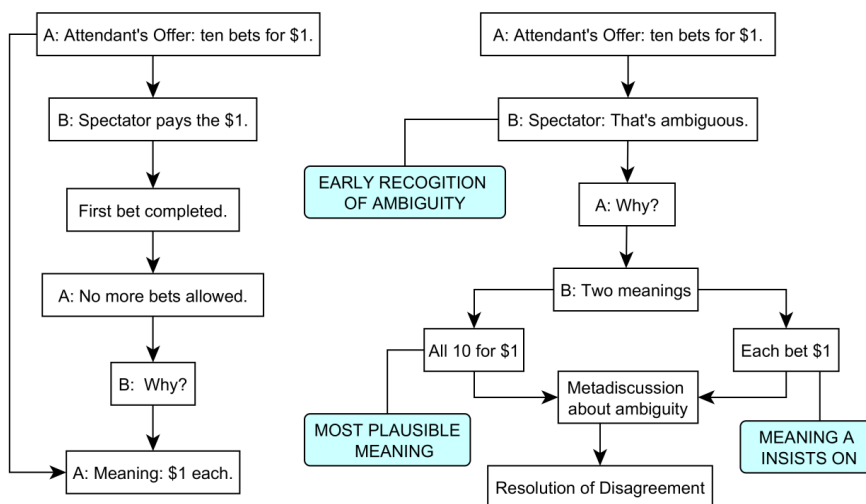

Figure 5: The Profiles Tool applied to the roulette example

Following the analysis of the pizza example, the natural or more plausible interpretation of 'ten bets for a dollar' is that if you pay the dollar you should get ten bets. However, what happens in this case is that the attendant insists that the spectator had misunderstood him. The attendant specifically says that the ambiguous sentence means ten bets for a dollar each. In this case, the roulette wheel attendant is using the ambiguous sentence as bait, so that once the spectator has paid the dollar, he is caught in the trap. The roulette wheel attendant now has the dollar, and when the customer tries to get it back from him, he switches around and insists that the syntactically ambiguous sentence must be taken in the second meaning, ten bets for a dollar each.

There can be different possibilities for how the problem posed by the fallacy of amphiboly can be solved. One possibility, represented by the profiles of dialogue shown in figure 5, is that the spectator realizes early on that the attendant's offer is syntactically ambiguous and then actually tells the attendant that this is so. In this way of solving the problem, the spectator responds to the attendant's question of why the original sentence is ambiguous by giving an explanation that distinguishes between the two meanings of the sentence. Then at that point the two parties could have a meta-discussion about the ambiguity. This discussion might resolve their conflict of opinions, or not, depending on how it goes. Ideally it could lead to some resolution of the disagreement, but if not, further steps might have to be taken, such as going to some third-party dispute resolution procedure. In this dialogue, there would be pro and con argumentation, and whether or not there is a fallacy, or what kind of fallacy it is that has been committed, could be evidentially determined by the argument in the dialogue. In particular, the fallacy could be more than just a slip or error caused by the ambiguity but could be a strategic sales tactic used by the attendant to try to get the best of the spectator. The issue this example leads to, as well as the pizza example, it should be noted, is whether there could be two species of the fallacy of amphiboly that could be committed depending on the textual and contextual evidence.

According to the pragmatic theory of fallacy (Walton 1995, p. 257), recall, there are two types of informal fallacies. The one type is simply an error of reasoning consisting in some sort of mistake or oversight that has made an argument flawed in some way. The other type of fallacy is more complex. To identify and analyze it one must situate the argument in a context of dialogue where it is being used for some purpose. Essentially this type of fallacy consists in an attempt by one party in the dialogue to try to get the best of the other by using some tricky tactic to deceive the other party. The attempt does not always have to be intentional, but it does always involve some strategic maneuver (van Eemeren 2010) of a characteristic type that can be used to get the best of the other party unfairly. The tool used to analyze fallacies of this sort is the profile of dialogue. This type of fallacy is indicated by a deceitful tactic that hinders the proper progress of the dialogue towards achieving its collective

goal. The error of reasoning type of fallacy is called a paralogism (Walton 1995), meaning that is beside logic or deviating from logic in that it uses a form of reasoning that is in principle correct but is in some respect faulty. This type of fallacy can be identified and analyzed using argumentation schemes. The fault is one of incorrectly using the scheme, for example by leaving one of its premises out.

Judging by the account of Engels, one would be inclined to think that amphiboly (sometimes called amphibology) falls into the category of the paralogism type of fallacy. Grammatically ambiguous sentences can be subtle and confusing, and it may not be too easy to recognize the ambiguity of the text upon superficial reading. Indeed, in many cases the ambiguity may not matter because one interpretation is more obvious or preferable to another. It may be easy, however, to also overlook an ambiguity that does matter because a premise or conclusion in an argument might be understood more than one way, resulting in confusion and misdirection that could be the basis of arriving at a wrong conclusion. Three of the main examples of amphiboly studied in this paper are instances of the sophistical tactics type of fallacy.

How the profiles tool was used to compare and contrast the two graphs evidentially documents why use of the syntactical ambiguity by the roulette wheel attendant in that case supports the claim that he committed the sophistical tactics variant of the fallacy of amphiboly. He was using the ambiguity as part of his spiel to lure potential customers and to deceive the spectator. The offer he made of ten bets for a dollar sounded like a bargain, and therefore, rising to the bait, some spectators would likely give him the dollar. But once the spectator has given him the dollar, the attendant has left himself the opening for the follow-up move in the dialogue sequence to insist that the proper meaning of 'ten bets for a dollar' is 'ten bets for a dollar each.'

The dialogue reveals why the attendant has crafted his message in an inappropriate way to enable him to close the discussion. Such a strategy is inappropriate dialectically because it insists on only one meaning, shifting the burden of proof onto the other party to dispute the applicability of that one meaning as opposed to the other meaning. In fact, the other meaning is the more plausible one. So when

we put this textual and contextual evidence all together we can see how the fallacy of amphiboly is used as a sophistical tactic to con the spectators in, extract money from them, and then shut down any attempts they might make to have a reasonable solution to the problem.

8. The Ford example and the Cadillac example

The Ford example can also be shown to be an instance of the fallacy of amphiboly through the use of a pair of graphs similar to those used to analyze the pizza example. In this case, the sentence can be disambiguated using the brackets method as follows:

(1) [1964 Ford with automatic transmission, radio, heater, power brakes, power steering, and windshield wipers] in good condition.
(2) 1964 Ford with automatic transmission, radio, heater, power brakes, power steering, [and windshield wipers in good condition].

In a way closely comparable to that revealed in the analysis of the pizza example above, the vendor tries to use syntactic ambiguity to attract buyers to misrepresent the condition of the car, making it seem to have many features in good condition that are really not in good condition.

The difference between this example and the pizza example is there is at least some brief indication of a meta-discussion about the ambiguity when the reader of the ad charges the vendor with misrepresentation and the vendor replies that the reader misread the ad. Here the vendor is trying to escape the charge by arguing that even though the reader may have interpreted the meaning of the ad differently, the version claiming that only the windshield wipers are in good condition is the one that should be accepted. In the Ford example, as in the roulette example, the vendor has attempted turn the burden of proof around. He is claiming that he, the vendor, should be allowed to accept the interpretation he chooses. This is further evidence of the committing of the fallacy of amphiboly by the vendor in the Ford example as well as in the roulette example.

In the Cadillac example, the syntactic ambiguity can be disambiguated as follows. It could mean 'I promise to [pay David $5000 and give him my new Cadillac] only if he finishes the job by May

1' or it could mean 'I promise to pay David $5000 [and give him my new Cadillac only if he finished the job by May 1].' This example is more complex than the others, as shown by syntactic tree produced by the Stanford Parser displayed in figure 6. Clearly, as indicated in the discussion of the example, David will choose to accept the second interpretation because that way he gets to collect the $5000 even though he didn't finish the job by May 1, as he had agreed to by the terms of the contract.
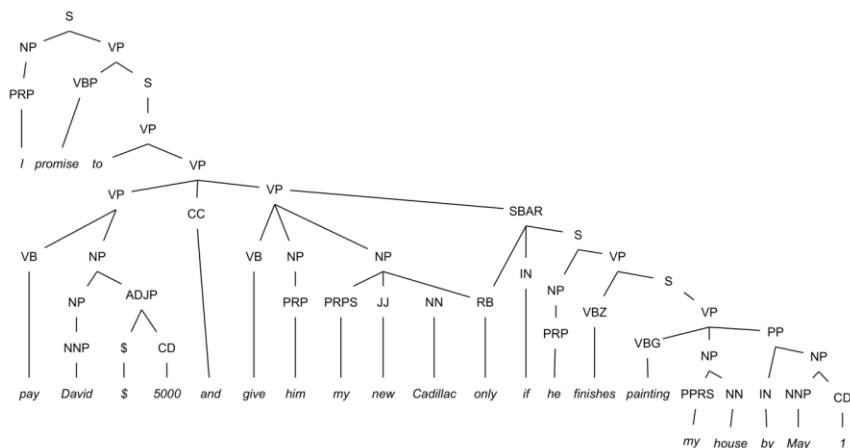

Figure 6: The Stanford Parser tree for the Cadillac example

The difference between this example and the other three examples discussed above is that the inference to the conclusion was actually drawn in the Cadillac example. This is the inference that since David did not finish until May 10, it follows that he gets neither the $5000 nor the Cadillac. So here we see that the ambiguity is part of an argument, explicitly presented in the text by the use of the conclusion indicator word 'therefore.' In this case, somebody, perhaps the lawyer representing Mr. James, has drawn as a conclusion the interpretation representing the side of Mr. James. So, this example is similar to the pizza example where there is no attempt to explain the ambiguity and no explicit meta-discussion at all of how the problem posed by the ambiguity might be resolved. Only the one interpretation is represented as the conclusion that should be drawn.

The combining of the automatic parser tool with the profiles of dialogue tool in testing an example of a natural language sentence

for amphiboly is illustrated by the way of solving the problem of amphiboly in these four examples. The combined procedure was composed of five main steps. The first step is the use of brackets, and/or syntactic parsers to recognize syntactic ambiguity in a natural language text containing argumentation. The second step is to draw a pair of graphs called a descriptive graph and a normative graph. The third step is to compare the two graphs to identify the problem. The fourth step is to continue the dialogue to evaluate an allegation that the fallacy of amphiboly has been committed by examining the evidence in the case. The fifth step is to make a decision on whether the fallacy that was committed in the given case is an instance of a sophistical tactic or an error of reasoning. The full procedure applicable to all cases will be modeled as an algorithm in section 10.

9. Evidence from the context of dialogue

The reader will also recall that fallacies are generally viewed according to the pragmatic approach in this paper and in the application of the profiles of dialogue in Krabbe (1992, 1995, 1999, 2002) and Walton (2015) as problems that can be repaired through a continuation of a dialogue, an evidence-based continuation in which information from the context of a disputed example is used. But the reader will also recall that according to the theoretical approach taken in this paper, the term fallacy can also be applied to errors of reasoning that did not represent sophistical tactics used to try to get the best of a speech partner unfairly. So the questions are whether the profiles method could be applied to the cookies example, and if so, what it would usefully tell us about the argumentation in that example, especially in connection with Engel's claim that, at least in some instances, a single ambiguous sentence can properly be said to commit the fallacy of amphiboly once implicit factors are taken into account.

Section 4 fed the ambiguous sentence in the cookies example into an automatic syntactic parser, showing that the ambiguity can be clearly explained using that tool once the grammatical structure of the sentence is exposed. So if there was some logical problem about the cookies example, such that there is a danger that it might

cause confusion in some case because of the ambiguity of the sentence, presumably simply using the automated parser tool would be enough to solve the problem. There is no need to try to apply the profiles of dialogues tool in the same way it was applied to the four examples where the fallacy of amphiboly was committed.

But still, suppose that there was some communication problem about the cookies example because one party to a discussion interpreted the sentence the one way while the other party interpreted it the other way. There might not be a fallacy of amphiboly at all in such a case. But still, it might help dialogue to proceed in a more constructive manner if a third party were to intervene, point out the ambiguity, and ask each of the two main parties in the dialogue what he or she takes to be the meaning of the sentence. This would be a species of clarification dialogue. It does not actually have to be a third party. One of the two main parties could also play this role.

This observation suggests an extension of the profiles of dialogue technique that can apply to cases where a syntactically ambiguous sentence can be a problem even though nobody is committing a fallacy with it in a communication exchange. Ambiguity is often a problem because the participants in a dialogue did not realize that a particular sentence was syntactically ambiguous, and not only were they confused about this before they disambiguated the sentence, but they also want to know which of the two interpretations was the one intended.

Using this approach, it can be shown how in many cases of ambiguity, such as with the example of the ambiguous sentence 'He ate the cookies on the couch,' the ambiguity can be coped with once the argument analyst knows something about the context of dialogue, such as a preceding move in the dialogue that could be used as evidence to clearly show that one meaning or the other was intended by the party who used the sentence. So, for example, the ambiguity in the sentence 'He ate the cookies on the couch' would disappear in context if the preceding sentence was the question 'Where did he eat the cookies?' In such a case it would be clear that the intended meaning of the sentences is the statement that he ate the cookies on the couch, as opposed to eating them somewhere else. What this means is that evidence can be drawn from the context of dialogue to show that this particular interpretation is the correct one.

There are four possible interpretations of the cookies example, each of which can be represented by a dialogue. Tables 1-4 below represent four possible interpretations of the ambiguous sentence 'He ate the cookies on the couch.' Tables 1 and 2 show how evidence from the context of dialogue could be given to support the claim that this sentence could be disambiguated in a particular way. Notice that, in principle, this dialogue could be continued so that pro and con arguments could be put forward attacking as well as supporting a given interpretation by evidence. However, the examples considered in this paper have all been brief ones in which very little if any context is known.

In table 1, at move 3, the questioner offers the correct disambiguation of the answerer's sentence at move 2. Moreover, importantly, this can be shown by evidence drawn from the context of dialogue by referring back to the question posed by the questioner at move 1.

Order	Participant	Content of Move	Description of Move
Move 1	Questioner	Where did he eat the cookies?	Prior Question in Dialogue
Move 2	Answerer	He ate the cookies on the couch.	Ambiguous Sentence
Move 3	Questioner	He [ate the cookies on the couch].	Correct Disambiguation
Move 4	Answerer	What is your evidence?	Request for Support
Move 5	Questioner	My question at Move 1.	Citing Prior Move in Dialogue

Dialogue Table 1: Evidence for a first correct interpretation

To represent this first interpretation, we could use the following bracketed sentence: he [ate the cookies on the couch]. This means that he ate the cookies while sitting on the couch. To represent the second interpretation, we could use this contrasting sentence: he ate [the cookies on the couch]. This means that he ate the cookies that were on the couch, as opposed to the cookies that might have been somewhere else. That interpretation of the original ambiguous sentence is also possible, as shown by the dialogue in table 2.

Order	Participant	Content of Move	Description of Move

Move 1	Questioner	Which cookies did he eat?	Prior Question in Dialogue
Move 2	Answerer	He ate the cookies on the couch.	Ambiguous Sentence
Move 3	Questioner	He ate [the cookies on the couch].	Correct Disambiguation
Move 4	Answerer	What is your evidence?	Request for Support
Move 5	Questioner	My question at Move 1.	Citing Prior Move in Dialogue

Dialogue Table 2: Evidence for a second correct interpretation

Hence what we have in tables 1 and 2 are examples where a correct disambiguation is made by citing evidence from the context of dialogue. The ambiguity can be clarified when one looks at the dialogue as a whole, and it is possible to cite evidence from the context to support a potentially disputed claim that one or the other interpretation is meant.

The two possibilities of going wrong by citing an incorrect disambiguation can also be mapped in a dialogue structure showing that the evidence from the context fails to support the interpretation chosen. These possibilities are shown in tables 3 and 4.

Order	*Participant*	*Content of Move*	*Description of Move*
Move 1	Questioner	Which cookies did he eat?	Prior Question in Dialogue
Move 2	Answerer	He ate the cookies on the couch.	Ambiguous Sentence
Move 3	Questioner	He [ate the cookies on the couch].	Incorrect Disambiguation
Move 4	Answerer	What is your evidence?	Request for Support
Move 5	Questioner	My question at Move 1.	Prior Move Fails to Support

Dialogue Table 3: Evidence for a first incorrect interpretation

Order	*Participant*	*Content of Move*	*Description of Move*
Move 1	Questioner	Where did he eat the cookies?	Prior Question in Dialogue
Move 2	Answerer	He ate the cookies on the couch.	Ambiguous Sentence

Move 3	Questioner	He ate [the cookies on the couch].	Incorrect Disambiguation
Move 4	Answerer	What is your evidence?	Request for Support
Move 5	Questioner	My question at Move 1.	Prior Move Fails to Support

Dialogue Table 4: Evidence for a second incorrect interpretation

These four dialogues that hypothetically extend the context of use of the argumentation in the cookies example suggest a general method that can be very useful for coping with problematic syntactical ambiguity even where no fallacy of amphiboly has been committed by either party in the dialogue. The problem in such cases is typically to try to figure out which of the two possible meanings was most likely intended given the textual evidence available in the given case. What has been shown by our analysis of this example is that, in general, which of the two possible meanings is justified by the contextual evidence can be inquired into in an evidence-based manner by extending the dialogue backwards. This thought experiment shows that the disambiguation should depend on the prior context of dialogue—in the case modelled here as a prior question asked in the sequence of dialogue.

Hence, we come back to issue of whether there still might be other kinds of cases where ambiguity is a problem even though it may or may not be one of somebody committing the fallacy of amphiboly. The issue—raised by the textbook accounts of amphiboly as a fallacy and the way this fallacy is commonly treated on the Internet (as shown in section 2)—as to whether a syntactical ambiguity is by itself enough to warrant an allegation that the speaker has committed the fallacy of amphiboly, or whether it has to be shown specifically how the ambiguity was used as part of an argument, remains.

The cookies example is clearly a case of syntactical ambiguity. But is it an instance of the fallacy of amphiboly? The answer given here is that it is not, provided nothing is known about the context of dialogue. As the example stands, it is simply an example of a syntactically ambiguous sentence. It is not being used for any particular purpose. Nor is anything known about its dialectical context, for

example, whether it was put forward as an answer to some specific question that can be found in the textual evidence of the case.

The pragmatic approach taken in this paper has shown that it is harder to pin down an allegation that someone has committed the fallacy of amphiboly in many cases, and even to deal with cases of troublesome ambiguity where no fallacy is involved, given the absence of any further context in which the utterance was made (for example, as part of a speech or a written document). To examine a case of this sort fairly, on the approach advocated here, one would have to have the text of the speech so that one could use it as evidence both to disambiguate the syntactically ambiguous sentence in question, and to draw some conclusion about whether the use of the ambiguous sentence in context can fairly be considered to be a case where the fallacy of amphiboly has been committed.

Finally, in this section, the question that most needs to be answered is: what kind of evidence needs to be used to disambiguate a term that is syntactically ambiguous? The answer is suggested by adapting the list of ten dialectical rules for ambiguity set out in (Walton, 2000, 267-268) to the problem of syntactic ambiguity. Following this approach, a list of nine disambiguation rules for evaluating argumentation in cases where a syntactic ambiguity is considered to be a problem, adapted from these prior ten rules, are set out below.

1. Evidence of how the sentence was used at a previous occurrence in a text should be relevant to interpreting a syntactically ambiguous term, one way or another, in another part of the same text.
2. When interpreting an ambiguous sentence, the interpretation that makes more sense of the text should be preferred. A meaning that makes the text absurd or meaningless should be avoided.
3. An interpretation of an ambiguous sentence should avoid making the text of discourse contradictory if it is possible to assign meanings that avoid or reconcile the contradiction.
4. Given a choice, a syntactically ambiguous sentence should be interpreted in such a way that it contributes to the common conversational goal of the dialogue that the text is part of.

5. If a sentence occurs twice in the same text of discourse, there should be a presumption that it has the same meaning at both occurrences.
6. If a syntactically ambiguous sentence has been explicitly defined at some prior point in the text of discourse, the meaning that conforms to this definition should be chosen.
7. If the discourse is part of some special context such as a domain of expert knowledge, the technical meaning of the sentence appropriate for this discipline or domain should be presumed.
8. If a sentence occurs in a non-ambiguous way in a closely related text that makes its meaning evident, the ambiguous text it should be interpreted in line with the non-ambiguous text.
9. If the author or speaker of the text has made a preference known on how to interpret an ambiguous sentence, weight should be given to disambiguating by accepting that preference.

These nine rules tell what kinds of evidence should be used for disambiguating syntactically ambiguous sentences, showing that the procedures advocated for evaluating, or supporting, or refuting a given proposal for disambiguating an ambiguous term are evidence-based.

In concluding this section, a careful distinction needs to be made between the profiles of dialogue technique, and the technique applied to the cookies example in this section. The latter technique also uses a profile of dialogue because it configures the example as occurring in a context of dialogue—a connected sequence of moves and counter moves in a multiagent dialogue between two or more parties. However, the profiles of dialogue technique, the technique used to analyze the four examples in order to show that a fallacy of amphiboly was committed in each case, uses two sequences of dialogue visually placed side-by-side. This method of identifying a fallacy of ambiguity, as committed in a particular case, works by comparing the one profile of dialogue to the other. So here we have to be careful to recognize that the profiles of dialogue technique, which has an "s" on the end of the word profile, is a tool for testing whether or not a fallacy has been committed in a given case. This tool works by comparing the normative profile of dialogue with the real sequence of dialogue. On the other hand, the dialogue technique

used in the cookies example works by comparing a dialogue sequence that is dialectically correct with another dialogue sequence that is incorrect. The outcome of applying this technique is to show that the one interpretation of the example is correct while the other is not, by tracking backwards through the two sequences to the original question asked in each instance.

The terminological issue is whether both techniques should be called uses of the profiles of dialogue tool, or whether the two techniques should have separate names to distinguish them. The profiles of dialogue method has already been established as a working tool used to determine whether or not a fallacy has been committed using that terminology (Krabbe 1992, 1995, 2002). The question that has to be discussed now is whether the two techniques are really all that different, and if not, whether they should have the same name. Since both tools proceed by using basically the same kind of procedure where they compare one sequence of dialogue to another, and where the one sequence is regarded as correct and the other incorrect, it is proposed here that they should be considered two subspecies of the same technique, which should be called the profiles of dialogue technique henceforth. The terminology being proposed suggests that that the original profiles of dialogue method should be broadened so that it includes the dialogue tracking technique applied to the cookies example in section 9.

10. Conclusions

This final section of the paper provides an evidence-based algorithm for amphiboly evaluation. This algorithm can be applied to test whether or not any natural language text (an example of argumentation) containing a syntactically ambiguous sentence is an instance of the fallacy of amphiboly. The work of this paper has been to apply the automated parser tool and the profiles of dialogue tool to some realistic textbook cases where syntactic ambiguity is a problem or where it has been suspected that the fallacy of amphiboly may have been committed with a specific purpose in mind. The outcome of this work is to provide a hypothesis about how this exercise can be fashioned into an algorithm that can help a user to break the tasks of analysis and evaluation down into an orderly sequence of

subtasks that, taken as a whole, provide guidance on which step needs to be taken first and how each of the series of subsequent steps can only be taken by carrying out the steps preceding it. Based on the examples analyzed using the profiles tools in this paper, the following algorithm is now constructed. Its purpose is to test any example of a natural language text to see if the argumentation in it can be justifiably criticized as committing a fallacy of amphiboly, based on the textual and contextual evidence that is available. The notation ST stands for the sophistical tactic type of fallacy, and the notation ER stands for an error of reasoning.

Algorithm for Testing an Example for the Fallacy of Amphiboly

(1) Check to see if the sentence to be tested that has been put forward in a dialogue as a speech act is part of an argument. If not, stop. If so, go to step 2.

(2) Check to see whether the sentence is syntactically ambiguous as indicated by tools such as the using of brackets or tree parser diagrams. If not, stop. If so, go to step 3.

(3) Check to see if the sentence contains implicit assumptions that may need to be extracted by inserting implicit premises or conclusions. If so, go to step 4. If not, go to step 5.

(4) Reconstruct the argument by making implicit premises or conclusions explicit. Go to step 5.

(5) Reconstruct what really took place in the example by interpreting the sequence of dialogue using a descriptive graph. Go to step 6.

(6) Construct a normative graph showing how the sequence of dialogue in the case should have ideally taken place in order to conform to protocols of some type of dialogue. Go to step 7.

(7) Compare the descriptive graph to the normative graph. Go to step 8.

(8) Based on the comparison, diagnose a fault that needs to be repaired, where the fault can be an ST or an ER. If it is a ST, go to step 9. If it is an ER, go to step 10.

(9) Using the profiles and other evidence, argue that the one agent is deploying a sophistical tactic as a means to get the other to draw a wrong conclusion.

(10) Construct two sequences of dialogue based on the textual and contextual evidence to argue that the syntactic ambiguity has led to an error of reasoning.

An outline of how the algorithm looks from the user's point of view, based on how it was applied to the examples analysed in this paper, is presented in figure 7. The procedure shown in this figure can be followed when first encountering a sentence or argument in natural language discourse that contains a syntactic ambiguity, and the aim is to evaluate the sentence or argument to determine whether or not a case can be made for taking it to be an instance of the fallacy of amphiboly.

To follow through with the algorithm, you start at the circular node on the left and proceed to step 1. Once you reach the node labeled 1, you are at step one, and then you have to make the decision indicated therein. If you choose the 'yes' step, you move on to step 2, at which point another decision is needed to be made. If you choose the 'no' step of the procedure, then the procedure stops, as indicated by the octagonal node. But if you choose the yes step, you move to node 3, which ultimately carries the procedure through to node 8, where a decision needs to be made. If the outcome of step 8 is that a sophistical tactic type of fallacy has been committed, the procedure moves to node 9, and from there it stops, as indicated by the octagonal stop sign. If the outcome at step eight is that an error of reasoning has occurred, the procedure moves to node 10, and after that it automatically stops. Once the algorithm starts, as applied to a particular case where there is an issue of whether the fallacy of amphiboly has occurred or not, it will automatically follow through and produce an outcome showing whether the fallacy has been committed or not in that case.
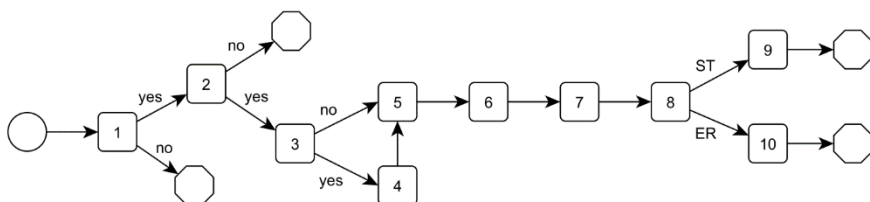

Figure 7: Outline of the procedure for amphiboly evaluation

The textual and contextual evidence is important at each step. Use of the procedure ensures that the evidence collected about the example at each point determines whether an allegation that the fallacy of amphiboly has been committed can be properly supported or not by this evidence. It has been argued in this paper that fairly judging whether a fallacy of amphiboly has been committed requires a pragmatic approach in which the arguments on both sides are supported or attacked by evidence drawn from the text and context of the document in which the ambiguity was recognized.

Applying this algorithm to a case where a fallacy of amphiboly is suspected can help logic students by providing a systematic method for dealing with examples where this fallacy has supposedly been committed based on evidence that can be collected and applied. It might also help the logic textbooks and other writings on amphiboly solve problems posed by amphiboly, deal with the inconsistencies in the current treatments of it, and in general achieve a more unified and coherent approach on how to treat the fallacy of amphiboly.

This paper has raised the more general methodological question for logic of whether a fallacy always has to be a fallacious argument. One can see that the same issue arises with other informal fallacies, such as the fallacy of many questions exemplified by the question, 'Have you stopped cheating on your income taxes?' Asking this kind of question has traditionally been taken as a fallacy in the logic textbooks, usually called the fallacy of many questions (Walton 1996, 22-26). A way around this difficulty is to argue that although, strictly speaking, a question is not a proposition, and hence it would seem that it cannot be part of an argument, this question could be taken as putting forward an implicit argument that implies the propositions that the answerer has cheated on his income taxes in the past and may be continuing to do so. Another way to portray such a question as an argument is to analyze the question as containing presuppositions or presumptions that are set into place when the question is asked. Such a presupposition could also be seen as an implicit conclusion drawn from the asking of the question that imputes unethical behavior to the person to whom the question was addressed. As indicated by the pragmatic solution to the problem of syntactic ambiguity in argumentation proposed in this paper, the

solution to the problem posed by the fallacy of many questions is comparable. The context of dialogue can be modeled as a sequence of questions and replies, and this context can be collected and used as evidence to solve the problem of whether a fallacy has been committed or not in a given case.

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