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Profiles of Dialogue: A Method of Argument Fault Diagnosis and Repair

Douglas Walton
University of Windsor, Centre for Research in Reasoning, Argumentation and Rhetoric

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This paper builds the profiles of dialogue tool into a fault diagnosis method that can be applied to problematic examples of argumentation such as those involving informal fallacies. The profiles method works by comparing a descriptive graph with a normative graph. 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. The descriptive graph is mapped into the normative graph, so that a comparison can be made to diagnose the fault in the sequence displayed in the descriptive graph and repair it.

Key Words: informal fallacies; directed graphs; formal models of dialogue; artificial intelligence

Argumentation, at the current point of its development, is very strong at two ends of the spectrum. At the bottom-up end a large corpus of problematic examples of real arguments has been analyzed that are, in many instances thought to commit fallacies or admit of other kinds of logical and communicative problems. A mass of studies at this end has been carried out by applying tools such as argument diagrams to actual cases of real arguments taken from news reports, Internet sources such as Debatepedia, legal argumentation and parliamentary and congressional debates. At the top-down end, abstract normative models of argumentation have been built to formalize structures with dialogue rules (protocols) that stipulate what kinds of moves (speech acts) are permissible and obligatory in sequences of argumentative exchanges. Formal argumentation systems of this kind have now been constructed in computer science, especially in artificial intelligence and multiagent systems, to model argumentative exchanges of the kind that take place on the Internet as arguments are put forward by one side and contested by the other side. This paper shows how to apply a profiles of dialogue method to real examples of argumentation in a text, bringing these two ends closer to working together.

In the informal logic textbooks, fallacies were often taken to be arguments that are inherently faulty or fallacious. There has been a gradual revolution in the subject starting with (Hamblin, 1970) moving to the view that such arguments can sometimes be reasonable, in the right context of use. The problem then confronted for an argument analyst or critic of an argument is to prove by means of objective evidence whether an argument used in a particular case can properly be diagnosed as defective or not. Formal dialogue models provide part of the answer at one end by using the context to make such evaluations by modeling the abstract conditions under which a sequence of argumentation is not fallacious. These models provide rules to determine if the dialogue proceeds in the correct order, asking necessary preliminary questions and establishing the arguer's commitments. Using the method of profiles of dialogue developed in this paper, an interpretative reconstruction of a given argument used in natural language discourse can be abstracted from the actual case using the evidence from the given text of discourse and compared to the requirements of the abstract, formal model. It is shown how a formal and computational argumentation model called the Carneades Argumentation System (CAS) can not only be used to evaluate arguments and to invent new arguments to support a contested claim, but can also support the profiles of dialogue method. In section 6, a twelve-step procedure is presented that explains how the method can be employed to help an argument analyst to determine whether a given argument exhibits faults, such as informal fallacies, that can be diagnosed and even repaired. In section 7 it is shown how this method has both normative and descriptive parts.

1. Normative and Descriptive Approaches

Reed et al. (2008, 2) bring out the distinction between the normative and descriptive aspect of argumentation by stating that argumentation protocols are specifications of how dialogues are to proceed, as contrasted with dialogue histories that are records of how a given dialogues did proceed. They maintain that there is a separation between prescriptive normative structures defined by abstract procedural rules for formal dialogue systems and the representation of actual arguments in actual dialogue histories. It has also been observed (Bruschke, 2004) that there is quite a gap between abstract normative structures of the kinds formulated as a formal models that represent how argumentation should ideally go, and actual practices of argumentation of the kind studied in the literature on public debates and political controversies. These latter kinds of studies tend to be more descriptive and empirical in their methods and approaches.

The technique of argument diagramming is a normative method of informal logic. An argument diagram is composed of two elements (Freeman, 1991): (1) a set of nodes (vertices, points) representing the premises and conclusions in the sequence of argumentation in a given case, and (2) a set of arrows (lines) representing inferences from premises to conclusions. Each arrow basically represents an inference, but the arrows also represent arguments from premises to conclusions. In applying the technique, the analyst designates the nodes in the diagram as premises or conclusions, based on his or her interpretations of the natural language text of discourse that is the target of the analysis. In making the diagram the analyst needs to designate one point that is taken to represent the ultimate proposition to be proved or contested.

Van Eemeren and Grootendorst (1992) advocated the use of the type of dialogue called the critical discussion, which has the goal of resolving a conflict of opinions set at the opening stage. They also distinguish a confrontation stage of the dialogue where the participants define the goals of the discussion and agree on the dialogue rules. The rules are meant to represent a way of codifying the Gricean conversational principles (Grice, 1975). In the argumentation stage both parties bring forward arguments to support their individual viewpoints, and have an opportunity to criticize the arguments put forward by the other side. On this view (van Eemeren, 2010) the argumentation stage of the critical discussion is an adversarial type of dialogue in which there is a good deal of strategic maneuvering on both sides so that each side can find the weak points in the argumentation of the other side. In the closing stage it is determined whether one side has been victorious over the other. The dialogue rules offer a normative model of argumentation.

On the formal dialectical approach (Walton and Krabbe, 1995), a dialogue is seen as an ordered sequence of moves in which each participant takes a turn in making a move containing a speech act. So a dialogue is essentially a sequence of pairs of moves by each side. Attached to each side is a set of propositions called a commitment store. At each move, depending on the rules of dialogue, propositions are inserted into this set or removed from it. The rules of dialogue define the permissible moves, the types of locutions involved in a move, the regulation of commitment insertion and deletion, and sequences of moves that fulfill the goals of the dialogue.

2. Formal Dialogue Systems

Traditionally in the informal logic textbooks, informal fallacies were treated as kinds of arguments that are fallacious. This traditional approach was called the standard treatment of fallacies by Hamblin (1970), who took a new dialectical approach that linked fallacies to formal dialogue systems. This approach had the implication that the forms of argument associated with the traditional fallacies are not necessarily fallacious, leaving us with task of judging in particular cases whether a given argument of one of these types is fallacious or not. But Hamblin also proposed a framework that was also the beginning of an answer to this question of how to tell whether or not a given argument in a natural language text of discourse is fallacious. He proposed that the context of the argument can be modeled dialectically using formal dialogue systems, and he constructed several simplified formal systems of this sort. Using formal dialogue systems was not altogether new, because philosophers and rhetoricians in both the ancient and medieval periods widely advocated such a dialectical approach both in rhetoric and applied logic. However, Hamblin's program of applying formalized mathematical dialogue systems to the study of informal fallacies was a revolutionary step forward.

Hamblin was just at the beginning point of the opening of this new field of investigation. While he built mathematical models of formal dialogues based on the traditional Greek models, and such systems as the Obligation Game of the Middle Ages, he made no serious attempt to take the next step of classifying different types of dialogues and modeling their properties. That step was subsequently taken in further studies such as (Walton, 1989) and (Walton and Krabbe, 1995). This formal dialectical approach advocated the view that argumentation is based on the kind of communication that takes place between agents in a dialogue structure. In such a structure one agent makes a move, such as putting forward an argument, and the other agent takes its turn responding to that move, such as criticizing the argument. A dialogue is defined as a 3-tuple: an opening stage, an argumentation stage and a closing stage. In this approach, six types of dialogue were initially recognized (Walton and Krabbe, 1995), called information-seeking, inquiry, persuasion, negotiation, deliberation and eristic dialogue. Another type called discovery was added in (Walton, 2013, 9), where the goal is to find a hypothesis to explain some a set of facts. Within the computational dialogue classification system of (McBurney and Parsons, 2001, 4), the properties of discovery dialogue and inquiry dialogue are different. In an inquiry dialogue, the proposition that is to be proved true is designated at the opening stage, whereas in a discovery dialogue the hypotheses are tested during the argumentation stage.

Dialogues are formal structures defined by a set of initial conditions, a set of goals for each agent, and collective dialogue goals binding both (or all all) the agents. An agent can be a human or a machine entity, such as a computer program designed to take part in multiagent communications on the Internet. It is assumed that each agent has a commitment store, a set of propositions it has gone on record in the dialogue as accepting. Each stage has rules (protocols) governing the permissible or obligatory activation of a speech act put forward in a move.

For example, in a persuasion dialogue the proponent has a thesis (claim) that it needs to prove by a sequence of logical reasoning in order to win. To win, the respondent needs to cast sufficient doubt on the proponent's proof by undercutting it, or produce a stronger argument for the negation of the proponent's claim. The collective goal of a persuasion dialogue is to resolve the conflict of opinions expressed at the opening stage by testing the one argument against the other. The global burden of proof, called the burden of persuasion in a persuasion dialogue, requires that the proponent has a thesis to be proved. The default burden of persuasion applicable in a typical case is set by the preponderance of evidence standard, essentially meaning that the stronger argument wins. Meeting this burden of persuasion is determined by coming up with a strong enough argument using a chain of argumentation in which individual arguments in the chain are of the proper sort (Prakken, 2006). Determining which argument is stronger requires that the entire sequence of argumentation on each sides needs to be evaluated. So argument evaluation is essential for determining whether the burden of persuasion has been met. The same is true with the other types of dialogue. Evaluating the argumentation on both sides, or on all sides in a multiagent dialogue exchange with more than two parties, is vitally important.

This dialectical approach of using formal dialogue systems to model argumentation has now been taken up in computer science, most notably in the fields of artificial intelligence and multiagent systems. This research has built formal and computational argumentation models representing these different types of dialogue. Formal and computational dialogue systems have been widely studied recently as multiagent systems (McBurney and Parsons, 2001). They include formal systems for persuasion dialogue (Prakken, 2006), deliberation, inquiry, negotiation and information-seeking dialogue. The critical discussion dialogue of van Eemeren and Grootendorst is classified as a subtype of persuasion dialogue.

Reed (2011, 5) describes the logical connection between moves in a dialogue sequence as the parties in the dialogue put forward assertions and arguments, as well as other kinds of speech acts, as dialogue glue. It is this glue that holds the individual speech acts together as the parties in the dialogue take turns putting forward as their moves. Asking the question what provides this glue, Reed (2011, 5) provides the answer that it is the protocols of the formal dialogue systems. Argument protocols are essentially specifications determining how such dialogues should proceed ideally in order to move forward toward a collective goal, such as resolving a conflict of opinions by using rational argumentation. For example, pre and post-conditions define what kinds of speech acts are permitted as communicative moves and what the range of options are for the respondent in making a reply at its next move. Protocols are what have so often in the past been called the procedural rules of the dialogue system (Walton and Krabbe, 1995).

Using these formal argumentation systems one can model the abstract conditions under which an argument pattern is not fallacious. If the dialogue proceeds in the correct order stipulated by the protocols, asking the necessary preliminary questions, establishing the arguer’s commitments, and only putting forward moves that fit the speech acts defined by the protocols, and that are connected together only in ways permitted by the protocols, an argument used in that setting can be shown to be not fallacious. But we are still left with the problem of applying the formal dialogue systems to instances of natural language argumentation where we suspect that a fallacy has been committed, and show decisively using the formal model that of fallacy has been committed in this particular case. This is sometimes called the problem of pinning down a fallacy in a particular case where an argument has been put forward in a natural language text.

The problem is how an analyst, when trying to analyze or evaluate a particular argument in a natural language text, can integrate the formal dialogue system with the data provided by the text. From the other side, argumentation scholars and researchers have learned to apply graph structures of the kind called argument diagrams or argument maps to instances of real arguments, in order to identify such arguments, and to analyze and evaluate them. But there is a large gap in the middle. How can the resources provided by the formal dialogue systems be integrated with the argument graphs and the textual data provided at the ground level by an argument graph? This paper provides a solution to the problem by using a device called a profile of dialogue, defined (Walton, 1989, 38) as a selected sequence of moves embedded in a longer sequence of moves in a dialogue exchange. This solution enables a graph structure to be abstracted from the case of actual argumentation so that the argument analysts can compare it to key elements of the abstract model of dialogue using a second graph structure. The pair of graphs is used as a tool to help determine whether the argument is fallacious or not in the given case.

3. Arguments Modeled as Graphs

A graph is defined mathematically as a set of vertices, also called points or nodes, and a set of edges, also called lines or arcs. Technically a *graph G* is defined as an ordered pair (*V*, *E*), where the set *E* is comprised of the two-element subsets of *V* (Harary, 1972, 9). In other words, an edge is seen as a relation between two vertices, represented as a pair of vertices. The graph is called a directed graph if every pair of its elements (*V*, *E*) is an ordered pair. In an undirected graph, the elements are not ordered pairs, but are merely sets of vertices. A mixed graph is one in which some of the edges can be directed while other can be undirected. Graphs can be infinite, but the ones dealt with here are finite. It is customary to represent a graph as a diagram.

Three examples of diagrams representing directed graphs, also called digraphs, are shown in figure 1. Each vertex has been assigned a number, and each edge is shown as an arrow joining a vertex to another vertex. These three diagrams all represent complete graphs, meaning that each pair of vertices is joined by an edge. Graphs such as these three are familiar to those of us working in argumentation. They can be seen as argument diagrams. Each number shown in a vertex represents a proposition in what is called a key list, a list of propositions making up the premises and conclusions in a given argument. Each arrow represents an inference from one proposition to another.

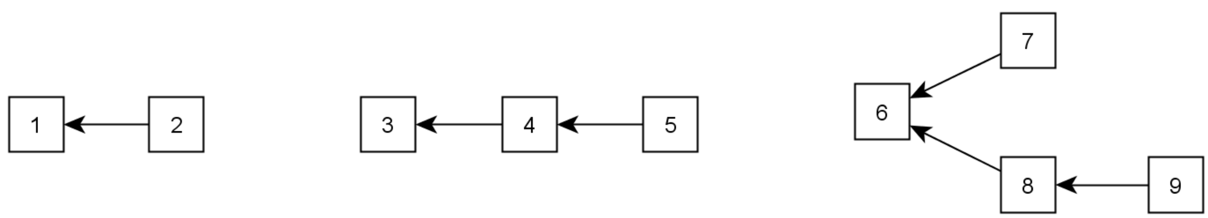

Figure 1: Three Argument Graphs

The graph on the left represents a single argument. A premise 2 supports the conclusion 1. The figure in the middle is a linear graph, meaning that the vertices can be listed as 1,2, . . ., *n*, representing a linear structure. This type of argument is called a serial argument in informal logic. The premise 5 supports the conclusion 4, and then 4 is reused as a premise to support conclusion 3. In the figure on the right, premise 7 supports conclusion 6 and premise 8 also supports the same conclusion. Premise 8 is supported by another argument with 9 as its premise. This figure also contains a serial argument of the kind represented in the middle figure.

A graph with no cycles is called a tree. The figure on the right is a typical tree, and box 6 is called the root of the tree. The part of it where the two premises 7 and 8 support the conclusion 6 is problematic from a point of view of argument diagramming. The graph figure on the right does not tell us whether this argument from 7 and 8 to 6 is a linked argument or a convergent argument. In a linked argument, both premises go together to support the conclusion, whereas in a convergent argument each premise independently supports the conclusion. Standard argument diagramming representations indicate this distinction on the diagram in various ways. However, most of them make the resulting argument diagram into something that is not graph. Next we will examine a formal argumentation system that draws representations of arguments as graphs while still enabling this distinction to be modeled in the graph. It does this by using what is called a bipartite graph, and this method has several additional advantages shown below. One of the most important advantages is that it enables the argumentation in a graph to be evaluated.

4. Profiles of Dialogue

A profile of dialogue as defined in (Walton, 1989, 3) is a selected sequence of moves embedded in a longer sequence of moves in a dialogue exchange between two or more parties. The motivating idea is that the selected local sequence fits into a longer sequence, so that the local sequence can be made sense of and analyzed by fitting it into the longer sequence. Generally the longer sequence is itself some selected part of the argumentation stage. In principle, a longer sequence could stretch from the opening stage of the dialogue to the closing stage. However, when using the profile of dialogue as a working tool for the study of argumentation, its purpose might be defeated if it went all the way from the opening to the closing stage. Customarily, the longer sequence does not need to be very much longer than the selected local sequence. Defined in this way, the profile of dialogue has already been used to analyze fallacies and other problems that occur in natural language argumentation.

Schlegloff (1988, 56) employed techniques in linguistics similar to profile reconstruction in order to study sequences of question-reply exchanges to investigate how a repair is made by one party to a misunderstanding shown by the other party in a dialogue. Krabbe (1992) used the profiles of dialogue to analyze cases where relevance or irrelevance of an argument is a problem. He described profiles of dialogue as "tree-shaped descriptions of sequences of dialectic moves that display the various ways a reasonable dialogue could proceed" (Krabbe (1992, 277). On his account, the advantage of using the profiles method is that it enables the analysis of dialectical fallacies and critical moves without going through all the technical preliminaries that would be required to apply a formal dialogue system.

This early version of the profiles method was used in Walton (1989, 37-39) to analyze cases thought to be associated with what was traditionally called the fallacy of many questions. An example is the question 'Have you stopped stealing funds from your clients?' The tricky thing about evaluating the funds-stealing question is that it is context-dependent, depending on the dialogue it is supposedly part of, and depending on presuppositions that may have been incurred as commitments prior to the part of the dialogue where the question was posed. Thus asking such a question is not fallacious in every instance. For example an attorney cross-examining a defendant could quite legitimately ask such a question in a trial provided the defendant has previously admitted stealing funds from his clients in the past. For an account of the standard treatment of these and related traditional fallacies, see (Hamblin, 1970).

These early uses of profiles of dialogue can be made into a generalizable method that has a special structure as a method of fault diagnosis more broadly useful for argumentation studies by extending the previous way of dealing the fallacy of many questions. How this is done can be illustrated using the funds-stealing example. The problem with evaluating the funds-stealing question as fallacious or not is that the question does not fit into a reasonable order of questioning and answering in the context of dialogue. To see why, you must compare the context of the asking of the question to a profile of reasonable question-answer sequence for that context. Then it can be seen whether or not the question asked violates the reasonable order of dialogue. The funds-stealing question, if it to be seen as a reasonable question, presupposes that the respondent has already given or is committed to affirmative answers to two prior questions asked in the following order: (1) Do you have clients you are having financial dealings with? (2)

Have you ever stolen funds from these clients? If these two questions have not been asked and answered first, then the funds-stealing question violates rules of reasonable dialogue indicated by the proper sequence shown in the profile.

The diagram in figure 2 shows the actual sequence of dialogue in the graph on the left. On the right is a graph indicating the proper ordering of the sequence of moves in the dialogue implicit in the argumentation in the example.

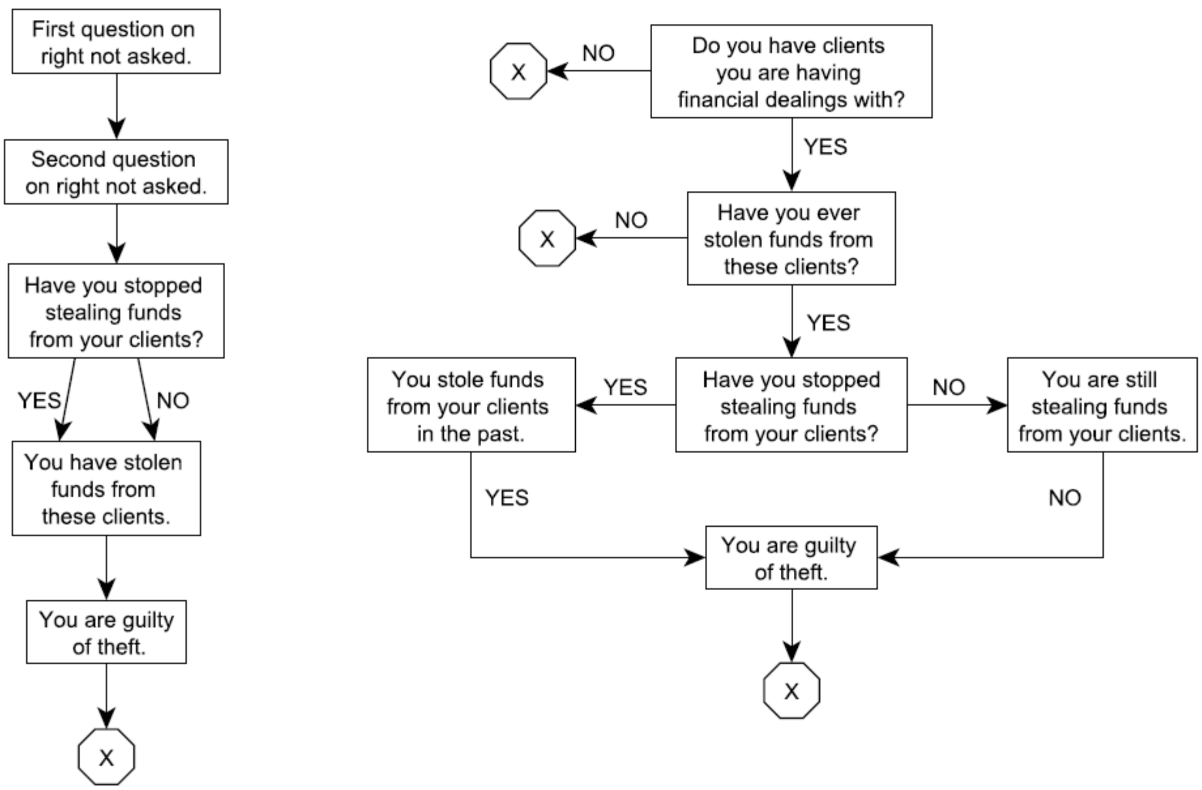

Figure 2: Applying the Profiles Method in the Funds-stealing Example

The reasonableness of the funds-stealing question can be evaluated by comparing the two graphs in figure 2. This comparison is the basis of the profiles technique. The funds-stealing question is only asked in the right graph once the two questions above it have been asked and given affirmative answers by the respondent. In contrast, in the left graph, as shown above the funds-stealing question, these two prior questions were never asked and replied to with answers that would make the dialogue move forward constructively.

The graph on the left in figure 2 represents a description of what literally happens as the moves are made by the two parties. When confronted with the question of whether he has stopped stealing funds from his clients, the respondent has only two choices, yes or no, if he is to give a direct answer to the question. No matter which answer he gives, he automatically becomes committed to the proposition that he has stolen funds from these clients. At this point in the dialogue, the questioner is justified in accusing the respondent of having committed the crime of theft. At that point, presumably, the dialogue stops, and the respondent is left no further options for attempting to deny that he stole funds from his clients.

The graph on the right in figure 2 represents a normative analysis of how the sequence of questions and replies should have properly proceeded in order to offer the respondent the options needed to avoid the trap (fallacy) shown in the figure on the left. The same question, ‘Have you stopped stealing funds from your clients?’, that occurred at the top of the diagram on the left reappears in the diagram on the right. However in the graph on the right, before the question ‘Have you stopped stealing funds from your clients?’ appears, two prior questions need to be asked and answered. The first one is whether the respondent has clients he is having financial dealings with. The second one is the question of whether the respondent has ever stolen funds from these clients. These two questions have to be asked in the right order, as shown in the graph. Only if both are answered affirmatively can the main question, ‘Have you stopped stealing funds from your clients?’ properly be asked. If the answer given by the respondent to either of the two prior questions is ‘no’, the dialogue immediately stops once this answer has been given. However, once the dialogue gets to the point where this main question is put to him, the same outcome as pictured in the figure on the left occurs, no matter how the respondent proceeds beyond that point in the dialogue.

Even though the outcome is the same in both dialogues, how the sequence of dialogue moves up to the point where the main question is asked is different. It is this difference that enables an explanation of the fallacy of many questions to be given. The graph on the left represents a sequence of questions and replies describing what actually happened in the text representing the argumentation in the case to be analyzed. The graph on the right represents a normative model of how that sequence of questions and replies should have proceeded in a way that is more rational. Hence as illustrated in this example, the profiles method requires a comparison of the two graphs shown in figure 2. The graph on the left shows how the sequence actually went in the real conversational exchange. The graph on the right represents a normative model specifying how the sequence of argumentation in the dialogue should ideally have proceeded. When compared, the two graphs indicate how the exchange is problematic. The graph on the left represents a sequence of dialogue exchanges that did not offer the respondent an adequate array of options to avoid being hemmed in by the overly aggressive questioner.

The profiles shown in figure 2 explain the fallacy, thus enabling someone to gasp what the failure is in this kind of case. It also offers resources for repairing the fault by indicate the right questions in the sequence of argumentation that should take place before the main question is asked.

5. Profiles for Burden of Proof Problems

Another problem that can potentially be solved by applying the profiles technique is the shifting of the burden of proof in cases where an attempt is made to avoid a reasonable burden of proof requirement. Hamblin (1970, 265-276) built a simple formal dialectical system, called a Why-Because System with Questions, designed to show that problems of organizing commitments can be solved. There are two participants called White and Black. White moves first, and then the two parties must take turns making moves. The language is that of propositional calculus, but it could be any other logical system with a finite set of atomic statements (Hamblin, 1970, 265). As each party moves, statements are either inserted into or retracted from the commitment set of the party who made the move. A record of each party’s commitments is kept throughout the dialogue and updated at each move. At each move Black and White are allowed to make moves called locutions. Nowadays we would say that these moves take the form of speech acts and that Black and White are agents, entities that can carry out communicative actions. Despite his formal orientation, Hamblin (1970, 216) pointed out that the study of dialectical systems to model fallacies can be formal or descriptive.

In the account of formal modeling of dialogues that follows, ‘statement’ is taken to be equivalent to ‘proposition’. P_1, P_2, …, P_n denote statements. An assertion is defined as a type of speech act containing a proposition, the proposition that has been asserted by the agent. So conceived, an assertion has three components: (1) the agent that made the assertion, (2) the proposition that was asserted, and (3) the move in an orderly dialogue at which the assertion was made. Speech acts of the following four kinds are allowed to be put forward in moves.

> *Assertion*: ‘Assertion AS_i’ is the speech act of putting forward a statement. When an agent asserts a statement, it goes into its commitment set.
> *Retraction*: ‘No commitment P_i’ is the speech act of retracting a commitment, assuming that agent Ag_i was previously committed to P_i.
> *Yes-No Question*: ‘Question P_1, P_2, …, P_n’ is the speech act of asking whether the hearer accepts that exactly one of the statements P_i is true.
> *Support Request*: ‘Why P_i?’ is a request for the other agent to supply an argument that would give reason for it to accept P_i. Such an argument needs to have P_i as its conclusion and it needs to have one or more premises.

Hamblin (1971, 130) defines a locution-act, which amounts to a speech act used by a participant in the dialogue, as a set of participant-locution pairs. To follow but update his framework, a move can be defined as a pair $\langle Ag_i, S_i\rangle$ with a set of agents $\langle Ag_1, Ag_2, \ldots, Ag_n\rangle$ and a set of speech acts $\langle AS_1, AS_2, \ldots, AS_n\rangle$. For example, $\langle Ag_0, AS_4\rangle$ is a speech act where A_0 is the first participant (White) and AS_4 is the fourth type of speech act allowed as a move in the dialogue. For example, AS_4 may be the speech act of asking of a why-question.

For our purposes, as noted above, we can treat the speech act of making an assertion as equivalent to the act of making a claim. The important things about making a move fitting this speech act are that (i) it commits the speaker to the statement made, and (ii) it represents a strong form of commitment that commits the speaker to defending the claim, if asked to do so (Walton and Krabbe, 1995). So for our purposes we can work with what we will call a Why-Because System, a simple system that has only assertions, retractions and support requests, but that can be made more complex by the addition of other speech acts and rules.

Hamblin (1970, 166) also discussed a number of syntactical rules for his Why-Because System with Questions. Two of these rules are especially significant. They can be formulated as follows, where Q is the questioner, R is the respondent, and P_i is a proposition.

The Presupposition Rule: Q can only ask ‘Why P_i?’ if R is committed to P_i?

The BoP Rule: If Q asks ‘Why P_i?’, then if R is committed to P_i, R must present an argument for P_i or R must retract P_i.

When put into a form suitable for the Why-Because System, Rule 2 can be formulated as the follows the 3 Responses Dialogue Rule, as it is called in (Walton, 2014).

The 3 Responses Dialogue Rule: When the questioner asks the question 'Why P_i?', the respondent must reply by putting forward one of the following three speech acts: (S1): Assertion P_i; or (S2) No commitment P_i; or (S3) Statements P_j, $P_j \rightarrow P_i$ (where $\rightarrow$ represents the material conditional of propositional calculus).

The 3 Responses Dialogue Rule is the rule most closely associated with the requirement of burden of proof (BoP). However, it is not identical to what is widely accepted as the standard rule for BoP that requires any party who has made a claim to back up that claim with support if challenged to do so by the other party in the dialogue (Walton, 2014). It is different from this because it allows the party to whom the why question is addressed the two other options of saying 'Assertion P_i' or 'No commitment P_i'. The 3 Responses Dialogue Rule is also obviously closely related to the funds-stealing question taken as our example of the fallacy of many questions analyzed by the profiles method.

As (Krabbe, 1995) observed, the following sequence of dialogue is often associated with the fallacy of argument from ignorance. Here, P is a proposition (with no subscript, for simplicity).

White: Assertion P.
Black: Why-P?
White: Why not-P?

As shown in (Walton, 2014), this problematic dialogue sequence is also associated with the problem of BoP shifting. An example from a parliamentary debate was given.

This example (Walton, 2014, 10), is from a debate in the Canadian House of Commons concerning a report that Canadian uranium was being used in American nuclear weapons, which would violate a treaty between the two countries. The question put to the government representative was a request to give reasons to show why he is certain that uranium was not being used in this way. The representative replied that he was satisfied that Canadian uranium was not being used in this way. An opposition member then asked the question, "What is your proof?" The government representative replied that if the opposition members has any information that the treaty is not being respected, then they should show why they think that. In this kind of case, each side tries to shift BoP back to the other side.

This kind of problem, or fallacy, if it is one, can be helpfully configured using the profiles tool. In figure 3, following the comparable profile method illustrated in figure 2, the actual dialogue is analyzed using the graph on the left and the normative profile showing how the dialogue should ideally go is shown by the graph on the right. What this example brings out, as shown in figure 3, is something that was already evident, though not as clearly so, in the profile for the many questions fallacy shown in figure 2. The graph on the left, in both instances, is not purely descriptive, because it also poses a problem. The problem shown by the graph on the left in figure 2 was that the respondent is trapped into a situation where he has only two legal replies that fit the post-condition for the speech act of asking a yes-no question. This is a problem frequently faced every day by those of us filling out automated forms on the Internet where only two (or an insufficient number) of response options are allowed. The problem shown in figure 3 is that both agents, Black and White, are locked into an infinite sequence of moves.

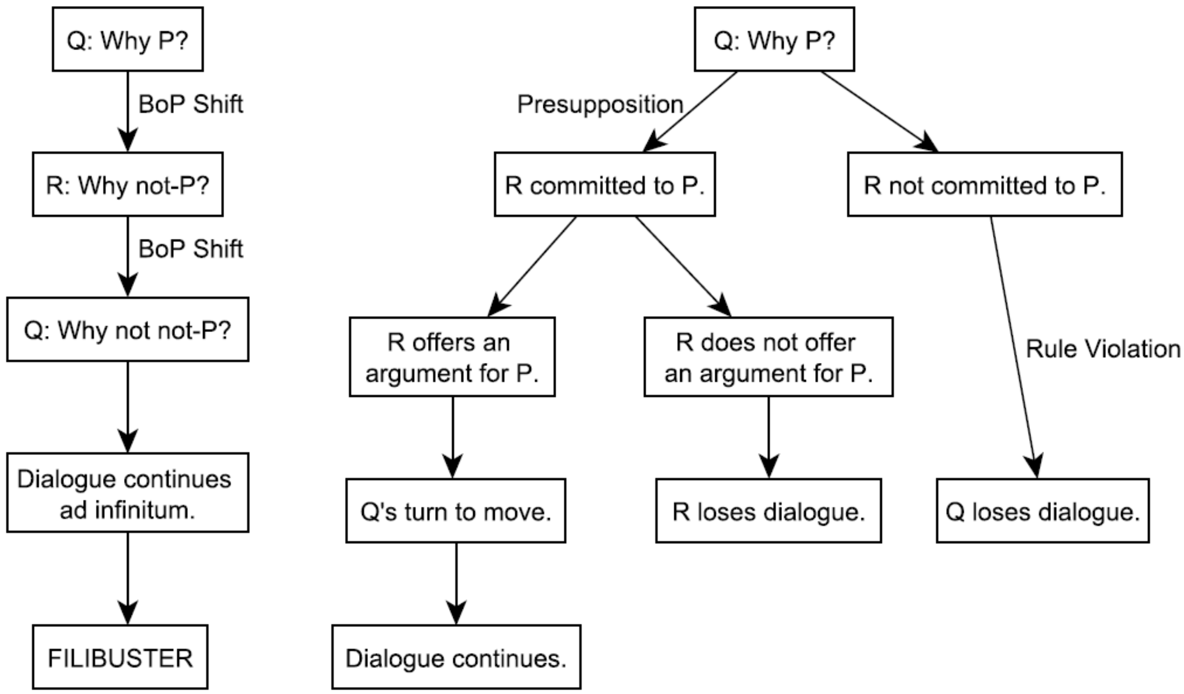

Figure 3: Applying the Profiles Method to the Shifting BoP Example

Looking down the diagram on the left side of figure 3, the directed graph begins with the questioner (Q) asking 'Why *P*?', But at its next move in the dialogue respondent (R) replies 'Why not-*P*?' Supposing that, as would most likely happen in a natural language conversation, there was no rule banning this kind of reply. One possible outcome is that it is open for the questioner to reply in kind, just as shown in the next move of the dialogue, by asking 'Why not-not-P?'. This was the root of the problem posed by the nuclear material example in the Canadian parliamentary debate. The problem posed is that, since there is no rule to ban the small dialogue (associated with the *ad ignorantiam* fallacy) that began the sequence, an infinite repetition of a sequence of moves was set in motion. In effect the outcome is like a filibuster, where the dialogue goes on in a meaningless fashion, blocking any further real progress from being made.

But as indicated by the graph shown on the right in figure 3, showing what should ideally happen, such an infinite repetition in the dialogue sequence is prohibited. Q can only ask the question 'Why *P*?' at the start of the dialogue (shown as the root of the graph) if R is committed to *P*. If R is not committed to *P*, the Presupposition Rule is violated, and so the original asking of the question can be disqualified as a violation of this rule. To show this in the graph, instead of putting two prior questions before the why-question, as was done in the profile of figure 2, we have invoked the notion of presupposition (Macagno, 2012). However, if Q has made the presupposition of ensuring that R is committed to *P*, then following the BoP rule, Q has to offer an argument in support of *P*. This obligation is essentially the BoP requirement, for as shown by the lower left side of the graph shown on the right side of figure 3, if R does not offer an argument to support *P*, it has violated this rule and loses the dialogue. However, unlike the sequence shown in the graph on the left side, constructive dialogue is not blocked. Q can go on to ask another question and the dialogue can continue, possibly in a constructive manner that will lead to the eventual fulfillment of the dialogue goal set at the opening stage. This is what ideally should happen, as opposed to what really did happen, displayed as a graph on the left side. Hence the two graphs shown in figure 3 can be used together to repair the fault, which is in this case the danger that the dialogue will lead to an infinite sequence of speech acts that will prevent it from reaching its proper goal.

At the same time, the graph on the left side in figure 3 indicates that there is a complication of a kind that is quite tricky to navigate through, and that can easily lead to this infinite dialogue sequence. The two burden of proof shifts shown at the top of the left graph in figure 3 can be legitimate or illegitimate depending on the type of dialogue that the participants are supposed to be taking part in, and the rules governing the speech acts in that type of dialogue (Gordon, Prakken and Walton, 2007). The variability of these rules for different types of dialogue was already a problem encountered by Hamblin (1970, 271) when he discussed the applicability of the following rule: why *P* may not be used unless *P* is a commitment of the hearer and not of the speaker. As his discussion of this rule reveals, Hamblin was aware that this rule is not applicable to all types of dialogues. He was aware of the problematic nature of this rule, as indicated by his linking it to several examples of argument in a circle. We now know that whether a burden of proof shift should be judged to be legitimate or illegitimate in a given case depends on rules such as the presupposition rule, the burden of proof rule and the three responses dialogue rule. Whether and how these rules are applicable to a given case cannot be determined by simply building a profile of dialogue of the kind illustrated in figure 3. A global burden of proof needs to be set at the opening stage of the dialogue (Walton, 2014), and this burden, along with the rules governing the speech acts that are permissible in the dialogue, determine whether the putting forward of speech acts such as the asking of a why question are permissible or not at a given point in a sequence of argumentation during the argumentation stage of the dialogue.

Once again, the reader needs to be reminded that the profiles of dialogue technique is a useful tool because it can enable us to avoid going into all the complications of bringing in the extensive apparatus of all the rules and requirements of a formal model of dialogue, a task which may be simply overwhelming for practical or pedagogical purposes. The profiles method is useful in the present case first because it can be used to show the danger posed by the asking of the initial pair of why questions that may lead to an infinite dialogue. Second, it shows by means of the graph on the left the danger and trickiness of these first two steps in the sequence, each of which involves a burden of proof shift that may be legitimate or illegitimate depending on rules for the asking and answering the why questions that may be applicable. Third, it shows by means of the graph on the right a way of navigating through the obstacles that leaves open an avenue for the dialogue to continue in a constructive manner so that it might ultimately arrive at reaching the original goal set at the opening stage.

6. The Twelve Steps in the Procedure of Applying the Profiles Method

To appreciate how the profiles of dialogue technique coordinates the normative and descriptive tasks in a way that enables it to combine abstract formal argumentation dialogue models with the particulars of an argument presented in a natural language discourse example, the procedure of applying a profile to a real case needs to be outlined in a general way. There are three parts to the procedure, a part that has both descriptive and interpretive elements combined, a normative part and a fault diagnosis part. Each of these three parts has four main steps. Henceforth I will call the second part the descriptive part, to contrast it with the normative part, even though much of the work that is carried out in this part concerns the interpretation of the natural language text of discourse that provides the evidence.

Let's begin with the four steps in the descriptive part.

1. First, the argument analyst needs to have a text of discourse, a quotation of the actual text of the argument, or argumentative exchange between the two parties, representing the data in a given case.

2. Second, the analyst needs to build an initial argument graph representing the premises and conclusions in the sequence of argumentation in the case.

3. Third, the analyst needs to use the textual evidence to support the claim that the graph fairly represents the real argument that is the target of the analysis.

4. Fourth, the analyst needs to refine the graph, for example by inserting implicit premises or conclusions needed to show how the argument makes sense. In this fourth step the analyst will need to use argumentation schemes, for example, to find implicit premises that need to be used to link parts of the argument together.

The aim of these first four steps is to build an argument graph comparable to the ones shown on the left in figures 2 and 3. This initial graph represents a reconstruction of the sequence of argumentation that supposedly took place in the given case. It is a hypothesis about how to reasonably interpret the given argument based on the textual evidence and on the Gricean communicative principles (Grice, 1975) represented by the dialogue protocols used to reconstruct the sequence of argumentation.

Once these first four steps have been carried through, the result should be that a problem is posed. Such a problem can be of various kinds. It could represent one of the traditional fallacies, such as the fallacy of many questions or the fallacy of begging the question (circular argumentation). Or it could be a problem of a different sort, such as an inappropriate shifting back and forth of the burden of proof in a way that makes further progress toward resolving the conflict of opinion in a given case problematic or even impossible, as things stand.

Next we proceed to the normative part of the procedure. This part requires the construction of a second argument showing how the sequence of dialogue should proceed in order to avoid the problem depicted in the initial graph. The second graph is constructed by using the protocols governing which moves are obligatory or permissible for each participant at each move any point in the dialogue. These rules can be applied to determine when it is allowable for one participant to ask a particular type of question, defined as an appropriate speech act in the formal model of dialogue and the permissible options available to the respondent in making its next move.

5. The first step in the second part of the procedure is for the argument analyst to look at the descriptive graph and reconstruct how it ideally should have gone.

6. The second step is for the argument analyst to build another graph, of the kind shown in figures 4 and 5 in the argument graph on the right. The analyst carries through this part of the procedure by applying the abstract normative dialogue model to the descriptive graph representing how the sequence of moves in the dialogue actually went, according to its descriptive reconstruction carried out in the first part of the procedure.

7. The third step is for the argument analyst to justify the second argument graph is a reasonable reconstruction of what should have taken place in the dialogue, using the dialogue rules of the normative model.

8. The fourth step is for the argument analyst to show how the dialogue initiated in the problematic descriptive graph could have been carried through in an appropriate sequence of

argumentation that would move the dialogue forward toward its communal goal in a cooperative manner.

Executing this fourth step requires summarizing the applicable protocols and showing how they should be applied to the nodes and transitions in the normative argument graph. For example, it was shown in the application of the profiles method to the shifting BoP example how rules such as the presupposition rule and the BoP rule, need to be applied and combined to generate the sequence of argument shown on the right side of the graph in figure 3.

Once the four steps in each of the descriptive and normative parts of the procedure have been executed, the fault diagnosis part of the procedure combines these two parts. The analyst, in this final part of the procedure, needs to examine the two graphs side-by-side and compare one to the other. The outcome of the descriptive part of the procedure was to build a graph that displays a problem, some sort of difficulty that represents a blocking of the dialogue, or interference with its proper progress, that needs to be dealt with.

9. The first step in this fault diagnosis part of the procedure is to show how the argument graph on the right moves forward in a constructive manner towards fulfilling the goal of the dialogue in a way that shows how the fault illustrated by the graph on the left side can be repaired.

10. The second step in this final part of the procedure is to use the evidence provided by the descriptive graph along with the normative graph to build a justification for categorizing the argumentation fault, error or failure that has been revealed.

11. The third step is to put forward a hypothesis to diagnose the fault. So, for example, the fault may be associated with the general pattern of error or difficulty, such as a traditional informal fallacy or a problem of shifting burden of proof, such that the fault can be diagnosed. The diagnostic procedure is to use the pair of graphs along with the original text of discourse of the case to support the diagnosis evidentially.

12. The fourth step in the fault diagnosis part of the procedure is to use the comparison between the two graphs to find a way to repair the fault.

The three-part procedure and its twelve steps are outlined in the activity graph in Figure 4.

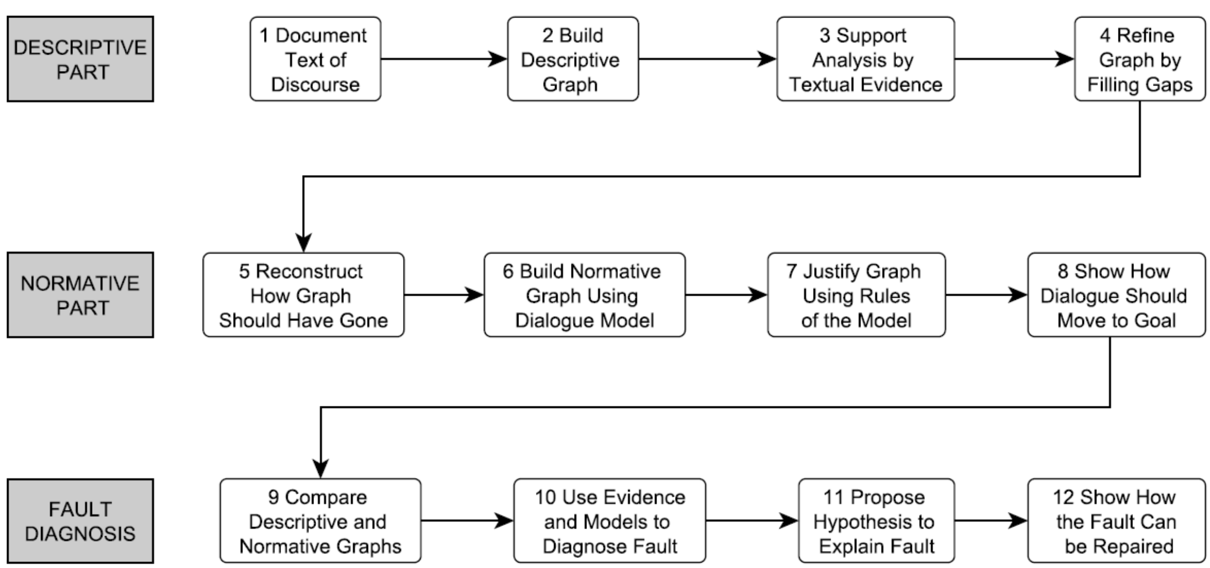

Figure 4: Activity Graph of the Twelve-step Procedure

As the outcome of the twelve-step procedure the analyst can draw some tentative conclusion based on the evidence provided by the twelve steps in the procedure in the form of a general hypothesis about what the fault is and how it can be repaired. So instead of merely taking the negative approach of merely identifying fallacies as errors or deceptive strategic moves, the procedure enables those trained in the technique to be able to mediate in debates and other organized real dialogues, and to teach arguers how to improve their argumentation skills by diagnosing, solving and even avoiding these problems before they arise.

7. The Normative and Descriptive Parts of the Profiles Method

Once the argument analyst has constructed an initial descriptive graph representing a hypothesis about the sequence of dialogue that supposedly took place, based on the textual evidence given in the real example that is being analyzed, CAS can be applied and will automatically tell the user whether the sequence represents a legitimate argument graph or not. If the user attempts to argue other than by following the CAS protocol, the system will not accept that input, because it violates some requirement of the protocol. CAS will not tell the user what mistake he or she made, but the CAS could be extended to offer such advice to the user. However, CAS can help a user to construct a normative argument graph of the kind shown in the right side of figure 5, revealing to the user that the sequence of argumentation represented in the graph conforms to the speech acts and protocols of the system. CAS is able to automatically perform an argument evaluation, once the user has supplied the required information in an initial argument graph, including the ultimate conclusion, the premises accepted by the audience, the argumentation schemes applicable in the graph, and so forth. CAS can also help the user to improve this initial graph by revealing implicit premises needed to make a given step in the argumentation sequence fit a scheme. Also, because CAS has the capability of argument invention, it can offer the user information about potential paths of argumentation leading from this graph toward the proving of the ultimate conclusion that has been identified by the user in the initial graph. Also, CAS can calculate on both sides of the profile to tell whether the descriptive argument graph one is a failed proof, and that the normative argument graph is a correct proof of the ultimate conclusion to be proved. In other words, computational argumentation systems such as CAS enabling the construction and evaluation of argument graphs can be applied during parts of the profiles of the twelve-step procedure.

The profiles method enables the user in who is attempting to deal with fallacies and other argumentation problems to rapidly apply the twelve-step procedure without having to bring in all the formal methodology and rules of a computational system such as CAS. The user can apply the profiles method in a more direct way by simply using pencil and paper to construct a descriptive graph alongside a normative graph, and then compare the two using the twelve step profiles procedure as a method. He or she can selectively bring to bear any rules of the system that are needed without having to apply all the protocol of the formal model.

However, it needs to be recognized that this task is not purely descriptive, and requires a normative component and interpretive elements. An automated computational systems such as CAS is very valuable for helping us to understand the structure and theory behind the profiles method, because such a formal system requires a precise statement of all the required types of dialogue rules needed to make the dialectical system into a precisely defined model that could be used, for example, to implement multiagent communications on the Internet between agents, or among a group of agents engaging in argumentation with each other.

There is also an intermediate step for the user. He or she can use any simple and easy-to-use tool of the kind easily found available at no cost on the Internet to construct a diagrammatic representation of a given example of argumentation. Such graphic tools as Microsoft Visio, GraphML, and so forth, are widely available (Scheuer et al., 2010). They can be used to make argument diagrams of the kind illustrated in this paper without requiring any significant time or effort to master. No doubt many readers of this paper are already familiar with such tools.

It needs to be appreciated that there is a division of labor in applying the profiles method described in this paper. The procedural rules and other normative requirements, such as rules for turn-taking, rules for putting forward speech acts, rules for replying to speech acts, and so forth, built into the formal argumentation system, are necessary to be in the background for argument evaluation, argument construction (invention), and for applying the profiles method. These parts of the method are mainly normative in nature. But a lot is left up to the user.

A formal argument graphing system such as CAS requires the user to interpret the argument in the given case, based on the textual evidence provided by the example. In CAS, for example, the user has to start by making an argument diagram in the form of a graph that has the ultimate conclusion of the sequence of argumentation represented as the root node in the graph. This means that the user has to start out by deciding what the issue of the persuasion dialogue is, by inputting a proposition that is being claimed or disputed into the system. Of course, this decision depends on how the given argument is to be interpreted, based on the evidence from the textual details of the case, and this interpretation can of course be disputed by someone who disagrees with this interpretation. In such a case, we ascend to a metalevel dialogue, where the two argument analysts have a conflict of opinions about which of their interpretations is better. Such a dialogue can, of course, be modeled as a persuasion dialogue. To help find and repair problems in such a dialogue, a third argument analyst can use the profiles method. As described in the twelve-step procedure, the arguments on both sides need to be compared and weighed against each other, and the textual evidence of the case needs to be marshaled to support the contentions on both sides. Cases of three party dialogues of this sort are familiar in legal argumentation, but it has to be outside of the scope of this paper to explore these kinds of applications of the profiles method in greater depth. Hamblin (1970, 256) was aware of the need to complement the formal study of dialectical systems with the descriptive study of dialogues such as parliamentary debates, cross-examinations and other stylized argumentative communication frameworks. It should be noted that CAS has been widely applied to test cases in legal argumentation, even though it can be applied to other domains such as everyday conversational argumentation in other specially constructed frameworks such as forensic debates. It can be applied to argumentation broadly across all such domains, but requires care to input different settings in order to evaluate argumentation in diverse legal and extra-legal settings.

8. Conclusions

The essence of the profiles method is revealed by how it was applied as shown in figures 2 and 3. Each figure represents a pair of graphs. Each graph represents a sequence of dialogue. The graph on the left represents how the sequence actually went in the example chosen for analysis. The graph on the right represents a normative analysis of how the sequence of questions and replies should ideally proceed, according to the protocol for this type of dialogue. The graph on the left it is mapped into the one on the right, so that a comparison can be made to determine what is missing or otherwise problematic in the sequence displayed by the graph on the left. The profiles method is essentially a fault diagnosis tool that can be applied to cases of problematic argumentation such as an illicit shifting of a burden of proof, or to fallacies that have a dialectical aspect, such as the fallacy of many questions.

What has been shown is how the profiles tool works at a middle level between the descriptive (and interpretive) and normative parts of the task of identifying, analyzing and repairing argumentation problems such as those associated with traditional informal fallacies. The profile of dialogue is the connector between the two graphs. How we evaluate the argument is by means of a graph G_1 mapped into a graph G_2. The descriptive graph G_1 is mapped into the normative graph G_2, and the pair of them constitutes the basis of the profiles of dialogue method used to isolate, identify, and analyze the fallacy, or in any event the dialectical problem that is at the basis of the difficulty. Given such a pair of graphs, the argument evaluator can then carry out a diagnosis of what is the problem shown in G_1, and how the problem can be reconfigured so that a solution is displayed in G_2. The argument evaluator can then propose the solution to the problem as a hypothesis. Another argument evaluator could propose a competing hypothesis, for example one based on a different descriptive graph based on an alternative interpretation of the text.

How the general procedure of argument analysis works by using the profiles tool is shown in figure 5. The descriptive graph G_1 and the normative graph G_2 are combined in applying the profiles technique to the text of discourse in a given case.

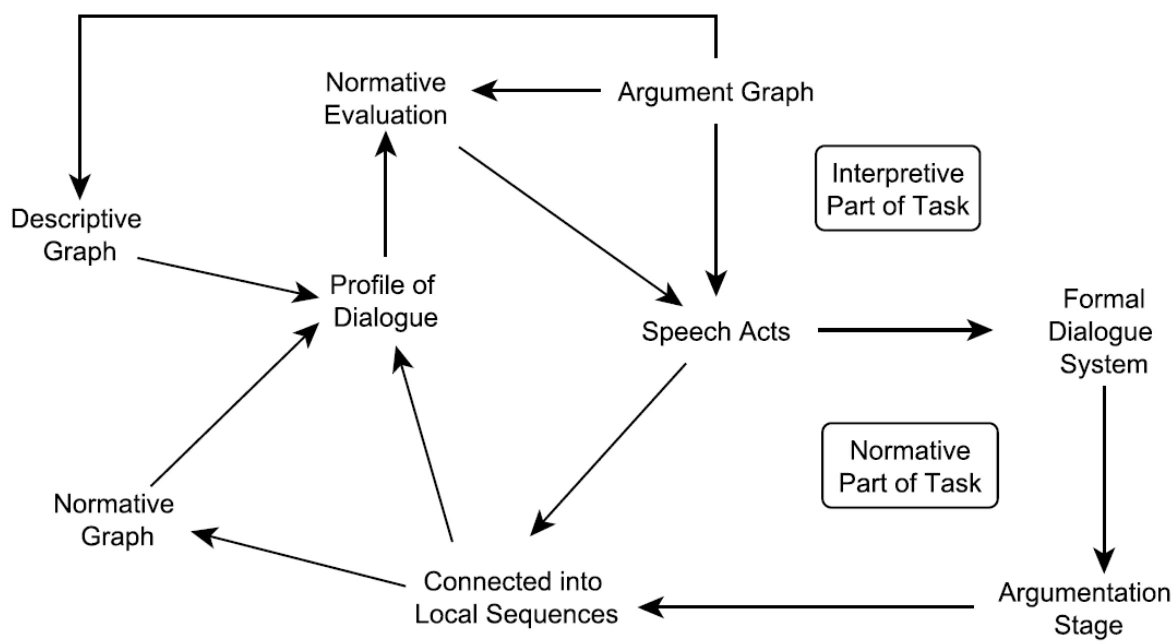

Figure 5: Evaluation Procedure Using a Profile of Dialogue.

The normative/descriptive part of the task is represented at the top of the figure, representing a case where an argument analyst has drawn up an argument graph to represent an argument, or sequence of argumentation, found in a natural language text of discourse. This type of argument graph represents a starting point of the twelve-step profiles procedure that needs to begin with the argument analyst constructing a rough beginning interpretation of the argument in the given discourse using an argument graph. In the application of the profiles technique to a particular example, this part of the argumentation is represented by a sequence of argumentation moves that presumably took place during the exchange of arguments. In figures 2 and 3 it is represented by the descriptive graph that appears on the left of the figure.

To the right of this argument graph in a given case there is also a normative argument graph. Now the question is, where does the information come in that provides the data for the normative evaluation? To see this, we have to look at in figure 5. It starts with a formal dialogue system that has a set of pre and post-conditions determining how speech acts can be used as moves in the dialogue by the participating agents. But what is needed for the evaluation is a sequence of moves in the argumentation stage where the argumentation in question was put forward. This provides us with the information that we need to construct a profile of dialogue. It is the comparison of these two profiles by the argument analyst that is the of the fault diagnosis and repair procedure.

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