Building arguments with argumentation: the role of illocutionary force in computational models of argument

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Abstract. This paper builds upon the proposed dialogical extensions to the AIF, termed AIF$^+$, by making explicit the representation of the role of illocutionary force in the connection between argument structures and dialogical structures. Illocutionary force is realised in the form of Illocutionary Application (YA-) nodes that provide an explicit linkage between the locutions uttered during a dialogue and the underlying arguments expressed by the content of those locutions. This linkage is explored in the context of two contrasting dialogue games from the literature, demonstrating how the approach can support the development of computational models in which the speech-act function of communicative moves can be accounted for.

Keywords. argumentation, dialogue, AIF, speech acts, illocutionary force

1. Introduction & Background

The Argument Interchange Format [2] is an attempt to bring together a wide variety of argumentation technologies so that they can work together. [8] reviews some of the more recent applications of the AIF. An important shortcoming, however, is that the AIF does not explicitly handle dialogue, and, crucially, cannot connect the execution of dialogue protocols to the creation and manipulation of argument structures. This limitation has been explored in [5] and [11], which introduce the AIF+, but these accounts leave important questions unanswered. Here, we build on those works, but sketch a solution to one of the most important questions: how dialogic actions – locutions – generate, or warrant, or substantiate, or update parts of the argument structure. These actions, and their effects on argument structure, are defined by the dialogue games of which they form a part. Our approach builds on existing conceptions of illocutionary force developed in speech act theory, and we show how the approach can be applied to existing dialogue games from the literature. The result is that for the first time we can start to build computational models that take account of the illocutionary connection between moves in argumentative dialogues and the argument structures that underpin them – a connection that has long been taken for granted in linguistically oriented models of discourse.

2. The Argument Interchange Format (AIF)

Descriptions of the AIF are given in a number of places, as are reifications in languages such as RDF and OWL [2], [9], [7], [8]. We provide here just a very brief summary of the main concepts. The AIF uses a graph-theoretic basis for defining an "upper" ontology of the main components (or nodes) of arguments. Nodes are distinguished into those that capture information (loosely, these correspond to propositions), and those that capture relations between items of information, including relations of inference (which correspond to the application of inference rules to particular sets of propositions), relations of conflict (which represent forms of incompatibility between propositions) and relations of preference (which represent value orderings applied to particular sets of propositions). The instantiated nature of these relations is emphasised in the nomenclature, so whilst information is captured in Information (I-) nodes, relations between them are captured as Rule Application (RA-) nodes, Conflict Application (CA-) nodes and Preference Application (PA-) nodes. The general forms or patterns that these applications instantiate are given in a second part of the AIF ontology, the Forms ontology. The approach follows in the philosophical tradition of Walton [18], [19] of schematizing stereotypical patterns of reasoning – and then extending the tradition into conflict and preference. It is this schematic underpinning which gives the collective name for RA-, CA- and PA-nodes: Scheme (S-) nodes. The AIF upper ontology is designed to allow specialization and extension to particular domains and projects, in an attempt to balance the needs of interchange against the needs of idiosyncratic development.

3. Architecture: Introducing the AIF$^+$

As has been argued elsewhere [8], the job of the AIF is solely to represent argument, not to perform computation on it. Of course, the representation should have various characteristics that make the sorts of computation we are expecting to want to perform as straightforward as possible. So, for example, both analysis and mark-up of naturally occuring argument and automatic computation of acceptability status using argumentation semantics defined in the style of [3], are computations we are likely to want to perform, and therefore, to a certain extent, drive representational considerations. From a dialogical point of view, we can describe, at an abstract level, an entire class of transformations and computations that we want to perform on structures defined using the AIF$^+$. Following in a long tradition in both the multi-agent community, and before that, the discourse and pragmatics community, dialogical action can be seen as update to a shared information state. In such a model, one needs a representation of the shared state, a representation of how specific dialogical action modifies the state, and, typically, a representation of dialogue *per se*. Then one needs some sort of execution engine that allows dialogues to be conducted (or analysed) to produce both a specific dialogue history and a shared dialogue state. It is usual for the dialogue history to change only monotonically as a dialogue proceeds (that is, once something has been said it cannot be unsaid). In representation of the shared state, monotonicity is less common: perhaps for some specific dialogue protocols, modifications to the information state will happen to be monotonic, but in general, the shared state may lose information as well as gain it – after all, one would not wish to prohibit retraction or withdrawal. The AIF$^+$ takes on all three representational roles described above (*viz.* the shared state, the dialogue history and the ways in which dialogue updates the shared state), and, to be precise, treats both the general and instantiated forms of the last role. That is, both the general rules about how dialogue moves could update the shared state, and the specific application of those rules actually updating the shared state in given dialogic situations, are handled by the AIF$^+$. The shared state is represented simply by AIF structures. The dialogue history is represented by Locution

(L-) nodes, which are a special type of I-node, and the connections between L-nodes, by Transition Application (TA-) nodes, which are a special type of inference [11]. The general part of describing how dialogue moves update the state is what constitutes (a part of) the dialogue protocol. This is represented in the Forms ontology. In the AIF simpliciter, the Forms ontology describes templates that define how schemes connect premises, conclusions and other schemes of particular types. In the AIF^+, the role is exactly the same: the Forms ontology again describes templates that define how schemes connect premises, conclusions and other schemes. In the AIF, the schemes concern inference, conflict and preference. In the AIF^+, the schemes concern dialogic transitions (which were the focus of [11]) and illocutionary relations; the former connect components of dialogue, the latter connect components of a dialogue history with specific parts of an AIF structure. The AIF^+ thus represents all (but no more) of the information required for a general purpose dialogue execution algorithm to run a particular dialogue protocol, and create both dialogue history and underlying AIF structures. One interesting issue concerns monotonicity of the AIF structures. On the one hand, most dialogues permit some form of retraction or other nonmonotonic change to the shared information space. On the other hand, the AIF and AIF^+ must record all that has happened in a dialogue, including the assertions that led up to a retraction (for example). The current solution to this dilemma is to assign commitment (loosely speaking) to particular propositions nonmonotonically, but to leave the accretion of AIF structures as monotonic.

4. AIF^+: Ontological Extensions

In this section we introduce the ontological extensions in a little more detail, first quickly reviewing the extensions from [11] and then exploring the new, illocutionary relations in more detail. Analyzing argumentation in the context of dialogue provides insight into its important properties which are not expressible in a model of monologic argumentation. In real-life practice, an argument is commonly related to and is therefore dependent on a dialogue: "to understand an argument, it is very often highly important to know something about the context of dialogue in which the argument has occurred" [17, pp411-2] The context of a dialogue becomes especially important when we aim to evaluate the argumentation. In philosophy, the term "argument" has long been known to have two interpretations: $argument_1$ and $argument_2$ [6]. $Argument_1$ refers to an argument as a static object and is described by sentences such as "He prepared an argument". On the other hand, $argument_2$ refers to a dialogue or discussion and is described by sentences such as "they had an argument". As mentioned above, in real-life scenarios both kinds of argument coexist and interact with each other. Consider the following dialogue:

Bob: You know what? We should increase funding for science.
Alice: Really! Why do you think that?
Bob: Well, because science is necessary for successful industry.

In this $argument_2$ (dialogue), Bob and Alice jointly build an $argument_1$ (argumentation): "Funding for science should be increased since it is necessary for successful industry". The context of the $argument_2$ enables to keep track of the agents' interaction which creates the $argument_1$: the argumentation is invoked by Alice's speech act "Why do you think that?", and provided by Bob's speech acts "science is neccessary for successful industry".[2] Locations are the fundamental building blocks of dialogue and are represented within AIF^+ in the form of L-Nodes, a subclass of I-Nodes. L-Nodes are employed to identify the individual utterances made during a dialogue. However, a dialogue is more than a mere sequence of unconnected locutions. A distinguishing feature of dialogue is the interplay between the locutors, as each locutor responds in turn to the utterances made by other participants of the dialogue. This aspect of dialogue is characterised as a form of inference called *transitional inference* and is represented by TA-Nodes, Transition Application nodes, which capture the flow of a dialogue, for example, recording that a given assertion has been made in response to an earlier question. One interesting question is how exactly L-nodes are connected to I-nodes. So for example, what is the relationship between a proposition p (e.g. "We should increase funding for science") and the proposition "X asserted p" (e.g. "Bob asserted that We should increase funding for science")? According to the original specification of the AIF, direct I-node to I-node links are prohibited (and with good reason: to do so would introduce the necessity for edge typing - obviating this requirement is one of the advantages of the AIF approach). The answer to this question is already available in the work of Searle [14] and later with Vanderveken [13]. The link between a locution (or, more precisely, a proposition that reports a locution) and its propositional content (i.e. the proposition or propositions to which the locution refers) is determined and authorized by *constitutive rules* for performing speech acts (see [1] for the role of the constitutive rules in argumentation). These rules describe in what (successfully) performing a speech act consists.

The constitutive rules can be of a number of types depending on the type of *illocutionary force* which the performer of the speech act assumes.[3] In this way, they bear more than a passing resemblance to scheme structure. These schemes are not capturing the passage of a specific inferential relation, but rather than passage of a specific linguistic relation dependent on the type of illocutionary force used in a speech act. As a result, we refer to these schemes as *illocutionary schemes* or Y schemes. Specific applications of these schemes are then, following the now familiar pattern, YA schemes. YA-nodes describe passage between L-nodes ("elements" of argument_2) and I-nodes ("elements" of argument_1 or, more rarely, argument_2). In the dialogue between Bob and Alice (see Fig. 1), the argument_2 consists of three speech acts represented by L-nodes (we use abbreviation L_i to denote subsequent locution nodes). The argument_1 consists of two propositions represented by I-nodes (I_i means subsequent information nodes). The interaction between the argument_2 and the argument_1 is described by means of the YA-nodes. The speech acts L_1 and L_3 have *assertive* illocutionary force connecting them with propositional contents I_1 and I_2, respectively. The passage between L_1 (resp. L_3) and I_1 (resp. I_2) is represented by YA_1 (resp. YA_4). The illocutionary node YA_2 links the *directive* L_2 and its propositional content I_1: not all YA-nodes are assertive schemes.

As noted above, the link between a speech act and its propositional content is *warranted (authorized)* by the constitutive rules. For instance, the assertion "Bob asserted

[2] A speech act $F(p)$, such as $claim(p)$, $why(p)$, consists of an illocutionary force F and a propositional content p [13]. An illocutionary force is an intention of uttering a propositional content. That is, the performer of a speech act may utter p with an intention of asserting, asking, promising and so on.

[3] Searle distinguishes five classes of speech acts: *assertives* express the speaker's belief, *directives* express his attitude about a possible future act performed by a hearer, *commissives* express the speaker's intention to do something, *expressives* express feelings toward the hearer, *declaratives* express that the speaker performs a given action. Depending on the further characteristics of an illocutionary force, each class divides into various subclasses. For example, assertives split into $claim(p)$, $deny(p)$, $guess(p)$, $argue(p)$, $rebut(p)$, etc.

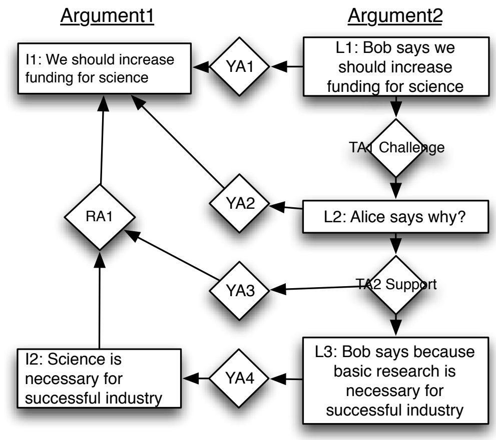

Figure 1. Illustrating the link between arguments (argument$_1$) and dialogue (argument$_2$) at the object layer.

that We should increase funding for science" is related to the proposition "We should increase funding for science", if the constitutive rules for assertives are satisfied. In natural contexts, the most important types of rules are the preparatory and sincerity rules, for which unfulfillment results in defectiveness of a speech act [13]. That is, an assertion may be successful but still defective, if its performer did not have enough evidence for the statement or he declared what in fact he disbelieves. In other words, in the case of the preparatory and sincerity rules, it is easy for a locutor not to satisfy them and still have a chance to perform a successful speech act, since a receiver may not notice their unfulfillment. Therefore, in the real-life practice they are the most often used for an attack on the YA-nodes. For example, the passage between "Bob asserted that We should increase funding for science" and "We should increase funding for science" could be blocked, if Bob was insincere. Of course, we have already met such blockers, or undercutters, before: most schemes, particularly inferential argumentation schemes, have similar components, which are represented in the AIF as presumptions or implicit premises. If we view the successful adherence to constitutive rules as presumptions on the applications of Y schemes, all of the existing AIF machinery handles the representation on attacks on the successful application of illocutionary force.

Finally, YA$_3$ captures the most complex relation of all. Intuitively, one might imagine Alice's question in isolation (but still connected through a YA to its propositional content), and at the same time Bob's assertion (also connected to its propositional content). They might perhaps be occurring in different dialogues. And if they were then, ceteris paribus, there would be no link between I$_1$ and I$_2$. It is only in virtue of the fact that Bob's assertion of I$_2$ is *responding* to Alice's question of I$_1$ that there is an inferential link being stated between I$_2$ and I$_1$. The link between the transitional inference that captures the notion of *responding* and the rule application that captures the inferential relationship seems to be sufficiently similar to other illocutionary schemes for it to be classed with them. It may turn out that this is hasty ontological assignment, but without any pressing need to do otherwise, the parsimonious course is preferable. What is clear, however, is that the forms that govern these YA schemes are quite complex. The

Y and T scheme forms that govern the YA and TA nodes are the AIF$^+$'s machinery for representing dialogue protocols, to which the next section is addressed.

In addition to delineating the relationship between locutions uttered and the underlying structure of arguments expressed during a dialogue, AIF$^+$ also supports representation of dialogue protocol. Protocols are described using Locution Description (LDesc-Nodes) nodes. For each locution, represented by an L-Node, there is a corresponding LDesc-Node which can in turn be linked to corresponding PreCondDesc and PostCondDesc nodes that describe, respectively, the pre-conditions and post-conditions for legally uttering a locution. Pres and post-conditions can be represented in a number of ways and rather than create a new protocol specification language to account for this, AIF$^+$ supports specification of pre- and post-conditions using fragments of appropriate dialogue protocol description languages such as the Dialogue Game Description Language (DGDL) [20]. For example, the post-condition associated with the challenge move of ASD, that the content "p" of the move should be added to the listener's commitment store, can be expressed using a fragment of DGDL as follows: *store(add, {p}, CS, listener)*. The development of a dialogue, as an ordered sequence of locutions, is handled by transitional inference schemes that describe, for a given locution, the available responding locutions.

5. Examples

To show how the AIF$^+$ supports both argument$_1$ and argument$_2$ in such a way that the links between them can be captured, we need examples of dialogue protocols. This section describes two examples of differing complexity: the *Two Party Immediate Response* (TPI) [15,4] and *Argument Scheme Dialogue* (ASD) [12] protocols. It is important to emphasise that these protocols are simply examples of protocols that can be represented in AIF$^+$. We are not arguing either for their utility, or for any special role for them in the general theory of AIF$^+$.

5.1. Two-Party Immediate Response Protocol

The *TPI* protocol is played on a Dung argumentation framework by two players who take turns to attack each other's arguments, and to both of whom all previous moves and the whole framework are visible. For the formulation of rules we adopt the more formal and detailed specification of [4] rather than the looser specification of [15]. It has two main differences. First, it is not enough for the *defender* (the first player) simply to attack the arguments cited by the *challenger* (the second player). It cannot win without a set of arguments which both attacks all of the challenger's arguments *and* is conflict-free. That is, it must find an *admissible* set [3] which contains its thesis. Second, *TPI* permits either player to backtrack, if it is unable to attack the other's previous argument. The challenger may simply return to the most recent of the defender's previous arguments for which it has an additional attacking argument, while the defender may return to its initial thesis, and begin the game all over again, with the new stipulation that it cannot cite the set of arguments which was shown to be inadmissible in its previous attempt.

The rules of the game are as follows.

1. The initial state of the game is defined by the players's identities, the argumentation system, and the defender's initial thesis, which is an argument in the argumentation system.

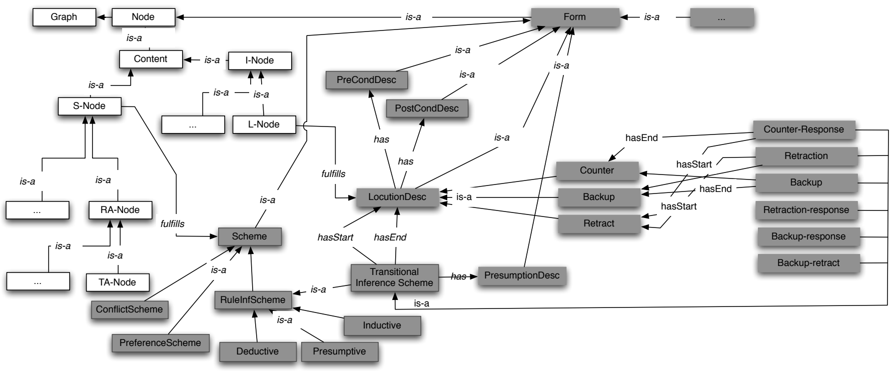

Figure 2. AIF^{+} description of the TPI dialogue protocol

2. The first move is made by the challenger.
3. Players move alternately.
4. A move must be a *counter*, a *backup*, or a *retract*.
5. A *counter* move is of the form *counter*(*a*), where *a* is an argument attacking the other player's most recent argument (including the initial thesis). If the player is the defender and *S* is the set of arguments it has cited since its last utterance of a *retract* locution, *a* must neither (i) attack any $s \in S$; nor (ii) be attacked by any $s \in S$; nor (iii) be such that $\{a\} \cup S$ has already been shown to be an inadmissible set. If the player is the challenger, *a* must be such that the defender has not cited any argument attacking it since its most recent *retract* locution.
6. If a player can make a *counter* move, it must do so.
7. A *backup* move is of the form *backup*(*a*,*b*) where *a* and *b* are arguments. Only the challenger can make a *backup* move. *b* must attack *a* and must not have been attacked by the defender since its previous *retract* move. *a* must be the defender's most recent argument *before* its immediately previous argument for which such an attacking argument exists.
8. If the challenger cannot make a *counter* move but can make a *backup* move, it must do so.
9. A *retract* move is of the form *retract*. Only the defender can make a *retract* move, and only when (i) it cannot attack the challenger's most recent argument and (ii) its own most recent argument is not its initial thesis.
10. If the defender can make a *retract* move, it must do so.
11. When a player cannot make a move, the game ends, and the other player wins.

In the AIF^{+} representation of *TPI*, there are three LocutionDesc nodes, six TransitionInfScheme Nodes, and six PresumptionDesc nodes. The LocutionDesc nodes correspond to the three types of locution and the TransitionInfScheme nodes correspond to the *counter—counter*, *counter—backup*, *counter—retract*, *backup—counter*, *backup—retrac* and *retract—counter* transitions. The PresumptionDesc nodes correspond to the TransitionInfScheme nodes, and in each case the node expresses the presumption that the proper relation exists between the nodes which are party to the transition.

5.2. Argument Scheme Dialogue Protocol

ASD extends a simple dialectical game based upon the formal game CB [16] to incorporate argumentation schemes and critical questions. The rules of ASD are as follows:

Locution Rules

- **i. Statements** Statement letters, S, T, U, ..., are permissible locutions, and truth functional compounds of statement letters.
- **ii. Withdrawals** 'No commitment S' is the locution or withdrawal (retraction) of a statement.
- **iii. Questions** The question 'S?' asks 'Is it the case that S is true?'
- **iv. Challenges** The challenge 'Why S?' requests some statement that can serve as a basis in (a possibly defeasible) proof for S.
- **v. Critical Attacks** The attack 'Pose C' poses the critical question C associated with an argumentation scheme.

Commitment Rules

- **i.** After a player makes a statement, S, it is included in his commitment store.
- **ii.** After the withdrawal of S, the statement S is deleted from the speaker's commitment store.
- **iii.** 'Why S?' places S in the hearer's commitment store unless it is already there or unless the hearer immediately retracts his commitment to S.
- **iv.** Every statement that is shown by the speaker to be an immediate consequence of statements that are commitments of the hearer via some rule of inference or argumentation scheme A, then becomes a commitment of the hearer's and is included in the commitment store along with all the assumptions of A.
- **v.** No commitment may be withdrawn by the hearer that is shown by the speaker to be an immediate consequence of statements that are previous commitments of the hearer.

Dialogue Rules

- **R1.** Each speaker takes his turn to move by advancing one locution at each turn. A No Commitment locution, however, may accompany a Why-locution as one turn.
- **R2.** A question 'S?' must be followed by (i) a statement 'S', (ii) a statement 'Not-S', or (iii) 'No Commitment S'.
- **R3.** 'Why S?' must be followed by (i) 'No commitment S', or (ii) some statement 'T' where S is a consequence of T.
- **R4.** After a statement T has been offered in response to a challenge locution, Why S?, then if (S, T) is a substitution instance A of some argumentation scheme of the game, the locution pose(C) is a legal move, where C is a critical question of scheme A appropriately instantiated.
- **R5.** After a 'Pose C' move, then either (a) if C is an assumption of its argumentation scheme, the move is followed by (i) a statement 'C', (ii) a statement 'not-C', or (iii) 'No commitment C', or (b) if C is an exception to its argumentation scheme, the move is followed by (i) a statement 'C' (ii) a statement 'not-C' (iii) 'No commitment C' , or (iv) 'Why not-C?'

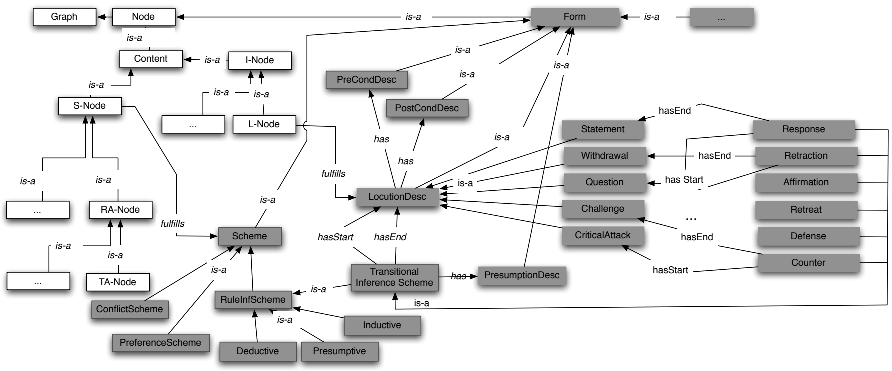

Figure 3. AIF$^+$ description of the ASD dialogue protocol

In the AIF$^+$ representation of ASD, there are five LocutionDesc nodes which correspond to the five available locutions specified in the ASD locution rules. There are also six explicit transitions, composed from these locutions, which involve particular constraints or presumptions (transitions which are simply inferable from the locutions themselves are captured by a generic, unconstrained transition scheme in much the same way that unspecified inference is captured by a generic rule of inference scheme). For example in ASD a Question locution may be followed by either a Statement or a Withdrawal. In the case of a Question → Statement sequence, the Statement is linked to the preceding Question locution by virtue of the Response transitional inference scheme. When such a *response transition* occurs there is a presumption associated with the transition, that the statement which is uttered in answer to the question actually fulfills the question → answer relationship. The locutions of ASD and the explicit transitions associated with them are illustrated in figure 3 which shows the AIF$^+$ upper ontology applied to the ASD formal game.

6. AIF$^+$: Dialogue Representation

Using the described protocols we can now provide examples to show how dialogue as well as protocols may be represented in AIF$^+$.

6.1. TPI Example

Fig. 4 represents a simple example provided by [4]. The dialogue includes a *backup* locution and a *retract* locution. The challenger first *counter*s x with y, which the defender *counter*s with v. The challenger then backs up to x and *counter*s it with z. Since the defender has used v and v attacks w, it cannot *counter* z with w, and must *retract* to its initial position. The challenger once again *counter*s x with y, and this time the defender *counter*s y with u. As nothing attacks u, the challenger must *backup* to x and *counter* it with z. The defender lost its commitment to v through its *retract* locution, so this time it can *counter* z with w, and it does so. There are no further moves available to the challenger, so the defender wins the game. This dialogue may be represented in AIF$^+$ as shown in Fig. 4.

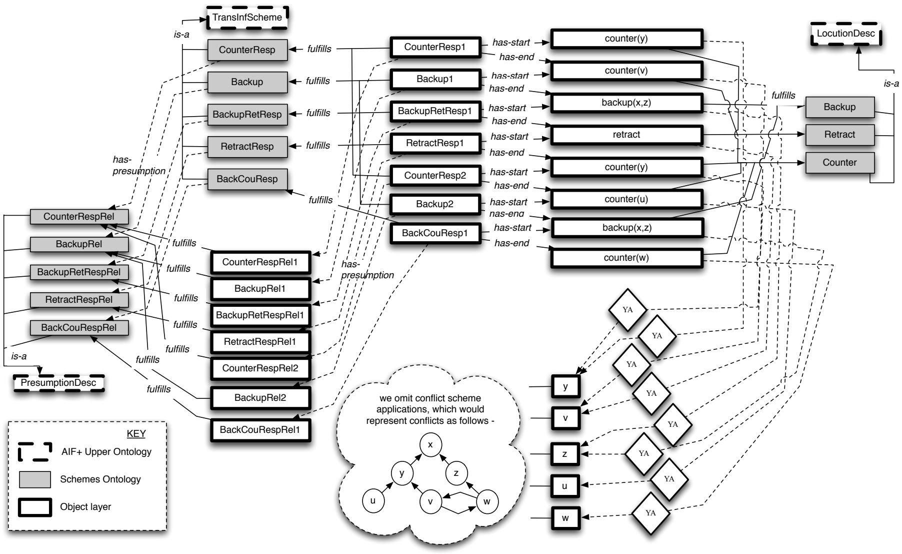

Figure 4. AIF$^+$ description of a TPI dialogue

6.2. Argument Scheme Dialogue Example

In the example ASD dialogue provided in [10], there appears the following exchange:

(L4) Alice: Well, do you remember that "expert" piece that Alf wrote in *South Western Ontario Philosophy Monthly* that said that most Canadian philosophers go to OSSA?
(L5) Bob: Yes, I remember.
(L6) Alice: Well, Alf should know, so we can take it that most Canadian philosophers do indeed go.
(L7) Bob: Yes, but he'd have a biased opinion.
(L8) Alice: Why do you think he's biased?
(L9) Bob: Er, not sure- OK so what if he wasn't biased? So what?

As shown in [10], this may be represented in formal ASD terms as follows-

(L4) Alice: (Alf said most Canadian philosophers go to OSSA)? [Question]
(L5) Bob: (Alf said most Canadian philosophers go to OSSA). [Statement]
(L6) Alice: (Most Canadian philosophers go to OSSA). [Statement]
(L7) Bob: pose(Alf is unbiased). [Critical Attack]
(L8) Alice: why(not(Alf is unbiased))? [Challenge]
(L9) Bob: no-commitment(not(Alf is unbiased)). [Withdrawal][4]

In this representation, the locutions and their propositional content are easily distinguishable – at (L4), for instance, the locution is "(Alf said most Canadian philosophers go to OSSA)?", while its propositional content is simply "Alf said most Canadian philosophers go to OSSA". The AIF$^+$ characterisation of this dialogue history is illustrated in Figure

[4]In [10] L9 is erroneously listed as the *statement* "(Alf is unbiased).".

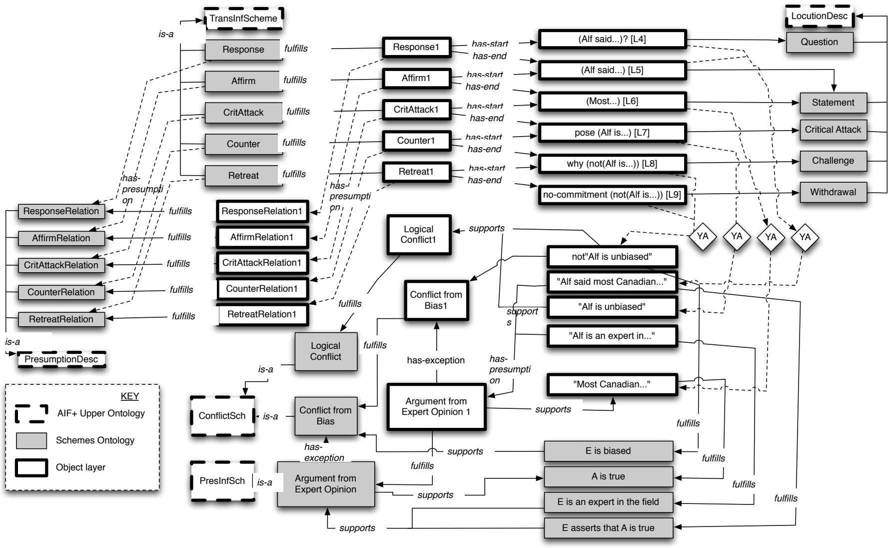

Figure 5. AIF^+ description of ASD dialogue

3, which falls into two main sections connected by the 'has-content' links on the right of the figure. The lower section represents the arguments appealed to during the dialogue – they are conventional AIF material. The upper section represents the actual dialogue itself. The solid-bold-bordered elements represent object-layer entities (capturing the actual data), the grey elements represent intermediate-layer entities (capturing protocols and schemes) and the dashed-bordered elements represent upper-ontology entities (capturing AIF^+ concepts). Some detail is omitted from Figure 3 for clarity - a fuller account of the monologic aspects of the scheme, for example, are given in [9, pp. 18-19]. The YA nodes in Figure 3 capture the relationship between the locutions and their targets or contents (or 'illocutionary points' in the language of [14]). Locution L5, for example is Bob's statement: "Yes, I remember" which might justifiably be analysed as an assertive claim in which the illocutionary point is the proposition that, "Alf said most Canadian philosophers go to OSSA." YA-schemes work just like other scheme applications in that they have multiple premises (as in the case of the L8-L9 instance), but only ever a single conclusion. They can also be attacked with conflict nodes, resulting in (claims of) defective speech acts. So for example if there were a third locutor, say John, who responded to the L5 "How can you remember? You don't read *South Western Ontario Philosophy Monthly*!", then this would be an attack on the YA-node connecting the L5 "Yes, I remember" to the I-node "Alf said most Canadian philosophers go to OSSA". This attack assumes that Bob's speech act L5 is defective (insincere).

7. Conclusions

Given that both $argument_1$ and $argument_2$ are common in computational systems, we need principled mechanisms underpinning their representation. Most challenging, we need a way of describing how the two sorts of argument interact. This paper has demonstrated how we can apply a model founded upon speech act theory to deliver exactly the required representational language. Neither the AIF nor the AIF^+ should tackle the myriad problems of generalised natural language mark-up. But the relationship between locutions uttered as a part of a dialogic argument and the argument structures to which they relate, plays a pivotal role in computational systems that handle natural arguments. As such, we hope that these extensions to the AIF will facilitate the development of a raft of new tools and techniques that blend arguments_1 and arguments_2.

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