# A Model for Processing Illocutionary Structures and Argumentation in Debates

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**Abstract**

In this paper, we briefly present the objectives of Inference Anchoring Theory (IAT) and the formal structure which is proposed for dialogues. Then, we introduce our development corpus, and a computational model designed for the identification of discourse minimal units in the context of argumentation and the illocutionary force associated with each unit. We show the categories of resources which are needed and how they can be reused in different contexts.

**Keywords:** Argumentation, Dialogue, Discourse

## 1. Introduction

Illocutionary structure and argumentation in real language is intricate and complex, and nowhere more so than in debates. Identifying this structure without any theoretical scaffolding is extremely challenging even for humans. New work in Inference Anchoring Theory, IAT (Budzynska and Reed, 2011) has provided significant advances in such scaffolding which are helping to allow the analytical challenges to be tackled. This paper shows how these advances can be used to develop an NLP approach designed to understand the structure of natural debate, in particular from an argumentation and persuasion point of view.

In this paper, we briefly present the objectives of IAT and the formal structure which is proposed for dialogues. Then, we introduce our development corpus, and a computational model designed for the identification of discourse minimal units in the context of argumentation and the illocutionary force associated with each unit. We show the categories of resources which are needed and how they can be reused in different contexts.

## 2. An Introduction to Inference Anchoring Theory (IAT)

In IAT (Budzynska and Reed, 2011) (and cf. (Reed et al., 2010)), different relations between propositions usually distinguished by logic and argumentation theory can be expressed. For example, modus ponens or argumentation schemes such as argument from consequences (Walton et al., 2008) are frequently encountered. Propositions may also be connected through other types of relations such as challenge or conflict, when one is the negation or some opposition of another.

The organization and the logical links between dialogical utterances are governed by dialogue rules which express how sequences of utterances can be composed (these steps are called transitions). For example, the disputants follow a dialogical rule stipulating that challenging is allowed after asserting. Such a normative view of dialogue structure is quite common e.g. in philosophy, authors such as Mackenzie (Mackenzie, 1990) have explored dialogue rationality in these terms in a thread of work rooted in Wittgenstein, whilst in linguistics, approaches founded upon discourse analysis such as Dialogue Macrogame Theory (Mann, 2002) and the HCRC dialogue coding (Carletta, 1997) aim to account for dialogue coherence. Characterizing the application of dialogue rules specifically as transitions between locutions is rather unusual, but is a central part of IAT, because these transitions can act as "anchors". Understanding the ways in which dialogical action can establish arguments and inferences stands at the intersection of many disciplines including (at least), discourse analysis, pragmatics and semantics.[1] It is unsurprising that within each of these fields there are approaches to which IAT can be compared. In discourse analysis, Rhetorical Structure Theory, RST (Mann and Thompson, 1988) has been enormously influential in facilitating computational models of discourse structure. It postulates a number of discourse relations that can account for the overall structure of any kind of text (a logical analysis of RST is given in (Fiedler and Horacek, 2007)). Within our framework, RST can be used to represent the structure of arguments (a conclusion being a nucleus and a support its satellite), and, to a larger extent, to represent the structure of explanations, clarifications, reformulations, elaborations, illustrations, conditionals, causes, etc. From that point of view RST offers a useful means to represent the linguistic structure of a dialogue. RST does not, however, capture inferential patterns, which lie at the very heart of IAT. It is also not sufficient at handling more fine-grained argument structures for at least two reasons (Reed, 1998; Peldszus and Stede, to ap-

[1]This disciplinary distinction is inevitable rather artificial: it aims to indicate broadly some of the scholarly perspectives on the issue.

pear): first, many argumentative relations seem to be quite orthogonal to rhetorical relations – whether two sentences are related through Elaboration or Justification says little or nothing about whether they form a part of a Modus Ponens or Modus Tollens, or a part of linked or convergent argument structure; and second, argument structure is often missed entirely by rhetorical structure, a problem which becomes manifest in the abundance of (vapid) JOINT relations in RST analyses of many arguments.

In pragmatics, one of the most significant approaches to dialogue meaning has come from DRT and particularly a more recent derivative, Segmented Discourse Representation Theory, SDRT (Asher and Lascarides, 2003). Where Inference Anchoring Theory focuses specifically on argumentative discourse, SDRT has much broader goals than IAT and, as a result, is less well adapted at handling the structure of inference-establishing discourse units. In particular, because SDRT defines all locutions as actions performed in the context of the entire history of the dialogue up to that point rather than on the functional relationship, it is impossible to single out that part of the history with which inference is being established. This loss of the functional relationship makes it impossible to recover the underlying inferential structure.

In semantics, Ginzburg (Ginzburg, 2012) has had a major impact on our understanding of the meaning of dialogical actions. The KoS approach, like SDRT, is much more general than IAT, but, also like SDRT, suffers in its ability to handle argumentation as a result. Specifically, KoS does not allow the establishment of a relation between propositions (such as inference) to be the result of a pair of locutions which together establish an illocutionary force, such as arguing. Without such pairing, understanding how challenge-response sequences establish inferences is precluded.

There are several other annotation schemes used specifically for corpus analysis of different dialogical structures. Probably the most comprehensive set of annotations originates from the switchboard dialog act, SwDA (Stolcke et al., 2000). This set of annotations was constructed from a large set of types of dialogues and is now widely used in the dialogue community. This rich tagset offers over 200 different tags (of which 60 are basic) that account for the various forms of exchanges found in dialogues, as found e.g. in help desks. There are however no specific tags that can directly account for argumentation attitudes and it does not allow for expressing different propositional or psychological attitudes, and belief expressions important from a point of view of argument recognition.

In this work, logical structures are said to be "anchored" in dialogical structures via illocutionary connections related to different illocutionary forces (i.e. the speakers communicative intentions (Searle, 1969)). This approach offers a significantly more fine-grained account of the context of a dialogue in which a logical inference is established, than is available in, for example, SDRT (Asher and Lascarides, 2003), whilst offering an illocutionary account of structure rather than a rhetorical account (Moeschler, 2002; Hernault et al., 2010), they provide a much better account of argument and debate. By analogy, work on rhetorical structure parsing (Stede, 2012; Marcu, 1997; Marcu, 2000) can be a mechanism for illocutionary structure parsing. Finally, the SwDA initiative has introduced a number of annotations and resources for dialogue analysis which are now widely used. Our approach is a kind of complement to SwDA: it is more oriented towards argumentation analysis, it is more likely to emphasize the nuances between illocutionary forces and to propose an accurate identification of the dialogical argument structure (with more details on discourse regulators, questions, challenges, etc.).

In order to be able to identify arguments and make explicit the logical structures that are involved in a dialogue, we first need to identify the illocutions of the dialogical moves involved (such as assertions and challenge). Our initial corpus (cf. (Reed et al., 2008)is the BBC Radio 4 programme The Moral Maze, which is explicitly structured around a debate format. The MM2012 corpus1 comprises 65,000 words of transcript, and includes the following example in which disputants are discussing whether the British Empire behaved in an uncivilized way during a war in Kenya in the 1950s:

(1) a. Lawrence James (LA): *It was a ghastly aberration.*

b. Clifford Longley (CL): *Or was it in fact typical? Was it the product of a policy that was unsustainable that could only be pursued by increasing repression?*

Intuitively, what Longley claims in (1-b) is that uncivilized behavior was typical for the Empire, and he supports this claim with a premise that such behavior was the product of an unsustainable policy. On the linguistic surface, however, not only do we have neither conclusion nor premise explicitly asserted, but the act (1-b) is cast as a series of questions. IAT introduces a formalism and a notation for modeling dialogues composed of three main elements (Budzynska et al., 2013)):

- Transition between dialogical units (to the right in the figure below), transitions may link non-adjacent units,
- Illocutionary forces (in the center of the figure below: asserting, disagreeing, rhetorical question, etc.) which connect: (1) dialogical units and their formal representation (to the left in the figure) and (2) transitions and the inferences which may be drawn between formal representations,
- Inferences between formal representations of dialogical units. Here again, inferences may occur between non-adjacent units.

Example (1) can be graphically represented as in Fig. 1.

Though speech act theory introduces the notion of illocutionary force, its models do not allow the representation of some communicative intentions characteristic for the MM2012 corpus. According to, for example, Searle and Vanderveken (Searle and Vanderveken, 1985)'s model, the utterances in (1-b) could be represented as having questioning force. But this would not allow us to express the relation of support between the propositional contents of those utterances. One could claim that the utterances have in fact an

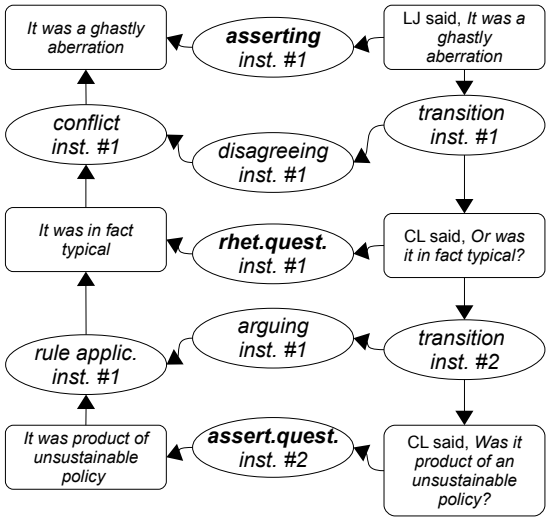


Figure 1: Illocutionary structures and argumentation according to IAT.

(indirect) assertive force, for the interrogative form of question is only the superficial grammatical surface.[2] But then a further problem appears: why the participants of *The Moral Maze* programme so often convey their opinions using the interrogative form instead of the straightforward indicative form?

The advantages of using questions to convey one's opinions are twofold: first the speaker has a weaker burden of proof, i.e. he can more easily withdraw when challenged, instead of being obliged to defend his standpoint: *"I didn't claim it, I was only asking"*. And second – he can also seek agreement with the other party, which is the main goal in such a type of dialogues. That is, the speaker not only conveys his beliefs, but also, in using the interrogative form, he expresses the desire of knowing whether the other party believes the same, and as a result – agrees with him.

The annotation scheme used in switchboard dialog act corpus, SwDA, in contrast, introduces a category of rhetorical questions, e.g. *"Who would steal a newspaper?"*, which are grammatically formed as questions but are used to convey opinions. Yet they have in fact *only* assertive illocution, because (by definition) they do not invite the hearer's response. As a result, they cannot fulfil the agreement-seeking function, since if the hearer is not allowed to respond, he cannot express whether he agrees or disagrees with the propositional content of the (rhetorical) question. In particular, if we understood (1-b) as a series of two rhetorical questions, then James would not be invited to respond and express his agreement or disagreement with the thesis that the British behaviour was the product of an unsustainable policy (while in fact in the next move James disagrees by saying: *"It is the product of a policy conceived in – by the Cabinet, in the context of the Cold War, when (...) the British Government is in a near state of funk about what will happen in their Empire"*).

[2]In this model, the exact representation of (1-b) would be: *argue(Uncivilised behaviour was typical for the Empire)*; *assert(Such a behaviour was the product of an unsustainable policy)*.

What we need is to be able to identify the assertive intentions behind such questions. Only then can we assemble the parts of the argument and attempt to model their composition into large structures. As far as we are aware, there is no model which would allow the representation of such double (asserting and questioning) function of utterances. Thus, as a general goal we need to identify what types of text units (unitary illocutionary structures) are characteristic for the MM2012 corpus and then develop a comprehensive list of these types.

The second challenge for establishing a reliable foundation for illocutionary structure parsing is to build a model in which both units and relations between units can be expressed. Argumentation is intrinsically relational (it constitutes a relation between premises and a conclusion) what was recognised by the relation-based approaches such as Rhetorical Structure Theory, RST and Segmented Discourse Representation Theory, SDRT. Yet the identification of argumentative illocution itself, especially in the dialogical context, can be substantially enhanced if we are also able to identify the types of units which are at the same time performed by the individual speakers.

Consider another example from the MM2012 corpus, in which disputants are talking about the morality of money and consider whether self-destructive and anti-social behaviours (such as getting into debt or going bankrupt) are (or should be) stigmatised:

(2) a. Michael Portillo: *(...) Why be so worried about restoring stigma?*
b. Simon Rose: *Well, what I don't want to see is a return necessarily to debtors' prison.*

Intuitively, this dialogue contains argumentation with the conclusion "*I am worried about restoring stigma*" and the premise "*I don't want to see a return to debtors' prison*". Using RST, we could identify a JUSTIFICATION relation between the conclusion, which constitutes the nucleus of the relation, and the premise, which constitutes its satellite. According to SDRT, on the other hand, Rose performs a speech act: *argue(I am worried about restoring stigma; I dont want to see is a return necessarily to debtors' prison)*, where the second sentence is the premise of the argument and at the same time - a dialogical context (history) of the conclusion.

But what are the cues which allow us to recognise that Rose is performing argumentation here (apart from the direct interpretation of the analyst about what constitutes an argumentative illocution)? Observe that a specific sequence of speakers' individual moves signals that Rose performed argumentation. More specifically, because (2-b) is a response to Portillo's challenge in (2-a), we can interpret this utterance not only as an assertion, but also as an argument supporting the sentence which was challenged. In other words, if we did not know what happened in the dialogue before (2-b), we could still interpret Rose's utterance as an assertion (conveying that he is worried about restoring to debtors' prison), but we would not be justified in interpreting it as argumentation (especially since we would not even know what the supported conclusion is without knowing what Portillo uttered).

Thus, the recognition of the (relational) argumentative force of the relation between (2-a) and (2-b) can be enhanced, if we additionally represent that Rose performed an assertion (a type of unit) as a response to the opponent's challenge (also a type of unit). Representing types of both units and relations is, however, not supported by existing approaches, due largely to their differing research focus. In the next section, we show how to extend and enrich the list of the types of units typical for the MM2012 corpus, and then we will show how this taxonomy can be combined with the types of relations (especially argumentative relation) in a single coherent model.

## 3. Construction of a corpus

### 3.1. Description of data

The analysis has been realized from a corpus composed of three transcripts from the BBC Radio 4 program The Moral Maze. Each transcript is a debate on controversial issues and contains a large diversity of argumentation situations. These debates typically involve a moderator, a panel of four persons and several witnesses. The MM2012 corpus comprises a variety of characteristics that make it relevant for the task at stake: several types of statements, varying sentences lengths, discourse regulators for managing the dialogue etc. The high quality of language, both accurate and explicit, allows for a clear definition of the speakers' positions. The total corpus contains 15200 words; it has 342 dialogue structures in 101 turns. We noted 124 questions or challenges for about 300 assertions, which is relatively well balanced. Discourse regulators, meant to manage the overall discussion, occur on average every 15 units, which shows the vitality of the discussions and the diversity of the sub-topics addressed. Obviously, more deteriorated forms of dialogue must also be considered to design a system usable in a number of contexts. We however believe that it is important to have first a very relevant linguistic model, realized from prototypical dialogues, before moving on to more deteriorated situations, where mechanisms dealing with flexibility need to be implemented on top of our model.
(1) and also (2) are examples of dialogues found in the MM2012 corpus:

### 3.2. Agreement Study

The corpus has been annotated (segmentation into dialogue and argumentative units, illocutionary forces, transitions, inferences and conflicts) by two annotators separately which have the same linguistic training and a good expertise of the IAT theoretical background. They then discussed their analyses in order to produce a single, stable analysis they both agree with, on which evaluations can be carried out for the language processing part described in the section that follows. The analyses, made in OVA+ [3], are available in the AIFdb Corpora[4]. OVA (Online Visualisation of Argument) is an interface for the analysis of arguments online which allows for a graphical representation of the argumentative structure of a text. The annotators were asked to notify the problems they came across when analysing as well as during their discussions: this helped understanding the difficulties and enhancing the model. The ultimate goal at this level is to design a guide for future annotators.
Obviously, consensus was not easy to reach, but disagreements situations were mostly due to relatively complex structures in syntax. Results of the Kappa test, calculated before discussion and summarized in table 1, are better than for general discourse annotation. The lower results concern the annotation of rules of inference (0.75) and the transitions (0.77), but it has to be acknowledged that some of the fragments showed a very tricky structure in terms of argumentation. For the annotation of indexical illocutionary forces, the Kappa test result is of 0.78. Since indexical illocutionary forces are directly linked to transitions and inferences, these results are not surprising. The agreement rate for conflicts, less frequent than inferences, is 0.8; and the one for segmentation is 0.81; the differences of segmentation, however, are mostly due to the fact that one of the annotators seldom made the conjunctions of coordination appear in her segmentation of the utterances; nevertheless, the two annotators always agreed upon the argumentative units. Eventually, the agreement rate for the attribution of illocutionary forces to each unit reaches 0.9. This result shows that the schemes of illocutionary forces can be considered as stable, easy to identify and accurate.

| Types of annotations | Kappa results |
|---|---|
| segmentation | 0.81 |
| illocutionary forces (YA) | 0.9 |
| indexical illocutionary forces | 0.78 |
| conflict relation (CA) | 0.8 |
| inference relation (RA) | 0.75 |
| rules of dialogue (TA) | 0.77 |

Table 1: Results of the Kappa test

## 4. A corpus for illocutionary structure analysis

The next sections briefly describe the linguistic modelling and the implementation of some of the foundational aspects of illocutionary force analysis presented above. We will show how (1) a dialogue can be decomposed into meaningful dialogue text units using a dedicated grammar than can identify and delimit such units and (2) how an illocutionary force can be assigned to each of these units, following the definitions given in Section 5. The analysis has been realized from a development corpus and tested on a different corpus of the same origin.
The analysis work is based on the MM2012 corpus which is a series of discussions held by, in total, 12 different participants on controversial issues that contain a large diversity of dialogue and argumentation situations covering all the types presented below (Table 3) in which the transcript involves punctuation but no prosodic marks; some very long

[3] http://ova.computing.dundee.ac.uk/plus
[4] http://www.arg.dundee.ac.uk/aif-corpora/

sentences; several types of statements; and discourse regulators and other forms of dialogue management.

The language is quite explicit and speaker positions are made clear in terms of e.g. beliefs, strength of position or of assumptions. Therefore, we consider this corpus to be valid and relevant for the task at stake.

Both corpora (development and test) have been manually annotated with discussion between two annotators to reach a consensus. Annotating discourse and argumentation structures is not an easy task compared e.g. to part of speech annotation tasks.

The global characteristics for our two corpora development (dev) and test is described in Table 2, and the distribution of the different illocutionary forces, manually annotated, found in these two corpora is summarised in Table 3. This provides us with a picture of the frequency of each type of illocutionary force. The chart shows the prominence of standard assertions (noted as A) over the other types: 124 questions (pure, rhetorical or assertive) have been identified as opposed to about 300 assertions, which is relatively well balanced. Assertions are differentiated regarding the strength of the proposition (A+ or A-) and the strength of the speaker's position (+A and -A). Cn and PCn respectively stand for *concession* and *popular concession*. Discourse regulators (DR), meant to manage the overall discussion, occur on average every 15 assertion or question discourse units, which shows the vitality of the discussions and the diversity of the sub-topics addressed. These figures are also useful to manage priority identification in the implementation.

| Corpus | size (words) | annotated structures | turns |
|---|---|---|---|
| dev | 15200 | 342 | 101 |
| test | 9000 | 179 | 169 |

Table 2: Corpus characteristics

| Illocutionary force | Frequency |
|---|---|
| PQ | 36 |
| AQ | 52 |
| RQ | 36 |
| ACh | 2 |
| PCh | 5 |
| DR | 27 |
| A | 280 |
| +A | 9 |
| -A | 8 |
| A+ | 14 |
| A- | 6 |
| Cn | 1 |
| PCn | 8 |

Table 3: Illocutionary forces distribution

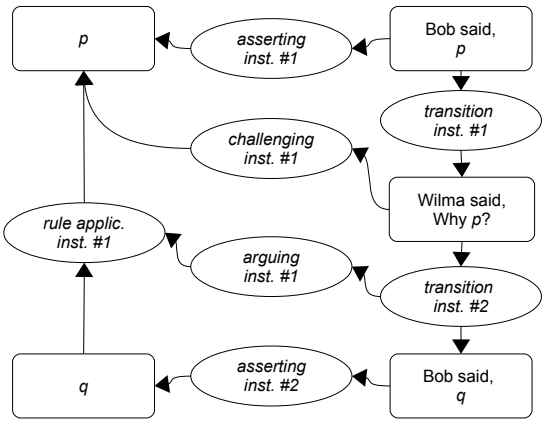


Figure 2: IAT

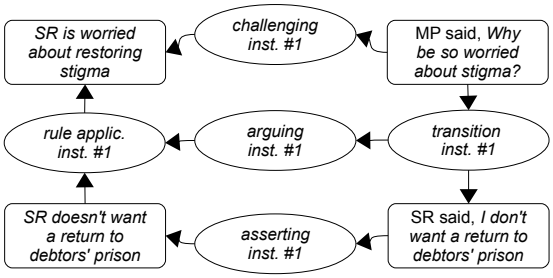


Figure 3: Arguing

## 5. A grammar for text unit identification

Given a dialogue transcript, the first task is, for each dialogue turn, to identify the basic dialogue units. These basic units are the minimal units, in terms of contents, which are autonomous and can be connected to other units via various types of dialogue relations. Our analysis posits that in a coherent argumentative text, these units are all linked to each other, and form a graph, as shown in Figs. 2 – 3.

No unit is left pending: all units are connected to others. The structure is however not as hierarchical as discourse analysis in general, and there is no a priori notion of kernel and satellite.

For that purpose, we developed a specific elementary discourse unit (EDU) analysis dedicated to dialogical situations. These specific EDUs turn out to have specific forms and linguistic marks proper to argumentative dialogue compared to those defined for discourse analysis in general. According to the observations made on our corpus, in most situations, units can be identified on the basis of discourse marks typical of dialogue, e.g. marks related to challenge, position or belief statements, or an aggregation of such marks, e.g. when there is an intention of persuasion. A number of psycholinguistic investigations summarized in (Grosz and Sidner, 1986) show that marks are used by human subjects both as cohesive links between adjacent clauses and as connectors between larger textual units. An important result is that discourse markers are used consistently with the semantics and pragmatics of the textual units they connect and they are relatively frequent and unambiguous. These marks can be used for several purposes such as

EDU delimitation, characterization and identification of relations between units. The semantics and pragmatics of a number of connectors are investigated in e.g. (Winterstein, 2012).

A grammar that allows for the identification and the delimitation of these text units can be elaborated on the basis of these marks. Identification and delimitation are two different parameters which share a lot of lexical features. It is not possible at our stage to include intonation or prosodic indications, however punctuation, considered here, partly reflects these parameters.

The main categories of marks used to identify text units include:

- verbs, which promote controversies, beliefs, position statement and argumentation. The following classes are the most prominent: propositional attitude verbs (*think, believe, agree, deny*), epistemic verbs (*know, understand*), communication and report verbs (*claim, hold*) and psychological verbs (*dream, worry, be intrigued*); we also noted a few metaphorical uses (*it tends to*);

- modal expressions specific to interaction (*could be, may mean*);

- opinion expression adverbials and related expressions (*definitely, surely, obviously*) found in assertive statements;

- specific interrogative forms, rhetorical questions, or marks suggesting challenges (*where does + pronoun, isn't + demonstrative, why should*).

Unit delimiters include the above verbs and modal categories when they are in an initial position of a proposition (e.g. *I think, it seems to, where does*), connectors (*but, because*), conditional and goal expressions and punctuation (essentially commas, question marks and dots).

In terms of lexical resource development, these marks correspond to relatively stable lexical categories. Our main contribution lies at this level in the categorization of the two last items above which are proper to argumentative dialogues.

To handle these marks and their associated linguistic elements (e.g. subjects, pronouns, negation, modals, etc.) and morphological variations, we developed 'local' grammars dealing with e.g. propositional attitude expressions, position statements, psychological expressions, questions, etc. in their linguistic diversity. A total of 52 rules have been developed for that purpose. These rules implement what we call **g-marks** (grammaticalized marks), e.g. informally:

```
g-mark(Type) --> pronoun,
opt(negation), verb(Type).
```

where negation is optional and `Type` is the category of the verb, e.g. prop-attitude.

These rules were designed manually and emerged from corpus observations, leading to the above categorizations, and to generalizations (e.g. including all the relevant propositional attitude verbs in the lexicon even if only a few have been observed) in order to have an adequate linguistic coverage.

These local grammars are then integrated into larger grammatical forms which both identify and delimit the text units. The general form of these rules in Dislog syntax is roughly as follows:

```
unit_identifier -->
unit delimiter, gap, (g-mark, gap)*,
unit delimiter.
```

where (g-mark,gap)* indicates a sequence of one or more g-marks, a g-mark being a call to a grammaticalized mark. The symbol gap indicates a finite set of words which are of no present interest and which can be skipped. For example, in:

*well, isn't that a source of injustice?*, the first unit delimiter is the beginning of the sentence, the g-mark is `isn't that` and the second unit delimiter is the question mark. The two gaps are respectively: `well,` and `a source of injustice`.

The grammar is implemented using the <TextCoop> platform and the Dislog language (Saint-Dizier, 2012), specifically designed for discourse processing. Dislog extends and generalizes the expressive power of regular expressions in several ways, most notably via the introduction of typed feature structures, controls over skipped structures (gaps) and its ability to include reasoning schemas, e.g. to resolve ambiguities or to compute a result. In general, the result of an analysis is an XML tagged text; it can also be a dependency structure.

We have conducted an indicative evaluation (to identify improvement directions) on the previously manually annotated test text where 179 text unit occurrences have been identified. This is a small scale test but it turns out to be sufficient for a preliminary analysis. Out of this set of 179 units, our system :

- (i) correctly annotated 153 units (85%) (identification and delimitation);

- (ii) failed to identify 6 units (4%) because of a lack of mark;

- (iii) correctly identified 13 units (7%) but with incorrect delimitation (a unit is split into several or vice-versa);

- (iv) identified 7 units (4%) which are not directly dialogical text units.

These results are surprisingly good. One reason is probably that the language in our corpora is a rather good English, where speakers make sure they can be understood by their listeners. The discussion is essentially "rational", forms of irony, dramatization or trickery are quite unusual. Another reason is that an adequate organization of an argumentative dialogue requires that statements, questions, challenges, etc. are made as clear as possible so that the argumentation can lead to a conclusion, or a set of weighted conclusions. Nevertheless, the results are very encouraging and lay out a promising platform for further research.

## 6. Illocutionary structure identification

The next step is to identify for each text unit the illocutionary structures and the illocutionary forces presented in section 5. A coherent dialogue requires that each text unit is assigned a type. Unlike at the previous step, it is not possible, however, to identify all illocutionary force types solely on the basis of linguistic marks. In some cases the illocutionary force cannot be assigned to a unit in isolation: it is necessary to take into account e.g. the illocutionary forces assigned to adjacent units, the position of the unit in the dialogue turn (starting, ending) and the role of the speaker in the debate (e.g. moderator).

Linguistic marks alone do, however, provide substantial information about illocutionary structure and force. In this preliminary analysis, we present results obtained on that basis. Some of these marks may be common to unit delimitation, in particular verbs. Their semantics and syntactic behavior explain these multiple roles in our linguistic description. Similarly as above, these linguistic forms have been identified from our corpus, and then expanded to similar terms and represented as above for text units by means of g-marks.

A significant number of linguistic forms we have identified are very general and are shared by several illocutionary forces. Our strategy is not to have default illocutionary force assignment, but to represent the ambiguity, which may be resolved later by other means, including inferences, which can be introduced in Dislog rules. For that purpose, we introduced polymorphic types to represent the ambiguity (or underspecification). For example, AQ-RQ is the polymorphic type assigned to a text unit which can be one of the two types AQ or RQ, when it was not possible to make a decision between these two types. Of interest is the study of the overlap situations, so that the pragmatic factors at stake can be better identified. Polymorphic types concern questions or assertions separately, since these two main categories have different functions and can be relatively well identified via punctuation.

Our corpus analysis shows that linguistic forms associated with illocutionary force identification are quite diverse (42 forms have been identified), with a large number of morphological variants. 12 types, simple or polymorphic, have been defined for questions. Forms which are common to two or more basic types are included into specific rules and directly assign the relevant polymorphic type.

From our analysis, it turns out that about 63% of the linguistic marks are typical of a unique illocutionary force, therefore proper to specific types. We have, for example the following types of marks:

- RQ: conditional questioning (*why should, should we*), and indirect forms based on negation (*aren't, isn't*);
- AQ: important use of the past (*was it, were we*), and forms using would (*would you, would that*);
- ACh: *why* followed by the auxiliary *to be*;
- PCh: *why* followed by *do* or *would*;
- Polymorphic types such as PCh-RQ include forms which are ambiguous, in particular why + (do) + demonstrative;
- RQ-PQ includes forms in should + demonstrative or personal pronoun.

To identify illocutionary forces we have then written 18 rules that integrate the above systems of marks (as g-marks) in Dislog that implement the recognition of illocutionary forces. This modest number of rules allows a good management of concurrency between rules.

Considering our corpus of three manually annotated texts, we have the following distributions for polymorphic types:

- PQ-AQ: 13%,
- AQ-RQ: 10%,
- RQ-PCh: 4%,
- RQ-ACh: 4%,
- and 3% for the remainder.

This means that about 62% of the text units are a priori unambiguous w.r.t. their illocutionary force, which is a rather low proportion. It is thus crucial to identify additional factors (pragmatic, typographic) that contribute to resolve the ambiguities.

If, finally, we consider the 153 text units that were correctly identified, as indicated in the previous section, we obtain the results given in Table 4. In the first case, the assignment is made for the basic type of illocutionary forces, so there is no ambiguity. In the second case, it is important to note that 65% of the polymorphic types is the combination of different strengths of assertions where the distinction, even for humans, is difficult to make. The erroneous assignment can still be improved by some typographic and linguistic adjustments. These results – of 78% accuracy with polymorphic types – although still preliminary, are very encouraging considering the difficulty of the task.

| | |
|---|---|
| correctly via basic types | 38% |
| correctly via polymorphic types | 40% |
| erroneously | 22% |

Table 4: Assignment of the illocutionary forces.

The results of the parse are annotations over the original text, as shown for example (1):

<utterance speaker = "lj" illoc = "standard_assertion"> <textunit nb = "215"> it was a ghastly aberration < /textunit> .
<utterance speaker = "cl" illoc = "RQ"> <textunit nb = "216"> or was it in fact typical ? < /textunit> < /utterance> .
<utterance speaker = "cl" illoc = "RQ-AQ"> <textunit nb = "217"> was it the product of a policy that was unsustainable that could only be pursued by increasing repression? < /textunit> .

### 6.1. Towards a model for Transitions and argumentation analysis

Dialogue transitions are elaborated on the basis of illocutionary forces, then the type of argumentation can be induced from these transitions. This task is ongoing. For example, the dialogue pattern:

pure_question(Speaker1) → Affirmation(Speaker2) → Assertion(Speaker2).

can be interpreted as an agreement, a reframing or a support of speaker2 to speaker1's question.

In a large number of cases, to properly identify transitions, it is necessary (1) to introduce knowledge and pragamtic factors and (2) to consider quite a large frame that includes several illocutionary forces for each speaker since

dialogues have a relatively complex structure and relevant transition identifiers may not be adjacent. This introduces additional complexity and risks of ambiguity. Dislog rules allow the introduction of knowledge and reasoning which may enable the system to improve transition identification.

## 7. Conclusions

Using the general framework of Inference Anchoring Theory, the paper proposes a simple taxonomy of unitary illocutionary structures that accompany argumentation in dialogical contexts in the MM2012 corpus, and reports preliminary results for recognition of those illocutionary structures in raw, spoken-language transcripts. These results are encouraging and bring the automatic identification of dialogic argument structure in discourse such as the real-world, complex examples **??** and (1) one step closer, with the parse above representing a crucial milestone.

This is a first experiment in illocutionary structure parsing that needs to be further extended to other texts of the same type (agreement-seeking dialogues on controversial issues), so that the linguistic model can be enhanced. Results so far are relatively good, though more deteriorated forms of dialogues will also be considered, where irony and emphasis may present additional challenges.

Then, we will need to develop the last two steps shown in Figs. 2 – 3, namely the representation and implementation of relational illocutionary structures and transition types specific for agreement-seeking dialogues. In particular, we expect that besides argumentative illocutionary structures, the participants could have explanatory intentions (which will introduce inferences as well), and disagreeing and undercutting intentions (which will introduce the relation of conflict between propositional contents). In terms of transitions typical for the MM2012 corpus, we expect to encounter sequences of PCh-A which will anchor argumentative illocutions and inferences, but also, e.g. sequences of AQ-A which will anchor illocution of disagreement and conflict. Together, these techniques can pave the way towards recognition of the structure of the argumentative dialogue as a whole.

## Acknowledgments

We gratefully acknowledge the support of the Polish National Science Center under grant 2011/03/B/HS1/04559.

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