Taking Situational Factors into Account when Resolving Anaphora:
an Approach based on Salience and Events – DRAFT VERSION

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Abstract

Anaphora resolution in human-machine dialogue systems is often based on models and algorithms that were designed for text. But dialogue brings out a situation, i.e., an immediate physical environment and events that are perceived simultaneously by the participants. This situation can be at the origin of referential expressions called "exophora", "antecedentless anaphora" or "anaphora with a non-linguistic antecedent". Attributing some referents to such expressions is difficult for two reasons. First, because situational factors are numerous and implicit. Second, because ambiguities can appear between a potential situational antecedent and a potential linguistic one. In this paper we focus on the nature of situational factors and we investigate how they can be taken into account when doing anaphora resolution in dialogue and then in text. Our points of departure are the notion of salience and the nature of the events that intervene in dialogue and that can be described in text. We propose a characterization of such events and we draw some theoretical conclusions on the principles that can be added to existing anaphora resolution algorithms.

1. Introduction

Resolving anaphora can rely not only on the linguistic material, but also on the visual context and on events whose perception is common to the dialogue participants. Such events can be linked to the behavior of a participant (e.g., any gesture) or can be completely external to the dialogue. In the literature we can find only rare examples of such situations (Isard, 1975; Halliday and Hasan, 1976) or, more recently (Cornish, 1996). The one from Isard (perhaps the first one) involves a child who puts his hand on the bar of a cage with a lion inside, and someone who says *"be careful, he might bite you!"*. In this utterance the pronoun *"he"* is a typical case of an anaphor with a non-linguistic antecedent. The antecedent is the lion, and its identification can only be made through the child's behavior, i.e., his action towards the cage, which is perceived by the speaker. The fact that the action comes from the addressee and not the speaker (and then that it is not simultaneous to the utterance) is an argument for the use of the term "anaphor" instead of "deixis" or "deictic reference".

With this example as a basis, it is easy to imagine some other situations. For instance *"he is really good"* can talk about an actor who has not been previously mentioned, but who is particularly lighted up at the moment of the utterance. It is also easy to imagine apparent ambiguities between a situational antecedent and a linguistic one, for instance if another actor has been talked about earlier in the dialogue (to whom does *"he"* refer?), or when considering that *"our dog Rex seems to be hungry"* has been uttered just before *"be careful, he might bite you!"* (dog or lion?). In this paper we want to explore the factors that intervene when identifying the antecedent. Thus, we will not focus on the form of the anaphoric expressions, nor on the models and theories that were designed for the text, but more on situational aspects that were not often studied and need to be clarified. Our aim here is not to provide another anaphora resolution algorithm, but to propose a set of principles that can be integrated to existing algorithms.

2. Anaphora, Situation and Salience

In this section we quickly illustrate the role of situation and salience when resolving anaphora, and we discuss on the wideness of salience phenomena.

2.1. Anaphora Resolution

Many methods in linguistics and computational linguistics confront only syntactic aspects to privilege a potential antecedent to other ones (Grosz et al., 1995). Some approaches integrate semantic aspects (Hajičová et al., 1995). With a computational purpose, a lot of algorithms have been proposed, many of them relying on salience scores (Alshawi, 1987; Lappin and Leass, 1994) and others on computation procedures (Mitkov, 2002). Moreover, it is useful when designing anaphora resolution models to take into account some work in the domain of the natural language generation, for instance (Stevenson, 2002) that deals with salience and salience factors.

Usual main strategies can be synthesized as follows:

1. Identifying and treating linguistic constraints, in particular those linked to the number and gender of referents and to some semantic aspects. With the example of *"be careful, he might bite you!"* uttered just after *"Rex seems to be hungry"* or, why not, *"do you see the zoo keeper?"*, the masculine singular pronoun *"he"* can refer either to the lion, the dog, or the zoo keeper. Moreover, all of these potential antecedents are able to bite.

2. When several potential antecedents remain, there is the need to classify them in term of salience or accessibility. Linguistic indications such as grammatical function, word order, thematic role, topic, etc., are useful (Sidner, 1979; Stevenson, 2002). In our example, *"Rex"* is privileged to the zoo keeper because its mention is recent and because he has some privileged status such as being the subject of the sentence (privileged grammatical function) and being at the first place (word order).

3. Classical approaches do not take into account the lion because it does not correspond to any discourse entity. But the situation involves an action from the addressee, and then the participants to this action (the

child and the lion) that can be referred to. In the example, *"be careful"* can be seen as an important indication, with the aim to catch the addressee's attention on a new element of the context or on a context change (Isard, 1975; Beun, Cremers, 1998).

2.2. Salience and Related Problems and Issues

Salience characterizes what captures attention, what appears first in the mind ("pop-up" effect). This property, sometimes called "obtrusive", applies to the discourse entities with lexical, syntactic, semantic and pragmatic characteristics (in the case of written discourse), to which we can add phonetic and prosodic characteristics (in the case of spoken discourse). Salience is then linked to the emergence of a figure from a ground, whatever the cause of this emergence, between physical aspects linked to text or speech perception and more semantic or cognitive aspects linked to language understanding.

A first issue when studying salience is the nature of the unit to which salience can apply. Our examples have put forward the word or nominal phrase as the unit for written discourse, the phoneme or phoneme group for spoken discourse, and the discourse entity for cognitive aspects. Since the physical salience of words or phonemes has a consequence on the cognitive salience of the related discourse entities, it seems reasonable to consider these entities as the units. Thus, when confronted to ambiguous anaphora, we will consider the salience of each potential antecedent in order to privilege one of them. In the case of exophora, the units are the visible objects, i.e., the potential referents in the visual context.

A second issue is the nature of the salience factors. Concerning situational anaphora, classical physical factors are the physical properties of the objects: form, size, color, texture, orientation, position, etc. For instance, a visible object is salient if it is the only one to be red whereas all other objects are blue or yellow. The biggest object may also be salient because of its presence in the scene. Another example concerns the objects positions in the visible field. An isolated object is salient if all other objects belong to perceptual groups. Cognitive factors are linked to the participant's mental states such as intention, memory or emotions. An object which is directly linked to the ongoing task is salient. This is the case of a chair if the participant has just entered a room and wants to seat down. Is also salient an object which is well known by the participant, e.g., computers and all related technological objects for a computer scientist. If these cognitive aspects are common to visual salience and linguistic salience, dedicated physical and semantic factors have to be defined for discourse entities. We now focus on such factors.

3. Linguistic Factors

In this section we present a personal point of view concerning linguistic salience, with the significance of several factors repartitioned into two main categories.

3.1. Formal Linguistic Factors

The formal factors are often emphasized (Alshawi, 1987; Lappin and Leass, 1994; Grosz et al., 1995). From these approaches and the related classifications of salience factors, especially (Stevenson, 2002), we propose the following classification:

Salience that is intrinsic to the words. A word can be salient by itself, because of the phonemes or graphemes it includes, or because of its grammatical status. For instance, proper nouns are a priori more salient than common nouns. Because they are deictic and therefore require a particular interpretation process that brings back to the situation, indexicals are also salient.

Salience due to an explicit emphasis. The way a sentence is uttered can have consequences on the salience of the discourse entities. This is for instance the case of a particular prosody and of the presence of a pause before and after uttering a word or noun phrase.

Salience due to a dedicated syntactic construction. This factor is often studied because the linguistic material reflects the intention to make salient a discourse entity. Presentational cleft constructions or topic constructions are examples of such a category (Lambrecht, 1994).

Salience linked to word order. The order and the frequency with which words are uttered is another formal factor. In particular, the beginning and the end of the sentence are privileged positions. The repetition of a word or noun phrase is also an argument to make salient the related entity, as well as the exploitation of symmetry.

Salience linked to grammatical functions. Following (Sidner, 1979) and Centering Theory (Grosz et al., 1995), the subject is privileged to the direct object, the indirect object and then other functions. This is the interest of passive constructions. Another salient grammatical function (less frequent) is the vocative (Lambrecht, 1994).

3.2. Semantic Linguistic Factors

Concerning more semantic factors, we consider the first approach of (Sidner, 1979) and the work about the notion of communicative structure (Lambrecht, 1994). In fact, there is the need of such theories to apprehend the notion of salience in a semantic way.

Salience linked to lexical semantics. A discourse entity can be salient because of its semantic features. In particular, human beings are more salient than animals, and animals are more salient than inanimate objects. When all discourse entities are human beings, a salience hierarchy can be defined considering the influences between each others. For instance, a teacher can be considered as more salient than a pupil (Wanner and Bateman, 1990).

Salience linked to verbal semantics. There exist several proposals to privilege a thematic role to another one. (Sidner, 1979) considers that when it appears, the "theme" thematic role is the most salient. When it does not appear, the agent and the patient are good candidates, but, considering the semantic category of the predicate, the first or the second will be the privileged thematic role. With the example of implicit causality verbs, the most salient entity is the one that is linked to the cause. With the example of a sentence that describes an event, the salient entity is the one to whom the consequences of the event apply. With the example of a transfer, the salient entity is the receiver (Pearson et al., 2001).

Salience linked to sentence semantics. Between the sentence theme and rheme, one may be considered as the most salient, generally the theme (or sentence topic). In fact, there is no consensus and it is hard to classify the theme and rheme in term of salience. One reason is that the theme is often assimilated to the first entity in the

sentence and to its grammatical subject. The salience of the theme is then linked to word order and to grammatical functions, i.e., to other aspects we already discuss. Then it has not to be defined autonomously.

Salience linked to discourse semantics. The notions of discourse topic and aboutness are here linked to salience. The problem is that these notions can group a lot of phenomena (aggregates of discourse entities, macrostructures, supertopics, subtopics and so on). If the discourse topic groups several entities, a solution is to privilege the one that is the more often mentioned.

Then, a lot of linguistic aspects can be classified in term of salience. Scores can thus be imagined for a system to handle salience and to privilege the most salient antecedent (i.e., the antecedent which is salient for the highest number of salience factors). Now we want to determine whether situational aspects can also be classified in term of salience. Since very few approaches deal with situational aspects, we have to construct our model of situation. We choose situational events as a starting point.

4. Situational Factors

With the aim to explore indications such as *"be careful"* and to compare them when resolving anaphora in dialogue situations, we propose here a classification of the events that characterize the situation and its evolution.

Events Linked to the Enunciation. As a first category of events, the ones linked to the enunciation concern the speaker and include all types of conversational gestures as well as postures and attitudes. On the first hand there are communicative gestures that convey meanings and then participate to the dialogue. The most frequent examples are coverbal gestures (deictic, illustrative, expressive, paraverbal), iconic gestures, and synchronization gestures such as turn taking gestures. On the second hand there are extra-communicative gestures that do not really participate to the dialogue but consist of indications on the speaker's emotional and intentional states. This is the case of automatic gestures such as the handling of a pen, which constitutes an interesting example because it can introduce the pen as a new referent (*"you are going to break it"*). We can also mention the gestures that bring the dialogue participants closer (or not) to each other, the postures that express a particular impatience or discomfort, as well as all the feelings that are conveyed by the gaze. These phenomena can put an element into salience and then allow an anaphor.

Events Linked to a Task that is Joined to the Dialogue. This second category of events concerns both the speaker and the addressee. This is typically the fact that they are walking side by side, or that they are working in a meeting room using a white board as a dialogue support. The task can be the collaborative redaction of a paper, and utterances such as *"is it progressing?"* or *"it seems incomplete, we should add a paragraph"* can be understood with no linguistic antecedent. We can include in this category of events the sociological aspects that underlie any dialogue between an employee and his chief, for instance, with the importance of keeping face, being sociable, giving a good impression, etc.

Events Linked to a Task that the Dialogue has Left Aside. The third category of events groups the events that are linked to a task that the dialogue has left aside, but that

remains predictable. This is typically the case of a dialogue during the wait for a train, or just before a meeting or a conference, waiting for its beginning. Such a dialogue does not involve complex sub-dialogues and utterances, because the potential occurrence of the event is active in the participants' mind. Anaphor is then easy, even if for instance the train has never been mentioned: *"here it is"*, *"it is only five minutes late"*. To the contrary of the following category, the train does not constitute here a new element in the communication situation. Moreover, it does not have to be present to be referred to. Cf. the notion of cognitive accessibility (Cornish, 1996).

Events External to the Dialogue. The last category is the one of events that are external to the dialogue, and therefore are unpredictable in the communication context. These events concern both the speaker and the addressee, and can be at the origin of a new dialogue situation. They can introduce a new topic that will take the place of the current one(s). This is the example of the chief that comes right during a break in an office, or the fire alert. The salience of the new element allows the use of an anaphor.

Events and Related Objects. With the information that is conveyed by these events are the objects and participants. These entities more than the events themselves constitute the potential referents. In this manner we can prepare the treatment of the zoo example. The event that justifies the enunciation is the movement from the child to the lion cage. The main participant is then the child, but the entities that are involved are the cage, the bar, the lion, the jaw, etc. Then, the determination of the potential antecedents implies the modeling of the micro-world around the movement.

5. Conjunction of Linguistic and Situational Aspects

We focus now on the ambiguities between situational antecedents and linguistic ones. We have factors to identify and classify linguistic antecedents, we have factors to identify situational antecedents, but we do not have factors to compare a linguistic antecedent to a situational one. With that purpose we propose the following set of parameters, with seven concerns:

Temporal sequence of situational events and linguistic mentions. The most recent situational or enunciative event is privileged because it is probably the most active in the participants' minds. But "recent" does not mean "salient", and semantic considerations are needed in complement. In this way this first parameter is just one among a set of parameters that have to be put together.

Prosodic aspects when uttering the anaphoric expression. A first aspect is the rhythm. Any rupture within a regular rhythm, any pause is significant and must be analyzed as so. If the anaphor follows the antecedent without any cohesion rupture, and if a situational event occurs simultaneously with the antecedent mention, nothing can be decided, i.e., the ambiguity remains. To the contrary, if a pause follows the linguistic antecedent mention, the resulting rupture leads to put the situational antecedent forward. A second aspect groups the intonation and the accents. If the two utterances are very different in term of prosody, then the resulting rupture leads to put the situational antecedent forward. This is the case if *"Rex seems to be hungry"* is uttered calmly, whereas *"be*

careful, he might bite you!" is uttered with stress, with an accent on *"be careful"*. If both utterances have the same intonation, the linguistic antecedent is privileged to the situational one, which is not materialized in term of prosody.

Lexical aspects. For instance, the roles of *"be careful"* are numerous. First, with the presupposition that the addressee may focus his attention on something more important than the ongoing task, this expression expresses the occurrence of an exceptional event, and therefore puts the situational aspects forward. With an adequate prosody, this expression refers to the immediate situation and not to the dialogue history. Second, such a lexical item favors the hypothesis of a dialogue rupture, i.e., puts forward the events that are the least linked to the ongoing dialogue, and then the current situational events, especially in the case of events of category 3 (linked to a task that the dialogue has left aside) or category 4 (external to the dialogue).

Syntactic aspects. Syntax can also bring indications concerning cohesion ruptures that allow identifying a discrepancy between the mention of the linguistic antecedent and the mention of the anaphor. A lack in the textual cohesion can then be an important factor. Another syntactic factors are the presence in the utterance of an isolated referring expression, and the presence of a vocative expression that brings back to the situation.

Semantic aspects. Concerning the utterance meanings, there are first all the expressions explicitly linked to the situation, such as indexicals or utterances like *"look!"* (*"look, here is the zoo keeper"*) or *"you see"*. In parallel with syntactic aspects, we can also mention the coherence ruptures, which can indicate in a significant way the occurrence of an extra-dialogic event. As a very general example, if we consider that in the usual succession of two sentences, the rheme of the first corresponds to the theme of the second, each breach of this rule can be such an indication. For instance, if the anaphoric expression is included in a second rheme, its antecedent might be the situational one rather than the linguistic one, which corresponds to the rheme of the first sentence.

Pragmatic aspects. The rupture of continuity on which we have based our approach can apply also to illocutionary forces. To emphasize the variations, we reduce them to the three main categories that are assertion, order and question. If the utterance with the anaphor has a particular illocutionary force (inadequate or unexpected) that differs from the ones of previous utterances, that particularity might be an indication of the presence of a situational event. With our zoo example, it is the case of the following utterances succession: *"Rex seems to be hungry. Be careful, he might bite you"* as opposed to *"Rex seems to be hungry. He might bite you"*. The textual anaphor is more relevant in this last case. Prosodic aspects, which are linked to illocutionary forces, may be of importance here, and therefore must be taken into account in parallel with pragmatic aspects.

Cognitive aspects. To end the list, it is interesting to evoke the participants' mental states or intentional states, especially when the aim is to design human-machine dialogue systems where hypotheses on these states are made by the interpretation and generation modules. Then, when the task is predictable and when expected events can be identified, like in the train example, the system can put forward the hypothesis that corresponds to the related referent.

6. Preliminary Principles for Linguistic and Situational Factors Processing

In this section we give some first principles for the computation of linguistic salience and situational aspects. The aim here is not to propose a model or a theory. Our principles reflect some recommendations for salience processing, and still have to be included in a more formalized framework. For now, we present numeric scores for handling salience, but these scores are only illustrative and have to be refined before being included within an existing framework.

6.1. Principles for Salience Comparison

Now we have a list of aspects that lead to privilege situational or linguistic interpretations in ambiguous situations. When combined to syntactic and semantic analyses, this list may allow the system to order potential antecedents in term of relevance. One way to order hypotheses is to use numeric scores, for instance between 0 and 1. The hypothesis with the highest score is the most relevant. As a first way to proceed, a hypothesis is labeled with a score that depends on the number of factors privileging it. The only prerequisites to this process are algorithms whose aims are to determine whether a factor applies or not to a hypothesis. For instance, an algorithm is needed to determine which discourse entity is the theme and which is the rheme, another algorithm is needed to determine which entity is the agent and which is the patient, etc. In this paper we suppose that we dispose of such algorithms, and we focus on the comparison processes that allow identifying the best antecedent hypothesis.

One important point is that there are two ways to attribute salience scores to the discourse entities. First, given one factor, we can consider that only one status is salient. Concerning the grammatical function, that corresponds to consider that only the sentence subject is salient, and then to attribute a score to the related entity (1 for it, 0 for the others). Second, we can consider the all status have a certain salience. Concerning the grammatical function, that corresponds to consider that all entities have a certain salience, the highest score being attributed to the privileged status (e.g., 1 for the subject, 0.5 for the direct object, 0.2 for the indirect object, 0 for the others). The first way to attribute score emphasizes the fact that the entity is the only one that verifies the current salience factor, whereas the second emphasizes the comparative significances of the entities for the given factor. We define these two principles as follows:

Singularity principle. The salient entity can be distinguished from the others by a singularity. In the case of a situational antecedent, it is the example of the only red object in a visual scene including blue and yellow objects. In the case of a linguistic antecedent, this point of view corresponds to consider that only one grammatical or thematic role is salient. That is not so far from Optimality Theory (Prince and Smolensky, 1993) but in another domain. A salient entity is seen here as a *singleton*, i.e., as being the most *different* from the other entities.

Primordiality principle. The salient entity can be distinguished from the other entities by a particular

importance. In the case of a situational antecedent, it is the example of the size: the biggest the object is, the highest its salience. In the case of a linguistic antecedent, it corresponds for instance to the hierarchy of the grammatical functions. Salience is here close to the notions of importance and significance, and the most salient entity is the most *important* one.

Now, these considerations apply to the attribution of a score for one salience factor. Then, there is the need to confront all factors and all resulting scores in order to attribute a global salience score to each entity. For that, a lot of mathematical processes are possible, from the classical sum or arithmetic mean to complex statistical computations. Here is a quick review:

The factors sum or average. The only prerequisite is a list of factors. The sum, the arithmetic mean and the geometric mean have all been exploited (Pattabhiraman and Cercone, 1990). The main weak point of this first category of method is that all factors are taken into account with the same importance. Then, several factors can be correlated and therefore privilege an entity in a too strong manner.

The optimal factor. The prerequisite here is an ordered list of factors. The principle is that the entity that satisfies the most important factor is labeled as being the most salient, even if another entity satisfies a lot of secondary factors. Cf. the description of the singularity principle and the exploitation of Optimality Theory.

The weighed average of factors. This is a solution to the weak points of the two previous methods. With weights, the importance of the factor influences can be modeled. (Alshawi, 1987) is perhaps the first to exploit such a method in a relevant way. The difficulty is to determine the weights from corpus studies or just intuition.

The procedural methods. Heuristics can be designed to increase or decrease the scores considering the characteristics of the discourse. This is the approach of (Mitkov, 2002), with rules like "0 for definite determiners" and "−1 for indefinites". The problem with such a calculatory method is that it breaks up from linguistic theories.

The statistical and hybrid methods. Statistics can also be computed from corpora and exploited when attributing a salience score to an entity. This process can be used as a complement to one of the previous methods, for instance when determining weights. Machine learning techniques can also be implemented, following in particular the approach of (Strube and Müller, 2003) for anaphoric and exophoric pronoun resolution in spoken dialogue.

6.2. Back to our Initial Example

We want now to show how the example *"Rex seems to be hungry—Be careful, he might bite you!"* (for which we have analyzed some prosodic and syntactic variations) can be processed. Since this section is only a preliminary illustration of what a salience processing may be, we choose to apply the simplest methods for this example. Then, an analysis driven by singularity principle (i.e., only 0 and 1 scores) and using the factors average computation method can be:

- Concerning the temporal sequence of events, nothing can be concluded.

- Concerning prosodic aspects, we keep the case where the first sentence is uttered calmly and the second is uttered with stress, and then we give one point to the situational antecedent. Thus, 1 for the lion and 0 for the dog.
- Concerning lexical aspects, *"be careful"* emphasizes the situational hypothesis. Then one more point for the lion.
- Concerning syntactic aspects, both utterances present certain cohesion. That leads to privilege the linguistic antecedent. Then, 2 points for the lion and 1 for the dog.
- Concerning semantic aspects, the same remark can be made with coherence. The succession of utterances is coherent and then we give one more point to the linguistic antecedent (2 points for the lion as well as for the dog).
- Concerning pragmatic aspects, the directive force coming from *"be careful"* confirms the importance of the situation. Thus, 3 points for the lion and 2 for the dog.
- Concerning cognitive aspects and hypotheses on the participants' mental states, we consider that we have here to few indications and we prefer to ignore these aspects.

Then the situational antecedent is privileged. If we normalize the scores (division by 7), we get 0.57 for the lion and 0.43 for the linguistic one. Thus, the system will attribute the lion as the referent of the pronoun *"he"*, which of course seems reasonable…

6.3. Discussion

The numeric scores we used to illustrate the confrontation of linguistic and situational aspects seem very simple but cannot be implemented so easily. In fact, a lot of work is still to be done to identify the correct parameters for a salience computation. We have mentioned some prosodic aspects, as well as semantic features that are not yet computed by existing systems. A lot of parameters of salience are for now difficult to automate. Then a complete working system that integrates all the aspects we focused on seems very difficult to implement… Nevertheless, our aim in this paper was to emphasize some aspects, in particular the situational aspects, that are not so studied in the literature and that, to us, seem useful to the design of models for anaphora and exophora resolution. The implementation of a system is then postponed…

Another point of discussion deals with the reuse of multimodal corpora. To us, existing corpora such as the ones exploited by (Strube and Müller, 2003) are not sufficient to allow a correct automatic process of situational aspects. All information related to visual events must be represented and annotated. It includes the following aspects: the description of the list of the visible objects with their physical properties (form, size, color, position in the scene), the description of the apparition and disappearance of objects (where, how, etc.), the description of the movements of dynamic objects (including possible deformations or other phenomena), the description of the behavior of human beings (not only movements, but also expression, bearing, visible

emotions, etc.), and so on. Annotating situational aspects in an exhaustive manner can then be very long and difficult. The annotation schemas that are proposed for multimodal corpora, with several layers and various levels, seem to be a relevant framework. But some aspects have still to be studied before designing a schema for situations. This is the case of how time is managed. Representing the state of a visual time at a precise moment is feasible, whatever the complexity of the scene and the number of objects it groups. But representing changes and movements raises a lot of problems and is susceptible of interpretations from the persons who annotate. The apparition of an object can be automatically deduced from a comparison between two successive states of the scene (and then has not to be annotated). But complex and significant movements cannot be deduced in the same way. For instance, the fact that the hand of the child is moving more and more near the lion may not be automatically inferred from the related states of the visual scene. This observation has to be made and manually annotated. The need of such an observation is an argument to build on particular corpora, or to exploit corpora where this kind of observation is explicitly described. In this way we plan to study theater didascalies, where the behaviors of the actors are described and may be exploited as a kind of annotation.

7. Conclusion

We have presented some classifications and principles for the combination of linguistic and situational characteristics for the resolution of anaphora in dialogue and in texts. The strong point of this work is to take into account heterogeneous aspects that have not been often confronted to each other in the literature.

Due to the lack of corpora including complete descriptions of the situation (descriptions of the visual context, of external events and so on), we have built our argumentation on a set of examples based on the one of (Isard, 1975). Thus we emphasized on subtle variations in the prosodic, syntactic and semantic aspects. This is a first step and we now consider, as a future work, exploiting existing situation descriptions such as theater didascalies in order to improve our apprehension of the phenomena. The next step will be the design of a model and the proposition of a formalization that can lead to a further algorithm for exophora processing.

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