Generating plural NPs in discourse: Evidence from the GNOME corpus

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Abstract

Research on the automatic generation of referring expressions has extended algorithms for the generation of full definite NPs to deal with anaphoric references. However, there has been relatively little work on the specific problems raised by plural anaphora. In particular, since plurals involve a reference to a set rather than an individual, one of the interesting questions concerns the extent to which elements of the set introduced by a plurality are salient, as compared to the plurality itself. This paper offers a preliminary exploration of these questions through a study of a small, richly annotated corpus. We discuss the implications of some of the findings for automatic referring expression generation, and also identify some fruitful avenues for future work.

Keywords: Generation of Referring Expressions, plurals, anaphora, discourse

Introduction

Generation of Referring Expressions (GRE) has focussed to a large extent on algorithms for the generation of full definite descriptions (Dale, 1989; Dale & Reiter, 1995). These algorithms have also been extended to deal with plural definites (Gardent, 2002; van Deemter, 2002; Horacek, 2004; Gatt & van Deemter, 2007). Within the computational community, interest on the role of discourse context has tended to be focussed on the singular case. Here, the main question concerns the selection of an appropriate form for a referring expression, for example, whether to generate a full or reduced definite description or a pronoun. In this work, the role of salience and discourse structure tends to occupy centre stage (McCoy & Strube, 1999; Kibble & Power, 2000; Callaway & Lester, 2002; Krahmer & Theune, 2002), in line with theories such as Centering (Grosz, Joshi, & Weinstein, 1995) and Accessibility Theory (Ariel, 1988, 2001), where one of the central principles is that information reduction in a referring expression is warranted to the extent that the referent of an NP is salient enough to be identified in context.

Despite the substantial amount of work on the generation of references in context, the problems raised by plurals have not been tackled systematically. Extending existing algorithms to anaphora involving plurals raises many new questions. This paper reports on work in progress which seeks some preliminary answers to these questions through a corpus study. In what follows, we first outline the cases of interest and motivate some of the main questions with reference to previous work in psycholinguistics. We then introduce the corpus and discuss the main findings.

Plurals in discourse

In this section, we introduce 4 main types of reference involving a plural noun phrase, whether this involves a single, plural head noun, or a coordinate NP of the form *the* np_1 *and the* np_2. In line with previous work, we assume that the task of a GRE algorithm is to identify a referent unambiguously, distinguishing it from its distractors (Dale, 1989). The simplest case involves a discourse-new referent, that is, one to which no previous reference has been made in the discourse. The more complex cases, which are the main focus of this paper, involve one or more referents which have already been introduced in the discourse. What distinguishes this from the singular case is that if a plurality is discourse-old, then there is in principle the possibility of referring anaphorically not only to the plurality as a whole, but to one or more of its elements. This raises the question of whether these elements are as salient as the plurality itself. There is a separate question which is, in a sense, the inverse of this one: suppose a number of referents have been introduced in the discourse separately, and a reference to the set as a whole now needs to be generated. Should the set be viewed as a completely new discourse entity, or does the fact that its elements are discourse-old influence the salience of the set itself?

For generality, we represent a target referent as a set (denoted R); we are primarily interested in the case where $|R| > 1$.

Case 1: R is discourse-new. Various GRE algorithms have been proposed to deal with such references (Gardent, 2002; van Deemter, 2002; Horacek, 2004; Gatt & van Deemter, 2007). These can be viewed as generalisations of the algorithms for generating full definite references to singulars (that is, singleton sets or individuals). Although such plural references raise numerous challenges for generation, they are not the primary focus of this paper.

Case 2: R has been referred to before using a plural reference, that is, R is discourse-old. We shall refer to this as IDENTITY anaphora, where a reference needs to be generated which is co-referential with an earlier-mentioned referent. Various algorithms exist for the case where the referent is a singular (Krahmer & Theune, 2002; Siddharthan & Copestake, 2004), but the case where the referent is a set is less

well understood. Various options are available to the generator, three of which are shown in (1) below[1].

(1) [A young man and a young woman]$_{i+j}$ went to the park.

(a) (PRONOUN) They$_{i+j}$ took their dog with them.
(b) (SAME HEAD, possibly reduced) [The (young) man and the (young) woman]$_{i+j}$ took their dog with them.
(c) (REDESCRIPTION) [The couple]$_{i+j}$ took their dog with them.

Which of these is best depends on a variety of factors, one of which is the salience of the referent in the discourse. Of these three, REDESCRIPTION is arguably the odd man out: it seems to involve a completely new referential act, in which a referent is conceptualised in a new fashion, perhaps because new properties of the referent are relevant in the current context of discourse, or there is the intention to impart new descriptive information.

Case 3: *R* has not been introduced as a plurality, but its elements have been introduced. We shall refer to this as plural anaphora with SPLIT antecedents. An example is shown below.

(2) [A young man]$_i$ went to the park.
[A young woman]$_j$ was strolling by.

(a) (PRONOUN) They$_{i+j}$ stopped and greeted eachother.
(b) (SAME HEAD) [The (young) man and the (young) woman]$_{i+j}$ stopped and greeted eachother.
(c) (REDESCRIPTION) [The acquaintances]$_{i+j}$ stopped and greeted eachother.

As the example shows, the same possibilities as in (1) are available. The question is whether, in case the plurality as such does not form part of the discourse, any form of information reduction is warranted (as in 2a or the reduced form of 2b), or whether *R* should be treated as an entirely discourse-new referent. If the latter is the case, then there is the question of whether the reference to the plurality is indeed part of a chain of identifying references to the same set of objects, or whether it should be viewed as a new referential act introducing a new discourse entity. In the latter case, we should find fewer pronouns or reduced plurals with split antecedents, and more non-reduced SAME HEAD references and/or redescriptions.

Case 4: $R \subset R'$, where R' is a previously-introduced plural referent. We shall refer to this as ELEMENT anaphora. In a sense, this case mirrors Case 3 above, and the same question arises here: should a reference to an entity which was introduced as *part* of a plurality be considered anaphoric, and does it warrant information reduction, as in (3a) or, to a lesser extent (3b)?

(3) $\Big[$[A young man]$_i$ and [a young woman]$_j\Big]_{i+j}$ went to the park.

(a) (PRONOUN) He$_i$ took his dog with him.
(b) (SAME HEAD) [The (young) man]$_i$ took his dog with him.
(c) (REDESCRIPTION) [The husband]$_i$ took his dog with him.

Cases 3 and 4 raise the question of how pluralities in discourse are represented, as (a) a set of tokens, each of which is salient independent of the plurality itself; or (b) a complex object, which functions as a 'gestalt' in that it is more salient than its parts. These possibilities have their couterparts in various psycholinguistic studies.

Early psycholinguistic research was based on the assumption that sets or pluralities are represented as sets of individually identifiable tokens (Johnson-Laird, 1983; Murphy, 1984). More recently, stronger evidence for the second of the two possibilities has been adduced. One important source of evidence is the *Conjunction Cost*, which is observed when a plural discourse referent has been introduced using conjunction, and there is subsequent anaphoric reference to an element of the plurality (Gordon, Kendrick, Ledoux, & Yang, 1999; Albrecht & Clifton, 1998; Moxey, Sanford, Sturt, & Morrow, 2004). In the terminology of the present paper, this is a case of ELEMENT anaphora (Case 4 above). A consistent finding in these studies is that such anaphors take longer to resolve than the IDENTITY case. Similar effects have been observed for NPs which are related through other syntactic means than conjunction. For example, the conjunction cost is also evinced if two entities are referred to via NPs which are combined in a construction where their roles are understood to be symmetrical[2] (Moxey et al., 2004). Semantic factors also play a role, particularly the extent to which referents in a discourse can be understood to have something in common, either because they are introduced in a narrative where they have common roles, or because they are known to be related through semantic knowledge (Sanford & Moxey, 1995; Koh & Clifton, 2002). The latter is in effect an example of Lang's *common association basis* (Lang, 1984; Eschenbach, Habel, Herweg, & Rehkamper, 1989), which has been cited as a constraint for the felicitous use of NP coordination.

Data

The data for the study comes from the GNOME corpus (Poesio, 2000, 2004), a collection of 9 texts from two different domains, medical patient information leaflets and museum artefacts. All NPs in GNOME are marked up, as are the anaphoric links between them. Various types of anaphoric links are distinguished, including IDENTITY. Crucially for the purposes of this paper, the links include cases where an NP is anaphorically linked to a previously introduced plural NP, or a constituent of a coordinate NP. In addition, the annotation distinguishes utterance units (roughly corresponding to clauses).

We collected all the anaphor-antecedent pairs in the corpus. In the nine texts, there were a total of 2093 anaphor-antecedent pairs. From these, instances of IDENTITY, SPLIT

[1] Some of the terminology in these examples is borrowed from Poesio and Vieira (1998).

[2] An example of a symmetrical construction is one of the form NP$_1$ *with* NP$_2$.

and ELEMENT anaphors were identified, using the following criteria.

1. Any anaphor-antecedent pair $\langle np_i, np_j \rangle$ is included in the sample if np_j is referential, that is, np_j is a definite NP or a bare plural or mass generic NP. Bare NPs such as *brass* or *children under the age of four* were assumed to be referential in the sense that they refer to kinds or classes rather than concrete instances (Krifka et al., 1995).

2. $\langle np_i, np_j \rangle$ is an instance of IDENTITY plural anaphora if both i and j are plural and the link is annotated as an instance of IDENTITY in the corpus. An example of such a link is given in (4). First-person and second-person pronouns were never included in the dataset.

3. $\langle np_i, np_j \rangle$ is an instance of a SPLIT anaphor if:
   (a) np_i is a singular or plural NP;
   (b) np_j is a plural NP;
   (c) np_j has at least one other anaphoric link to another $np_k, k \neq i$;
   (d) The type of anaphoric relation annotated in the GNOME corpus between np_i and np_j is one of the following:
      i. IDENTITY: In case there are two NPs, np_i and np_k, which are constituents of the same singular NP, such that $np_j = np_i + np_k$. This only occurred in case np_i and np_k were parts of a relational NP, such as a possessive. An example of such an anaphoric relation is shown in (5).
      ii. ELEMENT-INV: This is an inverse ELEMENT relation between np_i and np_j, which indicates that np_i is an element of the entity denoted by np_j. An example of this kind of anaphor is shown in (6).
      iii. SUBSET-INV: This is an inverse SUBSET relation, which indicates that np_i denotes an entity which is a subset of that denoted by np_j.

   For the ELEMENT-INV and SUBSET-INV relations, only those cases where the antecedent was identical to some part of the entity denoted by the anaphor were included. Other instances of these relations included generalised part-whole relations and generic subtyping. For example, the corpus annotation indicates that in the phrase *these wall lights are part of a set of eight*, the NP *these wall lights* denotes a subset of the set denoted by *a set of eight*. This was not included, as the anaphor does not have a split antecedent. Similarly, the SUBSET-INV relation in GNOME is used to annotate subtyping relations, such as that holding between the two NPs in *these panels ... such panels*, where the second NP is a kind-denoting reference to instances of the kind denoted by *these panels*. These too were excluded from analysis.

4. $\langle np_i, np_j \rangle$ is an instance of an ELEMENT anaphor if np_i is a coordinate NP, and np_j refers to one or more of the entities denoted by np_i, but not to all of them. The reason for restricting attention to coordinate NPs was that they make it possible to identify true cases of the anaphoric relation under discussion. For instance, a coordinate NP of the form *the* NP_1 *and the* NP_2, followed by an anaphor referring back to np_1 is clearly a case of the kind of ELEMENT relation discussed at the beginning of this section. The relevant anaphoric relations in the GNOME corpus for these cases were:
   (a) IDENTITY: In case the referent of np_j was annotated as identical to the referent of one of the coordinates of np_i. An example is shown in (7).
   (b) ELEMENT: In case the referent of np_j was marked up as an element of np_i. See (8).

(4) (IDENTITY)
[Precious metals such as silver and gold]$_i$, have been widely used from antiquity to the present day. [Their]$_i$ use is due, at least in part, to [their]$_i$ essential physical properties.
(GNOME:text3:34 – 35)

(5) (SPLIT; GNOME link is IDENTITY)
In 1740, $\Big[$ [Caffieri]$_i$'s [wife]$_j$ $\Big]$ bought a royal privilege
... which allowed [them]$_{i+j}$ to gild bronze as well as cast it ...
(GNOME:getty:49)

(6) (SPLIT; GNOME link is ELEMENT-INV)
[The pin]$_i$ is inserted into a sheath ...
[The bow]$_j$ is decorated with a complicated arrangement of horses' and lions' heads ...
Three pairs of lions clamber up the section from the point where [the sheath and bow]$_{i+j}$ are joined.
(GNOME:janet2:62 – 65)

(7) (ELEMENT; GNOME link is IDENTITY)
$\Big[$ [The Swiss artist Verena Sieber Fuchs]$_i$ and the
[German-born but Irish-based artist Brigitte Turba]$_j$ $\Big]_{i+j}$ use discarded or waste materials as a source for their work.
For [Sieber Fuchs]$_i$, old pill packaging, wrapper or film create possibilities...
(GNOME:text3:22 – 26)

(8) (ELEMENT; GNOME link is ELEMENT)
In this example, $\Big[$ [the pendulum]$_i$ and [weights]$_j$ $\Big]_{i+j}$ have been enclosed in a case for protection.
The center of the narrow body swells to allow for [the pendulum]$_i$'s swing.
(GNOME:getty:59 – 60)

Using these criteria, 208 anaphor-antecedent pairs fell into the three categories of interest (SPLIT, ELEMENT and IDENTITY).

Results

The distribution of different types of anaphors is shown in Table 1. The 'OTHER' category in the table consisted entirely of reintroductions, which were defined as references to entities involving a full definite NP to a discourse-old referent, after the referent had been referred to at least once using a pronoun. We shall not discuss these further in this paper. In this section, we discuss some of the salient patterns in the data.

	IDENTITY	ELEMENT	SPLIT
SAME-HEAD	43.2	91.5	45.8
PRONOUN	42.5	2.1	37.5
REDESCRIPTION	9.6	4.3	16.7
OTHER	4.8	2.1	0
total (N)	100 (146)	100 (49)	100 (13)

Table 1: Percentage of each NP type within each anaphor type .

Perhaps the most notable aspect of the data in the table is the difference between IDENTITY anaphors and the other two types. IDENTITY anaphors display an even split between SAME-HEAD and PRONOUN; in contrast, the other types are not as evenly split.

The majority of ELEMENT anaphors fall into the SAME-HEAD category. Pronominal references to elements of a previously introduced set are rare, while some redescriptions are also attested. This contrasts with IDENTITY anaphors, which are evenly distributed between PRONOUN and SAME-HEAD, again with some redescriptions. The paucity of pronominal references in this category is in part due to the fact that plural antecedents in these cases tend to be of the same type, and there is little scope for distinguishing them via grammatical cues such as gender. This is the case, for example, in (7) and (8).

Plural references to SPLIT antecedents also have a greater tendency to be SAME-HEAD, though pronouns are attested to a much greater extent than with ELEMENT anaphors. This is also the category where the majority of redescriptions are found.

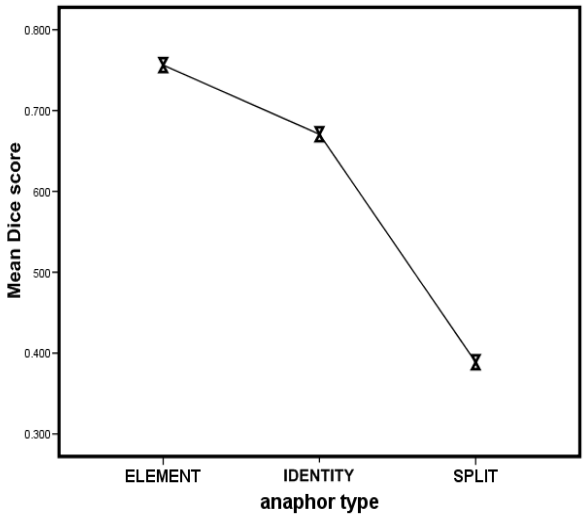
Information reduction and anaphor-antecedent distance

The dominance of SAME-HEAD NPs in the ELEMENT and SPLIT cases raises the question of how much information reduction there is in these anaphors. To test this, we compared all SAME-HEAD anaphoric NPs to their antecedents. After stripping function words such as definite articles, the tokens in the NPS were reduced to their base forms using the Sussex morphological analyser (Minnen, J. Carroll, & Pearce, 2001). We then computed the content overlap between anaphor and antecedent using a version of the Dice coefficient:

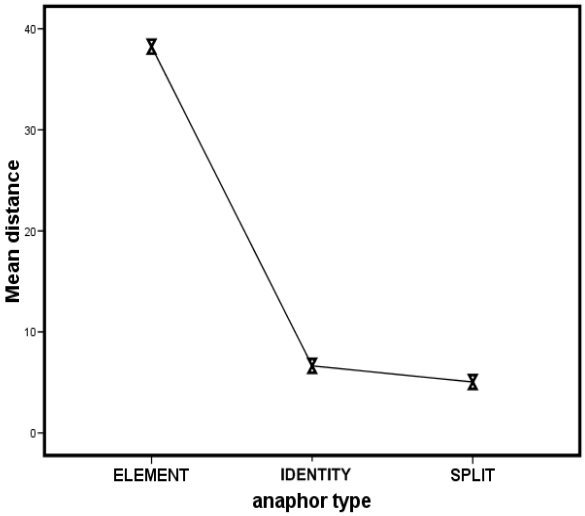
$$\text{DICE}(\text{NP}_i, \text{NP}_j) = \frac{2 \times |W_i \cap W_j|}{|W_i| + |W_j|} \quad (9)$$

where W_i be the set of word types in NP_i, and W_j word types in NP_j.

The results are plotted in Figure 1(a). As the Figure shows, the highest mean Dice score is obtained for ELEMENT anaphors. In fact, it is close to 1, suggesting that in the majority of cases, an element of a previously introduced plurality was identified by repeating the description of the element. In contrast, SPLIT anaphors have a very low Dice coefficient,



(a) Mean Dice score in SAME-HEAD anaphors



(b) Mean anaphor-antecedent distance

Figure 1: Common word ratio and anaphor-antecedent distance in three anaphor types

suggesting that the anaphoric NP tends to repeat less of the information in its antecedents. However, this figure needs to be treated with caution, given the low number of anaphor-antecedent pairs in the latter group (see Table 1). Furthermore, the relatively high proportion of redescriptions in this category, compared to the others, suggests that the SPLIT case may be best seen as a new reference to a set, rather than a case of anaphoric identification.

We also computed the mean distance in utterance units between anaphor and antecedent in each of the three types. This is displayed in Figure 1(b). The most striking trend in this fig-

ure is the high distance between ELEMENT anaphors and their antecedents, compared to the distance in the other two cases. Earlier, we made the observation that ELEMENT anaphoric references tend to be SAME-HEAD because they elements of a plurality were of the same type and therefore hard to distinguish based on grammatical gender. The fact that such anaphor-antecedent pairs are so distant may also provide a partial explanation for the low rate of information reduction in these anaphors. In contrast, the fact that SPLIT and IDENTITY anaphors tend to occur relatively close to their antecedents also accounts for the higher proportion of pronouns in these categories (since pronouns tend to be used for highly accessible referents; see, e.g. Ariel (1988)).

Implications for GRE

Our data suggests that in referring to an element of a set (Case 4 in section 1), or to a set whose elements were introduced independently in the discourse (Case 3), a GRE algorithm should not treat the antecedents as 'salient' in the same way that the antecedent of an IDENTITY anaphor would be treated. The clearest case is that of ELEMENT anaphors. If GRE algorithms such as that of Krahmer and Theune (Krahmer & Theune, 2002) regarded these simply as anaphoric references, then pronouns and highly reduced descriptions would be the norm. Clearly, this tendency would interact with the degree of salience of the element, which Figure 1(b) suggests is often very low, considering how far away these references are from their plural antecedents.

Be that as it may, our data suggest that generation algorithms should do justice to the higher proportion of SAME-HEAD references, and the high amount of repeated information in them. One remarkably simple way in which they could do this is by simply *repeating* the relevant part of the antecedent NP. Another possibility is that, having referred to an element of a set, it is the element's *properties* that become salient. In this case, an algorithm would still treat a reference to the element as a new reference (rather than a reference to a salient discourse entity), but it would be biased in favour of selecting properties already selected, thus accounting for the high amount of repeated information.

The remarks made here are no more than preliminary, given the limited nature of the present study. However, the data also throws up some novel questions, to which we turn below.

Limitations and prospects

Some of the trends identified in this section are based on sparse data, particularly in the case of SPLIT antecedents. One reason for this is the relatively stringent criteria applied to the identification of anaphor-antecedent pairs: restricting the cases to those where an anaphor was referential, in the sense outlined above, drastically cuts down the number of relevant cases. The problem becomes particularly acute when dealing with a small-sized corpus such as GNOME. We are exploring the possibility of expanding the set of candidates for inclusion in our dataset, with a richer array of different anaphoric links from among those annotated in the corpus, and more diversity among NP types.

The study reported here focussed on a small typology of anaphor types, emphasising the amount of information reduction and the distance between anaphor and antecedent. There are, however, numerous other factors that can play a role in determining the nature of an anaphoric reference to a plurality, some of which have been partially investigated in the psycholinguistic literature discussed above. One important issue concerns plurals with SPLIT antecedents, namely, the syntactic and/or semantic relationship between the antecedents themselves. For example, in (5), the two antecedent NPs are related via a possessive relation. Though the possessive np *Caffieri's wife* is singular, it introduces two antecedents for the subsequent plural pronoun which stand in a much closer relation than that between two NPs which are introduced separately, as was the case in our preliminary example (2). Such relations may make it more likely that a reduced anaphoric NP covering all antecedents is produced. Moreover, semantic relationships between antecedents may play an important role. For example, all other things being equal, antecedents such as *man* and *woman* are more likely to be conceptualised as a set than *man* and *baseball*, which are conceptually quite distant (Sanford & Moxey, 1995; Koh & Clifton, 2002). In future work, we intend to pursue these possibilities through corpus-based and experimental work.

Among the types of anaphors we have identified, redescriptions seem particularly challenging to a computational approach. The factors influencing the choice of content for a redescription are potentially open-ended and may include, among others, the intention of an author or speaker to signal the relevance of new information about a referent. To our knowledge, there has been little work on the automatic generation of such references (but see O'Donnell, Cheng, and Hitzeman (1998)).

Conclusions

This paper reported on preliminary results of a corpus study aiming to investigate different patterns of anaphora involving plurals, with a view to improving current algorithms for the Generation of Referring Expressions. It focussed in particular on cases in which an anaphor does not involve identity with a previously introduced referent, but refers to an element or subset of a set, or to a set whose elements had been introduced previously. In future work, we plan to extend this study, which was based on a small dataset, and explore some of the issues raised here through experimental work. We also plan to further investigate other factors that may influence the form that an anaphoric NP takes in these cases. Of particular interest are the factors that may increase the likelihood of a plural anaphoric reference to split antecedents, such as whether the antecedents are semantically related.

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References

Albrecht, J., & Clifton, C. (1998). Accessing singular antecedents in conjoined phrases. *Memory and Cognition*, *26*, 599–610.

Ariel, M. (1988). Referring and accessibility. *Journal of Linguistics*, *24*, 65-87.

Ariel, M. (2001). Accessibility theory: An overview. In T. Sanders, J. Schilperoord, & W. Spooren (Eds.), *Text representation: Linguistic and psycholinguistic aspects.* John Benjamins.

Callaway, C., & Lester, J. C. (2002). Pronominalization in generated discourse and dialogue. In *Proceedings of the 40th annual meeting of the association for computational linguistics.*

Dale, R. (1989). Cooking up referring expressions. In *Proceedings of the 27th annual meeting of the association for computational linguistics, acl-89.*

Dale, R., & Reiter, E. (1995). Computational interpretation of the Gricean maxims in the generation of referring expressions. *Cognitive Science*, *19*(8), 233–263.

van Deemter, K. (2002). Generating referring expressions: Boolean extensions of the incremental algorithm. *Computational Linguistics*, *28*(1), 37-52.

Eschenbach, C., Habel, C., Herweg, M., & Rehkamper, K. (1989). Remarks on plural anaphora. In *Proceedings of the 4th conference of the european chapter of the association for computational linguistics, eacl-89.*

Gardent, C. (2002). Generating minimal definite descriptions. In *Proceedings of the 40th annual meeting of the association for computational linguistics, acl-02.*

Gatt, A., & van Deemter, K. (2007). Incremental generation of plural descriptions: Similarity and partitioning. In *Proceedings of the conference on empirical methods in natural language processing, emnlp-07.*

Gordon, P., Kendrick, R., Ledoux, K., & Yang, C. (1999). Processing of reference and the structure of language: An analysis of complex noun phrases. *Language and Cognitive Processes*, *14*, 353-379.

Grosz, B. J., Joshi, A. K., & Weinstein, S. (1995). Centering: A framework for modeling the local coherence of discourse. *Computational Linguistics*, *21*(2), 203–225.

Horacek, H. (2004). On referring to sets of objects naturally. In *Proceedings of the 3rd international conference on natural language generation, inlg-04.*

Johnson-Laird, P. (1983). *Mental models.* Cambridge University Press.

Kibble, R., & Power, R. (2000). An integrated framework for text planning and pronominalisation. In *Proceedgins of the 1st international conference on natural language generation.*

Koh, S., & Clifton, C. (2002). Resolution of the antecedent of a plural pronoun: Ontological categories and predicate symmetry. *Journal of Memory and Language*, *46*, 830-844.

Krahmer, E., & Theune, M. (2002). Efficient context-sensitive generation of referring expressions. In K. van Deemter & R. Kibble (Eds.), *Information sharing: Reference and presupposition in language generation and interpretation.* Stanford: CSLI.

Krifka, M., Pelletier, F. J., Carlson, G., Meulen, A. ter, Chierchia, G., & Link, G. (1995). Genericity: An introduction. In G. Carlson & F. J. Pelletier (Eds.), *The generic book.* Chicago: Chicago University Press.

Lang, E. (1984). *The semantics of coordination.* Amsterdam: John Benjamins.

McCoy, K. F., & Strube, M. (1999). Generating anaphoric expressions: Pronoun or definite description? In *Proceedings of the acl-99 workshop on the relation of discourse/dialogue structure and reference.*

Minnen, G., J. Carroll, J., & Pearce, D. (2001). Applied morphological processing of english. *Natural Language Engineering*, *7*(3), 207-223.

Moxey, L., Sanford, A. J., Sturt, P., & Morrow, L. I. (2004). Constraints on the formation of plural reference objects: The influence of role, conjunction and type of description. *Journal of Memory and Language*, *51*, 346–364.

Murphy, G. (1984). Establishing and accessing referents in discourse. *Memory and Cognition*, *12*, 489–497.

O'Donnell, M., Cheng, H., & Hitzeman, J. (1998). Integrating referring and informing in np planning. In *Proceedings of the coling-acl workshop on the computational treatment of nominals.*

Poesio, M. (2000). Annotating a corpus to develop and evaluate discourse entity realization algorithms: Issues and preliminary results. In *Proceedings of the 2^{nd} international conference on language resources and evaluation, lrec-00.*

Poesio, M. (2004). Discourse annotation and semantic annotation in the GNOME Corpus. In *Proceedings of the acl-04 workshop on discourse annotation.*

Poesio, M., & Vieira, R. (1998). A corpus-based investigation of definite description use. *Computational Linguistics*, *24*(2), 183–216.

Sanford, A., & Moxey, L. (1995). Notes on plural reference and the scenario-mapping principle in comprehension. In C.Habel & G.Rickheit (Eds.), *Focus and cohesion in discourse.* Berlin: de Gruyter.

Siddharthan, A., & Copestake, A. (2004). Generating referring expressions in open domains. In *Proceedings of the 42nd annual meeting of the association for computational linguistics, acl-04.*