Abstract Anaphora Resolution in Danish

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Abstract

In this paper[1] I describe the use of Danish pronouns and deictics in dialogues. Then I present an adaptation to Danish of Eckert and Strube's algorithm for resolving anaphora referring to individual NPs and abstract objects in English dialogues (Eckert and Strube, 1999b; Eckert and Strube, 1999a). The adapted algorithm is tested on four Danish dialogues from two dialogue collections and the results obtained are evaluated.

1 Introduction

Many natural language processing applications involve the complex task of resolving anaphora. Different strategies for anaphora resolution have been proposed, some exclusively relying on the syntactic structure of discourse, some including semantic and pragmatic constraints, some based on statistical methods. One of the most popular approaches to anaphora resolution is centering (Grosz et al., 1995), henceforth GJW95, which accounts for the relation between the saliency of entities in discourse and the use of referring expressions, incorporating syntax, semantics and pragmatics. Centering fits into Grosz and Sidner's model of discourse structure (Grosz and Sidner, 1986). In this model a discourse is composed of segments which exhibit *global* coherence. A discourse segment, on the other hand, is composed of a sequence of utterances which exhibit *local* coherence. This latter phenomenon is accounted for by centering theory. Centering predicts that there is a connection between the coherence of a referring expression and the inference load necessary to resolve it. Although Grosz, Joshi and Weinstein recognize that many factors determine the prominence of entities in an utterance, in GJW95 this prominence is established simply by the linear order of the entities in the utterance. Different centering algorithms have been presented, spelling out the strategy described in GJW95, extending the theory to more linguistic phenomena or specifying the concept of prominence of discourse entities. Strube and Hahn (Strube, 1998; Strube and Hahn, 1999) in particular, calculate prominence considering the information structure of the utterances (functional centering).[2] The prominence ranking they adopt does not exclusively rely on word order, which is language dependent. Moreover GJW95 only dealt with intersentential anaphora, while Strube and Hahn account for both intrasentential and intersentential, pronominal and nominal anaphora.[3]

Centering-based algorithms have been tested on written texts. Recently they have also been applied to written dialogues. Byron and Stent (1998), in particular, test centering on multi-party dialogues. They conclude that centering seems to be a valid theory also in this case, but it must be extended to ac-

[1]This work has been carried out under **Staging**, an on-going Danish project funded by the Danish Research Councils.

[2]In (Strube and Hahn, 1996) a functional-based prominence ranking has been proposed.

[3]An other extension of the centering framework to intrasentential anaphora has been proposed by Kameyama (1998).

count for dialogue-specific aspects such as the definition of utterance boundaries, the specification of a strategy for tackling partial utterances and including discourse participants in the list of relevant discourse entities.

Eckert and Strube (1999a; 1999b), henceforth ES99, describe an algorithm for resolving anaphors referring to individual NPs and abstract objects in English dialogues. The algorithm is based on rules for discriminating among the two types of anaphor based on the predicative contexts in which the anaphors occur. The individual anaphors are then resolved by the functional centering algorithm described in (Strube, 1998), while abstract anaphors are resolved with a different algorithm. ES99 test the approach on selected dialogues and obtain a precision of 63,6% for discourse deictics and 66,2% for individual anaphors. They report that most errors are due to the inability to distinguish between discourse deictics and pronouns which vaguely refer to concepts in the preceding discourse (vague anaphors). Another cause of error is the lack of information about abstract nominals. I believe that the strategy followed by ES99 is a good starting point for investigating how far one can go in resolving individual and abstract anaphors in dialogues on the basis of the local contexts in which the anaphors occur. I have adapted the algorithm so it accounts for Danish data and have applied it to Danish dialogues.[4]

In section 2 I shortly present the original centering framework and functional centering as described in (Strube, 1998), S98. In section 3 Eckert and Strube's algorithm is introduced and in 4 the Danish personal and demonstrative pronouns are described with focus on discourse deictics in dialogues. In section 5 I present my adaptation of the ES99-algorithm to Danish data. Section 6 contains an evaluation of the results obtained by manually testing the adapted ES99-algorithm on randomly selected dialogues from the collection "Samtale hos Lægen" (Conversation at the doctor's) (**SL**) and "ProjektIndvandrerdansk" (Project Immigrant Danish) (**PID**), collected by researchers at the Department of General and Applied Linguistics of the University of Copenhagen. In section 7 I outline future work for improving the results of the algorithm and make some concluding remarks.

[4]Centering-based algorithms have recently been tested on Danish discourse (Navarretta, 2000).

2 Centering

In GJW95 the entities which link an utterance U_n to the others in the same discourse segment are the *centers* of that utterance. Each utterance is assigned a set of *forward-looking centers*, C_f, and, with the exception of the initial utterance of the segment, a *backward-looking center*, C_b. The C_b of an utterance U_n connects with one of the *forward-looking centers* of the preceding utterance U_{n-1} while the *forward-looking centers* only depend on the expressions in U_n. The *forward-looking centers* are partially ordered to reflect relative prominence. GJW95 recognize three types of transition relation across pairs of utterances: continue, retain and shift (see table 1).

Center movement and realization are constrained by two rules:

Rule 1: If any element of $C_f(U_{n-1})$ is realized by a pronoun in U_n, then $C_b(U_n)$ must also be realized by a pronoun

Rule 2: Center continuation is preferred to center retaining which is preferred to center shifting

2.1 Functional Centering

In S98 the functions of the *backward-looking center* and the transitions in the centering theory are replaced by the order of elements in a list of salient discourse entities, the **S-list**. The ranking criteria for the elements in the S-list are based on (Prince, 1981), where discourse entities are classified into *hearer-old* (OLD), *mediated* (MED) and *hearer-new* (NEW). The two tuples (x, utt_x, pos_x) and (y, utt_y, pos_y) in the S-list indicate that the entity x is evoked in utterance utt_x at position pos_x and that y is evoked in utterance utt_y at position pos_y respectively. Given that utt_x and utt_y refer to U_n or U_{n-1}, the follow-

Table 1: Transition States

	$C_b(U_n) = C_b(U_{n-1})$ OR no $C_b(U_{n-1})$	$C_b(U_n) \neq C_b(U_{n-1})$
$C_b(U_n) = C_p(U_n)$	CONTINUE	SHIFT
$C_b(U_n) \neq C_p(U_n)$	RETAIN	

ing ranking constraints on the S-list entities are valid (Strube, 1998)[p.1253]:[5]

1. if $x \in$ OLD and $y \in$ MED, then $x \prec y$
   if $x \in$ OLD and $y \in$ NEW, then $x \prec y$
   if $x \in$ MED and $y \in$ NEW, then $x \prec y$

2. if x,y $\in$ OLD or x,y $\in$ MED or x,y $\in$ NEW,
   then if $utt_x > utt_y$ then $x \prec y$
   if $utt_x = utt_y$ and $pos_x < pos_y$ then $x \prec y$

The S98-algorithm consists in testing a referring expression against the elements in the S-list from left to right until the test succeeds. The S-list is then updated so that new elements are inserted according to the S-list ranking criteria. When the analysis of an utterance is finished all the entities which were not realized in the utterance are removed from the S-list.

3 Eckert and Strube's Algorithm

ES99 propose a new algorithm for resolving anaphors with abstract object antecedents. Analyzing a collection of telephone conversations they distinguish the following anaphor types: individual anaphors, discourse deictics, inferrable-evoked anaphors[6] and vague anaphors. Other types of pronoun are not taken into consideration.

Predicates that are preferentially associated with abstract objects are marked as **I-incompatible** (***I**) while predicates that are preferentially associated with individual objects are marked as **A-incompatible** (***A**).

[5]I mark ranking precedence with $\prec$.

[6]Inferrable-evoked anaphors refer to the use of the plural pronoun *they* indirectly co-specifying with a singular NP which indicates a country or an institution.

ES99 define the following ***I** predicates (Eckert and Strube, 1999b)[p. 40]:

- Equating constructions where a pronominal referent is equated with an abstract object, e.g., *x is making it easy, x is a suggestion.*
- Copula constructions whose adjectives can only be applied to abstract entities, e.g., *x is true, x is false, x is correct, x is right, x isn't right.*
- Arguments of verbs describing propositional attitude which take S'-complements, e.g., *assume.*
- Object of *do.*
- Predicate or anaphoric referent is a "reason", e.g., *x is because I like her, x is why he's late.*

Predicates that are preferentially associated with individual objects are the following (Eckert and Strube, 1999b)[p. 40]:

- Equating constructions where a pronominal referent is equated with a concrete individual referent, e.g., *x is a car.*
- Copula constructions with adjectives which can only be applied to concrete entities, e.g., *x is expensive, x is tasty, x is loud.*
- Arguments of verbs describing physical contact/stimulation, which cannot be used anaphorically, e.g., *break x, smash x, eat x, drink x, smell x* but NOT **see x*

Grounded acts are used as domain for the anaphor resolution algorithms in dialogues.

In particular two dialogue acts, **Initiations** (**I**s) and **Acknowledgments** (**A**s) are recognized. **I**s have semantic content, while **A**s are only used to ground the preceding **I**. **Acknowledgments/Initiations** (**A/I**s) are dialogue acts that have both the function of grounding the preceding **I** and that of establishing a new **I**. An **I** and the corresponding **A**, together with longer **I**s in the same turn-taking which do not need to be acknowledged, constitute a **Synchronizing Unit** (**SU**). Short **I**s which are not acknowledged are ignored by the resolution algorithms.

ES99 follow i.a. (Webber, 1991) in assuming that anaphoric discourse deictic reference involves reference coercion and that only discourse sections adjacent to the anaphor or, using Webber's terminology, sections on the right frontier of the discourse structure tree, are available for discourse-deictic reference. Like (Asher, 1993) they assume that the type of abstract object is determined by the context in which the anaphor occurs. Anaphora referring to abstract objects are resolved using a list, the A-list. The A-list is only filled when discourse deictics occur and its elements remain for one **I**. The parts of the linguistic contexts are accessed in the following order: 1. the A-list; 2. in the same **I** the clause to the left of the clause which contains the anaphor; 3. within the previous **I** the rightmost main clause and subordinated clauses to its right; 4. within previous **I**s the rightmost complete sentence, if previous **I** is an incomplete sentence.

The anaphora resolution algorithm for third person singular neuter personal pronouns is the following (Eckert and Strube, 1999a):

case PRO is **I-incompatible**
  if *resolveDiscourseDeictic*(PRO)
    then classify as discourse deictic
    else classify as vague pronoun;
case PRO is **A-incompatible**
  if *resolveIndividual*(PRO)
    then classify as individual pronoun
    else classify as vague pronoun;
case PRO is ambiguous
  if *resolveIndividual*(PRO)
    then classify as individual pronoun
  else if *resolveDiscourseDeictic*(PRO)
    then classify as discourse deictic
    else classify as vague pronoun;

The same algorithm is used for demonstratives, with the exception that the last two **if** constructions in the algorithm for pronouns are reversed reflecting the preference for demonstratives to be discourse deictics (Webber, 1991).

4 Danish Data

In this section I shortly describe Danish third person personal and possessive pronouns and demonstrative pronouns. The description focuses on the discourse deictic use of these pronouns based on occurrences in three Danish dialogue collections, Bysoc,[7] **SL** and **PID**. My description is also based on (Allan et al., 1995). The third person singular personal and possessive pronouns can be found in table 2, while the third person plural personal and possessive pronouns can be found in table 3.[8]

Den, *det* and *de* are also used as definite articles (the) and demonstrative determiners (this/that and these/those). In spoken language the demonstratives are always stressed.[9] *Den*, *det*, *de* are demonstratives if followed by the adverbials *her* and *der* in which case they correspond to the English this/these and that/those respectively. Furthermore, the demonstratives *denne, dette* (this) and *disse* (these) exist.

Feminine and masculine pronouns generally co-refer[10] with persons, but can also refer to pets as in English. Common gender pronouns refer to common gender nouns which do not denote humans. Common gender nouns denoting humans are neutral as to the sex of the person they refer to. Thus the gender of

[7] The Bysoc corpus has been collected by researchers at Copenhagen University under "Projekt Bysociolingvistik" (Project Urban Sociolinguistics).

[8] The Danish reflexive pronouns are used differently than the English ones, see i.a. (Neville, 1998).

[9] Because I do not have access to phonetic information about the considered dialogues I cannot account for important phenomena such as intonation and prosody, see i.a. (Vallduví and Engdahl, 1995).

[10] From now on I will simply write "refer to".

Table 2: Third person singular pronouns

gender	**subject**	**object**	**reflexive**	**possessive**	**pos.refl.**
feminine	*hun* she	*hende* her	*sig* herself	*hendes* hers	*si-n/t/ne* hers
masculine	*han* he	*ham* him	*sig* himself	*hans* his	*si-n/t/ne* his
common	*den* it	*den* it	*sig* itself	*dens* its	*si-n/t/ne* its
neuter	*det* it	*det* it	*sig* itself	*dets* its	*si-n/t/ne* its

Table 3: Third person plural pronouns

subject	**object**	**reflexive**	**possessive**
de they	*dem* them	*sig* themselves	*deres* their/ theirs

the referring pronoun corresponds to the sex of the person the noun refers to.

Neuter gender pronouns are used to refer to neuter nouns. They can also refer to a few common person nouns in neuter gender, such as *barn* (child) and *menneske* (person) if the sex of the person is unknown or irrelevant (syntactic agreement). In case the sex is known or relevant, the appropriate feminine or masculine pronouns are used (semantic agreement). The two cases are illustrated in the following examples:

> *barnet var på millimeter så stort* **det** *skulle være i længden og i hovedstørrelsen og...*
> (the child was precisely as high as it ought to be and **its** head was as big as it ought to and...)

> *så øh... jeg kunne gå ud for jeg havde mit barnebarn med på tre et halvt år så..., kunne jeg jo bare holde* **ham** *i hånden*
> (so oh... I could leave because I was together with my three and half year old grandchild so..., I could just hold **his** hand)

Both *den* and *det* can refer to collective nouns. In this case the choice between the singular *den* or *det* and plural *de* depends on whether the speaker focuses on the collective meaning or on the individuals. *Det* and in few idiomatic expressions *den* are also used as expletives.

In Danish the most frequently used discourse deictic is *det* which corresponds to *it*, *this* or *that*. Other discourse deictics are *det her* (this) and *det der* (that). These two deictics can be used in most of the same contexts as *det*, although there seems to be a preference for using them to refer to several clauses. The neuter demonstrative *dette* (this) has also a discourse deictic use, but is mostly used in written language. I did not found any occurrences of it in the three dialogue collections.

As discourse deictic *det* refers to an infinitive or a clause, as it is the case in the following examples:

> *At ryge er farligt og det er også dyrt*
> (Smoking is dangerous and it is also expensive)
> A: *Du skal tage en blodprøve*
> (You have to take a blood test)
> B: *Hvorfor det?*
> (Why is that?)

Det is also used as the subject complement of *være* (be) and *blive* (become) in answers.

> A: *Blev du færdig med opgaven?*
> (Were you done with the task?)
> B: *Ja, det blev jeg*
> (lit. Yes, that was I)
> (Yes, I was)

Det refers to a verb phrase when it is used as the object complement for the verb *have* (have), *gøre* (do) and modal verbs as in

Alle faldt, men det gjorde jeg ikke
(lit. All fell, but that did I not)
(All fell, but I did not)

Det refers to a clause in constructions with attitude verbs and other verbs which take clausal complements, such as *synes* (think), *tro* (believe) and *vide* (know), *sige* (say), *håbe* (hope):

A: *Det begynder snart at regne.*
(It will soon begin to rain)
B: *Det håber jeg ikke*
(lit. That hope I not)
(I hope not)

In the latter three cases the pronoun *det* is often topicalized, i.e. it appears before the main verb, in the place that usually is occupied by the subject[11].

Det can also refer to more clauses, or to something that can vaguely be inferred from the discourse.

A: *barnets far øhm ...*
(the baby's father uhm ...)
B: *ja*
(yes)
A: *havde alvorlig, øh... spædbørnsgulsot da han blev født*
(had serious, uh ... infant icterus when he was born)
B: *ja*
(yes)
A: *og fik så også skiftet sit blod ikke også*
(and then he also got a blood transfusion, didn't he)
B: *mmh*
A: *det havde hans storebror også*
(lit. that had his brother too)
(his brother had it too)
B: *ja*
(yes)
A: *og er blevet hjerneskadet af det*
(and he got brain damage from it)
B: *ja*
(yes)
A: *altså jeg ved ikke om* ***det*** *er noget jeg skal, om* ***det*** *skal skrives nogen steder eller gøres noget ved*
(so I don't know whether **it** is something I should do, whether **it** should be written somewhere or something should be done)

[11]This position is called *fundamentfelt* (actualization field) by (Diderichsen, 1984 1946).

In the above example the deictics in the last utterance do not refer to a single clause or predicate, but to the whole family history of icterus.

To conclude, Danish deictics are used in more contexts than the English ones. Especially noticeable is the Danish use of discourse deictics in cases where elliptical constructions are normal in English.[12]

5 The Adapted ES99-algorithm

On the basis of the deictics in the two Danish dialogue corpora, **SL** and **PID** I have established the following ***I** predicates for Danish:

- constructions where a pronoun is equated with an abstract object, e.g., *x er et forslag* (x is a suggestion)
- copula constructions with adjectives which can only be applied to abstract entities, such as *x er sandt* (x is true), *x er usandt* (x is untrue), *x er rigtigt* (x is correct)
- arguments of verbs which take S'-complements, e.g., *tro* (believe), *antage* (assume), *mene* (think), *sige* (say)
- anaphoric referent in constructions such as *x er fordi du er holdt op med at ryge* (x is because you have stopped smoking) *x er på grund af at du er gravid* (x is because you are pregnant)
- object of *gøre* (do)
- subject complement with *være* (be) and *blive* (become) in answers

[12]I have not included in the description cataphoric deictic pronouns.

- object of *have* (have) if the verb was not used as a main verb in the previous clause
- object of modal verbs

The last four predicates are specific for Danish. I have assumed the following ***A** predicates, which are mainly translations of the English ones:

- constructions where a pronominal referent is equated with a concrete individual referent, such as *x er en legemsdel* (x is a body part), *x er et barn* (x is a baby)
- copula constructions with adjectives which can only be applied to concrete entities, such as *x er rødt* (x is red)
- arguments of verbs describing physical contact/stimulation, which cannot be used anaphorically, e.g. *spise x* (eat x), *drikke x* (drink x)

As Eckert and Strube notice for English, also in Danish there are cases where the contexts of an anaphor can allow both an individual NP and an abstract object. Some examples are copula constructions like *x er godt/dårligt* (x is good/bad), and objects of verbs such as *elske* (love), *hade* (hate), *foretrække* (prefer). To partially accomodate this, I have added the following condition to the algorithm: in the above cases the anaphor is classified as **A*** incompatible unless the previous clause contains a raising adjective construction in which case it is considered **I*** incompatible. Consider the following two examples:

> *Peter boede i et rødt hus. Det hadede han.*
> (Peter lived in a red house. He hated it.)
>
> *Det er dødsygt at sidde på et vaskeri. Det hader jeg.*
> (It is boring to be in a laundry. I hate it)

In the first example the algorithm chooses *et rødt hus* (a red house) as the antecedent of *det*, while in the second example the algorithm chooses *at sidde på et vaskeri* (being in a laundry) instead of *et vaskeri*. There are cases, similar to the first example, where it is impossible, without a deeper analysis of the discourse to determine whether an anaphor refers to an individual NP or an abstract object.

In the test I have taken into account the metaphorical uses of verbs encoded in a semantic lexicon, the Danish SIMPLE lexicon (Pedersen and Nimb, 2000).

From the analysis of anaphors in the considered dialogue collections I found that many individual anaphors refer back to entities which have not been evoked in the immediately preceding utterances (**SU**s) and thus they would not be on the S-list (the entities which are not evoked in the current SU are removed from the list). Thus I have extended the scope of resolution for all individual anaphors except the neutral singular. If an antecedent to an individual NP cannot be resolved by looking at the actual S-list, the elements on the S-lists for the preceding SUs are considered.[13]

6 Evaluation of the Algorithm

I have applied the modified ES99-algorithm to three randomly selected **SL** dialogues (6,305 words) and to one of the dialogues between native Danes recorded in the **PID** collection (5,367 words). It must be noted that in my test only one annotator (the author) identified dialogue acts, classified the anaphors in the dialogues, marked NPs and anaphor antecedents. In (Eckert and Strube, 1999a) these tasks have been accomplished by two annotators.

In dividing the three **SL** dialogues into discourse segments I have mainly used a partition made by two researchers at the University of Copenhagen in an independent project. The discrimination criteria were topic shift and a few linguistic clues. I have then ap-

[13] I have followed the cache model described in (Walker, 1998). In the present test it was necessary to go back maximally seven **SU**s to find an antecedent to an individual pronominal anaphor.

plied the same discrimination criteria to the dialogue from the PID collection.

I have defined dialogue units syntactically following (Eckert and Strube, 1999a).[14]

Because it is not always possible to distinguish between *den, det, de* used as personal or demonstrative pronouns without having access to stress information, I have classified them as personal pronouns unless they are topicalized, or occur in syntactic constructions where demonstratives are normally used. The manual classification of pronouns and demonstratives in the four dialogues can be found in table 4.

The results of the individual anaphora resolution algorithm can be found in table 5, while the results of the discourse deictics resolution algorithm are given in table 6.

The results obtained are better than those reported in (Eckert and Strube, 1999a), but I have used more background information than ES99 and extended the scope of resolution for individual anaphors (without this extension the precision of the individual resolution algorithm was of 64.5). Furthermore the Danish deictic *det* occurs in more contexts than the English *it, this* and *that*, thus there are more **I*** predicates in the Danish version of the algorithm than in the original one. The fact that only one annotator divided the dialogues into SUs may also have influenced the results.

The algorithm classifies anaphors and resolves some of them, thus there are two types of error, classification errors and resolution errors. Most of the instances of wrongly classified anaphors are due to the fact that the algorithm classifies vague anaphors as discourse deictics and then resolves the anaphor to a preceding predicate or clause. Few errors are due to the fact, already noticed by ES99, that the defined I* and A* predicates do not contain information about nominals referring to abstract objects.[15] These errors resulted in most cases in resolution errors.

Some errors are due to the inability to find an individual NP antecedent to the pronoun *det*, when this refers generally to an NP of different gender[16] and to wrongly resolved plural pronouns with complex NP antecedents or with no antecedent. Correctly classified, but wrongly resolved discourse deictics are, i.a., due to the fact that I did not mark in any particular way parenthetical utterances. The latter kind of errors are chaining errors. In table 7 the occurrences of each type of error are reported.

7 Concluding Remarks

The adapted ES99-algorithm has been tested on two kinds of dialogue, that have been classified by one annotator. Although the types of dialogue in the Danish test is quite different from that used by ES99, the results reported in the previous section (6) indicate that the algorithm performs as well for Danish as for English. Because the use of Danish pronouns, especially those referring to abstract objects, is different from the English one, these results provide an interesting evaluation of the algorithm.

As noticed by ES99, adding more lexical knowledge to the algorithm could improve its performance. I also believe that the contexts of abstract anaphors should be studied in more dialogues, and that more attention should be given to the connection between discourse deictics and the relations that link pieces of discourse to each other (Webber, 1991; Fraurud, 1992; Asher, 1993; Kehler, 1997).

Further work will thus consist in analyzing the occurrences of discourse deictics in both written texts and dialogues and paying additional attention to the relations linking pieces of discourse to each other (i.a. (Hobbs, 1979; Mann and Thompson, 1987; Polanyi, 1988)

[14] The dialogue collections have been tagged.

[15] The semantic lexicon I used did not contain the relevant nominals.

[16] The use of especially generic plural pronouns in Swedish is discussed in (Fraurud, 1992).

Table 4: Classification of Pronouns and Demonstratives

	A5	AA10	AA11	TR3	$\sum$
Individual Pro	39	43	34	51	167
Discourse Deictics Pro	25	16	17	34	92
Vague Pro	4	6	0	2	12
Inferrable Evoked	1	0	0	2	3
Individual Dem	1	5	0	4	10
Discourse Deictics Dem	27	20	19	28	94
Vague Dem	2	5	3	3	13

Table 5: Results of the Individual Anaphora Resolution Algorithm

	A5	AA10	AA11	TR1	$\sum$
No. resolved correctly	31	40	23	40	134
No. of Individual Pro	41	48	34	57	180
Precision	0.756	0.833	0.676	0.701	0.744

Table 6: Results of the Discourse Deictics Resolution Algorithm

	A5	AA10	AA11	TR1	$\sum$
No. resolved correctly	43	25	33	49	147
No. of Discourse Deictics	58	47	39	67	211
Precision	0.741	0.489	0.846	0.716	0.696

Table 7: Wrongly resolved anaphors

DD-vague	10
wrongly resolved plural	13
generic *det*	7
abstract nominals	5
individual anaphora instead of DD (% abstract nominals)	6
wrongly resolved DD	28
wrongly resolved individual anaphora (singular)	2
chaining errors	39

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