

Discourse

BSc Artificial Intelligence, Spring 2011

Raquel Fernández

Institute for Logic, Language & Computation
University of Amsterdam



Plan for Today

Part I: Discussion of the research papers to be read for HW#4:

J. R. Tetreault (2001) A Corpus-Based Evaluation of Centering and Pronoun Resolution, *Computational Linguistics*, 27:507–520.

I. Hendrickx, G. Bouma, F. Coppens, W. Daelemans, V. Hoste, G. Kloosterman, A. M. Mineur, J. Van Der Vloet, J. L. Verschelde (2008) A Coreference Corpus and Resolution System for Dutch, in *Proceedings of the Sixth Conference on Language Resources and Evaluation*, pp. 144–149.

Part II: Deictic pronouns – example of recent research on second person English pronouns

Centering Theory: Recap

Last week we introduced the main ideas behind Centering Theory.

- The coherence of a discourse depends (at least in part) on the local **focus**, i.e. the topic or the entities that occupy our attention during a discourse segment.
- Main notions: each utterance U_n has...
 - * a backward-looking center C_b
 - * an ordered set of forward-looking centers C_f
 - * a preferred center $C_p = \max C_f$
 - * $C_p(U_{n-1}) = C_b(U_n)$
- **Constraint**: Each utterance has a unique C_b .
- **Rule 1**: If utterance contains pronouns, at least one of them must be resolved to its C_b .
- **Rule 2**: Transition types (do C_b or C_p change from U_n to U_{n+1} ?)
 - * Continue \prec Retain \prec Smooth-Shift \prec Rough-Shift

Centering Theory: Some Caveats

- Centering is not a method for pronoun resolution, but a broader theory of attention in discourse.
- It can however be used as a framework for pronoun resolution.
- Many aspects of Centering Theory were left underspecified in the original formulation. For instance:
 - * what is an utterance (sentence or clause)?
 - * exactly how are the elements in C_f ranked?
 - * do all non-initial utterances have a C_b ?
 - * are there additional transition types?
- Researchers taking up the theory have proposed different formalisations.
 - * Tetreault (2001) presents some of them.
 - * A more systematic study considering a greater number of instantiations of the theory is presented in Poesio et al. (2004).

Poesio et al. (2004) Centering: A Parametric Theory and its Instantiations, *Computational Linguistics*, 30(3):309-363.

An Application of CT: Essay Grading

Centering theory has been applied to automatic essay grading:

E. Miltsakaki and K. Kukich (2000) The Role of Centering Theory's Rough-Shift in the Teaching and Evaluation of Writing Skills. In *Proceedings of ACL 2000*.

E. Miltsakaki and K. Kukich (2004) Evaluation of text coherence for electronic essay scoring systems, *Natural Language Engineering* 10:1.

Machine Learning Approaches

So far, we have seen algorithms for anaphora resolution that are hand-crafted. In contrast, the approach taken in the COREA project is an example of a supervised *machine learning* approach.

These are the main ingredients of this kind of approaches:

- Annotated **corpus labelled by hand** where each anaphor is linked to each antecedent.
- Resolution is seen as a binary **classification task**: for each pair of NPs, are they co-referent, yes or no?
- **Features** are extracted for each pair of NPs. For instance:
 - * compatibility of number and gender
 - * grammatical role
 - * linguistic form (definite, indefinite, pronoun, proper name, . . .)
 - * sentence distance between anaphor and potential antecedent
- The classifier will learn **probabilities** (weights) indicating which of the features are good **predictors** of a successful antecedent.

For an overview of anaphora and coreference resolution, see chapter 21 (sec. 6 and 7) from Jurafsky & Martin (2009) *Speech and Language Processing*.

Deictic Pronouns

- Deictic pronouns have not received a lot of attention because they are less common than anaphoric pronouns in written texts – which is the medium most commonly studied.
- There are many issues involved in resolving deictic pronouns. At the very least, we need a discourse model that contains a representation of the entities in the extra-linguistic context. For this to work out, we need to:
 - * decide what sub-set of the potentially very large extra-linguistic context is in focus, and
 - * define a notion *salience*.
- A possible reference to learn more about this:

Byron et al. (2005) Utilizing visual attention for cross-modal coreference interpretation, In *Proceedings of Fifth International and Interdisciplinary Conference on Modeling and Using Context*.

Today we will look into one example of work that investigates deictic pronouns: in particular English ‘you’.

Dialogue vs. Written Monologue

Language in spoken dialogue has characteristic features. For instance:

According the British National Corpus word frequency lists:

	spoken dialogue	written discourse
I	30k p.mil.(the most freq.)	9k p.mil.(16th most freq.)
you	27k p.mil.(2nd most freq.)	7k p.mil.(20th most freq.)
it	25k p.mil.(3rd most freq.)	11k p.mil.(10th most freq.)

- In text, most pronouns are **anaphoric**: they refer to entities that have been introduced previously into the linguistic context.

(1) The Prime Minister of New Zealand visited the US yesterday.
This was the first time she had come to New York since 1998.

- In dialogue, the most common pronouns are **exophoric** (deictic): they refer to entities in the extralinguistic dialogue situation.

(2) A: I think the application needs to be sent in by next week.
B: Yes, I know. Could you please take care of that?

First & Second Person Pronouns

Classic picture of deictic/indexical personal pronouns:

- First person pronoun **I** refers to the speaker – OK.
- Second person pronoun **you** refers to the hearer – really??

The 2nd person English pronoun **you** has different interpretations, which often correspond to different pronouns in other languages:

- (3) Sometimes **you** have meetings where the decision is already taken.
Soms heeft **men** bijeenkomsten waar de beslissing al genomen is.
- (4) Do **you** want an extra sheet of paper?
Wil **jij** / Wilt **u** een extra blaadje?
- (5) Hope **you** are all happy!
Ik hoop dat **jullie** allemaal blij zijn!

What are the factors that play a role in disambiguating ‘you’?

- interesting linguistic question
- useful for machine translation, automatic summarization, information extraction, addressee detection (e.g. in human-robot interaction), ...

Investigating English ‘you’ in Multi-party Dialogue

Sketch of the methodology employed in our study:

- 1) Corpus of utterances containing the pronoun ‘you’.

Ca. 1000 utterances randomly taken from the AMI Meeting Corpus: freely available corpus of dialogues among 4 participants, containing transcriptions, audio, and video. [corpus.amiproject.org]

- 2) Each ‘you’ instance is manually annotated with an interpretation:

generic / deictic plural / deictic singular – referent

↪ These are the dependent variables we want to be able to predict.

Distribution in our data set:

generic	plural	singular
49%	18%	33%

Investigating English ‘you’ in Multi-party Dialogue

Sketch of the methodology employed in our study:

- 3) We consider several factors (features of the utterance containing the pronoun and of the dialogue context) that may play a role in the disambiguation. \rightsquigarrow These are the variables we'll use for prediction.
- 4) We try to automatically predict the right interpretation of ‘you’ given the features taken into account.
 - * To address the linguistic question, we investigate the predictive power of each factor.
 - * To assess how useful this would be for applications, we calculate the accuracy achieved in disambiguating the pronoun.

Frampton, Fernández, Ehlen, Christoudias, Darrell, & Peters (2009) Who is You? Combining Linguistic and Gaze Features to Resolve Second-Person References in Dialogue. *Proc. of EACL*, Athens, Greece.

Fernández, Frampton, Peters, & Purver, Second-Person Pronoun Resolution in Multi-party English Dialogue. Manuscript under submission.

Generic Uses

What factors contribute to assign a generic interpretation to 'you'?

- The **dialogue act** type of the utterance containing the pronoun: generic uses rarely appear in questions (although they may (6)-(7))
- Generic uses are more common in **hypothetical/conditional** contexts (9) and in those utterances containing **frequency adverbs** like '*always*', '*usually*', '*often*' (8)
- **Prosody**: generic uses tend to have lower average pitch.
- These are not hard rules, but defeasible constraints.

Some instances annotated as "generic" in our data set:

- (6) How do **you** wear this thing?
- (7) Um, how many solar cells do y- do **you** need?
- (8) Often **you** need to know specific button sequences to get certain functionalities done.
- (9) If **you** submit the application by November **you** get a discount.

Deictic Uses and Participant Roles

Can we stick to the classic picture that deictic uses of 'you' refer to the hearer?

- Goffman criticises the inadequacy of the classic speaker-hearer dyadic model and proposes a finer-grained classification:

All hearers that perceive a speech act have some participation status:

- * **unratified** participants: do not participate in the conversation
overhearers and **eavesdroppers**
- * **ratified** participants: those allowed to participate in the conversation
addressed recipients and **unaddressed recipients**

- According to Goffman, addressed recipients or **addressees** are:

those participants “oriented by the speaker in a manner that suggests that his words are particularly for them, and that some answer is therefore anticipated from them more so than from the other ratified participants”

Goffman (1981) *Forms of Talk*, University of Pennsylvania Press.

Deictic Uses and Participant Roles

Can we then assume that deictic '*you*' refers to the addressee(s)?

- Perhaps more appropriate to say that it refers to a subset of an utterance's addressees:

Addressed to a group:

(10) Tomorrow we can all discuss the report *you*_[sg] sent.

- In our context (4-party meetings) all hearers are ratified participants: distinguishing between *addressed* and *unaddressed* ratified participants can be tricky:
 - * low inter-annotator agreement deciding whether there is only 1 addressed participant or more (annotators \approx overhearers)
- Not surprisingly, disambiguating between *singular* and *plural* interpretations of '*you*' is not easy ...

Singular vs. Plural 'you'

What factors contribute to interpret 'you' as plural or singular?

- Obviously, some **lexical clues**, such as vocative names:

(11) John, I think **you** should take care of the reservations

(12) Do **you** guys have any further questions?

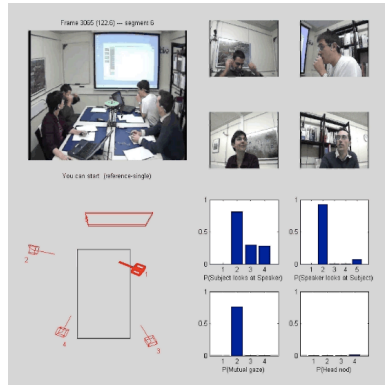
(13) Are **you** all ready?

- Certain **dialogue act** types tend to be addressed to individuals:
 - * especially reactive acts such as (dis)agreeing, clarifying, answering
- There are no reliable prosodic differences in this case.
- What about extralinguistic factors such as **gaze**?

Singular vs. Plural 'you'

Visual focus of attention can be detected automatically from head orientation rather reliably.

- Speakers tend to look at their addressees – specially towards the end of an utterance
- The **speaker's gaze direction** is a great clue to identify the referent of singular 'you'
- When the speaker does not focus her gaze on any participant, the interpretation tends to be plural



Investigating ‘you’: Conclusions

- Personal pronouns are understudied but very common in dialogue.
- In English, the 2nd person pronoun ‘you’ is highly ambiguous. What factors play a role in its disambiguation?
 - * Prosody: generic uses have lower pitch.
 - * The type of dialogue act favours particular interpretations.
 - * Some lexical clues favour particular interpretations.
 - * Gaze (and hand-gestures) guide the interpretation of singular uses.
 - * Differences in number may be underspecified in some situations?
- If we were to automatically disambiguate ‘you’ for practical applications, how well would we do?

Sketch of results (see paper for details):

	baseline	best result
gen./deictic	51% (deic.)	87% (+36%)
sing./plural	65% (sing.)	86% (+21%)
sing. referent	56% (prev. spk)	86% (+30%)

Summing Up

We have looked into pronoun and coreference resolution:

- Hand-build algorithms: DRT-style pronoun resolution, Centering-based algorithms
- Machine learning approaches
- Resolving deictic pronouns: the case of English ‘you’

Next week:

- Another discourse-related phenomenon: Presupposition
- **To do:**
 - * read chapters 4 and 5 from Blackburn & Bos.
 - * test the related Prolog programs and identify possible problems.