

Semantic Approach to Identity in Coreference Resolution Task*

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Abstract. It has been recently discussed in linguistics that the notion of identity in the task of coreference resolution is of continuous nature, ranging from “complete” identity to non-identity. The current paper confronts this idea with experimental data for Polish, resulting in a new approach to the notion of identity. It extends the definition of coreference with speaker/recipient relation, believed to be valid for all languages, and explains the near-identity with lexical and conceptual means. The theory is supported with Polish-English examples presenting difficulties in coreference interpretation.

1 Introduction

Two recent works on the nature of identity-of-reference relation in coreference resolution by Recasens et al. [1,2] discuss the situation when “two references denote *almost* the same thing”. Such need is said to arise when e.g. metonymy is used to refer to objects non-identical in strict sense, but carrying the common reference due to traditional reading (such as *the White House* denoting *the US president*). To express this phenomenon, a concept of *near-identity* is introduced in line with “complete” identity and non-identity and the typology of coreferential relations is presented with four main types (name metonymy, meronymy, class and spatio-temporal function) and 15 subtypes, based on the nature of difference between coreferent objects and degree of their similarity. This concept is further extended by referring to mental space and conceptual blending theories [3] and introducing dual operations of refocusing and neutralization.

The above-mentioned ideas are currently being tested in a *Computer-based methods for coreference resolution in Polish texts* project financed by the Polish National Science Centre and targeted at implementation of coreference resolution tools for Polish. One of its subtasks is preparation of the manually annotated corpus containing identity-of-reference direct nominal coreference (the Polish Coreference Corpus, PCC), 15% complete (wrt. target size) at the moment of paper submission. The results of this first annotation phase encourage us to dispute the concept of near-identity and redefine the notion of coreference by inclusion of the speaker in the process of signalling coreference.

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2 Verification of the Typology of Identity

The first stage of the annotation resulted in an interesting observation. First of all, the annotators were quite confident with distinguishing the “complete identity” relation from the near-identity. The latter was selected not as rarely as expected, making 13% of the total links (calculating the number of identity links as identity cluster size minus one). However, a closer adjudicator examination indicated that the quasi-identity links were mostly used to represent semantic relations between lexical items such as mero-/holonymy (part-whole, element-set), sometimes hyperonymy, or other relations, e.g:

- (1) *PL: impreza* \longleftrightarrow *balanga*
EN: a party \longleftrightarrow *the bash*
- (2) *PL: trzy córki* \longleftrightarrow *najmłodsza, 12-letnia*
EN: three daughters \longleftrightarrow *the youngest, 12-years-old one*
- (3) *PL: (zniszczyć) pszczoły* \longleftrightarrow *barć*
EN: (to destroy) bees \longleftrightarrow *a hollow in a tree where bees live*

Taking into account only the “true” quasi-identical links following assumptions resulting from the classification of Recasens et al., they appeared considerably less frequently (3.4% of the total number of links, using the method of calculation described above). This disparity poses a fundamental question about the character of identity, its relation to quasi-identity and the way it is perceived by recipients of the textual message (here: the annotators). To answer it, we have to rethink the nature of quasi-identity and probably supplement the definition of coreference.

3 From Pragmatics to Speaker-Recipient Relation

Recasens et al. define coreference as “a scalar relation holding between two (or more) linguistic expressions that refer to DEs [discourse entities] considered to be at the same granularity level relevant to the linguistic and pragmatic context”.

This example definition, corresponding to the common understanding of coreference, takes into account only the recipient’s point of view in the process of decoding the textual content. The term is itself fuzzy — it is not clear whether coreference is primarily linguistic or conceptual phenomenon. While most NLP researchers stop at the border of discourse-world entities, the conceptual level should be also taken into consideration: the knowledge, experience and beliefs about the world common (or individual) to the speaker and the recipient due to differences in environment, culture, education etc. Then come two additional layers influencing the process: the language — the imperfect tool we describe the world with, and pragmatics, making the message intelligible. All these means are used by the speaker to intentionally “establish the coreference” which in turn the recipient “decodes”.

4 Does Near-Identity Really Exist?

Following this argumentation we can confront the sheer idea of near-identity as a “continuum, ranging from full identity to non-identity” ([2], p. 1139). Such vagueness of identity does not appear to be the property of objects, but a matter of interpretation, safe from blurring their identity. A popular quasi-identical example of spatio-temporal pseudo-splitting of an object into its multiple layers does not really seem to split the object at all — a person aged 3 and 40 is still the same person (as far as identity is concerned). On the contrary, sharing a set of features is not enough to make two objects identical — they are at most similar, which does not require invocation of the new term of near-identity. All relations described as such by [1] are in principle either semantic relations between expressions in the text or similarity relations between the discourse-world objects. What makes this interpretation possible is referring to the role of the speaker who triggers the impression that the recipient should perceive one object as two different entities.

5 Linguistic and Conceptual Reasons of Difficulties in Coreference Interpretation

A closer look at the experimental data shows that it is our conceptual system and language which may make the interpretation of coreference difficult for the recipient. Below we present an initial classification of situations which correspond to this problem based on experimental data from PCC and several external sources. In our opinion these cases can be explained without referring to the notion of near-identity, but appear as a result of disturbance of the interpretation of the text by the recipient (due to numerous reasons):

- violation of the linguistic system or poor stylistics:

(4) *PL: parówki dla dzieci, które mają dużo mięsa*
EN: sausages for children, which contain lots of meat

- limitations of the linguistic system; for example, Polish does not use articles for signalling the (in)definite character of objects, which sometimes makes it unclear whether the text refers to “an entity” or “the particular entity”,
- lexical reasons; the speaker can use different tools to indicate coreference, such as anaphora, synonymy, hyperonymy. Very often phrases can carry contradictory semantic features and at the same time stay coreferent in a particular text:

(5) *PL: Anna: Co to za okropne ziółko?*
Jan: Ładna roślinka, ale Ź parzy!
Piotr: To pokrzywa — zióło, które obniża poziom cukru we krwi.
EN: Ann: What is this horrible weed?
John: Nice plantlet, but it stings!
Peter: It's a nettle — a herb which reduces blood sugar level.

- different perspectives of discussing the same object (particularly specific to dialogues):
 - (6) *PL: Podobało mi się to przedstawienie — powiedział Jan. ØUśmiechnął się do Marii. — A mnie nie! Nie rozumiem, coś ty zobaczył w tym kiczu! — skrzywiła się Maria.*
EN: I liked the show — said John. He smiled to Mary. — And I hated it. I can't understand what you saw in this kitsch! — grimaced Mary.
- syntactic reasons (e.g. hidden predicative usage of nominal phrases or simple ellipsis, easily mistaken for near-identity):
 - (7) *Have you read “Gone with the Wind”?*
No, but I've seen [the film based on] it (the book).
- differences between the speaker and recipient's conceptual systems:
 - (8) *The Einstein-Rosen-bridge is a hypothetical topological feature of space-time. (...) However, there is no observational evidence for the wormhole.*
- redefinition of the object or category contrary to their real features:
 - (9) *PL: ØJestem teraz bardziej doświadczony, ale Øbrakuje mi starego mnie, gdy Øbyłem bardziej spontaniczny.*
EN: I am now more experienced, but I miss my old self, when I was more spontaneous.

6 Conclusions

Our annotation experiments with identity vs. quasi-identity show that the common definition of coreference should be enhanced with the speaker/recipient relation, being the factor that makes the reference resolvable. Although the theory of refocusing and neutralization can help with the most straightforward cases of quasi-identity relations (such as name metonymy or instantiation of the discourse entity in different temporal or physical locations), the conceptual background seems better explanation of the underlying phenomena of the ostensible identity change.

References

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