

Computing sense and reference

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Central questions in analytic philosophy of language relate to referential issues. This paper describes model generation techniques for computing reference in context. The techniques are applied to proper names, definite descriptions and certain polymorphic nouns. These examples are meant to illustrate the diverse nature of referential expressions of natural languages.

The unique name assumption in model generation (Baumgartner and Kühn, 1999) refers to the habit of translating proper names as constant terms and interpret them “as themselves”. This kind of interpretation is a possible feature of generation of Herbrand models. Is such a feature sound?

Three possible objections are considered. The first objection is trivial and addresses quite specifically the variation in naming of humans (and various artifacts and places). The second objection is that in special cases substantially different names with quite different lexical semantics apply to the same individuals (Saul, 1999). Finally, a third objection may center around the fact that the same name, if modified appropriately, may refer to different discourse referents even within sentence boundaries. In the light of these objections, I abandon the unique name assumption in its present format.

A simpler translation of proper names is into Russellian definite descriptions. In the case of multiple naming, the coreference is accounted for by a (sound) meaning postulate stating that people can generally be referred to by their full names, their last names (with an appropriate prefix), etc. If the background theory of the discourse participant allows it, the two noun phrases can now be interpreted as co-referential, since there might be an individual of some Herbrand model which is the unique denotation of two distinct naming functions. This also resolves the second objection. Finally, the third objection is met, since modifications are outscoped by the ι -operator.

On the other hand, Russellian definite descriptions are not entirely adequate translations of regular definite noun phrases, i.e. headed by common nouns, or pronominal possessives. Consider (1):

- (1) Your car’s headlight is out!

Uniqueness is not really what is presupposed here, but some sort of familiarity. The ι -operator need not be abandoned, however. An adequate translation of *the singer* is:

$$\iota x_1.\mathbf{singer}(x_1) \wedge \mathbf{familiar}(x_1)$$

Informally, this means that there is one and only one singer in the set of (discourse) familiar singers. Uniqueness is interpreted wrt. familiarity, in other words. This also accounts for the semantic effects of possessives. If someone utters:

(2) Is that Fred's car?

this need not entail that Fred has only one car, but it does presuppose that there is only one car familiar from the discourse context. The compositional fragment of English determiners, numerals and possessives is presented in Sjøgaard (2005). The philosophical morale here is that definite descriptions are locally defined, i.e. wrt. to the set of discourse familiar objects.

Some common nouns have a polymorphic nature. This is an issue where the notion of sense is of direct importance. To illustrate the current state of computational linguistics, a test case is considered; namely, the disambiguation of polysemous words in context. The disambiguation is performed by model generation, but the polysemy (polymorphism) is encoded in the lexical semantics. Consider (3):

(3) The novel was 300 pages long and lasted the whole flight.

(3) is an example of copredication. It is said the novel in question as an object is 300 pages long, but it is not the novel as an object which is said to have lasted the whole flight, is it? It seems rather that the second predication relates to the novel conceived of as a piece of information or a story. In contemporary computational linguistics, (3) is said to predicate over various aspects of the sense of the referring expression. Standard qualia theory differentiates between formal, constitutive, agentive and telic aspects (Pustejovsky, 1991). If the telic quale of *book* is some function $\lambda x_1.\lambda x_2.\mathbf{read}(e_1, x_1, x_2)$ (ignoring the modal relationship between books and the associated reading events), some function $\lambda e_1.\mathbf{last_flight}(e_1)$ can be said to predicate over the event associated with that quale.

If model generation is applied to polymorphic nouns, the minimal model-theoretic interpretation will always correspond to the interpretation on which only the necessary assumptions about the nature of their referents are presupposed. In addition, if predicates range over different qualia and thus give rise to ambiguities, these ambiguities can be resolved (if resolved in the discourse at all) by generating the consistent models from the set of analyses.

How is qualia then to be interpreted philosophically? Recall Frege's famous analogy of the telescope (Frege, 2001 [1896]). Frege painted the picture of an astronomer watching the moon through a telescope. While the image on the astronomer's retina, said Frege, is a pure idea, and while the sign's reference is the moon itself, the image on the lens of the telescope corresponds to its sense. I think of qualia structure in much the same way. In fact, you can say that qualia structure is a telescope with four lenses; it comprises four distinct optical images. In addition, and along the lines of the standard instructions metaphor, you can say that the sense is an instruction on how to determine a sign's reference, and qualia structure provides four alternative paths.

In sum, the unique name assumption is abandoned on philosophical and empirical grounds. Similarly, reasons were found to modify the usual application of Russellian definite descriptions. The true challenge to Fregean analytic philosophy is the existence of polymorphic nominals. It is demonstrated how an adequate account of those may fall out of a simple elaboration of Frege's conception of sense, i.e. substituting sense with qualia (or conceiving sense *as* qualia).

1 References

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