A Dynamic View of Reference

Matthias Scheutz, Jenett Tillotson

Computer Science Department
Indiana University
Bloomington, IN 47405

mscheutz@indiana.edu

jtillots@indiana.edu

Abstract

In this paper we argue that standard philosophical and logical notions of reference fail to capture important aspects of human reference. In particular, we will show that these notions neglect two essential components: the process of referring and the individual resolving the reference. A new approach is therefore needed to account for the dynamics involved in human reference. As a consequence we will propose a list of necessary features that a model of human reference resolution should possess.

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Introduction

Reference is a highly ambiguous term - what does "reference" refer to? Does it just mean the denotation of a term in a formal/natural language or does it apply to the whole process by which humans assign meaning to symbols and extract it from them? Over two millennia, philosophers have used almost the whole bandwidth of possible notions to argue why the ability to refer to arbitrary things makes humans special. And it is the "referential apparatus" in humans that allows for the development of language. Therefore it seems a natural and at the same time necessary step for a "cognitive theory of natural language" to investigate what essential components are needed for the referential apparatus to work.

Reference revisited

One of the most widely accepted notions of reference is what could be called "the logical," the gist of which presents itself as follows: Given a formal language and a formal model for this language, the interpretation of expressions from the language in the model, i.e., the function that assigns "meaning" to the descriptive vocabulary, determines what a term "refers to". Although this notion of reference comprises all the essential properties for dealing with formal languages [1] it soon becomes too restrictive when natural language is considered. Descriptive terms do not simply denote things, they also have sense [5]. So it should not be too surprising that the question "What is the real meaning of descriptive terms?" gains new life. The philosophical importance of this issue is apparent from the still ongoing debate about whether a proper name also has connotation besides its denotation [10]. [2] Does it not sound almost tautological to pronounce extensional semantics insufficient to capture intensions?

Another major challenge for the static evaluation of classical logic are context-dependent terms such as "here," "now," "you," or "this," so-called "indexicals." These hermaphrodites between constants and functions overwhelmed the classical idea of eternal truth-values. The only way to overcome the refractory behavior of these terms was to augment the classical interpretation function, and indeed various extensions have been proposed. [3] The most common one was probably the introduction of a set of contexts into a model which in turn required a three-place interpretation function to assigns each term in every context a particular meaning. Although such models can then account for the change in denotation of indexical terms, they still neglect a, if not *the* crucial part of reference: the referring individual.[4]

Logical systems normally do not deal with the problem of evaluating expressions at all. On the contrary, it is a declared job of the logician to determine reference and truth of formal expressions in a given model, the underlying assumption being that we - the humans - use the same kind of interpretation function and inductive truth definition as the ones used in formal logic. Therefore one need not be bothered with such "minor" details as carrying out the process of determining reference and truth. This is the time for the otherwise silently listening cognitive scientist to veto: Exactly what kind of mechanism humans use to determine reference and truth is as yet unknown; in fact, it might be completely different from the logical dogma.

But this is not the only handicap of logic from a cognitive scientist's perspective. The neglect of time seems by far the more severe pretermission. [5] Reference in humans is certainly a process during which some sort of association has to be established, a link between (a token of) a symbol which itself has to be perceived and its "meaning," another (possibly memorized) perception.

Logical models always assume an ideal agent very much alike the Kantian transcendental self which can determine the reference of all terms in no time. And as a matter of course, this agent is not prone to errors. But for cognitive scientists, errors are an integrative part of their research, especially because errors reveal bits and pieces of the mechanism of the referential apparatus.

Modeling human reference

What should models of reference look like? Firstly, the model should use context to determine the proper referent. This context could include previous utterances, properties of the speaker such as mood or idiolect, or any other information perceivable in the environment. Intonation for the auditory system and pointing behaviors performed by the speaker for the visual system are also important aspects of the context. In particular, these aspects should be used by the model to draw its attention to the important features in the environment and to distinguish signals from noise or background.

Secondly, if a model is to properly capture human reference resolution, the perceivable environment of the model has to reflect some of the complexities of the real world. Particularly, human references are made in a changing environment where objects in the visual field might be moving and signals in the auditory system happen over time. A model of human reference should be able to deal with these dynamical aspects of the perceivable environment and still successfully resolve references.

Lastly, a model should be capable of resolving references even when the linguistic reference is imperfect or fails altogether. For instance, if an object is pointed to by a speaker, but the linguistic utterance is not the correct one for that object, the model should still resolve the reference and also determine the correct linguistic utterance. Similarly, if a linguistic utterance is garbled or cluttered by noise, the model should still determine the reference as long as enough information is present in the utterance. In other words, the performance of the model should degrade relative to the imperfections of the reference.

There have been attempts by scientists to build models of reference resolution which exhibit some of the above properties [6,7, 8,9]. However, these models fail to realize crucial elements of human reference (e.g. the dynamics of the environment). We are proposing a model elsewhere which combines and extends several promising approaches [3, 4] to capture the essential components of reference resolution.

Conclusion

The ability to refer to objects and to resolve these references lies at the heart of natural languages. We believe that a satisfactory model of human reference will enable us to get a better understanding of the nature of human language. We have argued that denotational models fail to capture essential aspects of human reference and that a different approach is needed in order to account for its variety and complexity. Extra-linguistic meaning, the dynamics of the referring act, and the referring individual, as well as the person resolving the reference, are central components of reference. Models that account for these factors seem promising candidates for understanding and modeling the human referential apparatus which in turn might lead to new insights into the representation of language and the evaluation of truth.

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Footnotes

[1]The fact that this notion of reference is sufficient for logical purposes seems to be the only reason why most philosophers can still live with it. back

[2] There are also psychological studies of how humans create and use names that shed new light on this controversy [2]. back

[3]Montague, Kaplan, Putnam, Kripke, Donnellan, and Davidson are among the authors that have addressed this issue and suggested various solutions. back

[4] One way of addressing this problem is by distinguishing between *linguistic* and *speaker reference* [1]. As Bach puts it: "Referring is ultimately not something that words do but something that speakers use words to do." back

[5]There are certain logics that can deal with time, so called "temporal logics," which differ depending upon the assumption of what "the flow of time looks like," i.e., whether time is linear, branching into the future, never ending, etc. Whether or not they are useful for philosophy, and in consequence for cognitive science, is more than controversial, and we tend to follow the characterization of Ulrich Blau, a German logician and philosopher, who once remarked "temporal logics are nothing else but number theory." back