Formal Aspects of a Pragmatic Theory of Definiteness

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Final version appeared in:
P. Bærentzen (ed.) 1995. Aspekte der Sprachbeschreibung. Akten des 29. Linguistischen Kolloquiums in Aarhus 1994. Tübingen: Niemeyer, 81-84. (Linguistische Arbeiten 342)

1. Introduction

The concept of definiteness in natural language is of particular interest because it is pragmatic in its nature but it also has an important semantic impact. Therefore, every semantic theory has to deal with the problem of definiteness for two reasons. Firstly, definite expressions are necessary to fix the reference and to determine the truth condition of an utterance. And secondly, the analysis of definiteness helps us to understand more about the (vague) borderline between pragmatics and semantics and their interaction. The present paper traces definiteness back to the pragmatic principle of salience according to which an expression is definite if it refers to a salient object. Several different factors play a role in establishing a certain salience or salience hierarchy. This paper is not concerned with those factors but it gives a formal representation of expressions that depend on such salience hierarchies. Salience is reconstructed by the formal tool of context dependent choice functions, that assign one of its elements to each non-empty sets. In this way the pragmatic concept of definiteness gets its semantic adequate place.

2. Definite Expression

A definite singular expression unambiguesly denotes or refers to exactly one object. The object can be identified as the only one that is denoted by the definite expression. Traditionally, proper names, definite NPs, demonstratives, personal pronouns and possessive constructions are regarded as definite. In this paper, I concentrate on definite NPs since they show a complex behavior in relation to definiteness and contextual parameters. Generally, three main uses of definite NPs are considered: the anaphorical linkage, the functional relation and the situational salience.

In the anaphorical use (1), the definite NP *the man* refers to an object that has been explicitly introduced into the linguistic context by the indefinite NP *a man*. Thus, in this case definiteness can be reduced to anaphora. In the functional use (2), the definiteness of the NP is based in the functional concept *mayor of*_ that assigns to each town exactly one object, namely its mayor. Definite NPs that are neither functional nor anaphorical related can also be used if the situation or the non-linguistic context contains additional information to single out the referent. Sentence (3) can be felicitously uttered if the context supplies a salient referent for the definite NP *the city*.

(1) A man walks. *The man* smiles at a woman.
(2) *The mayor of a small town in Wales* is a woman.
(3) *The city* is small but beautiful.

3. Theories of Definiteness

I discuss four semantic theories and their treatment of definite NPs: Russell´s classical theory of descriptions, Heim´s familiarity theory, Löbner´s functional approach and, finally, Lewis´ salience theory. Russell´s classical theory from 1905 stands in a logical and epistemological tradition and is used mainly in formal and logical approaches to semantics. It it the most favorite approach to definiteness among formal semantists even today. It licenses definite NPs in the context of a sentence only if exactly one unique object fits the descriptive content of the NP. This analysis works well for uniques like functional concepts as in (2) and lexical determined uniques (like *first man on the moon*) which have been the expressions that Russell was especially interested in. He did not care about contextual dependent definite NPs like anaphorical or deictic NPs. Therefore, the anaphorical use and the situational or deictic use cannot be adapted in this format without problems. Especially the uniqueness condition creates unsolvable problems since we can utter sentences like (3) without assuming that there is only one city.

Heim´s (1982) familiarity theory focuses on the anaphorical use of definite NPs as in (1). According to her view, an indefinite NP introduces a new discourse referent and a definite NP refers to an already established one. Definiteness is explained in terms of anaphora, i. e. a term is definite if it is mentioned before. However, her approach gets into trouble explaining examples like (2) where we do not have an antecedent. Heim (1982) analyses this use with the help of accommodation rules. According to Lewis (1979), an accommodation rule is a pragmatic determined repair of the semantic interpretation process. Such repairs are necessary if the semantic interpretation fails although the sentence is intuitively felicitous. However, such pragmatic rules are very powerful and their interactions with semantic rules are not yet investigated in detail.

Löbner (1985) takes the opposite position to Heim, namely that the prototypical use of definite NPs is not the anaphorical use, but the functional one. However, he differs dramatically from Russell, since the meaning of the definite article is not part of the lexical meaning of the definite NP but the definite article only shows that the expression refers unambiguesly to an object due to its functional content. Therefore, the definiteness of the NP in (2) can be explained. But Löbner has to construct functional dependencies on situations and other entities to explain the definiteness in (1) and (3).

Each of the three discussed theories is quite successful in their primary domain but fails to describe other uses in the same adequate way. A more general approach to definiteness seems necessary. The general function of the definiteness lies neither in uniqueness nor in anaphorical linkage or functional use but rather in the very property of referring to a salient object. This view is advocated by Lewis (1979) who explicitly rejects Russell´s uniqueness claim: "It is not true that a definite description 'the F' denotes x if and only if x is the one and only F in existence." He considers following examples:

(4) The pig is grunting, but the pig with floppy ears is not grunting.
(5) The dog got in a fight with another dog.

In both examples, two definite NPs with the same descriptive content introduce two

different individuals each into the discourse. Thus, the definite NPs must refer uniquely according to another and more general principle. Lewis names this principle *salience*: "The proper treatment of description must be more like this: 'the F' denotes x if and only if x is the most salient F in the domain of discourse, according to some contextually determined salience ranking" (Lewis 1979:178). This view on definiteness is called pragmatic since it needs essentially pragmatic information in form of a salience hierarchy for fixing the referent of a definite NP. The next section is devoted to the formal representation of this theory.

4. Context Dependent Choice Functions

The classical epsilon operator was introduced by Hilbert & Bernays (1939) for metamathematical purposes. It is interpreted by a choice function, that assigns to each non empty set one of its elements and to the empty set an arbitrary element. One could say that a choice function picks the first element out of a set. Since in mathematics the objects are naturally ordered a choice function always selects defined elements out of a given set (e. g. the smallest number or largest number). However, natural language expressions do not refer to naturally ordered sets but to sets of objects whose order may vary with the linguistic context or the non-linguistic situation. Therefore, we do not use one choice function, but a family of choice functions that vary according to the situation or context (cf. Egli 1991; von Heusinger 1992).

The definite NP *the F* is represented by the modified epsilon term $\varepsilon_i x\, Fx$ that selects the most salient F according to the order (or choice function) *i*. The context *i* assigns a certain order to the given set *F* and then the epsilon operator can select the first F out of this set. In this view the definite article gets a proper meaning, namely that of a context dependent choice function. The context index of the epsilon operator represent the relevant contextual or pragmatic information, namely the salience hierarchy. The theory does not claim anything about the derivation of such salience hierarchies, but it integrates a given hierarchy into the semantic representation.

According to the epsilon theory, both definite and indefinite NPs are uniformly represented as modified epsilon terms. The definiteness of an expression is not part of its lexical meaning but it is rather a condition on the salience hierarchy according to which the expression is interpreted. An expression is definite if it is interpreted according to a determined choice function. An expression is indefinite if it is interpreted not to a given choice function but to a new one. Generally, we can reduce the concept of definiteness to the dependence of choice functions. We formulate the following conditions:

(6) An expression $\varepsilon_i x\, Fx$ is definite if its context index *i*
- (i) corresponds to a global order or
- (ii) if it is determined by the local context or
- (iii) if it is a function of the linguistic discourse.

5. Definite NPs as Context Dependent Epsilon Terms

We are now in a position to give a formal account of the example discussed in section 2. The situational use of definite NP, as illustrated in (3), is the prototypical use for Lewis´ salience theory. The modified epsilon term $\varepsilon_i x\ City(x)$ in (7) represents the

definite NP *the city* in (3). The epsilon term is interpreted as the context dependent choice function that selects the most salient city in the context i. Thus, the index *i* is determined by the local context (cf. (6ii)). The functional use of definite NP as in (2) does not cause any problem for the present approach since a unique concept always yields exactly one object regardless of the choice. Sentence (2) is assigned the logical form (8) with the complex epsilon term. This term is interpreted by a context dependent choice function that selects one element out of the set of mayors that are the mayors of an arbitrary chosen city in Wales. Since there is only one mayor of this town, the term refers exactly to this mayor in all possible circumstances. Due to the complex character of epsilon terms, the functional use can be subsumed under the present analysis.

The anaphorical use of the definite NP *the man* in (1) can be explained by representing it with the epsilon term $\varepsilon_{f(i)}x\ Man(x)$. The context index does not depend on the physical environment or the background knowledge, but it is determined by the linguistic discourse. This is indicated by the function *f(i)* which expresses that the choice function is updated by the linguistic environment. In this example, the preceding indefinite NP *a man* raises a new referent to salience. The modified salience hierarchy is passed on to the second sentence by the updated choice function such that the definite NP refers to the same referent as the indefinite.

(7) $\text{Small_but_beautiful}(\varepsilon_i x\ \text{City}(x))$
(8) $\text{Woman}(\varepsilon_i x\ [\text{Mayor_of}(x, \varepsilon_j y\ \text{Small_Town_in_Wales}(y))])$
(9) $\text{Walks}(\varepsilon_i x\ \text{Man}(x)) \ \&\ \text{Smiles}(\varepsilon_{f(i)} x\ \text{Man}(x), \varepsilon_j y\ \text{Woman}(y))$

6. Conclusion

The epsilon analysis of definite NPs combines the pragmatic view of Lewis with the formal transparency of Russell and the dynamic interpretation of Heim. Definite and indefinite NPs are uniformly represented as context dependent epsilon terms. Definiteness is considered as a restriction on salience hierarchies which are reconstructed as choice functions. Starting from the situational use of definite NPs, it was shown that all main uses of definites can be described by complex epsilon terms.

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