Exactly reading vs. at least reading of NPs with a numeral determiner

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논문 초록

서수 한정사의 수식을 받는 명사구는 "정확히"의 의미와 "적어도"의 의미를 둘 다 가질 수 있다. Horn(1972)과 Kadmon(1985, 1987, 2001)은 "적어도"의 의미를 의미론적 의미로, "정확히"의 의미를 화용적 의미로 분석하고, Kamp는 그 반대 입장을 취한다. 그러나 서수 한정사의 의미를 그 의미 구조와 무관하게 일률적으로 분석하는 이런 접근 방식은 양쪽 중 어떤 입장을 취하든 다음의 두 사실을 설명할 수 없다.(i) 서술구에 쓰인 서수 한정사는 항상 "정확히"의 의미만을 갖는다. (ii) 초점을 받는 서수 한정사도 항상 "정확히"의 의미만을 갖는다. 이 연구는 초점 구문에 대한 논리-의미적 분석 방법에 근거하여 서수 한정사의 중의성의 의미를 설명한다. 구체적으로, 서수 한정사는 통사적 논항에 나타나든 통사적 서술구에 나타나든 상관없이 의미적으로 동일성의 서술구에 나타나면 항상 "정확히"의 의미만을 갖게 되고 의미적 주부에 나타나면 "적어도"의 의미를 갖게 된다는 사실을 보인다.

I. Introduction

NPs with a numeral determiner (*n CN*, henceforth) can have both "exactly" reading and an "at least" reading. For instance, sentence (1) can mean (2), yielding an exactly reading, but it is also compatible with the sentence (3), yielding an at least meaning.

(1) Lisa has three cats.
(2) Lisa does not have more than three cats.
(3) Lisa has three cats. In fact, she has five.

While Horn (1972) and Kadmon (1985, 1987, 2001) treated the "at least" reading as the

only semantic reading and gave a pragmatic explanation for the "exactly" reading as a scalar implicature, Kamp proposed the opposite analysis: that the "exactly" reading is semantic and the "at least" reading is pragmatic. These approaches to this issue, regardless of which side they stand on, cannot explain the following two facts, however.

(i) Numeral expressions in predicative positions do not get the "at least" readings, but the "exactly" readings only.
(ii) Focused numeral determiners render the "exactly" meaning only.

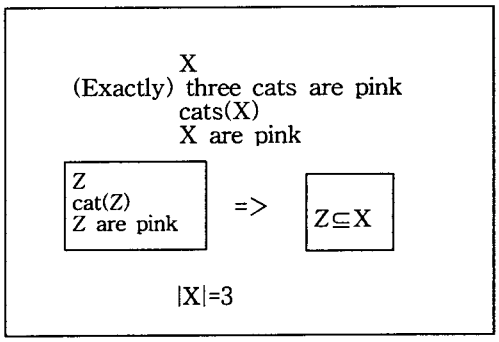
This paper provides an account for these two observed facts.

2. Previous Studies

2.1 Kamp's analysis

n CN and *exactly n CN* have the identical representations.

(4)



- 'exactly' is the semantic reading and 'at least' is created pragmatically: when this DRS is evaluated with respect to a restricted domain.

(ex) It could be evaluated with respect to the domain of all the animals on the neighborhood which the speaker knows about, in which case it would claim that there are exactly three pink cats that the speaker knows of in the neighborhood.

2.2 Kadmon's counterclaim

i) Sometimes it is impossible to define a domain with respect to which the sentence could

be evaluated so as to give it its "at least" reading.

(5) Leif has four chairs.

When Leif has ten identical chairs; when there is no way of construing (5) as claiming that inside some domain (which is sufficiently narrow), there are exactly four of Leif's chairs.

ii) According to Kadmon, (6) cannot be true when Leif has ten chairs.

(6) Leif doesn't have four chairs.

Under the "exactly" semantics plus domain narrowing approach of Kamp, a wrong prediction is yielded: (6) would mean "Leif has exactly four chairs", and this could be true if Leif has more than four chairs.

iii) It fails to distinguish NPs of the form *n CN* from NPs of the form *exactly n CN*.

2.3 Kadmon's proposal

- the "at least reading" of *n CN*: just like Kamp and Heim's indefinites

(7)

X
Three cats are pink
cats(X)
X are pink
|X|=3

- the "at least" reading: a semantic meaning from DRS (7)
- the "exactly" reading (8):

a pragmatic meaning; scalar implicature; added to DRS later; cancellable

(8)

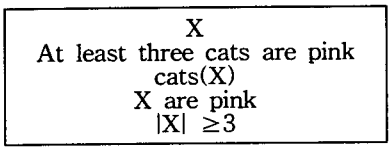
Z
cat(Z)
Z are pink

=>

Z⊆X

- [at least n] CN

(9)



2.4 Problems

2.4.1 Problem 1

In predicative position as in (10) and (11), we do not get the "at least" readings but the "exactly" readings only.

(10) The guests are four women and one man.

(11) Bill, John and Adam are two boys.

(10) cannot mean that there are at least 4 women and one man among the guests, and (11) is false. The previous accounts cannot provide an explanation of why *n CN* CANNOT have the "at least" reading in predicative positions, but CAN in argument positions.

2.4.2 Kadmon's answer

- Assumption: A numeral *n* is invariably adjectival -- it is nothing but the predicate that sets the cardinality of a set as equal to *n*.
- Explanation: In predicative positions, the expression *n CN* functions as a predicate.
  In argument positions, *n CN* functions as a full indefinite NP.
- In DRT terms, *n CN* in argument positions introduce a new discourse referent into the DRS, and in predicative position, it will be treated as any other predicate.

2.4.3 Problem 2

(12) is OK and suggests the "exactly" reading, contrary to Kadmon's claim in (6).

(12) She doesn't have THREE cats --She has SEVEN.

2.4.4 Kadmon's answer

(12)'s negation is not logical negation, but "metalinguitic negation" in the sense of Horn 1985.

"The speaker does not say that the sentence she has three cats is false, but rather rejects this sentence because it commonly gives rise to a scalar implicature, and therefore tends to suggest that "she" has exactly three cats."

2.5 My Objection against Kadmon

(i) Kadmon's solution for problem 1 is OK, but problem 2 is not nicely treated.

a. The notion of metalinguistic negation is controversial: Geurts (1998) argues for the truth functional nature of the so-called metalinguistic negation.

b. Contrary to Kadmon, when focused, a numeral determiner has the "exactly" reading only in argument positions as well as in the predicative positions.

(13) Q: How many cats are pink?
A: $[\text{TWO}]_F$ cats are pink.
B: No, $[\text{THREE}]_F$ cats are pink.

- If the *n CN* in (13A) could yield the "at least" reading, there would be no point here to negate (13A) by *no* in (13B), since it would be still compatible with (13A) without negation.
- By negating (13A), the focused numeric determiner reasserts the exact number of the cats which are pink.

(13') A: Two cats are pink.
B: No, $[\text{THREE}]_F$ cats are pink. ?And actually, FIVE cats are pink.

A reasonable speaker would not add the second sentence in this context. If the speaker found out that the number of cats is not three, he would certainly say the following.

(13'') A: Two cats are pink.
B: No, [THREE]F cats are pink. ....Oh, no. FIVE cats are pink.

- Indicates that a focused numeric expression expresses the "exactly" reading only, but not the "at least" reading.

(14) A: I need two dimes to buy candy from this vending machine. Does anybody have?
B: I have two dimes.
H* L L%

(15) A: I need some dimes for the vending machine.
B: Well, I have [TWO]$_F$ dimes. (Will that be enough?)
H* L L%

While (14B) and (15B) consist of exactly the same string of words, they have different truth conditions depending on the different placements of focus. Without a focal accent on two as in (14B), even if speaker B had more than two dimes, B's utterance would not be false. But with a focus on two as in (15B), the sentence should be considered false in the same situation. This indicates that prosodic focus affects the truth condition and yields a semantic "exactly" reading of numeric determiner of "two".

(ii) While Kadmon proposes two different solutions for the two problems, I argue that two problems can be uniformly explained in a nicer and neater way.

3. My solution

3.1 My proposal

The choice between the "exactly" and the "at least" reading of a numeral determiner depends on the *semantic structure* of a sentence.

i) Numeral determiners can express the "exactly" reading only in a *semantic predication*, excluding the "at least" reading.
ii) Non-isomorphism between the syntactic subject-predicate structure and the semantic subject-predicate structure: A focus can yield a *semantic subject-predicate* structure different from the surface *syntactic subject-predicate* structure. (Frege 1982, Peregrin 1995, Wee 2001)
- Topic-focus structure of a sentence in Prague approach is viewed as a

logico-semantic structure rather than a pragmatic structure.

- Frege (1982) sees the semantic subject-predicate pattern as constitutive of the object-concept opposition, and remarks that it need not be the grammatical subject which act as the semantic or logical one.
- On syntactic level the subject-predicate pattern means that a typical sentence consists of a subject (nominal phrase) and a predicate (verbal phrase)

(16) John walks. Walk{john}

- On semantic level it means that the content of a typical sentence can be considered as an assignment of a property to an object.

(17) JOHN walks. λf.f(john){walk}

3.2 Semantic predication

(18) The semantic function of predication is to turn a property expression of type π, assigned to the constituent XP, into a propositional function (an unsaturated expression) of type <e, t>, whose argument position is then saturated by the entity expression ... (Chierchia 1985, 1989; Chierchia and Turner 1988)

3.3 Semantic predication in a focused sentence

- LF representations for the focused sentences in (19aB) and (19bB) (Chomsky 1971),

(19) a. A: Who ate the pie? B. [JOHN]F ate the pie.
b. A: What did John eat? B: John ate [the PIE]F.

(20) a. the *x*, such that x ate the pie, is John. b. the x, such that John ate x, is the pie.

- The variable bound by the definite quantifier *the* in (20a, b), which implies the maximal/unique assignment as a definite description, is assigned a value by the primitive **predicate of equality** (i.e. the specification or equative *be*).

(20a') a. the *x*, such that x ate the pie, **is John.**

- Semantic predicate part (the bold faced part); predicate of equality (Zubizarretta 1998, E Kiss's (1998) identificational focus, Wee 1999)

(21) λy (y=john) --> propositional function of type <e, t>

- Semantic subject part: a definite referent with the property of the focus frame, the underlined part (Wee 1999, Chomsky 1971); Uniqueness of definite expression (Link 1980, Kadmon1990)

(22) ιx[x∈λ x [x ate the pie] ∧∀x'∈λ x' [x' ate the pie] [x'≤x]
= max(λ x [ate (x, the pie)]) --> entity expression

- Focal Predication (function application):
(23) λy (y=john) {max(λ x [ate (x, the pie)]}

- Semantic subject-predicate structure:
(24)max(λ x [ate (x, the pie)] = john

Likewise, the LF representation in (11) for (13B) implies that the maximal/unique assignment for the variable *x* equals to the assignment for the number three, which entails that there is no value for the variable *x* other than number three.

(13B) The x, such that x number of cats are pink, is number 3.

By analyzing the focused constituents as occurring in the *semantic predicative* position as shown in the LF representations of a focused sentence, as in (20a,b), and accordingly as having the same semantic function as the surface syntactic predication of the *n CN*s in (10) and (11).

3.4 Explanation of DATA

3.4.1 Numeric determiner in a syntactic predicate
(10) The guests ***are four women and one man***.

Semantic (and syntactic) Subject: "The guests"
(25) [the N] = max([N])
[the guests] = max([guests]) = ιx[x∈ [guests] ∧∀x'∈ [guests] [x'≤x]

Semantic (and syntactic) Predicate: "***are four women and one man***"
(26) λy (y= ⟦ four women and one man ⟧); Predicate of equality

Predication:
(27) λy (y= ⟦ four women and one man ⟧) {max(⟦ guests ⟧ }
max(⟦ guests ⟧) = ιx [x∈ ⟦ women ⟧ and |x|=four] + ιy [y ∈ ⟦ man ⟧ and |y|=one]

3.4.2 Numeric determiner in focus

(13) A: TWO cats are pink.
B: No, [THREE]$_F$ cats are pink.

Following (20), (13B) converts into the following semantic structure.

(13B) the x, such that x number of cats are pink, ***is three***.
- Semantic subject: *the x, such that x number of cats*

(28) ιx[x∈λx[x number of cats are pink]∀x'∈λx'[x' number of cats are pink][x'≤x]]
= max(λ x [x number of cats are pink])

- Semantic Predicate: "*is three*"
(29) λy (y = 3)

Predication:
(30) λy (y = 3) {max(λ x [x number of cats are pink])} -->
max(λ x [x number of cats are pink]) = 3

- Given this formula true, the x should not be any number bigger than 3, yielding the "exactly reading".

3.4.3. Disambiguation of Generic sentences

(31) German is spoken in Australia. -- true
(32) German is spoken in AUSTRALIA. -- false

"Australia is the country, or at least the most representative country in which German is spoken." (Peregrin 1995 P.244)

- Semantic subject part:

(33) $\iota x[x \in \lambda\, x \ [\![\text{German is spoken in } x]\!] \wedge \forall x' \in \lambda\, x' \ [\![\text{German is spoken in } x']\!] \ [\![x' \leq x]\!]$
= max(λx [German is spoken in x])

- Semantic predicate part:

(34) λy (y=Australia) ; Predicate of equality

- Focal Predication:

(35) λy (y=Australia) {max(λx [German is spoken in x])}
=> max(λx [German is spoken in x])=Australia --- FALSE

4. Conclusion

i) Differences in topic-focus mean differences in the "deep word order" which may result in the different truth conditional meaning.
ii) With a proper logico-semantic analysis of focus phenomena, we could explain the ambiguity of the "exactly" reading and the "at least reading" of a numeral expression.
iii) When a numeral expression occurs in a *semantic predicate of equality,* regardless of its syntactic structure, it renders the "exactly" reading.
iv) The propositional meaning of a sentence yielded without considering its focus structure is compatible with the "at least reading."

(36) (a) Lisa has three cats. In fact, (b) she has FIVE cats.
(37) A: I need three cats. Does Lisa have three cats perhaps?
B: Yeah. Lisa has three cats. In fact, she has FIVE cats.
H* H*

- The semantic structure of (36a) is different from that of (36b).
"three cats" in (36a) occurring in the context of (37B)is an indefinite: It is compatible with the reading that Lisa has more than three cats.
- The semantic structure of (36b):

(38) max(λ x [Lisa has x number of cats] = five (due to the focus structure)

v) The ambiguity between the "at least" reading and the "exactly" reading is due to the different semantic structures of the two.

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