

Propositional Negation and Constituent Negation

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Many linguists use constituent negation (negation of non-sentential, i. e. non-propositional constituents) in the semantic analysis of sentences.¹ Ikeya 1977 presents a semantic analysis that uses constituent negation. This paper criticizes such an analysis, and discusses some of the problems and difficulties involved in the use of constituent negation, and gives an alternative semantic analysis that does not use constituent negation.

Ikeya says that (1) is a case of adverb negation, and represents its meaning by (2).²

- (1) He did not test the bulb slowly.
(2) a. he [[not slowly] [test the bulb]]
b. [[$\sim \xi$] ($\wedge \lambda x Pxb$)] (a)

where : ξ : slowly, i. e. “ ξ ” is the semantic representation of *slowly*.

Pxb : x test the bulb a : he

$\lambda x Pxb$: the set of x such that Pxb , i. e. the set of persons who test the bulb

$\wedge \lambda x Pxb$: property of being a person who tests the bulb
 $\sim \xi$: not slowly

Ikeya argues that since (1) entails (3), only the adverb *slowly* is negated.

- (3) He tested the bulb.

However we could explain the semantic relation between (1) and (3) without using constituent negation. If (1) is a case of propositional negation (which corresponds to sentential negation on the syntactic level), its semantic representation would be (4).

- (4) a. not [he [showly [test the bulb]]]
 b. $\sim [[\xi (^{\lambda}x Pxb)] (a)]$

It is predictable that (1) does not negate (3), since, if (3) were negated, then (4) would have nonsensical meaning (5).³

- (5) a. he [slowly ($^{\lambda}x$ [not [x test the bulb]])]
 b. $[\xi (^{\lambda}x \sim Pxb)] (a)$

(5) does not make sense because it claims that non-occurrence of an action (i. e. not testing the bulb) was slow. Since (5) is impossible, (4) has to imply (3) in ordinary discourse context. Therefore, we cannot reject (4) for the reason that (1) entails (3).

The anomaly of (6) and (7) is explained by the anomaly of (5).

- (6) *He slowly didn't test the bulb.
 (7) *Slowly he didn't test the bulb.

We have to prevent Topicalization or Adverb Placement from preposing adverb *slowly* of (4) across the boundary of the scope of the negative. It can be prevented by a general constraint on VP-adverbs.

Ikeya also analyzes the meanings of (8), (9) as (10), (11) respectively by means of VP-Adverb Negation.⁴

- (8) He definitely did not speak to the people.
 (9) He didn't definitely speak to the people.
 (10) a. he [definitely ($^{\lambda}x$ [not [x speak to the people]])]
 b. $[\xi (^{\lambda}x \sim Pxb)] (a)$

where : ξ : definitely ; Pxb : x speak to the people.

- (11) a. he [[not definitely] ($\wedge \lambda x$ [x speak to the people])]
 b. [[$\sim \xi$] ($\wedge \lambda x$ Pxb)] (a)

But we could represent the meaning of (9) by (12) with a propositional negation.

- (12) a. not [he [definitely ($\wedge \lambda x$ [x speak to the people])]]
 b. \sim [[ξ ($\wedge \lambda x$ Pxb)] (a)]

It might be argued that (9) entails (13) but not (14).

- (13) He spoke to the people.
 (14) not [he spoke to the people]

But it is not obvious that (11) entails (13). If the semantic representation of (9) should indicate that it entails (13), it should distinguish the assertion and the presupposition as in (15).

- (15) Presupposition : He spoke to the people.

Assertion : not [he [definitely ($\wedge \lambda x$ [x speak to the people])]]

Ikeya classifies *intentionally* as an adverb whose scope is always outside the scope of *not* except when the adverb occurs immediately after *not*. He claims that (16), (17), and (18) are synonymous, and analyzes them as (16b), (16c), but analyzes (19a) as (19b), (19c).⁵

- (16) a. He intentionally did not test the bulb.
 b. he [intentionally ($\wedge \lambda x$ [not [x test the bulb]])]
 c. [ξ ($\wedge \lambda x$ [\sim Pxb])] (a)

where : ξ : intentionally ; Pxb : x test the bulb ; a : he

- (17) He did not test the bulb intentionally.
 (18) Intentionally, he did not test the bulb.
 (19) a. He did not intentionally test the bulb.
 b. he [[not intentionally] ($\wedge \lambda x$ [x test the bulb])]
 c. [[$\sim \xi$] ($\wedge \lambda x$ Pxb)] (a)

But we do not believe that VP negation is necessary for the

semantic analysis of these sentences. We could analyze (19a) as (20) by propositional negation.

(20) not [he [intentionally [test the bulb]]]

If (19a) entails (21), we could indicate that by distinguishing presupposition and assertion as in (22).

(21) He tested the bulb.

(22) Presupposition : He tested the bulb.

Assertion : not [he intentionally tested the bulb]

If only propositions are negated, the semantic function of negation can be defined by the change of the truth value of the negated proposition. For any proposition p , if p is true, $\sim p$ is not true, and vice versa. Negative belongs to the syntactic category "S/S" since it maps a sentence into another sentence. On the semantic level, negative belongs to the semantic type $\langle\langle s, t \rangle, t\rangle$ since it maps a proposition into another proposition. But how could constituent negation be defined? How could its syntactic category or semantic type be determined? Though Ikeya does not give any, let us assume a definition of constituent negation (23).

(23) Constituent negation

$$[x \sim a y] = [x y] \& \sim [x a y]$$

where : a is a logical expression (i. e. a semantic unit of some type) ; $[x a y]$ and $[x y]$ are propositions.

According to (23), we cannot assign to the negative a single syntactic category nor a single semantic type. A negative that negates a VP is like a VP-adverb since it maps a VP into another VP. Such a negative belongs to the same syntactic category "VP/VP" and the same semantic type $\langle\langle s, \langle e, t \rangle \rangle, \langle e, t \rangle\rangle$ as VP-adverbs. When a negative negates a VP-adverb, its syntactic category is (VP/VP) /

(VP/VP), and its semantic type has to be $\langle\langle s, \langle\langle s, \langle e, t \rangle \rangle, \langle e, t \rangle \rangle \rangle, \langle\langle s, \langle e, t \rangle \rangle, \langle e, t \rangle \rangle \rangle$. If we allow constituent negation, we will have to have as many negatives of distinct syntactic categories and semantic types as there are syntactic categories.

There are exceptions for which (23) cannot be used. Quantifiers are one kind of such exceptions since the sentential complement of a quantifier is not a proposition but a propositional function. If we applied (23) to a proposition with a universal or an existential quantifier as in (24), the result would be uninterpretable.

$$(24) \text{ a. } \bar{\forall}x Px = \sim[\forall x Px] \ \& \ Px$$

$$\text{ b. } \bar{\exists}x Px = \sim[\exists x Px] \ \& \ Px$$

where : $[\forall x Px]$ is a notational variant of $[[\sim\forall x] Px]$, in which only the quantifier is negated.

Therefore, negation of a quantifier must be defined independently of (23) if it is to be defined.

Ikeya interprets (25a), (26a) as equivalent to (25b), (26b) though it is not clear why he can do so.⁶

$$(25) \text{ a. } \bar{\forall}x Px \qquad \qquad \qquad \text{ b. } \exists x Px$$

$$(26) \text{ a. } \bar{\forall}y [[\xi (\wedge \lambda x Pxy)] (a)]$$

$$\text{ b. } \exists y [[\xi (\wedge \lambda x Pxy)] (a)]$$

He seems to accept the following equivalence relations among negated and non-negated quantifiers.

$$(27) \text{ a. not [a few] = most}$$

$$\text{ b. not most = a few}$$

$$\text{ c. not several = several}$$

For example, he claims that (28a) has (28b) as one of its readings.

$$(28) \text{ a. John did not date a few girls.}$$

$$\text{ b. John dated most girls.}$$

There are many other cases for which (23) cannot be used, but we will ignore them because (23) is not explicitly claimed in any place.

Ikeya does not think that (29a) is just the negation of (29b), but argues that (29a) has the four readings of (30)–(33), depending on the stress contour.⁷

- (29) a. He did not test all the bulbs slowly.
 b. He tested all the bulbs slowly.
- (30) a. He tested some of the bulbs slowly.
 b. $\overline{\text{all}}_y$ [he tested the bulbs_y slowly]
 =some_y [he tested the bulbs_y slowly]
 c. $\overline{\forall}_y$ [[ξ ($\wedge \lambda x$ Pxy)] (a)]
- (31) a. He tested some of the bulbs quickly.
 b. $\overline{\text{all}}_y$ [he [$\overline{\text{slowly}}$ [tested the bulbs_y]]]
 =some_y [he [quickly [tested the bulbs_y]]]
 c. $\overline{\forall}_y$ [[ξ ($\wedge \lambda x$ Pxy)] (a)]
- (32) a. He tested none of the bulbs slowly.
 b. all_y [he [$\overline{\text{slowly}}$ [tested the bulbs_y]]]
 c. \forall_y [[ξ ($\wedge \lambda x$ Pxy)] (a)]
- (33) a. He tested all the bulbs quickly.
 b. all_y [he [$\overline{\text{slowly}}$ [tested the bulbs_y]]]
 =all_y [he [quickly [tested the bulbs_y]]]
 c. \forall_y [[ξ ($\wedge \lambda x$ Pxy)] (a)]

To make the discussion simpler, let us assume that *not slowly* means ‘quickly’, ignoring the difference between them. Though Ikeya says that (30a) is one of the four readings of (29a). (29a) cannot be used to convey the information expressed by (30a). (30a) represents only one of the situations in which (29a) can be uttered. In other words, (30a) represents only one of the possible presuppositions of

(29a). It does not express the new information conveyed by (29a).

In (31), the negation line extends over both the quantifier and adverb, but the quantifier and the adverb together do not form a constituent. In other words, two independent constituents are negated in (31). In (32), though the negation line is over the adverb *slowly*, (32a) does not use *quickly* instead of *slowly*. This may appear inconsistent, but it seems that the VP *tested the bulbs slowly* is treated as a single unit and is negated as a whole as in (34).

(34) all_y [he [not [tested the bulbs_y slowly]]]

Though (29a) is said to have the four readings of (30)–(33), it is not explained why it has exactly these four readings. There does not seem to be any reason why it should not have other readings such as (35).

- (35) a. He did not test some of the bulbs slowly.
 b. $\overline{\text{all}}_y$ [he [slowly [tested the bulbs_y]]]
 c. $\overline{\forall}_y$ [[ξ ($\wedge \lambda x$ Pxy)] (a)]

Suppose any constituent and any combination of constituents can be negated (as it is assumed in Ikeya 1977 with respect to (31), and take, for example, (36), which consists of three constituents: *John*, *love*, and *Mary*.

- (36) a. John loves Mary.
 b. Love John Mary.

The negative sentence (37) would have seven different readings of (38).

(37) John does not love Mary

- (38) a. $\overline{\text{Love}}$ John Mary.

John does not love Mary. He is just friends with Mary.

- b. Love $\overline{\text{John}}$ Mary

John does not love Mary. Tom loves her.

c. Love John $\overline{\text{Mary}}$

John does not love Mary. He loves Susie.

d. $\overline{\text{Love John Mary}}$

John does not love Mary. Tom is just friends with Mary.

e. $\overline{\text{Love John}} \overline{\text{Mary}}$

John does not love Mary. He is just friends with Susie.

f. Love $\overline{\text{John Mary}}$

John does not love Mary. Jimmy loves Martha.

g. $\overline{\text{Love John}} \overline{\text{Mary}}$

John does not love Mary. Jimmy is just friends with Martha.

In general, if a proposition consists of n constituents, its propositional negation would be $2^n - 1$ ways ambiguous because there will be $2^n - 1$ distinct constituent negations.

Once constituent negations are introduced, propositional negations would be ambiguous and incomplete. For the sake of consistency, we would want to reduce every propositional negation to one of the constituent negations, and to dispense with all propositional negations. But that is not possible. Propositional negation is needed. For example, sentences like (39) are used for propositional negation.

(39) a. It is not true that John tested all the bulbs slowly.

b. It is not the case that John tested all the bulbs slowly.

Such sentences are used to indicate that what is stated by the complement clause is not true as a whole. It is against intuition to consider (39) ambiguous as to the scope of negation. Nor is it possible to reduce them to any of the constituent negation without arbitrariness. Adoption of constituent negation does not make propositional negation unnecessary, but it would have to be adopted in addition

to propositional negation.

Negation is only one of the modals. If constituent negation should be adopted in addition to propositional negation, we would have to do the same with other modals, too, if we want to be consistent. We would have to adopt constituent modalization in addition to propositional modalization. For example, (40) would be ambiguous between readings like (41), (42), (43), etc., in which constituents within the scope of modal *may* are indicated by double line.

(40) He *may* have tested all the bulbs slowly.

(41) a. (He tested some of the bulbs slowly.) He *may* have tested all of them slowly.

b. [may all_y] [he [tested the bulbs_y slowly]]

c. $\bar{\forall}_y$ [[ξ ($\wedge \lambda x$ Pxy)] (a)]

(42) a. (He tested all the bulbs.) He *may* have tested all of them slowly.

b. all_y [he [[may slowly] [tested the bulbs_y]]]

c. $\forall y$ [[$(\bar{\xi})$ ($\wedge \lambda x$ Pxy)] (a)]

(43) a. (He tested some of the bulbs.) He *may* have tested all of them slowly.

b. [may all_y] [he [[may slowly] [tested the bulbs_y]]]

c. $\bar{\forall}_y$ [[$\bar{\xi}$ ($\wedge \lambda x$ Pxy)] (a)]

Not only with modals like *may*, *must*, *likely*, etc., but also with non-factive predicates like *think*, *want*, etc., we would have to do the same to make our analysis consistent. For example, in discourse (44), what is in the scope of predicate *I think* in (44b) would be the part with a double line.

(44) a. A : Someone has tested some of the bulbs carefully.

b. B: I think John has tested all of the bulbs carefully.

c. $[[[I \text{ think}] \text{ all}_y] [[I \text{ think}] \text{ John}] \text{ has tested the bulbs}_y \text{ carefully}]$

d. $\bar{\bar{V}}_y [[\xi (\wedge \lambda x Pxy)] (\bar{j})]$

where : j : John ; ξ : carefully

Note that *think* normally takes only a sentential complement, but it takes a quantifier and *John* as its complement in (44c), (44d), and thus belongs to several distinct semantic types.

It might be argued that constituent negation is needed in order to make our semantic representations more precise, but all the semantic distinctions that constituent negation (and constituent modalization) tries to make can be made by presuppositions. Distinction of presupposition and assertion is independently motivated in the grammar. It is necessary not only in the semantic representation, but also in the syntactic structure since it controls some of the syntactic rules.⁸ (45a), for example, which is the negation of (45b), can be analyzed as propositional negation as in (46).

(45) a. He did not test all the bulbs carefully.

b. He tested all the bulbs carefully.

(46) a. not $[all_y [he [carefully [tested the bulbs_y]]]]$

b. $\sim [V_y [[\xi (\wedge \lambda x Pxy)] (a)]]$

Let us assume that it consists of three constituents : *all_y*, *carefully*, and *tested the bulbs_y*, and ignore their internal structure.

If we ignore presuppositions, (45a) is not ambiguous, and (46) shows its semantic structure. But it becomes ambiguous if presuppositions are taken into consideration. The following are some of the possible presuppositions.

(47) a. $all_y [he \text{ tested the bulbs}_y]$

b. $some_y [he [carefully [tested the bulbs_y]]]$

c. some_y [he tested the bulbs_y]

Whenever (47a) and/or (47b) is presupposed, (47c) has to be presupposed. Depending on what is presupposed, (45a) can be paraphrased by any of, (48—51), in which the sentence in parentheses represents the presupposition.

(48) a. (He tested all the bulbs, some of them carefully.) But he didn't test all the bulbs carefully.

b. presupposition : (47a) and (47b)

(49) a. (He tested some of the bulbs carefully.) But he didn't test all the bulbs carefully.

b. presupposition : (47b)

(50) a. (He tested all the bulbs.) But he didn't test all the bulbs carefully.

b. presupposition : (47a)

(51) a. (He tested some of the bulbs.) But he didn't test all the bulbs carefully.

b. presupposition : (47c)

The scope ambiguity of sentences with a modal other than the negative can be explained in the same way. For example, (52a) is a modalization of (52b), but depending on which of (47) is presupposed, we can explain the scope ambiguity of (52a) as in (53—54).

(52) a. He may have tested all the bulbs carefully.

b. He tested all the bulbs carefully.

(53) a. (He tested all the bulbs, some of them carefully.) He may have tested all the bulbs carefully.

b. presupposition : (47a) and (47b)

(54) a. (He tested some of the bulbs carefully.) He may have tested all the bulbs carefully.

b. presupposition : (47b)

55 a. (He tested all the bulbs.) He may have tested all the bulbs carefully.

b. presupposition : (47a)

56 a. (He tested some of the bulbs.) He may have tested all the bulbs carefully.

b. presupposition : (47c)

we do not know yet exactly how to define the notion “relevant presupposition”, and there seem to be involved a variety of pragmatic considerations (which involve our knowledge of this world).⁹

On the surface structure, there may appear to be cases of non-sentential negation as in (57).

- (57) a. I hit him, but *not with a hammer*.
 b. He is my cousin, *not my brother*.
 c. I come to bury Caesar, *not to praise him*.
 d. *Not every* soldier is willing to fight.

We might call these examples “negation of a prepositional phrase, noun phrase, infinitive, quantifier, etc.” on the surface syntactic level. But for each of these, there corresponds a sentential negation like (58) that paraphrases it.

- (58) a. It is not the case that I hit him with a hammer.
 b. It is not the case that he is my brother.
 c. It is not the case that I come to praise him.
 d. It is not the case that every soldier is willing to fight.

Examples like (57) are not evidence for non-sentential negation on the semantic level or even on the underlying syntactic level.

Conclusion

We have argued above that :

1. The meaning of constituent negation is not clear unless it is defined by a combination of propositions and negated propositions. Propositional negation is necessary, and cannot be replaced by constituent negation. Introduction of constituent negation does not simplify the grammar, but complicates it.
2. Introduction of constituent negation will result in introduction of constituent modalization for each modal and non-factive predicate. This adds to the complexity of the grammar.
3. The scope ambiguity that constituent negation tries to explain is explained even better by distinguishing presuppositions in the semantic representation.
4. Distinction of presuppositions and assertions in the semantic representation as well as in syntactic structure is independently motivated in the grammar.
5. Therefore, constituent negation is unnecessary and inadequate in the semantic representations of sentences.

References

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Notes

1. Most semantic interpretivists use constituent negation in their semantic interpretation.
2. Tenses are ignored in our semantic representations since they are not directly relevant to the discussion. What Ikeya actually gives is (i) instead of (2a) or (2b).

(i) $(\sim \xi) \hat{x} Pxb$ (a) (= (22) in Ikeya)

Some brackets are omitted in (i), but what was intended by (i) is considered to be (2b). Individuals and concepts of individuals are not strictly distinguished in (i) or (2), but that will not affect the following discussion. According to analysis (2), *not slowly* in (1) is a VP-adverb, modifying *test the bulb*. *Not* in (1), therefore, belongs to the syntactic category "VP-Adverb / VP- Adverb" (in the Montague Grammar framework) since it maps a VP-adverb into another VP-adverb. It has to be distinguished from sentence-negating *not*, which belongs to the category "S/S" because it maps a sentence into another sentence.

3. (i) would be a VP negation, and VP negation is a constituent negation, but (ii) does not involve any VP negation.

(i) not [test the bulb]

(ii) λx [not [x test the bulb]] (= λx [x does not test the bulb])

(ii) represents the meaning of a VP [*do not test the bulb*].

4. Ikeya actually gives (i) and (ii) instead of (10) and (11).

(i) $\xi \sim \hat{x} Pxb$ (a) (= (28) in Ikeya)

(ii) $(\sim \xi) \hat{x} Pxb$ (a) (= (29) in Ikeya)

But we assume that he intended (10) and (11) by (i) and (ii). Note that what is negated in (i) is $\hat{\lambda}x Pxb$, which is not a proposition but an expression of the semantic type $\langle s, \langle e, t \rangle \rangle$, and which approximately means the property of being a person who tested the bulbs. In (10), only propositional negation is used.

5. Ikeya actually gives (i) instead of (16b) or (16c) as the semantic

representation of (16a), (17), (18), but analyzes (19a) as (ii) instead of (19b) or (19c).

(i) $\xi(\sim\text{Pab})$ (= (34) in Ikeya)

where: Pab: He tested the bulbs.

(ii) $(\sim\xi)\hat{x}\text{Pxb}$ (a) (= (29) in Ikeya)

Note that (i) analyzes *intentionally* as a sentential adverb, but (ii) analyzes *not intentionally* as a VP-adverb. Ikeya does not give any reason for that. (16b), (16c), (19b), (19c), treat both *intentionally* and *not intentionally* as VP-adverbs. It seems that (17) is ambiguous for many speakers as to the scope of negation.

6. Ikeya gives (i), (ii) instead of (26a) and (26b), but they are notational variants. cf. p. 31 of Ikeya 1977.

(i) $(\bar{y})\xi^{\wedge\lambda x}\text{Pxy}$ (a)

(ii) $(\underline{y})\xi^{\wedge\lambda x}\text{Pxy}$ (a)

7. Ikeya gives (i) and (ii) instead of (30a) and (31a), but he should have given the latter.

(i) He tested some bulbs slowly.

(ii) He tested some bulbs quickly.

8. See Muraki, 1974, 1978 for arguments for the necessity of distinguishing presuppositions in the underlying syntactic structure.
9. See Ota 1980 for pragmatic interpretation of presuppositions.