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A Paradox of the Negation of Change Sentences and Copular Sentences

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1. Introduction

The purpose of this paper is to present, within the Mental Space Framework (Fauconnier 1985, 1997), a paradox of the negation of the change predicate *naru* in Japanese and to show that the copula functions as a negative counterpart of *naru* despite their syntactic differences.

2. The constructive rule for the change predicate *naru*

Following Sakai (2004) we assume the constructive rule for the change predicate *naru* illustrated in (1).

(1) Constructive Rule of the sentence [$_{S1}$ (NP) [$_{S2}$P] naru][1]
a. M1: ? ¬P[2], where M1 is a viewpoint space
b. M2: P, where M2 is a focus space and M1 < M2[3]
c. The spaces M1 and M2 are linked by connectors.

The rule (1) assigns the sentences in (2a), (2b) and (2c) the space configurations in (3a), (3b) and (3-c) respectively.

(2) a. [$_{S1}$[$_{S2}$Daitooryoo ga Bush ni] naru]
president NOM COP become
Lit: The president becomes Bush.
"Bush becomes the president."
b. [$_{S1}$Ken$_i$ ga [$_{S2}$PRO$_i$ bengosi ni] naru]
NOM lawyer COP become
"Ken becomes a lawyer."
c. [$_{S1}$[$_{S2}$Otamazyakusi ga kaeru ni] naru]
tadpole NOM frog COP become
"A tadpole becomes a frog."

(3) a. (2a):
? M1: ¬[RVC (R) = x],
where R = president, x = Bush, RVC = role-value connector
M2: RCV (R') = x', where C (R) = R', C (x) = x' and M1 < M2
b. (2b):
? M1: x = Taro, ¬lawyer (x)
M2: x' = Taro, lawyer (x'), where C (x) = x' and M1 < M2
c. (2c)[4]:
? M1: tadpole (x)

M2: frog (x'), where C (x) = x' and M1< M2

In (3), the interpretations of the sentences rely on the types of Connector C, but this is not of interest here. It suffices to assume that C is an identity connector, giving rise to temporal interpretations. For example, (3c) represents the transformation of a tadpole into a frog[5].

3. The constructive rule for negation

We follow Sakai (2002) in assuming the constructive rule for negative sentences (4).

(4) The constructive rule for Mn: [ϕ nai]
Mm: $\neg\Psi$, where Mm is the focus space of ϕ,
and Ψ is the assertion of ϕ.
Otherwise the configuration is identical to the one constructed by Mn: [ϕ].

This rule can be justified independently of the change predicate *naru*. Applied to the sentences in (5a) and (6a), it yields the adequate representations in (5b) and (6b) respectively. Note that the negation operates only on the assertion of the sentence, leaving aside its presupposition marked by "?" in (5-6).

(5) a. M1: Tama wa siroi neko dewa nai.
TOP white cat COP NEG
"Tama is not a white cat."
b. ? M1: x = Tama[6]
M1: $\neg$[white (x) $\wedge$ cat (x)]

(6) a. M1: 2000 nen Tama wa nezumi wo toru no wo
year TOP mouse ACC catch COMP ACC
yame nakat-ta
stop NEG-PAS
"In 2000 Tama did not stop catching mice."
b. ? M1 : x = Tama
? M1 : catch-mice (x)
M1 : in 2000, [[M2]]
M2 : x' = Tama,
M2 : $\neg\neg$catch-mice (x') (= catch-mice (x'))
where C (x) = x', M1 < M2, M2 < S[7]

It is assumed here that the double negation can be eliminated from the representation. In (6b), the predication $\neg\neg$*catch-mice (x')* valid in M2 can be simplified as *catch-mice (x')*. The elimination of double negation in semantic representation as just seen should be clearly distinguished from the elimination of syntactic double negation[8]. Our argument developed below rests on the observation that a double negation which feeds the symbols $\neg\neg$ in a semantic representation cannot always be eliminated while the symbols can be deleted. This mismatch between syntax and semantics will play a crucial role in identifying a special character of the change predicate *naru*.

4. Negations of change sentences

4.1 Main clause negation and a theorem of the negation of the change predicate

Given the rules in (1) and (4), change sentences with main clause negation are processed as in (7)[9].

(7) The processing of [$_{S1}$ (NP) [$_{S2}$P] nara-nai]
? M1 : $\neg$P
M2 : $\neg$P

This correctly captures the semantics of (8), for example.

(8) a. [$_{S1}$[$_{S2}$Daitooryoo ga Bush ni] nara-nai]
president NOM COP become-NEG
Lit: The president does not become Bush.
"Bush does not become the president."

b. [$_{S1}$Ken$_i$ ga [$_{S2}$PRO$_i$ bengosi ni] nara-nai]
NOM lawyer COP become-NEG
"Ken does not become a lawyer."

c. [$_{S1}$[$_{S2}$Otamazyakusi ga kaeru ni] nara-nai]
tadpole NOM frog COP become-NEG
"A tadpole does not become a frog."

The processing of (8) is shown in (9).

(9) a. (10a):
? M1: $\neg$[RVC (R) = x],
where R = president, x = Bush, RVC = role-value connector
M2: $\neg$RCV (R') = x',
where C (R) = R', C (x) = x' and M1 < M2

b. (10b):
? M1: x = Taro, $\neg$lawyer (x)
M2: x' = Taro, $\neg$lawyer (x'), where C (x) = x' and M1 < M2

c. (10c):
? M1: tadpole (x)
M2: $\neg$frog (x'), where C (x) = x' and M1< M2

As one can see, the interaction between (1) and (4) yields the theorem shown in (10).

(10) a. In change sentences with main clause affirmation, the predications in M1 and in M2 are different.
b. In change sentences with main clause negation, the predications in M1 and in M2 are identical.

4.2 The negation of the sentential complement

When the sentential complement P in (1) is a negative clause *Q de-nai* as in (11), we have space configurations of type shown in (12).

(11) a. [$_{S1}$[$_{S2}$Daitooryoo ga Bush de-naku] naru]
president NOM COP-NEG become

Lit: "The president becomes not-Bush"
"Bush gives up his job as president."

b. [$_{S1}$Ken$_i$ ga [$_{S2}$PRO$_i$ bengosi de-naku] naru]
NOM lawyer COP-NEG become
Lit: Ken becomes not-lawyer.
"Ken gives up his job as a lawyer."

c. [$_{S1}$[$_{S2}$Otamazyakusi ga otamazyakusi de-naku] naru]
tadpole NOM tadpole COP-NEG become
Lit: A tadpole becomes not-tadpole.
"A tadpole is transformed into a frog."

(12) The processing of [$_{S1}$ (NP) [$_{S2}$ Q de-naku] naru]
? M1 : Q (= $\neg\neg$Q)
M2 : $\neg$Q

Note that in (12), as in (6b), a double negation is eliminated from the semantic representation.

(13) a. (11a):
? M1: [RVC (R) = x],
where R = president, x = Bush, RVC = role-value connector
M2: $\neg$RCV (R') = x',
where C (R) = R', C (x) = x' and M1 < M2

b. (11b):
? M1: x = Taro, lawyer (x)
M2: x' = Taro, $\neg$lawyer (x'), where C (x) = x' and M1 < M2

c. (11c):
? M1: tadpole (x)
M2: $\neg$tadpole (x'), where C (x) = x' and M1< M2

Naturally enough, the configurations in (13) obey the theorem in (10); the predications in M1 and M2 are different in each case.

4.3 Double negation

When both the main clause and the embedded clause are negated in (1), as in (14), we get the configuration of the type shown in (15).

(14) a. [$_{S1}$[$_{S2}$Daitooryoo ga Bush de-naku] nara-nai]
president NOM COP-NEG become-NEG
Lit: "The president does not become not-Bush"
"Bush is still the president."

b. [$_{S1}$Ken$_i$ ga [$_{S2}$PRO$_i$ bengosi de-naku] nara-nai]
NOM lawyer COP-NEG become-NEG
Lit: Ken does not become not-lawyer.
"Ken is still a lawyer."

c. [$_{S1}$[$_{S2}$Otamazyakusi ga otamazyakusi de-naku] nara-nai]
tadpole NOM tadpole COP-NEG become-NEG
Lit: A tadpole does not become not-tadpole.

"The tadpole is still a tadpole."

(15) The processing of [$_{S1}$ (NP) [$_{S2}$ Q de-naku] nara-nai]

? M1 : Q (= $\neg\neg$Q)

M2 : Q (= $\neg\neg$Q)

(16) a. (14a):

? M1: [RVC (R) = x],

where R = president, x = Bush, RVC = role-value connector

M2: RCV (R') = x',

where C (R) = R', C (x) = x' and M1 < M2

b. (14b):

? M1: x = Taro, lawyer (x)

M2: x' = Taro, lawyer (x'), where C (x) = x' and M1 < M2

c. (14c):

? M1: tadpole (x)

M2: tadpole (x'), where C (x) = x' and M1< M2

It is clear that these configurations also obey the theorem in (10). Since the main clause is affirmative in (14), the predications in M1 and M2 are identical in (16).

4.4 A paradox of the elimination of double negation

In this section we present a paradox concerning the elimination of syntactic double negation in sentences containing the predicate *naru*.

To begin with, it is necessary to note that the constructive rule (4) generally allows for eliminations of syntactic double negation, provided eliminations of double negation in semantic representations (= for any space Mn and any proposition γ, Mn : $\neg\neg\gamma \Leftrightarrow$ Mn : γ) are licensed. If sentence *Mn: "Q"* has *Mn:* ζ as presupposition and *Mm:* ξ as assertion, the rule in (4) assigns sentence *Mn: "Q-nai"* the same semantic representation as the one assigned to *Mn: "Q"*, namely the representation (17).

(17) ? Mn : ζ

Mm : ξ

We do not give the proof here; we simply show an example. The rule in (4) says essentially that the negation affects only the assertion of the sentence while leaving the presupposition unchanged, an assumption generally accepted in the literature. Consider the negation of sentence (5), repeated here as (18).

(18) a. M1: Tama wa siroi neko dewa nai.

TOP white cat COP NEG

"Tama is not a white cat."

b. ? M1: x = Tama

M1: $\neg$[white (x) $\wedge$ cat (x)]

According to (4), negating sentence (18a) leads to adding a symbol $\neg$ to the formula $\neg$[white (x) $\wedge$ cat (x)] which represents the assertion of the sentence. Thus, sentence (19a), negation of (18a), is associated with the representation in (19b), which is equivalent with (19c) due to the elimination of double negation in semantic representations assumed to be valid here.

(19) a. M1: Tama wa siroi neko de nai koto wa nai.
TOP white cat COP NEG fact TOP NEG
"It is not the case that Tama is not a white cat."

b. ? M1: x = Tama
M1: $\neg\neg$[white (x) $\wedge$ cat (x)]

c. ? M1: x = Tama
M1: [white (x) $\wedge$ cat (x)]

(19c) is exactly the same as the representation that the affirmative counterpart of (18a) illustrated in (20) would be associated with.

(20) M1: Tama wa siroi neko da.
TOP white cat COP
"Tama is a white cat."

(19a) and (20) are thus equivalent, given the rule in (4). This amounts to saying that (4) allows for eliminations of syntactic double negation.

Now, compare (11-12) and (14-15). One could see that the negation in the sentential complement of *naru* contributes a symbol $\neg$ to the formula valid in M2 and that the negation in the main clause contributes another to it. When the complement is negative as in (11) and (14), the proposition valid in M1 contains a symbol $\neg$, so that it is represented as $\neg Q$. The main clause negation as illustrated in (14) adds another symbol $\neg$ to the formula, giving rise to a proposition represented as $\neg\neg Q$. This shows that the negation in the complement and that in the main clause constitute a syntactic double negation, despite the fact that the two constituents are syntactically dissociated.

As mentioned above, it is assumed in this work that the double negation in semantic representations can be eliminated. The elimination of the double negation in $\neg\neg Q$ in (15) gives rise to the proposition Q. The semantic representation in (15) now does not contain any negation. The question which arises here is whether the syntactic double negation in (14) can be eliminated accordingly. The answer is no. Sentences (21), obtained by eliminating the double negations in (14), are by no means synonyms of (14), if not unacceptable.

(21) a. #[$_{S1}$[$_{S2}$Daitooryoo ga Bush ni] naru]
president NOM COP become
Lit: The president becomes Bush.
"Bush becomes the president."
Intended: Bush is still the president.

b. #[$_{S1}$Ken$_i$ ga [$_{S2}$PRO$_i$ bengosi ni] naru]
NOM lawyer COP become
"Ken becomes a lawyer."
Intended: Ken is still a lawyer.

c. #[$_{S1}$[$_{S2}$Otamazyakusi ga otamazyakusi ni] naru]
tadpole NOM tadpole COP become
"A tadpole becomes a tadpole."

Intended: The tadpole is still a tadpole.

Why is the elimination of syntactic double negation impossible in (14)? Put differently, why is it impossible to associate the sentences in (21) with the representations in (16)? The reason lies in the theorem stated in (10) above. The main clauses of (21) are affirmative and the predications in M1 and M2 are different in (16). Then the theorem (10) forbids linking them.

Note that the fact that the two negations are syntactically dissociated in the sentences in (21) does not suffice to rule out the elimination of the syntactic double negations in them. This is confirmed by the possibility for the syntactic double negation to be eliminated in (22a) as in (22b). (22b) would be interpreted in the same way as (22a) is[10].

(22) a. Watasi wa Ken ga tensai de-nai to wa omowa-nai.
I TOP NOM genius COP-NEG COMP TOP think-NEG
"I do not think that Ken is not a genius."
b. Watasi wa Ken ga tensai da to omou.
I TOP NOM genius COP COMP think
"I think that Ken is a genius."

The impossibility of (21) is a real paradox. The theorem (10), which bans the elimination of syntactic double negation in the sentences in (14), derives from the rules in (1) and (4). But, as discussed above, (4) itself generally allows for the elimination of syntactic double negation. Thus, the meaning potential of the change predicate *naru* stated in (1) contains something that gives rise to the contradiction observed between (4) and (21).

5. The copula as a negation of the change predicate *naru*

As argued in the previous section, the lexical semantics of *naru* rules out the affirmative sentences in (21) although they contain no negation in their semantic representations shown in (16). Is there any way to avoid the mismatch between syntax and semantics? To express the state of affairs represented by (16) with affirmative sentences, on can use copular sentences as in (23).

(23) a. Daitooryoo wa Bush (no mama) da.
president TOP stay COP
"The president is (still) Bush."
b. Ken wa bengosi (no mama) da.
TOP lawyer stay COP
"Ken is (still) a lawyer."
c. Otamazyakusi wa otamazyakusi (no mama) da.
tadpole TOP tadpole stay COP
"The tadpole is (still) a tadpole."

The sentences in (23) serve as negative counterparts of the change sentences in (11), despite their syntactic difference. This can be accounted for by the fact that the copula is a trans-spatial operator (Fauconnier 1985) just as the change predicate *naru*, and that it is nothing to do with such a theorem as (10). In short, the copula functions in just the same way as the change predicate except that it escapes from the effect of (10).

The correspondence between the copula and the change predicate can be independently justified by the following facts. First, (24a) and (24b) always contradict each other and cannot be asserted at the same time.

(24) a. X becomes not-Y at time T.
b. X is (still) a T at time T.

Second, the diversity of the spaces M1 and M2 coincides in (11) and (23).

(25) a. Naomi no {sinnen / e / eiga} de wa {(11a) / (11b) / (11c)}.
GEN belief picture movie in TOP
"In Naomi's {belief / picture / movie}, {(11a) / (11b) / (11c)}."
b. Naomi no {sinnen / e / eiga} de mo {(23a) / (23b) / (23c)}.
GEN belief picture movie in also
"In Naomi's {belief / picture / movie}, {(23a) / (23b) / (23c)}."

Third, in order negate (26a), it is often more natural to use sentences of type (26c) than to use (26b).

(26) a. Mikka go mo X wa Y da.
3-days in also TOP COP
"In three days, X will still be Y."
b. Mikka go ni wa X ga Y de-nai.
3-days in at TOP NOM COP-NEG
"In three days, X will not be Y."
c. Mikka go ni wa X ga Y de-naku natte iru.
3-days in at TOP NOM COP-NEG become PER
"In three days, X will not have become not-Y."

Fourth, although the possibility of (27a) depends on the expectation of (27b), negation of (27a) (cf. Michaelis 1996), the possibility of (28a) does not rest on the expectation of (28b), which can never be true, but on that of (28c).

(27) a. Ken wa mada ikite iru.
TOP still alive PROG
"Ken is still alive."
b. Ken wa ikite i-nai.
TOP alive PROG-NEG
"Ken is not alive."

(28) a. X wa mada X da.
TOP still COP
"X is still X."
b. X wa X de-nai.
TOP COP-NEG
"X is not X."
c. X ga X de-naku natte iru.
NOM COP-NEG become PER
"X has become not-X."

This suggests that the negation of (27a) is not (27b) but rather (27c).

6. Conclusion

The negation of affirmative change sentences such as (11) is expressed by negative change sentences with a double negation such as (14). But the theorem in (10), derived from the lexical semantics of the predicate *naru*, does not allow for the elimination of the double negation. In this situation, copular sentences such as (23) are resorted to as negative counterparts of (11).

Although we do not enter into the details here, the argument developed in this work provides a basis for giving a systematic account of Sakahara's (1992, 2002) suggestion that the tautology "X is X" is a double negation of "it is not the case that X is not X", expressed as an affirmative sentence. We leave the discussion to future research.

Abbreviations

ACC: accusative
COMP: complementizer
COP: copula
GEN: genitive
NEG: negation
NOM: nominative
PAS: past
PER: perfective
PROG: progressive
TOP: topic

Notes

[1] "P" represents the embedded clause.

[2] "?" represents a precondition in the sense of Dinsmore (1991).

[3] In general "Mn < Mm" means that the space Mn precedes the space Mm temporarily.

[4] Applying (1) to (2c) first produces (i).

(i) ? M1 : tadpole (x), ¬frog (x)
M2 : tadpole (x'), frog (x')

But space M2 is not coherent given the relation (ii), which holds in normal situations. By a default strategy, the subject description *tadpole (x')* is deleted from M2 as in (iii).

(ii) ∀x[frog (x) → ¬tadpole (x)]

(iii) ? M1 : tadpole (x), ¬frog (x)
M2 : frog (x')

(iv) ∀x[tadpole (x) → ¬frog (x)]

(v) ? M1 : tadpole (x)
M2 : frog (x')

Furthermore, the equivalence between (ii) and (iv) allows us to delete the redundant predication $\neg$*frog (x)* from M1, as in (v) (= (3c) in the text).

5 For other interpretations, see Sakai (2004).

6 The particle *wa* is assumed to represent an existential presupposition.

7 S: speech time

8 The two types of eliminations of double negation can roughly be formulated as follows:

(i) Elimination of double negation in semantic representations:
For any space Mn and any proposition γ, Mn : $\neg\neg\gamma \Leftrightarrow$ Mn : γ

(ii) Elimination of syntactic double negation:
For any proposition P, [[P-nai]-nai] $\Leftrightarrow$ P

9 Correspondences between (4) and (1):

(i) Mn = M1

(ii) Mm = M2

(iii) ϕ = [$_{S1}$ (NP) [$_{S2}$P] naru]

(iv) Ψ = P

10 It is not claimed here that (22a) and (22b) are completely equivalent. They are interpreted differently at the pragmatic level of course, due to a Gricean principle. The fact that the speaker uses a less concise expression such as (22b) leads to a conversational implicature that there is some reason he cannot use (22a).

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変化文の否定のパラドックスとコピュラ文

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この論文では、メンタル・スペース理論 (Fauconnier 1985, 1997)の枠組みで、変化述語「なる」の否定のパラドックスを提示し、コピュラ文がある種の変化文の否定を補完していることを示す。

まず、変化文の構築規則を次のように定める。

(1) 変化文[$_{s1}$ (NP) [$_{s2}$P] なる]のスペース構築規則 (P は補文)

a. M1 : ? $\neg$P ただし、M1 は視点

(?は Dinsmore 1991 のいう前提条件を表す)。

b. M2 : P ただし、M2 は焦点で、

かつ M1 < M2 (= M1 は M2 に先行する)

c. M1 と M2 はコネクターで結合される。

次に、否定の構築規則を次のように定める。

(2) Mn : [ϕ ない]のスペース構築規則

Mm : $\neg\psi$、ただし Mm はϕの焦点スペースであり、

ψはϕの断定を表す。

その他に関しては、Mn : [ϕ]の処理と同様。

この規則は変化文とは独立に正当化できる。

規則(1)と(2)から、次の定理が導出される。

(3) a. 主文肯定の変化文では、M1 と M2 の述定は異なる。

b. 主文否定の変化文では、M1 と M2 の述定は同一である。

(9)のように主文否定(4)の補文が否定文「Q でない」であるときは、得られるスペース構成(の一部)は(5)のようになる。

(4) [オタマジャクシがオタマジャクシでなく]ならない。

(5) [$_{s1}$ (NP) [$_{s2}$ Q でなく]ならない]の処理

? M1 : Q (= $\neg\neg$Q)

M2 : Q (= $\neg\neg$Q)

一般に否定の構築規則(2)は意味表示上の二重否定除去に伴う統語上の二重否定除去を認可するが、(2)と(1)から導かれる(3)により変化文(4)では統語上の二重否定除去が不可能になるというパラドックスが観察される。

(6) *[オタマジャクシがオタマジャクシに]なる。(4 の意味で)

変化述語はその語彙的性質により(4)を(6)に簡略化することができないが、窮余の策として、「X が X でなくならない」の二重否定除去版としてコピュラ文「X は X(のまま)だ」が使われる。これはコピュラがスペース間操作子であり、かつ(3)の定理と無縁であることから帰結されるが、独立の証拠によっても裏付けることができる。

以上の議論は、トートロジーが肯定文の形で表現された二重否定であるとする坂原(1992, 2002)の議論に理論的裏付けを与えるための出発点となる。