'Not' as inherently modal[1]

Yasuhiro Sasahira
University of Wisconsin-Madison

1   Some background: Negation vs. affirmation

The standard theoretical assumption on the semantics of negation is that it is a truth-functional operator, a function from propositions to propositions defined as follows:

(1) $\|\neg p\|$ = true if and only if $\|p\|$ = false.

Negation, as defined in (1), is a one-place propositional operator that takes a proposition p as its argument and yields another proposition that denotes the complement of what is denoted by p. However, simple as it may look, negative sentences in natural language do not always denote what is expected by the semantics defined in (1).

As has long been noted and discussed, negative sentences are more discourse-linked than their affirmative counterparts, in the sense that a negative sentence is interpreted as if its affirmative counterpart is already in the discourse.[2] To see this, consider the following examples:[3]

(2)   a.   My wife isn't pregnant.
         b.   My wife is pregnant.

If (2a) is uttered in a context where the listener doesn't know whether or not the speaker's wife is pregnant, the listener's likely response will be: "Oh, I didn't

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know that she was supposed to be pregnant" or something along this line. In contrast, the affirmative counterpart in (2b) is not interpreted as such. The sentence in (2b) is perfectly natural when uttered in a discourse-initial context. That is, there is no requirement that the listener know the status of the speaker's wife's pregnancy.

According to Horn (1989), the 'asymmetricalist' position, i.e. the view that negative statements are more marked than affirmative statements, holds that negative statements are "less informative than" or "accentuating" (Horn 1989: 61) affirmative statements, either by presupposing them or by correcting them. On this view, the asymmetry between negative and affirmative propositions lies in the domain of semantics, in that negation is a higher order affirmation of correcting a previously affirmed statement.

Horn reports that recently, the markedness thesis has received support from psycholinguistic evidence that "negation seems to require – or at least strongly prefer – an affirmative context against which to operate" (172); processing evidence shows that negative statements are responded to more slowly than affirmative ones, even when the same information is conveyed (168). Based on this, Horn concludes that "the asymmetry thesis [...] applies at the level of pragmatics. [...] [T]he real asymmetry is located, not in the relation of negative to positive propositions, but in the relation of (speaker) denials to assertions" (201). And the nature of this relation is explained immediately afterwards: "while affirmation not only can but does standardly function to introduce a proposition into the discourse model, negation [...] is directed at a proposition already in the discourse model" (203). It is this directionality that ultimately makes the asymmetricalist thesis "literally false but psychologically true" (203). To this end, Horn supports a symmetric analysis of negation and affirmation, and proposes the following semantics for them:

(3)   a.   NEG (negation operator) applies to a predicate P and a subject s such that P is denied of s.
         b.   AFM (affirmation operator) applies to a predicate P and a subject s such that P is affirmed of s.

There are at least two potential problems for the symmetric analysis put forth by Horn. First, although Horn's conclusion is empirically supported from psycholinguistic and processing data, and therefore has achieved descriptive adequacy, it has not yet achieved explanatory adequacy. It would be desirable to derive the pragmatic asymmetry directly from the semantics of negation and affirmation. The second potential problem has to do with the cross-linguistic generalization that negation is morphologically marked, whereas affirmation is not. Again, it would be desirable to derive this generalization directly from the

semantics of negation and affirmation. The present paper is an attempt to provide an explanatory theory of negation to account for these problems. To do so, we ask the following questions:

Q 1: Why is negation discourse-linked in a way affirmation is not?
Q 2: What is the nature of this discourse linkage?
Q 3: Why is negation morphologically marked cross-linguistically while
      affirmation is not?

In this paper, I show that the answers to these questions lie in the very nature of the semantics of negation. I argue that negation is inherently modal in the sense that it has a semantics shared with that of a conditional. The modal analysis of negation immediately provides answers to all three questions. First, negation as a modal operator answers the first two questions. If negation is inherently modal, its domain of application is relativized to a set of possible situations. Assuming Kratzer's (1980) analysis of modality as a context-sensitive operation, negative sentences are evaluated with respect to a *Conversational Background*, an accessibility relation determined in part by the modality expressed in negation and in part by the discourse context. Treating negation as inherently modal also answers the third question, since modality is morphologically marked cross-linguistically, whereas assertion is not.

      I will begin by discussing the data that support the conditional analysis of negative sentences. Then, after developing a specific definition for the semantics of negation, I will make a first attempt at explaining the nature of modality associated with negation.

2   Motivating a modal analysis of negation

This section provides two pieces of evidence to motivate a modal analysis of negation. One has to do with the essential nature of negative sentences. The other has to do with the phenomenon of modal subordination originally discussed by Roberts (1989).

2.1   The essential nature of negative sentences

The term 'essential' implies that there is a relation between A and B such that the relation between them is essential. In this way, 'essential' is a relational notion. That negative sentences denote essential propositions implies that negative sentences must denote some sort of relation. Since essential quantification is non-factual in the sense that it does not commit itself to the existence of the members of the domain of quantification, the essential nature of negative sentences

motivates a modal analysis of negation.

Dayal (1998) makes a distinction between two types of universal quantification: *accidental* and *essential*. The characteristic distinction between the two types she notes is a distinction in "existential commitment," where accidental quantification commits itself to the existence of the members of the domain of quantification, whereas essential quantification lacks this existential commitment. To see this, consider the following example from Dayal (1998):

(4)   a.   Every student who is in Mary's class is working on polarity items.
        b.   It happens to be true of every student in Mary's class that he/she is working on polarity items.
        c.   Every student in Mary's class, by virtue of being in her class, is working on polarity items.

Dayal notes that (4a) is ambiguous between a reading in which membership in the set denoted by the relative clause is accidental (4b), and one in which it is essential to the truth of the statement being made (4c). The distinction is reminiscent of the distinction Donnellan (1966) makes between referential and attributive uses of definite descriptions.

According to Dayal, the ambiguity disappears when the phrase *whoever they may be* is added after the modified noun phrase, which isolates the essential reading as in (5a), while the addition of the accidental predicate *happen to* to the main predicate isolates the accidental reading as in (5b):

(5)   a.   Every student who is in Mary's class, *whoever they may be*, is working on polarity items.
        b.   Every student who is in Mary's class happens to be working on polarity items.

As Dayal notes, the combination of the phrase *whoever they were* and the accidental predicate *happen to* in (6a) or the addition of the phrase *whoever she may be* after the modified noun phrase of a sentence whose preferred reading is the accidental one as in (6b) leads to ungrammaticality:

(6)   a.   *Every student who is in Mary's class, *whoever they were,* happened to vote for the Republican.
        b.   *Every woman standing under that tree, *whoever she may be*, is Mary's best friend.

Interestingly, negative sentences only allow essential readings. Consider the following examples:

(7)   a.   *Whatever the situation was,* Peter didn't eat Mary's cookies.
       b.   Peter didn't *happen to* eat Mary's cookies.
               (i)   It happened to be true that Peter didn't eat Mary's cookies.
               (ii)   *It is not the case that Peter happened to eat Mary's cookies.

(7a) shows that the negative sentence is compatible with the *whatever* phrase, indicating the essential nature of the sentence. (7b) can only have the reading where the accidental predicate *happen to* is interpreted outside the scope of negation, as paraphrased in (7b)-(i).[4] The fact observed in (7b) indicates that negation somehow makes the content that is negated essential. In other words, while a negative sentence itself can be accidental, negation cannot be.

2.2   Modal subordination

Another piece of evidence in favor of a modal analysis of negation is that a negative sentence can host an inter-sentential anaphora in non-factual contexts. Consider the following examples:

(8)   a.   John didn't buy a mystery novel$_i$.
       b.   He would be reading it$_i$ by now.
       c.   #He is reading it$_i$ now.

(9)   a.   Peter might have bought a Porsche$_i$.
       b.   There isn't anyone who saw him driving it$_i$, though.
       c.   There is someone who saw him driving it$_i$.

In (8), the pronoun *it* in (8b) can be interpreted as anaphorically related to the indefinite *a mystery novel* in (8a), but it can't in (8c). In (9), the pronoun *it* in (9b) can be anaphorically linked to the indefinite *a Porsche* without assuming that Peter actually bought a Porsche or that there is a Porsche that Peter is associated with. In contrast, (9c) can be felicitously uttered only if there is a Porsche that Peter is associated with. (9c) could be used as evidence for the possibility that Peter bought the car, and that he did not just borrow it from someone. In other words, on this reading, there is a Porsche that has something to do with Peter and what is at issue is whether Peter bought it or not.

The phenomenon just discussed has been known as *modal subordination* since Robert's (1989) work on this topic. It is called *modal subordination* because in the felicitous cases in the above examples the (b) sentences may be interpreted

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[4] The paraphrase illustrated in (7b)-(ii) is possible if negation in (7b) is understood as metalinguistic negation, which has a function that denies a previously made assertion. See Horn (1989) for details.

as a sort of continuation of the (a) sentences without committing the speaker to the existence of a mystery novel in (8a) and a Porsche in (9a).

According to Roberts, the successful anaphoric linkage crucially relies on the mood of an utterance that tells us whether or not it is asserted. For instance, in the following examples (cited from Roberts 1989), the pronoun *it* in (10b) cannot be anaphorically linked to the indefinite *a book* in the antecedent of the conditional, whereas such linkage is possible in (11b):

(10) a. If John bought a book$_i$, he'll be home reading it$_i$ by now.
      b. # It$_i$'s a murder mystery.

(11) a. If John bought a book$_i$, he'll be home reading it$_i$ by now.
      b. It$_i$'ll be a murder mystery.

Roberts assumes that if a speaker indicates that a sentence or clause is to be interpreted as true in the actual world, the sentence or clause was uttered in the factual mood, whereas if a clause, such as the antecedent of a conditional, expresses a hypothetical assumption, it is uttered in a nonfactual mood. According to this criteria, the contrast between (10) and (11) is the contrast in mood, that is, (10b) is uttered in a factual mood whereas (11b) is in a nonfactual mood.

Viewed in this way, the fact that negative sentences can host successful anaphoric linkage indicates that negative sentences are interpreted in a nonfactual mood. Although the modal subordination fact we have just observed does not necessarily imply that negation must be treated as something similar to a conditional, given the essential nature of negation as discussed in the previous section, it becomes plausible to motivate a modal analysis of negation.

3   Lexically driven inferences: Negation vs. affirmation

To develop a modal analysis of negation, let me introduce a particular type of lexically driven inference discussed in Kamp and Rossdeutscher (1994). The type of inference in question has to do with the inferential behavior of the two types of adjectives such as *healthy* vs. *sick*, *safe* vs. *dangerous*, and *dry* vs. *wet*, to name a few. Kamp and Rossdeutscher (henceforth, K&R) call the former type of adjective "universal" and the latter type "existential." The terms are based on the way these types of adjectives behave in the two sets of inferences to be discussed in what follows.

K&R point out that universal adjectives such as *healthy* and existential adjectives such as *sick* behave differently with respect to the validity of a certain type of inference. Consider the following set of inferences adapted from K&R:

(12) a.   A tourist comes down with typhoid.
              After three weeks, he is *healthy*.

              ∴ The tourist recovers from typhoid in these three weeks.

      b.   A tourist recovers from typhoid.
              After three weeks, he is *sick*.

              ∴ The tourist comes down with typhoid in these three weeks.

The two inferences appear to be symmetric, yet the conclusion in (12a) follows from the two premises, whereas the conclusion in (12b) doesn't. According to K&R, the conclusion in (12a) is a logical consequence derived from the two premises based on the semantics of the adjective *healthy*. K&R attribute the contrast in validity to the universal nature of *healthy* and the existential nature of *sick,* and propose the following semantics of these adjectives:

(13) a.   <u>Universal Adjective</u>
              $||healthy|| = \lambda s.\lambda x.\forall w[\text{AILMENT}(w, s) \rightarrow \text{RES(CURE)}(x, w, s)]$
              'x is maximally separated from ailment.'
              = 'x doesn't have ailment any more or doesn't have one.'
      b.   <u>Existential Adjective</u>
              $||sick|| = \lambda s.\lambda x.\exists w[\text{AILMENT}(w, s) \wedge \text{PRE(CURE)}(x, w, s)]$
              'x is in a pre-cure state from ailment' = 'x has some ailment.'

        Given the semantics of these adjectives defined in (13), let us examine how to account for the contrast in validity between (12a) and (12b). The first premise in (12a) entails that the tourist has typhoid, the onset of which is deduced from the second premise, that is, the onset of the three-week period. Given the semantics of *healthy* defined in (13a), the Universal Instantiation rule applies, which removes the antecedent of the universal quantifier and we obtain the result-state. The result-state RES(CURE(the-tourist, typhoid)) (i.e., the state of the tourist being cured of typhoid) obtains some time within the three-week period. Since the existence of the tourist having typhoid is instantiated at the onset of the three-week period, given the result-state being instantiated, we can infer that there is a change of state event that takes place some time within the three-week period that is immediately preceded by the state of the touring having typhoid and immediately followed by the result-state. The change of state in question is the one from the state of the tourist having typhoid to the state of his being cured of typhoid, which takes place some time within the three-week period. In other words, the change of state is one in which the tourist recovers from

typhoid in these three weeks. This is equivalent to the conclusion stated in (12a); therefore, the inference is valid.

The account of the invalidity of (12b) is brief. Given the existential nature of *sick* defined in (13b), it is clear that Universal Instantiation cannot apply. Consequently, we cannot derive a relevant pre-cure state (i.e., PRE(CURE(the-tourist, typhoid))) or a change of state that corresponds to the conclusion in (12b).

Now, let us consider the following set of inferences involving negation and affirmation:

(14)   a.   Black stains appear on the table.
                After three hours, there aren't stains on the table.

                ∴ Black stains disappear from the table in these three hours.

        b.   Black stains disappear from the table.
                After three hours, there are stains on the table.

                ∴ Black stains appear on the table in these three hours.

Interestingly, in (14a), negation in the second premise patterns with *healthy* in (12a) in that negation seems to contribute to the validity of the argument, and affirmation in the second premise in (14b) patterns with *sick* in (12b) in that it seems to be the affirmation that makes the argument invalid.

At this point, we need to ask a question. Is the conclusion in (14a) a logical consequence that is inferred from the two premises? Or is it something else? To answer this question, notice that one of the steps crucial in (14a) in inferring the conclusion involves inferring a change of state from the existence of black stains to their non-existence. There are at least two ways that the change of state that we want could be inferred. One is by appealing to world knowledge, and the other is by inferring the change of state from the structures of the two premises. If the former is the case, then the inference is pragmatic, and if the latter is the case, the inference is logical. Let us consider the two possibilities in turn.

Appealing to our knowledge of the world doesn't seem to be plausible here. This is because if the change of state is inferred based on world knowledge, then it would also be possible to think about an alternative non-contradictory world where the reasoning doesn't hold. Such an alternative world would require that something other than a change of state take place when there is a state where there are black stains on the table that is temporally followed by another state where black stains don't exist on the table. What would such an alternative look like? If there were such a world, then replacing the conclusion in (14a) to its negation, that is, 'black stains don't disappear from the table in these three hours'

and thinking about a situation where the revised conclusion is valid in some of the alternative worlds, we should be able to come up with a world other than ours that makes the conclusion plausible. However, what we are left with is a contradictory world in which the conclusion holds. This indicates that world knowledge does not account for the validity of the argument in (14a). This in turn indicates that we have to find a way to derive the conclusion from the structures of the two premises and some inference rules that apply to the structures we already have.

It should be mentioned that the world knowledge we have just described cannot be freely turned into a logical inference rule. If it could, the rule would be something in the following line:

(15) **<u>The Change of State Rule</u>**
If a state where P (some property, e.g., black stains) exists is temporally followed by a state where P doesn't exist, then there is a change of state from the existence of P to its non-existence.

(15) is essentially a rule to derive an event, a change of state in particular, from the two states that are temporally ordered. In order for such a rule to work, it must be the case that there is already a structure in one or the other of the two states that corresponds to the event in question. In other words, we cannot just create an event that can be used to draw a conclusion.

A similar argument can be made for K&R's original examples in (12). The relevant change of state in the example in (12a) is one from a state where the tourist has typhoid to a state where he is cured from it. In this case too, we cannot simply create a rule to derive a change of state unless there is already a structure to infer the change of state in question.

Given the discussion above, it is concluded that the inferences illustrated in (12) and (14) are logical in nature, and therefore call for explanation.

4   Negation and affirmation: A Situation-Theoretic analysis

As discussed in section 2, the essential nature of negation and its non-factuality that supports modal subordination indicate that we need to intensionalize the semantics of negation. The goals of this section are (i) to accomplish this task in the framework of the Kratzerian possible situation semantics and (ii) to provide an account of the contrast in validity of inferences involving negation and affirmation illustrated in (14).

4.1   Kratzer's Situation Semantics: Some basics

This section is devoted to presenting the basics of a possibilistic Situation

Semantics (Kratzer 1989, 1990). First, throughout this paper, a situation-based ontology is assumed. Specifically, a model for interpreting natural language is a tuple M := <S,D,W,<, ‖ ‖>, where:

(16) a. S is the set of possible situations.
      b. D is the set of possible individuals. D ⊆ S.
      c. W is the set of possible worlds, maximal elements with respect to
          ≤.
      d. < is a partial ordering on S.
      e. ‖ ‖ is the interpretation function.

The partial ordering on S satisfies at least the following condition: for all s ∈ S there is a unique s' ∈ S such that s ≤ s' and for all s'' ∈ S: if s' ≤ s'', then s'' = s'. Notice, then, that ≤ imposes a mereological summation structure on S, with each world being the supremum of a complete join semilattice and each situation being part of a world. This in its turn implies that one individual can only be part of one possible world, which requires adopting some version of the counterpart theory, as advocated by Lewis (1968), to speak about possible alternatives of an actual individual.

The type theory of Kratzer's Situation Semantics is standard, except for the fact that the domain of expressions of type *e*, the set of individuals, is a subset of S and the domain of expressions of type *t* is the power set of S ($\wp$(S)), the set of sets of situations. Propositions, then, are sets of situations: the set of situations in which the proposition holds.

Finally, the notion of minimal situation is relevant for our purposes (Berman 1987; Heim 1990; von Fintel 2004; Kratzer 2007):

(17) **Minimality**
      A situation is a minimal situation in which a proposition *p* is true iff it has no proper parts in which *p* is true.

In other words, minimal situations are stripped-down situations that contain just enough to support propositions.

4.2   A Situation-Theoretic analysis of the semantics of negation

In the possible situation semantics adopted here, propositions denote sets of possible situations, or characteristic functions of such sets, and all predicates are evaluated with respect to possible situations. Given the essential nature of negation, in the present analysis, we treat negation as an intensional operator which is defined as follows:

(18) $\|not\|^c = \lambda P.\lambda s.\forall s'[[s' \leq s \land \min(f_c(s)) = s' \land \text{PRE}(\text{BECOME}(\neg P))(s'))] \rightarrow$
         $\exists s''[s' \leq s'' \land \text{RES}(\text{BECOME}(\neg P))(s'')]]$

(18) denotes the relation between sets of properties P and situations *s* such that every minimal situations *s'* that is accessible from *s* and instantiates a pre-state concept (PRE(BECOME((¬P))) is extendable to a situation *s''* of which *s'* is a part and instantiates the result-state concept (RES(BECOME (¬P))). The pre-state here corresponds to a state of becoming not P, which entails that P holds. The result-state corresponds to a state obtained after becoming not P. This amounts to mean that every pre-state is extendable to its corresponding result-state, that is, 'no degree of P-ness'.

     '*f*' in (18) denotes an accessibility relation in the sense of Kratzer's conversational background (1980; 1991). It is a function from evaluation situations *s* to possible situations *s'* that are accessible from *s*. 'min' is an operator that picks up minimal situations from the result of *f* applying to *s*. The nature of the accessibility relation denoted by *f* is determined by the lexical property of the negative operator in interaction with properties of the utterance context *c*. The intensionality associated with the negative operator is epistemic. The epistemic modality expressed by the negative operator relates the two situations *s* and *s'* just in case *s'* is equivalent to *s* with respect to the information available in *c*. That is, the speaker doesn't have enough information to distinguish between *s* and *s'*. Since the quantification is over possible situations accessible from the set of evaluation situations, the non-existential commitment characteristic of essential quantification follows naturally without stipulation.

     Given the semantics of negation defined in (18), we can now account for the validity of the inference illustrated in (14a), repeated here as (19):

(19)   Black stains appear on the table.
         After three hours, there aren't stains on the table.

         ∴ Black stains disappear from the table in these three hours.

In (19), the first premise entails that there are black stains on the table. The onset of the existence of black stains is set at the beginning of the three-hour period. Given the semantics of negation defined in (18), the proposition expressed by the negative sentence in the second premise is represented as follows:

(20) $\lambda s.\forall s'[[s' \leq s \land \min(f_c(s)) = s' \land \text{PRE}(\text{BECOME}(\neg\exists x[\text{STAINS}(x) \land$
         $\text{ON}(x, \textit{the-table})(s'))] \rightarrow \exists s''[s' \leq s'' \land \text{RES}(\text{BECOME}(\neg\exists x[\text{STAINS}(x) \land$
         $\text{ON}(x, \textit{the-table})]))(s'')]]$

(20) denotes a set of situations *s* such that every minimal situation *s'* that is accessible from *s* and instantiates a pre-state of stains becoming non-existent is extendable to a situation *s''* such that *s'* is a part of *s''* and instantiates a result-state of stains becoming non-existent. This amounts to saying that stains don't exist or no longer exist. The proposition expressed by (20) obtains sometime within the three-hour period and onward. Since a set of black stains is contained in the set of stains (more formally, a set of black stains is a subset of the set of stains), given (20), Universal Instantiation applies yielding a result-state where black stains become non-existent. Given that the existence of black stains is instantiated at the onset of the three-hour period from which the result-state obtains, we can infer that there is a change of state from the existence of black stains on the table to their non-existence, which takes place sometime within the three-hour period. This change of state is equivalent to what is expressed in the conclusion, namely, 'black stains disappear in these three hours'.

4.3   A Situation-Theoretic analysis of affirmation

This section provides an account of the invalidity of the inference discussed in section 3 by showing that affirmation is analyzed as existential quantification over minimal situations, in contrast to negation, which is analyzed as universal quantification over minimal situations as argued for in section 4.2.

 Now let us consider the inference that involves affirmation, repeated here as (21):

(21)   Black stains disappear from the table.
         After three hours, there are stains on the table.

         ∴ Black stains appear on the table in these three hours.

This inference is not valid. It is invalid not because the second premise involves a *there*-construction. This is shown by the following examples, where the predicates involved in the second premises are of achievement type:

(22)   A ship comes to arrive slowly.
         After three hours, the ship doesn't arrive.

         ∴ The ship comes to a state of not arriving slowly in these three hours.

(23)   A ship comes to a state of not arriving slowly.
         After three hours, the ship arrives.

∴ The ship comes to arrive slowly in these three hours.

The inference in (22) is valid whereas that in (23) is not, indicating that it is not the existential statement in the second premise that is responsible for the invalidity of (23). Given this, let us define affirmation as follows:

(24)　　$\|affirm\|^c = \lambda P.\lambda s.\exists s'[\min(s) = s' \wedge s' \leq s \wedge P(s')]$

In (24), the affirmation is defined in terms of a relation between a set of properties *P* and a set of situations *s* such that there is a minimal situation *s'* that is part of *s* and *P* holds of *s'*. In the definition given in (24), the nature of affirmation is contingent on the aspectual property of *P*. Thus, *P* in the second premise of (21) corresponds to an existential predicate as in (25a) and that of (23) to a predicate of achievement type as in (25b):

(25)　　a.　　$\lambda s.\exists s'[\min(s) = s' \wedge s' \leq s \wedge \exists x[\text{stains}(x, s') \wedge \text{on}(x, \textit{the-table}, s')]$
　　　　b.　　$\lambda s.\exists s'[\min(s) = s' \wedge s' \leq s \wedge \text{arrive}(\textit{the-ship}, s')]$

In this way, we can generalize the notion of affirmation in terms of existential quantification over minimal situations.

Given the definition of affirmation in (24), it seems clear why the inferences in (21) and (23) are invalid. The invalidity is attributed to the existential nature of affirmation. Since it is not the correct input for the application of Universal Instantiation, the conclusion fails to follow from the premises.

5　　Markedness: Negation vs. affirmation

In section 4, I showed that negation is inherently modal in the sense that it involves universal quantification over possible minimal situations, whereas affirmation involves existential quantification over minimal situations. The definitions are repeated here as (26) and (27):

(26)　　$\|not\|^c = \lambda P.\lambda s.\forall s'[[s' \leq s \wedge \min(f_c(s)) = s' \wedge \text{PRE}(\text{BECOME}(\neg P))(s'))] \rightarrow \exists s''[s' \leq s'' \wedge \text{RES}(\text{BECOME}(\neg P))(s'')]]$

(27)　　$\|affirm\|^c = \lambda P.\lambda s.\exists s'[\min(s) = s' \wedge s' \leq s \wedge P(s')]$

Besides the difference in the quantificational force associated with negation and affirmation, in negation, the domain of quantification is the set of possible

situations accessible from the evaluation situations. This means that the quantification is not over situations that are part of the set of evaluation situations. This explains the non-factual and essential nature of negative sentences. In contrast, in affirmation, the domain of quantification is a set of situations that is part of the evaluation situations. This explains the factual nature of affirmation when no independent intensional operator is involved.

The modal analysis of negation immediately gives answers to all the three questions given in section 1, repeated here:

Q 1: Why is negation more discourse-linked in a way affirmation is not?
Q 2: What is the nature of this discourse linkage?
Q 3: Why is negation morphologically marked cross-linguistically, while affirmation is not?

Negation as a modal operator answers the first two questions. Negation being inherently modal, its domain of application is relativized to a set of possible situations. Assuming Kratzer's (1980) analysis of modality as a context-sensitive operation, negative sentences are evaluated with respect to a contextually specified accessibility relation. In contrast, affirmation involves existential quantification, which typically introduces new information into a discourse. Negation as inherently modal also answer the third question, since modality is morphologically marked cross-linguistically, whereas affirmation is not.

6   Conclusion

This paper addressed the origin of the asymmetry associated with negation and affirmation. I presented an analysis of negation and affirmation that derives the pragmatic asymmetry (i.e., negative sentences are more discourse-linked than their affirmative counterparts) directly from their semantics. It was also shown that the morphological asymmetry (i.e., negative sentences are morphologically marked cross-linguistically, whereas their affirmative counterparts are not) also follows from this analysis without stipulations.

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University of Wisconsin-Madison
Department of Linguistics
1168 Van Hise Hall
1220 Linden Drive
Madison, WI 53706-1557

sasahira@wisc.edu