Building Alternatives
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Inferences that result from exhaustification of a sentence \( S \) depend on the set \( A \) of alternatives to \( S \). We will give a characterization of \( A \) which accounts for inference patterns that pose a challenge for other proposals. This is an example of such patterns:

(1) \( \text{Bill went for a run and didn't smoke. John (only) went for a run.} \)

*Inference: \( \neg \text{[Bill went for a run and didn't smoke]} \)

(2) \( \text{Bill passed some of the tests and failed some. John (only) passed some of the tests.} \)

*Inference: \( \neg \text{[John passed some of the tests and failed some]} \)

While (1) can imply that it is not the case that John went for a run and didn’t smoke (i.e. that John smoked), (2) cannot imply that it is not the case that John passed some of the tests and failed some (i.e. that John passed all of the tests). (The sequence in (2) is odd. We believe the reason for its oddness is that it cannot have the inference.) To derive the inference of (1), the exhaustification of \( S_1 = \text{John went for a run} \) must be relative to a set \( A \) that includes the sentence \( S_1'' = \text{John went for a run and didn't smoke} \) (to license the inference) and excludes \( S_1''' = \text{John went for a run and smoked} \) (so that the inference is not canceled out). To explain the lack of an inference in the case of (2), exhaustification of \( S_2 = \text{John passed some of the tests} \) must be relative to a set \( A \) that includes both \( S_2' = \text{John passed all of the tests} \) and \( S_2'' = \text{John passed some of the tests and failed some} \) (so that \( S_2'' \) and \( S_2'' \) cancel each other out). In both cases, \( S_1' \) and \( S_1'' \) are symmetric alternatives to \( S_1: S_1' \land S_1'' \) is a contradiction and \( S_1' \lor S_1'' \) is equivalent to \( S_1 \) (Fintel and Heim 1997). Our theory must “break symmetry” in the case of (1) (i.e. define \( A \) in such a way that it can contain \( S_1' \) but not \( S_1'' \)) without breaking symmetry in the case of (2). Assuming that \( A = F(S) \cap C \), where \( F(S) \) is the set of formally defined alternatives of \( S \) and \( C \) a contextual restriction (Rooth 1992), symmetry can be broken by imposing conditions on \( F(S) \) and/or \( C \).

Fox and Katzir (2011), henceforth F&K, advance a theory in which symmetry is broken in \( F(S) \) alone. They propose that \( F(S) \) be regarded the set in (3), where \( F_R(S) \) is the set of sentences derived from \( S \) by replacement of \( F \)-marked constituents with expressions of the same semantic type.

(3) \( \text{Formal alternatives (F&K): } F(S) = F_R(S) \cap \{ S' \mid S' \preceq_c S \} \)

The relation ‘\( x \preceq_c y \)’ is to be understood as ‘\( x \) is no more complex than \( y \) in discourse context \( c \).’ Here is the definition.

(4) a. \( E' \preceq_c E \) if \( E' = T_n(...)T_1(E)... \), where each \( T_i(x) \) is the result of replacing a constituent of \( x \) with an element of \( SS(E,c) \), the substitution source of \( E \) in \( c \)

b. \( SS(E,c) = \{ x \mid x \text{ is a lexical item} \} \cup \{ x \mid x \text{ is a constituent uttered in } c \} \)

(3)&(4) yield, correctly, that the sequence in (2) does not license \( \neg S_2' \) as an inference since the formal alternatives of \( S_2 \) in (2) include both \( S_2' \) (generated by replacing \( \text{some} \) in \( S_2 \) with \( \text{all} \), taken from the lexicon) and \( S_2'' \) (generated by replacing \( \text{passed some of the tests} \) in \( S_2 \) with \( \text{passed some of the tests and failed some} \), taken from the discourse context). (3)&(4) can also break symmetry: \( S_2 \) outside a context licenses \( \neg S_2' \) as an inference. This is predicted: the formal alternatives of \( S_2 \) in this case include \( S_2' \) (same as above), but not \( S_2'' \) (since \( \text{passed some of the tests and failed some} \) is neither in the lexicon nor in the context). Problematically, however, (3)&(4) fails to predict that the sequence in (1) does license \( \neg S_1' \) as an inference: the formal alternatives of \( S_1 \) in (1) include both \( S_1' \) (generated by replacing \( \text{went for a run} \) in \( S_1 \) with \( \text{went for a run and didn't smoke} \), taken from the context) and \( S_1'' \) (generated by replacing \( \text{didn't smoke} \) in \( S_1' \) with \( \text{smoked} \), also taken from the context; note that (4a) allows for successive replacements). Even worse, given what has been said the inference in (1) is licensed only if symmetry can be broken in \( C \).

At first glance, a strategy to explain the contrast between (1) and (2) by breaking symmetry in \( C \) is to appeal to the notion of a “pragmatic scale” (cf. Klinedinst 2004). It seems much easier to
construct an evaluative scale on which \( S''_1 \) is ranked lower than \( S'_1 \) (e.g. a healthiness scale), than it is to construct a scale on which \( S''_2 \) ranks lower than \( S'_2 \). However, a draft dodging context makes available, and salient, a scale on which \( S''_2 \) ranks lower than \( S'_2 \) (i.e. a scale measuring the degree of luck of a draft dodger). But even this context cannot support the relevant inference for (2):

(5) In the draft for the Korean war, Bill has been dealt a better hand than John. He passed some of the military fitness tests and failed some, while John (only) passed some of the tests.

*Inference: \( \neg [\text{John passed some of the tests and failed some}] \)

We conclude that a solution to the problem at hand in terms of pragmatic scales is not tenable and that a refinement of F&K’s approach is called for instead. As it turns out, we only need to make a minimal adjustment. We propose to impose the constraint in (6) on F&K’s concept of F(S):

(6) **Atomicity**: Expressions in the substitution source are syntactically atomic

Atomicity breaks symmetry in (1). The derivation of \( S''_1 \) proceeds as follows (where \( \text{AT} \) marks the atomic expressions): \( \text{John went for a run} \rightarrow \text{John [AT went for a run and didn’t smoke]} \rightarrow \text{John [AT went for a run and [AT smoked]]} \). The second step violates Atomicity so that \( S''_1 \) cannot be derived. It is still possible to derive from \( S_1 \) the alternative \( \text{John smoked} \), which is contradictory to \( S'_1 \), too. However, this is not a problem for our analysis since \( \text{John smoked} \) can be excluded from A: A=\{\( S_1, S'_1 \)\} satisfies the three conditions in (7) (equivalent to F&K’s hypothesis that A is restricted to the set of relevant sentences which is closed under negation and conjunction).

(7) **Conditions on A (F&K)**: (i) \( A \subseteq F(S) \), (ii) \( S \in A \), and (iii) there is no \( S' \) in \( F(S) \setminus A \) such that \( S' \) is in the Boolean closure of A

Atomicity does not break symmetry in (2): \( F(S_2) = \{\text{pass some, pass all, fail some, fail all, pass some} \land \text{fail some}\} \). To get the non-attested inference, A must be the set \( N = \{\text{pass some, fail some, fail all, pass some} \land \text{fail some}\} \). However, N does not qualify, as \( F(S_2) \setminus N \) contains \text{pass all} which, being equivalent to \text{pass some} \land \neg \text{fail some}, is in the Boolean closure of \( F(S_2) \).

F&K’s theory has another problem: given (3)&(4) and the assumption that exhaustification also involves logically independent alternatives (Spector 2006), (8) cannot be explained (Romoli 2012a).

(8) They did [\text{NegP not [VP pass all of my students]}]

Inference: \( \neg [\text{They didn’t pass some of my students}] \)

(3)&(4) predict both \( S'_3 = \text{they didn’t pass some of my students} \) and \( S''_3 = \text{they passed some of my students} \) to be formal alternatives of (8). Atomicity solves this problem, too: it rules out \( S''_3 \), as its derivation involves replacing NegP with VP and all in the then atomic VP with some.

The Atomicity constraint makes the substitution source a sort of numeration. If we further impose the condition that the derivation of F(S) must proceed from bottom up, we can account for the “switching problem” (Romoli 2012b): **Some of my students did all of the readings** cannot imply \( \neg [\text{all of my students did some of the readings}] \), while **None of my students did all of the readings** can imply that all of my students did some of the readings. Atomicity and the bottom-up constraint make the syntactic derivation of formal alternatives strikingly similar to the syntactic derivation of sentences, suggesting that the former might be a “cooptation” of the latter.