MODAL CONCORD

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Abstract

This paper discusses a phenomenon that we propose to call "modal concord". We speak of modal concord if the combination of a modal adverb with a modal auxiliary seems to be interpreted as if just a single modal operator was expressed. It is shown that concord interpretations can only arise if both modals are of the same type (i.e. the same accessibility relation is involved in both cases) and have more or less the same quantificational force. Our analysis is based on the idea that, in modal concord, the meaning of the adverb is shifted to a functional meaning which checks whether its argument, the auxiliary, is of the right kind.

1 Introduction

The most widely studied concord phenomenon is undoubtedly negative concord. But concord interpretations are not restricted to the domain of negation. In this paper we aim to show that concord readings also occur with certain combinations of modal adverbs and auxiliaries. Examples are:[1]

(1) a. You may possibly have read my little monograph upon the subject.
     b. Power carts must mandatorily be used on cart paths where provided.

The preferred interpretation of (1a) is the concord reading which says that the speaker considers it possible that you have read his monograph, not the cumulative one, according to which he thinks it is possible that it is possible that you have done so. Similarly, (1b) expresses that there is an obligation to use power carts, not that it is obligatory that there is an obligation to use power carts. Thus, even though (1a) and (1b) contain two modal expressions each, the sentences are interpreted as if they contained just a single modal operator. We propose to call this phenomenon "modal concord".[2]

If modal concord was only available for epistemic modals, the phenomenon could readily be explained by appealing to elementary principles of epistemic logic. For epistemic necessity, the principle of veridicality (2a) ensures that the concord reading follows from the cumulative one: $\Box\Box\phi \vdash \Box\phi$. For epistemic possibility, the cumulative reading entails the concord reading if the principle of positive introspection is assumed.

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[1] Example (1a) is from Sir Arthur Conan Doyle's, *The hound of the Baskervilles*. (1b) was found at `www.glendalegolf.ca/tourneyregs.html` using the Google search engine.

[2] In all our examples the two modal operators are clause mates. It may be that modal concord sometimes occur across clause boundaries. Here is an example by von Fintel and Iatridou (2003, 183), who write that they "found it very difficult to make sure that the epistemic modal is indeed included in the composition of the interpretation":

(i) John thinks that Sarah must have played on every piano that we had predicted he would.

In this example, *must* is embedded in an attitude context. Unfortunately, in such examples, the difference between the cumulative and the concord reading is unclear, and therefore we are not convinced that this is really the same as what we observe in (1a,b). See also Hara (2006) on the interpretation of modals under attitude verbs.

(2)   a.   Veridicality (knowledge is factive):
            $\Box\phi \rightarrow \phi$
      b.   Positive introspection (if an agent knows something, he knows that he knows it):
            $\Box\phi \rightarrow \Box\Box\phi$ ($\equiv \Diamond\Diamond\phi \rightarrow \Diamond\phi$)

Hence, if concord interpretations only occurred with epistemic modals, standard epistemic logic would suffice to explain the facts. However, as we saw in (1b), epistemic modals are not the only ones to engage in concord. The following Dutch sentence is another case in point:

(3)   Alle deelnemers moeten zich verplicht   registreren.
      all   participants must   self obligatorily register
      "All participants have to register."

The example is entirely natural, and its concord reading is strongly preferred. The sentence may also have a cumulative interpretation, but this only becomes available in rather special contexts. Imagine that your department is organizing a conference. You don't think that the participants should have to register, but the head of the department does. She might say: "It must not be the case that all participants register if they feel like it, but all participants must obligatorily register" — which would require a cumulative reading. The concord interpretation of (3) cannot be explained by deontic logic, because obviously veridicality doesn't hold in such a logic: sadly, not everything that is desirable is actually the case. So we must find another way of explaining modal concord, at least in these cases.

Some readers might be worried that modal concord is not really a grammatical phenomenon, but rather belongs to stylistics, and it is true that in English and Dutch modal concord is usually optional. It is not surprising, therefore, that (3) is felt to express a stronger obligation than either of its single-modal variants:

(4)   a.   Alle deelnemers moeten zich registreren.
            all   participants must   self register
            "All participants have to register."
      b.   Alle deelnemers zijn verplicht zich te registreren.
            all   participants be   obliged   self to register
            "All participants have to register."

However, not all occurrences of modal concord are optional. For instance, the Dutch expression *wel eens* only has a modal meaning when it co-occurs with other modals. In (5a) *wel eens* expresses epistemic possibility, and engages in concord with epistemic *zou kunnen* "may/might", whereas in (5b) it lacks this modal interpretation.

(5)   a.   Dat zou   wel eens de vrouw van Jan kunnen zijn.
            that would wel eens the wife   of Jan can   be
            "That could well be Jan's wife."
      b.   Heb jij   Jan's vrouw wel eens gezien?
            have you Jan's wife   wel eens seen
            "Have you ever seen Jan's wife?"

Further research is needed to establish whether there are languages in which modal concord is always obligatory, and whether there are languages where modal concord is not possible at all.[3]

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[3] Interestingly, in dialects of English spoken in the South of the United States that allow two auxiliaries to occur in the same clause, a concord reading of the two modals does not seem to be available. Thus, "I might could

Whatever the outcome of such investigations, the phenomenon of modal concord as it occurs in English and Dutch calls out for an explanation, since it is an obvious challenge to compositional semantics.

Before we proceed, we pause to note that, although the phenomenon of modal concord has not gone unnoticed before, it has never been discussed in any depth, and ours seems to be the first attempt at analysis. The earliest sources, to the best of our knowledge, are Halliday (1970) and Lyons (1977). But despite the fact that it has not received much attention, modal concord plays a key role in several recent semantic theories on a variety of phenomena. It is an essential ingredient in Geurts's (2005) account of free choice permission, in Geurts and Nouwen's (2005) analysis of superlative quantifiers like *at least/most three ducks*, and in Huitink's (2005) treatment of sufficiency modal constructions like *you only need to VP*.

2 Restrictions on modal concord

There appear to be two main constraints on modal concord. First, two expressions can only participate in a concord construction if they are of the same modal type, i.e., if they are both deontic, epistemic, or whatever. Note that in (1a) both modals are epistemic, while in (1b) both are deontic. Of course, many modal expressions, like English *must* and *have to*, are ambiguous between construals of various types. Such expressions are disambiguated by the context of utterance (Kratzer 1981), which determines the set of worlds that the modal quantifies over. In many cases, the complement of the modal helps to make one of the readings more salient. Stative predicates tend to favour epistemic readings, as in (6a), whereas eventive predicates are biased towards deontic interpretations, as illustrated by (6b):

(6)   a.   John must be at home.
          b.   John must do the dishes.

Now consider sentence (7). The auxiliary *might* can only be understood as expressing epistemic possibility, but *have to* is in principle compatible with both an epistemic and a deontic reading. Since its complement describes an event, the deontic reading is favoured, so (7) contains one epistemic and one deontic modal. Consequently, the sentence doesn't have a concord reading. The only available interpretation is the one according to which the epistemic modal takes scope over the deontic one: the speaker considers it possible that John has to work on Sunday.[4]

(7)   John might have to work on Sunday.

The second constraint on modal concord is that the modals involved have to have the same, or at least similar, quantificational force. This constraint entails that sentence (8) has no concord interpretation, but rather expresses the speaker's certainty that there is a possibility that there were weapons of mass destruction in Iraq. One could utter such a sentence in a dispute about whether there may or may not have been such weapons.

(8)   There may certainly have been weapons of mass destruction in Iraq.

For (8), a concord reading is impossible because the universal force of *certainly* is incompatible with the existential force of *may*. But, on the face of it at least, not all examples of modal

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do that" can only mean that I consider it possible that I am in the position to do that. See di Paolo (1989).

   [4] See Nauze (2006) and Nuyts (2004) for explanations why the reverse scope order *deontic > epistemic* isn't possible.

concord involve modals with the same quantificational force. An example is (9):

(9)   Pain in these diseases may probably influence the sleep process.

Perhaps, this sentence allows for a concord reading because the quantificational force of *may* is sufficiently close to that of *probably*. Combinations like *may certainly*, as in (8), on the other hand, are not close enough in quantificational force, apparently.

Languages differ in which modals count as sufficiently similar. For instance, in English we find (9), but in Dutch *waarschijnlijk* "probably" combines with expressions of necessity rather than possibility.

(10)   a.   Amalia kan waarschijnlijk Spaans   spreken.
              Amalia can probably   Spanish speak
              "Amalia can probably speak Spanish" (cumulative only)
        b.   Dat moet waarschijnlijk in 1943 zijn geweest.
              that must probably   in 1943 be   been
              "That was probably in 1943."

Both in (9) and (10b) the speaker presents the embedded proposition as being probable, that is, whereas in (9) the adverb seems to strengthen the force of the modal verb, in (10b) the effect seems to go in the opposite direction. However, as we will see in a moment, there is another way of viewing what is going on in these examples.

3   Analysis

We assume that modal adverbs are polysemous between their standard meaning and a functional meaning which, in effect, performs a type check on its argument. That is, we parse "It may possibly be raining" (on its concord reading) as [[possibly may] raining], where *possibly* checks whether *may* is of the same sort as itself. The two senses of *possibly* are related by a type shifting rule.

In order to implement this idea, we adopt a partial two-sorted type theory with primitive types e for individuals, s for possible worlds, and t for truth values. The meaning of "Barney sneezes" can now be represented as $\lambda j S j b$, where i and j are variables of type s. Simplifying things somewhat, we analyze *must* and *necessarily* as propositional operators: $[\![must]\!] = [\![necessarily]\!] = \lambda p \lambda i \forall j [R i j \rightarrow p j]$, where p is a variable of type st, ranging over propositions, and R is a constant denoting an accessibility relation. Assuming that "Barney must sneeze" is parsed as [must [Barney sneeze]], we obtain the following:

(11) $[\![Barney\ must\ sneeze]\!] = \lambda p \lambda i \forall j [R i j \rightarrow p j](\lambda j S j b) = \lambda i \forall j [R i j \rightarrow S j b]$

Thus, "Barney must sneeze" is true in world w iff Barney sneezes in all worlds w' that are accessible from w.

Our type shifting rule is to map $[\![necessarily]\!]$ into a function that yields $[\![necessarily]\!]$ if its argument denotes $[\![necessarily]\!]$, and is undefined otherwise. To define this, we introduce the following auxiliary construct:

(12) $[\![P \doteq Q]\!] = [\![P]\!]$ if $[\![P]\!] = [\![Q]\!]$, and undefined otherwise

(P and Q are variables of type $(st)(st)$.) We now define our type shifting rule as follows:

(13) $\lambda Q \lambda P[P \doteq Q]$

Assuming for convenience that this operation is denoted at LF by ©, we analyse "Barney must necessarily sneeze" as [[©necessarily must] [Barney sneeze]], which gets the same truth conditions as "Barney must sneeze," i.e. (11).

This is a strict way of analysing modal concord: on this version of the analysis, $[[[©\alpha]\beta]] = [[\alpha]]$ if $[[\alpha]] = [[\beta]]$, and is undefined otherwise. *Prima facie*, this wrongly excludes examples like (9) and (10b). But on reflection it is not so clear that it does. It may be that one of the standard uses of English *may* is to express probability, or something close to it. (The preceding sentence might be a case in point.) If this is so, we can maintain after all that the adverb in (9) serves to select one of the senses of the modal auxiliary. And if it is the case that Dutch *moeten* "must" can express probability, too, we can account for examples like (10b), as well.

For this line of defense to work, we would have to establish that there is a rather subtle difference between English and Dutch: it should be the case that, whereas Dutch *moeten* "must" may express probability, English *must* may not, while vice versa English *may* can but Dutch *zou kunnen* "may/might" cannot express probability. This is perhaps less implausible than it might seem at first, because the Dutch lexical field of epistemic modality doesn't map one-to-one on its English counterpart, and it is well possible that the division of labour between modal lexemes is not exactly the same in the two languages. But it is evident that teasing out the relevant differences isn't going to be easy. For example, if Dutch and English differed in the way just indicated, it might be the case that the Dutch sentence in (14) is more acceptable than its English gloss:

(14)   Hij moet in Amsterdam zijn, maar hij zou   ook in Berlijn kunnen zijn gebleven.
        he must in Amsterdam be   but   he could too in Berlin can   be stayed
        "He must be in Amsterdam, but he may have stayed in Berlin, too."

It is not obvious that this is so, but on the other hand it isn't obviously false, either. This is an empirical issue, to be sure, but a hard one to decide.

Rather than pursuing this possibility, let us a have a brief look at possible alternatives. Are there ways of changing the type shifting rule in (14), so that it produces functions that don't enforce identity of meaning? As far as we can see, there is only one way that makes sense, and even that we don't know how to formulate in the present framework (and we strongly suspect it cannot be done at all). The idea is to map the denotation *m* of an modal adverbial onto a function that checks if the denotation of its argument, m', is of the same "modal type" as *m*; i.e. it checks if *m* and m' employ the same accessibility relation. The problem with this version of the analysis—if it could be implemented somehow—is that it would be too weak. It allows for combinations like *may certainly*, which don't get a concord reading in any language we know of. We could try to pragmatically restrict this analysis by the constraint that the two expressions engaging in modal concord must be sufficiently close in terms of strength. Different languages can make different decisions as to which pairs are sufficiently close and which are too far from one another. But this raises empirical issues of the same sort as the one briefly discussed in the last paragraph. For we would need to argue on independent grounds that, whereas English *probably* is closer to *may* than to *must*, it is different in Dutch.

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