The conceptual structure of deontic meaning: A model based on geometrical principles

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Abstract

Deontic meanings have frequently been considered in relation to epistemic meanings and the present paper introduces a novel framework for investigating this relationship. The paper first introduces the basic ideas in Deictic Space Theory (DST), illustrating the geometrical elements involved with respect to counterfactual conceptualisations. This framework is then used to explore deontic conceptualisations in relation to epistemic conceptualisations. Following the implications of the geometrical structure logic of DST, epistemic concepts are taken as fundamental and as presupposed in deontic meanings. It is argued that counterfactuality, which can be modelled as a geometrical reflection transformation, is crucial to the modelling of the conceptual space of obligation concepts expressed in English modal verbs. It is further argued that a second-order reflection transformation can model permission concepts. Deontic 'force' is modelled in a natural way as force vectors, an already assumed ingredient of DST's geometrical framework. Finally the paper considers ways in which this framework does and does not run counter to existing claims about deontic and epistemic meaning in Cognitive Semantics.

Keywords

deontic, epistemic, geometry, modality, transformations, reflexion, vector, counterfactual, coordinate, metarepresentaton, force dynamics, permission, obligation

1. Introduction

This paper proposes a model of deontic meaning framed in Deictic Space Theory (see Chilton 2005, 2007, 2010), a model of language-linked conceptual representation. The basis of this model lies in physical spatial representation

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and its formalism draws on elementary three-dimensional Euclidean geometry, which provides a natural way of describing space-based relationships. The way this geometric formalism works will become clear in the course of using it to explore the conceptual structure of deontic meaning. However, this inevitably raises some controversial issues, because Deictic Space Theory (henceforth DST) takes epistemic cognition to be fundamental, while the prevailing account in Cognitive Semantics since the work of Talmy, Sweetser and Johnson claims the reverse—that deontic meanings are fundamental and that epistemic meanings are derived from them. This paper is thus bi-focal: it is concerned with rethinking the relationship between epistemic modality and deontic modality but it does so within a theoretical framework that is new, although grounded in principles familiar in Cognitive Linguistics.

1.1. *Epistemic and deontic in Cognitive Semantics*

The framework for current assumptions about modals in Cognitive Linguistics comes from Talmy's papers on force dynamics (e.g. Talmy 1985), summarised systematically in Talmy (1988, 2001). Talmy makes four connected proposals, subsequently taken up by Johnson (1987) and Sweetser (1990, as well as earlier studies contemporaneous with Talmy's). The first is that force-dynamic concepts, arising in embodied experience, are cognitively primary structures that are recruited in a wide range of lexical and grammatical structures. The second is that force-dynamic structures have a social interpretation as well as a physical one. The third is that sociophysical force-dynamic concepts are associated with deontic modals. And the fourth is that the deontic modals are 'basic'. Johnson (1987) formulates these proposals in terms of image schemas. Sweetser adopts the force-dynamic account of deontic modals and places them in a diachronic account of the meanings of English modal auxiliaries, arguing for a historical progression from deontic (more concrete) meanings to epistemic (more abstract) meanings, a claim supported by the work of Traugott (e.g. 1989). Stated in this way the claim is about the historical development of a vocabulary. The more general claim is that the relationship between the deontic and the subsequent epistemic meanings is metaphorical, in the sense of conceptual metaphor theory. The implication (possibly unintended) is that such a relationship is synchronically true also—i.e. that such a relationship is to be found in the semantic description of the synchronic meaning or utterance processing of deontic and epistemic modals. This ought surely to mean that if we seek to describe the conceptual structure associated with epistemic words, deontic concepts are somehow involved, but not vice versa. I do not think this is the case.

That metaphorical mapping from more concrete to more abstract concepts underlies semantic change is not at issue here. There is, however, a problem that was not in the focus of the Talmy-Sweetser-Johnson framework. This is

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the problem that, so far as the synchronic semantics are concerned, deontic meanings appear to presuppose epistemic ones. The connection is not metaphorical but presuppositional. For example, it is awkward to say *John must clean up the mess but maybe he won't*,[1] while it is acceptable to say *John should clean up the mess but maybe he won't*. This shows not just that *must* is 'stronger' than *ought* but that both verbs presuppose an epistemic judgement about the action denoted by the complement over which they scope, namely, *clean up the mess*. On introspection, to make a deontically modalised assertion seems to involve having in mind a representation of a world that is not actual, in parallel with one that is actual. In the parallel world desired or required actions are executed by actors who exist in the actual world, and this parallel world can be imagined as possible, probable, necessary, etc.

To put these points in a slightly different way, if a speaker S says that her friend *ought* to do so-and-so, two things are clear about the use of *ought*: the friend is not doing so-and-so, or not yet; the speaker is invoking some kind of authority, moral duty or practical rule. At least, it would on the most usual understanding be strange to say she ought to be doing such-and-such if she already is, and at least there will be a tacit invocation of a norm, even if that norm is simply what is required in order to accomplish a practical goal. Intuitively, when S says 'she ought to do it', the associated conceptualisation seems to involve some imaginary domain in which she *does* do it simultaneously with a *real* domain in which she does not. Such mental constructs are not confined to deontic expressions. There are two components here that go hand in hand: counterfactuality and normativity. The normative element can indeed be insightfully modelled as a sort of force, as the Johnson-Talmy-Sweetser approach does, and as the DST approach is also equipped to do. But the epistemic dimension should not be neglected; it is in fact already built into the fundamental DST framework.

In the current accounts of modality outlined above, the term 'root' modal has been adopted to place dynamic modality (loosely, to do with physical ability) and deontic modality (to do with obligation and permission) in the same category and epistemic modality in a separate one. The present article does not adopt this division, since the term 'root' is potentially misleading in appearing to already embody a claim of priority, as well as in putting together under 'root' types of modality that can be distinguished (cf. Palmer 1986: 102–3). It is thus epistemic and deontic concepts that are the focus of enquiry.

The approach that is adopted here starts with conceptual space. Rather than examining the lexical expressions first in terms of their interrelations and their

1. Unless we treat the first clause as a case of free indirect style, perhaps. Such a reading would be a special case rather than indicating the default conceptualisation.

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polysemy, the aim is to explore the structure of the conceptual space that gives rise to the need for lexically communicated modal meanings in the first place. This is the approach followed by Winter and Gärdenfors (1995) in their account of modals and also, more broadly, by Gärdenfors (2000). The present paper, then, seeks to outline the structure of deontic concepts, and to do this it uses a geometrical model of conceptual space that is developed in DST, not only for modal concepts but for other conceptual structures too that are communicated via language. The way DST works is described briefly in section 2.2 below.

Like Winter and Gärdenfors (1995), this paper also derives an important part of its account of deontic modals from Talmy's insights concerning force concepts, but does not use them in exactly the same way. Winter and Gärdenfors remain interested in the nature of the etymological shift from deontic to epistemic, which they claim is gradual rather than metaphorical, and they do not focus on a synchronic conceptual relation between epistemic and deontic domains. The DST approach does not treat epistemic modal concepts as 'derived' from deontic concepts in the sense of some kind of conceptual one-way relation in the mind of a speaker. It is not clear in any case what this would mean. Note that as soon as one formulates the problem in terms of concepts in the mind rather than lexical items the blurring of synchronic and diachronic in the Talmy-Sweetser-Johnson account becomes obvious. If we ask what is the nature of the epistemic concept that people have in mind when they use a modal like *must* or *should* in an epistemic sense, we need also to ask what it means to say that such an epistemic sense 'derives from' a deontic sense. What I want to look at in this paper is the structure of the deontic conceptualisation people have in mind when they express it in linguistically available code.

The normative part of this conceptualisation can, as already noted, be modelled in terms of a force-dynamic component: loosely, the sense of compulsion or 'oughtness' that is activated by the use of deontic expressions can be explained in terms of a force-dynamic image schema that metaphorically has a source and has impact on an affected participant. In this I do not fully follow Winter and Gärdenfors (1995), however, who reduce the deontic source to 'social power' existing between speakers in a speech act (see section 3.3 below).

I have argued above that deontic conceptualisations probably involve contrasting parallel conceptualisations, one in the actual world, one in a counterfactual imposed world. This view is similar in certain ways to Frawley's account of deontic meaning as 'involving two kinds of 'world' (1992: 420). But the DST account is distinct from Frawley's in viewing deontic conceptualisation as dependent on epistemic conceptualisation. More fundamentally it is distinct from all approaches in taking advantage of Fauconnier's theory of mental spaces as a way of understanding the idea that two 'worlds' are somehow involved in deontic conceptualisation. But in turn, DST is different from mental space theory too. DST incorporates Fauconnier's idea of multiple cog-

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nitive spaces and referent mappings across such spaces, but it goes beyond mental spaces in the following ways: DST proposes an essentially deictic grounding for such spaces, it takes the spatial underpinning of many conceptualisations seriously by using geometrical descriptions, and it uncovers unsuspected relationships between spaces when viewed geometrically.

The DST framework was not set up specifically to explain deontic modals. An account of deontic modals does, however, come out of it and the reason for this is that, precisely because of its geometrical conception, the DST framework intrinsically provides both for multiple related spaces and for directed forces.

1.2. *Deictic Space Theory (DST)*

The basic assumption of DST is that human minds set up a conceptual space as they process linguistic utterances, a conceptual space that is inevitably tied to a point of view attributed to the speaker. Languages encode conceptual structures that are essentially deictic, situating entities and events (i) in terms of their relative salience, (ii) in terms of their relation to the speaker's time and, crucially for the present paper, (iii) in terms of epistemic 'distance' from the speaker. Utterances always connect simultaneously to all three dimensions. Conceptualisations involve (a) referents situated relative to these three dimensions and (b) relations between these referents.

In DST a simple geometry of coordinate systems, vectors and transformation of coordinate systems is used to integrate these ideas, with the goal of exploring linguistically encoded, and deictically grounded, conceptualisations. It is not of course being claimed that people actually use (neural correlates of) geometrical diagrams in speaking. The use of geometrical diagrams is a form of abstract analytic modelling of conceptualisation. Nonetheless, geometrical models can be said to be motivated. As Cognitive Linguistics has consistently claimed, the spatial basis of linguistically coded conceptualisations appears to be fundamental. Geometry is a natural resource for modelling both literal physical concepts of space and their metaphoric counterparts. This should not be altogether surprising: elements of geometry have been used in various ways in linguistics, one notable example being the linguistic analysis of spatial expressions where geometrical axis systems ('frames of reference') have provided an essential, if not completely sufficient, means of description (cf. Levinson 2003).

As outlined in Chilton (2005, 2007, 2010), the three dimensions (i), (ii) and (iii) noted above are treated as orthogonal axes whose origin is the speaking subject or self (S). Each axis is a scale, representing 'distance' in the direction pointing away from S. The precise configuration that is used in DST is illustrated in Figure 1, which is actually a particular DSM (deictic space model) for a particular construction associated with a particular construction.

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The fundamental axis system used in all DSMs, is given in Figure 1 on p. 200 by the three unbroken lines *d*, *t* and *m* converging at S. This axis system constitutes the base, reality *R* from S's point of view. Within this space can be embedded axis systems of similar shape, prompted by linguistic constructions of various types. For example Figure 1 contains a second axis system shown by broken lines. Such embedded axis systems are copies of the base system *R* and they are related to *R* by 'transformations'—the standard term for operations on a set of axes that translate a copy to another location whose origin is a point in *R*, or rotates a copy, or reflects a copy. In Figure 1, the embedded axis system (broken lines) is a reflection (mirror image) transformation of *R*, and it is a transformation that plays an important role in our analysis of deontic conceptualisation. Reflection transformations play a role in cross-linguistic descriptions of spatial prepositions (Levinson 2003: 45). One of the central claims of this present paper is that they are highly relevant also in modelling abstract conceptualisations, in particular the counterfactual element in deontic conceptualisation.

A little more should be said about each axis in turn. Each of these is always the same conceptually, whether they are in the base system *R* or in an axis system embedded in *R*. The *d*-axis 'locates' discourse entities at relative discourse distances from S. By this is meant that, just as in physical space we perceive foreground, middle ground and background, so in discourse, given the grammatical constructions available in language, including word order, we use foregrounding and backgrounding effects. This occurs most obviously in spatial deixis but is found analogously in the 'perspectivising' effects of grammar also.

The *t*-axis represents bidirectional time from the point of view of S. The past is 'viewed' by S as more or less 'distant' or 'remote' and the same is the case for the future in the opposite direction. This geometrical modelling of the time axis is consistent with many cognitive-linguistic accounts of metaphorical projection of spatial relations onto temporal ones.[2]

The third axis, *m* (for modal) represents modal epistemic distance relative to S. It is especially important for the present approach because it postulates a scale of epistemic 'distance'. This scale points in a 'direction' away from S and ranges from the epistemic judgement of certainty (what is 'true' so far as S is concerned) to counterfactuality (what is conceptualised as not the case by S, here labelled 'neg'). This is based on the assumption that humans are likely to feel more certain about what is close spatially close to them than about what is remote. This metaphor of distance is not uncommon in discussions of epis-

2. Conceptualisation of the future implies increased epistemic uncertainty but DST does not attempt to model this effect in the basic axis system. It can, however, be accommodated by giving future events an appropriate coordinate on the *m*-axis.

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temic meaning. Frawley (1992: 412–415), for example, develops it explicitly in a deictic theory of epistemic meaning.

In taking the epistemic axis m to be fundamental, DST thus assumes that human cognition makes a primary and non-linguistic assessment of whether a representation of a state of affairs or an event is true, or rather, to what extent it may be true or false, in the perspective of S. This implies that the *m*-axis is metarepresentational. The term metarepresentation is used to refer to what is claimed to be a fundamental human cognitive ability, one which enables humans to organise environmental information in terms of reliability, source and degrees of epistemic certainty (Cosmides and Tooby 2000 and accompanying papers in Sperber 2000).[3] I therefore posit the *m*-axis in DST as an essential non-linguistc conceptual dimension that is necessarily involved in linguistic utterance. The *m*-axis is crucial for the DST modelling of, for example, constructions involving 'propositional attitude' verbs like *believe*, where the complement clause is not epistemically endorsed by S but may, privately as it were, be regarded by S as counterfactual, possible, probable, improbable, etc. Such cognitive facts can be modelled if we postulate the *m*-axis, because we can then 'locate' the complement clause 'modalised' by a verb such as *believe* at a point on *m* that corresponds to less than certain truth for S (see Chilton 2005, 2010). Human metarepresentation is complex, and the present paper will try to explicate some of the complex metarepresentational layering that accounts for deontic conceptualisation.

DST geometry, then, integrates three fundamental dimensions in a conceptual space that is always presupposed in utterances. Given this three-dimensional conceptual space, discourse entities are identified by labels on the *d*-axis. Thus, in Figure 1 the three discourse referents, *John*, *Sarah*, *the party*, are all real in the discourse world of the speaker, so they have coordinates at relative distances from S in S's base axis system. The referent *John* is thematised by the word order, and is thus taken to be conceptually 'closer' to S on the *d*-axis. The Cartesian geometry we are using has a useful implication. We know from Fauconnier's pioneering work that linguistic expressions involve epistemically variable mental spaces and further that referents are connected across these 'spaces by connectors'. In the DST geometry such connectors arise automatically, since coordinates apply across the entire space; there is no need to introduce a special category of 'connectors'. Further, DST can 'anchor' its referents by labelling points anywhere in the three-dimensional space, which means that they can be anchored in S's reality plane or at a more distal point that is non-real (*irrealis*). This makes it possible to model a conceptualisation in which a

3. Note also that Hurford, on the basis of primate and other animal studies, is inclined to think that what he terms 'metacognition' and what other researchers call 'uncertainty-monitoring', is found to some degree even in non-humans (Hurford 2007: 29–35).

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referent may be regarded as real by S, i.e. be anchored by its *d* and *m* coordinates in S's reality plane, but automatically connected by its *d* coordinate to a non-real plane distal from S on *m*, where there are referents that 'exist', i.e. anchored, only in that plane.[4]

There is a further essential geometrical concept in DST: vectors. Although this concept has not been formally applied in Cognitive Linguistics, it is adumbrated in many analyses. Vectors are defined mathematically as objects that have direction and magnitude, and in spatial terms this means direction and distance, both of which concepts are frequently mentioned in cognitive-linguistic work. Vectors are used standardly in applied sciences to describe position, translation and force, and each of these physical notions has its abstract metaphorical conceptualisation in cognitive semantics: location relative to S or another landmark, movement and path, and, importantly for the present analysis of deontic meanings, force dynamic image schemas. DST is inherently vectorial. The axes themselves are kinds of vector, but more centrally predicates on single referents and predicates between two or three referents are shown as vectors, conventionally represented as arrows. This approach gives more precision and potential to the iconic arrows found throughout the cognitive-linguistic literature. DST does not exploit the full range of mathematical properties of vectors and in particular it simplifies 'magnitude' by treating vectors between referents as unit vectors as an initial assumption. Vector analysis has been used for some time in the analysis of spatial relations (Zwarts 1997); it is given a biological slant by O'Keefe (1996) and an experimental-psychological slant by Wolff and Zettergren (2002).

1.3. *Outline of the argument*

In section 2, I demonstrate how DST provides explicit models of counterfactual spaces, using the inherent properties of geometrical principles, without introduction of ad hoc labelling of diagrammatic circles or other devices, as is needed in other approaches. Counterfactual spaces provide one of the key ingredients for exploring the structure of deontic conceptualisation in the subsequent sections. Section 3 uses the modelling of counterfactuals spaces to explore deontic meanings, working through a range of examples of English constructions based on modal verbs *must* and *should*. Section 3.1 presents the basic configuration that I think is needed to build a formal structured model of the deontic meanings associated with obligation: S's *R* space and its counterfactual mirror-image space diagrammed as two sets of corresponding but 'opposing' axes. This is a first-order reflection space. In order to model prohibition/permission conceptualisation, Section 3.2 argues that such meanings presup-

4. As is the case for *de dicto* as opposed to *de re* sentences.

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pose the obligation space described in 3.1. Thus the DST solution to modelling this is to construct a second-order conceptual space that is geometrically a reflection based on the obligation space. Section 3.2 further discusses a third-order reflection space. These two sections thus describe the metarepresentational complexities that can be described in the DST model by using the epistemic *m*-axis. The account thus far leaves out notions of deontic force, essential to any complete account. Section 3.3 addresses this matter and demonstrates how the modelling of deontic sources and their force falls out in a natural way from the DST framework, because of its use of locations and its use of geometrical vectors, which are a natural way to model forces of all kinds. The overall architecture of DST thus automatically integrates, though perhaps in an unexpected way, the insights of the Talmy-Sweetser-Johnson approach. It does not and does not need to make claims about the direction of lexical derivations between epistemic and deontic meanings. Finally, section 4 concludes with general points concerning the characteristics of DST, its account of deontic conceptualisation and its relationship with other approaches in Cognitive Linguistics.

2. Counterfactual conditionals

A sentence like (1) below gives rise to the sort of epistemic double vision that we have described above:

(1) If John had gone to the party, he would have seen Sarah.

We need to take account of the fact that (1) illustrates polarity reversal, as does its negative counterpart, (2):

(2) If John had not gone to the party, he would not have seen Sarah.

That is to say, under the influence of *if*, the polarity of 'John had gone to the party' is reversed. As is 'John had not gone to the party'. It may be that interpreting sentences like (1) and (2), in context and out of context, produces two simultaneous conceptual representations: one in which John did in fact go to the party (the *realis* representation) and one in which he did not (the counterfactual one). The converse is the case for (2).[5] If this is the case, what is needed is a formal system that can somehow naturally model this.

Given the DST geometry, what do we need in order to model counterfactual sentences? We can geometrically describe the conceptual representations associated with (1) and (2) by treating the counterfactual conditional construction as a reflection transformation copied within the base axis system of S, as

5. All combinations of protasis, apodosis, negative and positive can be modelled using the same geometry. It is not necessary to illustrate them all here.

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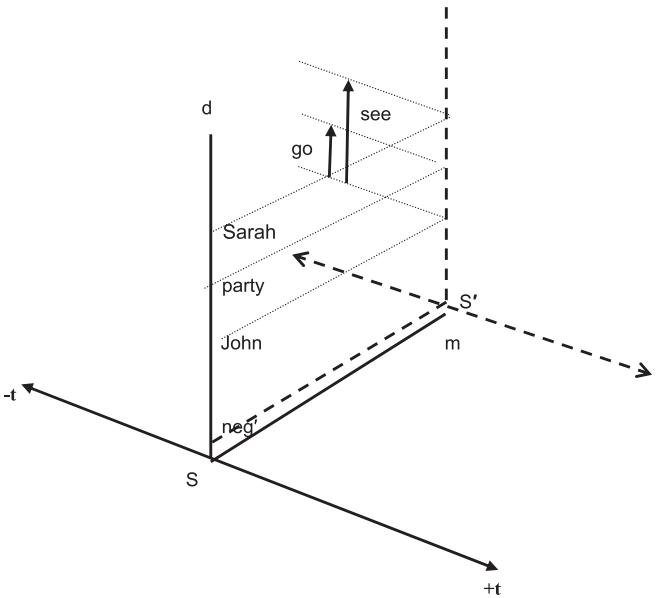


Figure 1. *Sentence (1) If John had gone to the party, he would have seen Sarah*

shown for (1) in Figure 1. This transformation reflects (and translates) the base system, so that what is counterfactual in the base coincides with what is factual in the reflected system and vice versa, while the discourse referents are held constant and the temporal directions do not change.

Figure 1 shows *R*, the base axis system whose origin is S and, superimposed on it, its reflection *R′*. Figure 1 assumes that the discourse referents are first defined in S's reality plane (i.e. the plane in *R* where all points that have a co-ordinate $m = 0$). In line with the positive polarity of both clauses of (1), but under the influence of *if* + *past perf*, which acts as an operator, the vectors *go* and *see* lie in the quasi-reality plane (running through $m' = 0$) of *R′*, the reflected axis system. S is, so to speak, projecting herself to a counterfactual viewpoint relative to her real-world viewpoint, imagining herself as S′. Simultaneously, the geometry makes the reality plane of S′ coincide with the *counterfactual* plane of the base system, the system that is real for S. In other words, from the point of view of S′ in the *if*-system, the events of going and seeing happened, but from S's point of view they did not happen.

Suppose now that we locate the vectors *go* and *see* in the counterfactual plane (at $m' = \text{neg}'$) in the reflected system. This gives us sentence (2). Under *if* + *past perf* the events are conceived as not having taken place (hence the lexically negative form), but simultaneously, in the base system *R* they coin-

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cide with the reality plane of S—that is, from S's point of view, the events *did* happen. In general, for counterfactual conceptualisations, including those involved in deontic expressions, we need this reflection transformation of the base coordinates.

The general claim is that a geometrical transformation of axes yields a description of counterfactual conditionals (and other kinds of counterfactuals) that captures their key cognitive effects. Such effects are not confined to this type of conditional construction and the geometrical model I have outlined is not purely ad hoc. One other interesting type of conceptualisation where it can be used arises in deontic uses of the English modal auxiliaries, as will be seen.

3. The deontic mirror

The task now is to show how geometrical modelling can be used to model deontic conceptualisations. This might seem a curious notion at first sight but I hope to show that the DST approach can capture a number of interesting dimensions of deontic meanings. In particular, in this section I show how epistemic meanings are part of the conceptual structure of deontic meanings. The essential epistemic component is counterfactuality, and as we have seen, counterfactual conceptions can be modelled as geometric reflections of the base space *R*. This does not mean the notion of force is irrelevant. Force is also an essential ingredient. It is not necessary to introduce any extra machinery to deal with this, as the DST approach already has vectors, which can be interpreted as standing for force directed from a binding source.

3.1. *First-order reflection of R: Obligation*

Deontic meanings presuppose epistemic meanings, primarily counterfactual ones. While a clear-cut distinction between epistemic and deontic modality is generally accepted, many of the theoretical semantic accounts (for example, Lyons 1977, Langacker 1991, Frawley 1992) make the point that deontic meanings, like directive meanings, involve a non-existent or not-yet-existent or desired or irreal or imposed action or state of affairs. This surely means that the epistemic is interwoven with the deontic in the conceptualisations that arise in the course of producing and understanding deontic utterances. Within the present framework I refer to the mental representations of the epistemically non-real simply as 'counterfactual'. The type of conceptualisation in question involves the combination of factual (for the speaker S) elements as well as (again for S) counterfactual elements. The geometrical format that DST uses is able to precisely characterise this combination.

We will consider examples such as the following:

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(3) a. Mary must write the report
b. Mary must not write the report

The crucial point here is that there is a counterfactual presupposition in (3a): that Mary is not at the time of speaking writing (or intending to write) the report, so far as the speaker S knows. At the same time, the sentence leads us (as presumably its utterer wanted) to entertain the notion that in some possible world Mary *does* write it. This is the basis on which I am proposing the idea of the *deontic mirror world*. Mary is not doing the desired action in the speaker's reality but is represented as doing it in the speaker's ideal or desired world. We need a way of modelling this kind of ideal or desired world relative to the speaker's real world and we can do it semi-formally as follows. There is a base axis system *R*, which is real-for-S, and within *R* Mary is not writing the report. Simultaneously there is another axis system *R′*, in which Mary 'is' writing it. And hearers of (3a) mentally represent both *R* and *R′* because of the conventional meaning of the English modal *must*.[6]

In describing deontic meanings semanticists sometimes talk of the 'imposing' of one world on another by some individual or institution with authority or power (cf. Lyons 1977: 827). Frawley (1992) speaks of the 'imposition' of an 'expressed world' on a 'reference world'. Langacker's account also appears to emphasize a similar epistemic structure (Langacker 1991: 269–281). Force-dynamic accounts do not speak of this simultaneous dual structure with its differentiated epistemic components.

As we have already noted, there is another component of the deontic meaning of *must*, namely the concept of some kind of compulsion, resembling the force dynamic account proposed by Johnson, Talmy and Sweetser. Since DST draws on the idea of vectors, we already have a force concept in the elementary physical understanding of vectors themselves. We shall explore how force vectors can in a natural motivated fashion be combined with insights about the different kinds of 'reality' involved in deontic meanings.

The model I am proposing for deontic obligation concepts is built on the same reflection geometry that structures counterfactual conditionals, as described in section 1. The configuration required is repeated in Figure 2 below. We can think of this as representing the fundamental counterfactual space that is apparent both in the kinds of conditional sentences we have examined and in

6. I don't mean of course that they have a little picture in their minds that resembles the figure we are about to contemplate. Rather the geometrical diagrams are abstract models of cognitive states. But it is important to note that these abstract models, unlike some others found in Cognitive Linguistics, are *motivated* in two senses. First, they use standard elementary mathematical ideas from geometry, *viz.* coordinates and vectors. Second, I suggest that geometric coordinates and vectors are themselves *motivated* because they are rooted in bodily experience of direction, distance and force (cf. Chilton 2005).

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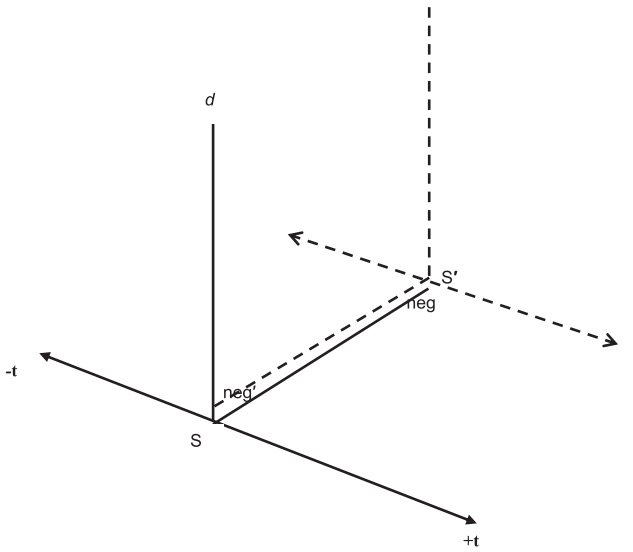


Figure 2. *Base axis system and reflected copy*

deontic conceptualisations. As we have already noted, this kind of conceptual space superimposes the non-real on the real (for the speaker).[7] The concept of counterfactuality makes no sense unless both a base world and a counter-world are simultaneously held in mind.

The range of obligation concepts facilitated by English modal verbs can be seen to be structured within this double world. In this world the time axis (*t*) and the referential axis (*d*) correspond, but the *m*-axis, the scale running from what is real for S is to what is not-real or counterfactual for S, is reversed. So for S′ at the origin of this reflected system *R*′ what is counterfactual in *R* is real, and conversely for the counterfactual in *R*′. The whole reflected space of *R*′ corresponds to a state of affairs that is desired, or desirable, including ethically desirable. Of course the precise deontic or ethical basis is determined pragmatically, that is, in the interlocutors' shared expectations, which can include merely S's desires or those of some source external to S.

Figure 3 below takes the fundamental counterfactual configuration of Figure 2 and positions vectors within it corresponding to modalised action verbs, in particular, obligation concepts encoded in the lexemes *must* and *should*. Various tense forms are considered.

7. We could say that the alternative counterfactual world is 'presupposed' or 'supposed': this could account for the English quasi-deontic modal in 'Mary is supposed to be writing the report'.

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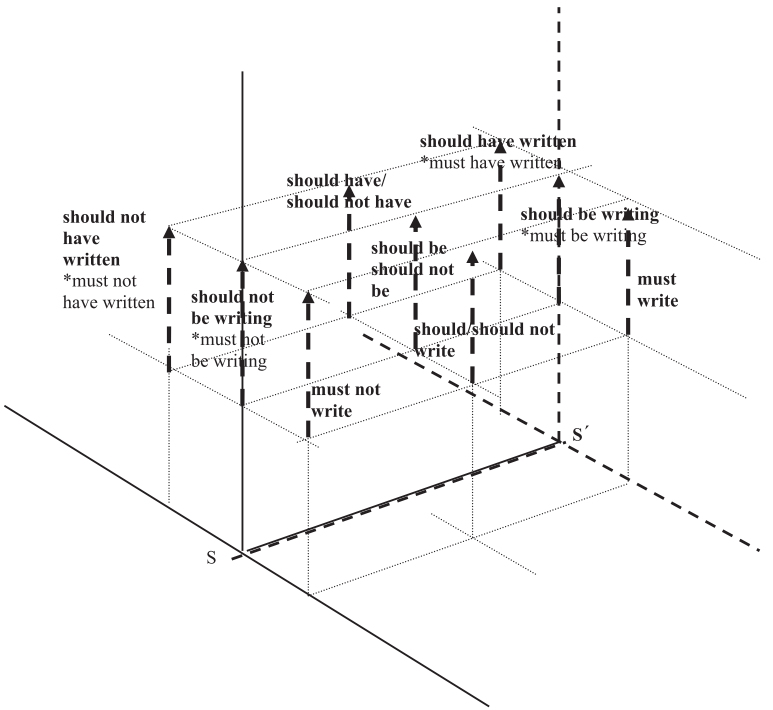


Figure 3. *Obligation expressions*

For example, we consider *Mary must not write the report* and *Mary should have written the report*. And we are concerned not only with the deontic meanings themselves but also with the effect of certain tenses that exclude deontic meanings but allow epistemic ones. The sentences we shall consider are listed below. They are variations on (3), which is repeated below for convenience. The sentences are ambiguous between deontic and epistemic meaning but it is the deontic meaning that is to be assumed here: the starred sentences are those for which a deontic reading is not available without further specification of context.

(3) a. Mary must write the report
    b. Mary must not write the report
(4) a. *Mary must be writing the report
    b. *Mary must not be writing the report
(5) a. *Mary must have written the report
    b. *Mary must not have written the report
(6) a. Mary should write the report
    b. Mary should not write the report

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(7) a. Mary should be writing the report
b. Mary should not be writing the report
(8) a. Mary should have written the report
b. Mary should not have written the report

In Figure 3 the vectors stand for the directed action *write*, the tail starts at the coordinate for the writer (Mary), the tip touches the thing written (report). The writer, Mary, and the report have their labels in *R*, the coordinate system representing the world as real for the speaker (subject) S, though of course their coordinates run through into *R′*, since *R* and *R′* are aligned.[8] But the vectors are another matter: they are modalised for S, that is, they may be true, untrue, desired, required, possible, probable, untrue, etc.

Let us consider each of the cases in turn as they are positioned in the dual-space configured in Figure 3.

must* + *V*, *must not* + *V

In example (3) the event of Mary writing the report is understood to be at some time $t > 0$. While (3) is perfectly normal, the examples in (4) and (5) are not. This follows from the natural conceptual structure of illocutionary acts that would be being performed, were a speaker to use sentence (3) in some plausible context. In more general terms, it also follows from assumptions about causations. That is to say, you cannot cause something to happen in the past. Nor can one impose on somebody the obligation to have done something in the past. Of course, we can say things like *John was obliged|had (got) to do x*, but this is a report of an obligation that John was under in the past, not a use of this utterance to bring about an action in the past that has not taken place. Moreover, a sentence like (3) requires that we understand the source of the obligation as being the speaker; it is not understood as a report of an obligation imposed by some other person. The use of *must* in the present tense with second person subject has a pragmatic effect related to that associated with imperative forms understood as commands.

In terms of Figure 3, the *must* + *V* construction gives a conceptual configuration that can be described as follows. In *R′*, the reflected deontic world, S′ views reality *R* from an opposed viewpoint. From this viewpoint, the event of writing referred to in (3a) is 'real' in *R′*, thus positioned at $m' = 0$, with tail coordinates at *Mary* and tip coordinates at the target of the action, *the report*. The location on the *t*-axis is at some time $t > 0$. And *t* must be greater than zero for the same reason that it cannot be less than zero—one cannot require or

8. As Lyons (1977: 791) puts it: 'We can also carry out the psychological process of trans-world identification across real and imaginary worlds of various kinds.' Compare also Fauconnier's mental space mappings (Fauconnier 1994).

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command an action that is already taking place at utterance time $t = 0$. In R, however, it is assumed to be not the case that the writing is taking place. Accordingly, the *write* vector in R is found at the counterfactual end of the epistemic modal axis m, as required. This result, which follows from the mirror reflection geometry, corresponds to a large part of the epistemic semantics that is incorporated in the deontic semantics of *must*.

Consider now (3b), *Mary must not write the report*. At the distal (counterfactual) end of m' in R', i.e. at what is the opposite of what S demands in the deontic space, is located an act of writing. Simultaneously, there is an assumption that Mary will, contrary to what S requires, write the report in R.[9]

Now (3b) and its geometric representation corresponds to a prohibition, and in section 3.2 we shall use this point in order to build a representation of deontic prohibition and permission modals. A consequence is that the obligation scale and the permission scale are not, *pace* Frawley (1992: 422), totally unrelated to one another; in fact, they seem to be conceptually entangled in certain ways that will be discussed below. For the moment it is important to point out that m' in R' corresponds to commands at $m' = 0$ and prohibitions at $m' =$ counterfactual (*neg* in the diagrams).

must be V-ing*, *must not be V-ing

The construction with present progressive clearly does not behave in the same way as *must* with bare infinitive. In Figure 3, examples (4) are starred because they are not acceptable on a deontic reading. The sentence *Mary must be writing* can only express S's epistemic assessment of the degree of truth of the assertion that Mary is writing—viz. that it is highly probable that the activity is occurring. For this the relevant DST diagram would not involve reflected axes, merely the base system, which already incorporates an epistemic scale, viz. the m-axis. It is true, of course, that a deontic reading can be imagined for *must (not) be V-ing*, but a special context is needed, one which embeds this construction in a future event. Thus for a deontic interpretation of (4) we have to invent a context like: *Mary must (not) be writing the report when the boss comes in*. The progressive in this reading is relativised to some future time (when the boss comes in) relative to S.

If the progressive is given a present time reading relative to S, the only interpretation is epistemic. This is consistent with the point that deontic modali-

9. In practice, she may or may not, but I am proposing here that, so far as the conceptualisation of *must not* is concerned, there is a presumption that she will. Cf. the following: A. *Mary must not write the report.*—B: *Who said she was going to?* This kind of exchange suggests that the kind of utterance used by A always carries a strong presumption which has to be challenged if some speaker wants to assert the weaker meaning (that Mary might not be intending to write the report).

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sation can only apply to events viewed as taking place at some $t > 0$. The same point applies to commands and similar speech acts. If event *e* is taking place at the same instant as utterance *u*, then the preparatory condition for uttering *u* is not satisfied.[10] If we put *e* at $t = 0$, then the meaning is limited to the epistemic meaning. Conversely, we cannot make the epistemic reading of *must* + *V* apply to a future event *e* at $t > 0$. The strong epistemic modal *must* applies only to events at $t \leq 0$. The reason is noted by many commentators: it is only present or past events about which we make a *strong* epistemic judgement about the probability of their occurrence, while future events are inherently epistemically uncertain. This means that weakly predictive *Mary* $may_{\text{epistemic}}$ *write the report next week*, is acceptable with reference to a *future* event of writing, but strongly predictive $must_{\text{epistemic}}$ is not acceptable in this construction.

However, we can have a future reference for the following progressive construction with *must* as epistemic: *Mary* $must_{\text{epistemic}}$ *(not) be writing the report next week*. Nonetheless, it is arguable that *must* in such expressions relates to an inference carried out by the speaker at a time coinciding with utterance time. The time of the event can, as in (7), be tied to the future by way of the time adverbial. Equally it can be tied to the utterance time in the same manner: e.g. *Mary must (not) be writing the report at the moment*.

Further, it is worth noting that when the natural conceptual constraint prevents the deontic reading of *must* for present time points, the epistemic meaning comes up as a default. This may be a corroboration of DST's assumption that the epistemic scale *m* is fundamental, not a derivative, at a conceptual level, of deontic meaning.

must have V-ed, must not have V-ed

The cases (5) follow the same pattern, *mutatis mutandis*, as (4) and for the same reasons, namely, that the conventional meaning of *must* is linked to illocutionary pragmatic force of a quasi-causal nature and thus cannot apply to a relation between present utterance and an event $e_{t \leq 0}$. When we turn to *should*, however, the situation is somewhat different.

should V, should not V

In cases (6), it is required that the future event is at $t > 0$, as for *must* in (3). How then does *should* differ in meaning from *must*? Whereas for *must* there is (it seems to me) a counterfactual inference connected with *must* in (3), this is not so obviously the usual interpretation for (6). We can, for instance, have the following:

10. I am grateful to Chris Hart for clarifying this point.

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(6′) a. Mary should write the report and she will / Mary should write the report but she won't
b. Mary should not write the report and she won't / but she will.

The assertion that Mary should (not) write the report can be overridden by its negation by the same speaker. This does not work for *must*. Taking another look at (3), we have:

(3′) a. Mary must write the report and she will / ?but she won't
b. Mary must not write the report and she won't / ?but she will.

In using *must*, it seems that the prompted conceptualisation (and the speaker by implication) does not admit the possibility of non-compliance or contradiction. The assertion that Mary must (not) write the report is questionably compatible with its negation by the same speaker. This rather subtle difference corresponds in part of the difference in meaning of English *must* and *should*.[11]

In addition, a word such as *maybe* is compatible with *should* but not *must*:

(6″) a. Mary should write the report and maybe she will / but maybe she won't
b. Mary should not write the report and maybe she won't / but maybe she will.

With *should*, the prompted conceptualisation seems to accept indeterminacy. But not so in the case of *must*:

(3″) a. Mary must write the report ?and maybe she will / ?but maybe she won't.

With *must*, taking the speaker as deontic source, epistemic uncertainty about the required event is not entertained.

In terms of the DST format, these points suggest that the construction *should|should not V* is located at the medial point on *m*, as it is in Figure 3. In saying 'Mary should write the report', a speaker is not presupposing that Mary is not writing the report: accordingly, Figure 3 does not show any instance of the *should* vector at the counterfactual end of the *m* axis in *R* or at the factual end for *should not*. This situation is, however, slightly different for the present progressive and present perfect constructions.

11. The intuitive native-speaker judgments reflected in (3′) seem to require that both clauses are uttered by the same speaker and that the source of the deontic force is also the speaker (as the usual meaning of *must* in such examples does indeed seem to require). However, sentences like (3′) seem acceptable if two speakers are involved. Thus: A. *Mary must write the report*. B. *But she won't.*

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should / should not be V-ing* and *should / should not have V-ed

A further important property that distinguishes *should* from *must* is the difference in the way the two English auxiliaries interact with aspect and tense meaning. Differently from the *must* construction, a deontic reading is available for the progressive aspect (7) construction and for the present perfect construction (8).

First, the present progressive and the present perfect tolerate deontic interpretation. This implies that the deontic semantics here do not, unlike those for *must*, include quasi-causal illocutionary force. They are not used in order to bring about some action; rather, they are used to pass judgement (with respect to some norm) on the doing or not doing of some action, whether or not these actions are viewed as present, past or future.

Second, though we cannot compare directly with must (since *must* has no deontic meaning for progressive and perfect constructions), it is worth considering whether there are counterfactuality inferences for *should* in sentences such as (5) and (6).

(5′) a. Mary should be writing the report and she is / but she isn't
b. Mary should not be writing the report and she isn't / but she is
(6′) a. Mary should have written the report and she has / but she hasn't
b. Mary should not have written the report and she hasn't / but she has.

Although I think the default, on hearing 'Mary should be writing the report', is to assume that she is not (i.e. to add 'but she isn't' is unproblematic), 'Mary should be writing the report and she is' does not seem impossible; certainly it is more acceptable to my mind than (3′).[12] Something similar seems to be the case for *should/should not have V-ed*. It is also important to note that *maybe* also seems to be within the limits of acceptability for (5) and (6), as it is for (4). The situation for the progressive and the perfect constructions thus seems to be different from that of the *should + V* construction. They are both compatible with inferences that a reference event has, has not or merely may have taken place, and that such an event is, is not or may be taking place. This is not the case for future events, since only *maybe* can be asserted for future events in *R*.

3.2. *Second-order reflection: Prohibition and permission*

Deontic meanings are inherently more complex than epistemic ones because they imply and interact with epistemic meanings. The geometric approach seems to be an elegant way of capturing the complexities. Though this does not mean the diagrams are simple, they are systematic. In standard accounts of

12. I am using native-speaker intuition as a heuristic here; corpus-based methods could possibly contribute.

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modal expressions, not only for English, the concepts of *prohibition* and *permission* are treated as members of the deontic category. The question that now arises, is whether they can be modelled in the kind of integrated theory of modal concepts that DST attempts to build.

Frawley (1992: 422) insists that the obligation and permission are on two separate, non-overlapping scales. This seems to be true up to a point but the two scales (corresponding to the two worlds of obligation and permission) are clearly in some sort of relationship one to the other. To make sense of the conceptual relationship, permission needs to be defined by reference to prohibition. Prohibition can be regarded as the issuance of an obligation to *not-p*, e.g. *Mary must not write the report*. In part, prohibition appears in the deontic obligation world that we have been exploring so far. I say in part, because *you must not do p* is significantly different from *you may not do p.* Nonetheless, these two sentences are in practice prohibitions, despite the conceptual difference.

The difference has to do with the fact that obligation is imposed on the real world *R* while permission is imposed on the obligation world *R′*. The presumed background to permission-giving is the obligation to not do *p*. This is why, in Figure 4, permission emerges as a mirror transformation *R″* of *R′*. That is to say, the permission world is a reflection, or reversal of *R′*, which brings it into alignment with *R*. Note that this does not mean it is the same as *R*, since all transformations are copies of *R* that remain in the DSM in their own right, as a kind of conceptual 'background'. If we appear to be just going back to where we started, that is what we need, because for one thing *R* is the world of fact that is resumed, as it were, once the 'imposed' worlds are lifted and for another thing we can see how we got there through ideal mirror worlds and their removal. From now on I shall refer to *R′* as the 'obligation space' ('*O*-space') and to *R″* as the 'permission space' ('*P*-space'). Every event (vector) that is located in O is an obligation (positive, negative or medial); every event (vector) in P is a permission (positive, negative or medial).

The permission world throws a different light on (3b), which can be understood in two ways, as shown informally in (9) corresponding to (3b above):

(9) (i) Mary must not-write the report (i.e. it is the case that Mary must not write the report)
(ii) Mary not-must write the report (i.e. it is not the case that Mary must write the report).

The first of these (i.e. (9 (i)) corresponding to one reading of (3b) above) can be regarded as prohibition. The second of these can be called 'exemption' (Lyons 1977: 773, 837–840). The sentence (9 (ii)) is not of course a natural English sentence but a way of representing a conceptualisation of what would more naturally be expressed as 'Mary need not write the report'.

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Turning to the *P*-space created by the transformation yielding *R″*, the expressions we are concerned with are the following:

(10) a. Mary may write the report
b. Mary may not write the report
(i) Mary may not-write the report
(ii) Mary not-may write the report.

Of examples (10), (10a) and (10b (i)) can be epistemic or deontic but (10b (ii)) can only be deontic. The progressive and perfect forms follow a different pattern:

(11) a. Mary may be writing the report
b. Mary may not be writing the report
(i) Mary may not-be-writing the report (if the boss comes in, it doesn't matter)
(ii) Mary not-may be writing the report (I don't want the boss to see her writing it).

Of these examples (11a) can only be deontic if the event is relative to a time point in the future relative to S. However, as in the examples in (10), (11b (i)) can be both epistemic and deontic, while (11b (ii)) is deontic only.

As for the following, none of them can be deontic:

(12) a. Mary may have written the report
b. Mary may not have written the report
(i) Mary may not-have-written the report
(ii) Mary not-may have written the report.

None of them can be deontic, for the same natural reason that governs present perfect deontic *must* (though not present perfect deontic *should*)—viz. that permission cannot be given for a past event or non-event to be enacted if it already has been (or has not been).

Let us now see how these meanings are produced by the mirror-mirror transformation that yields the permission space *R″*. Recall that this transformation sets up a reflection of the obligation space or *R′*. The result of this can be thought of as the reversal of the *m*-axis. The setting up of the *P*-space can be also thought of as the 'lifting' of obligations, whether positive ones (akin to orders) or negative ones (prohibitions). We illustrate this for case (10) in Figure 4 below.

In the *P*-space, S is the source of a representation which entertains the scenario of Mary writing the report. We understand *may* as setting up such a mental space: a world in which Mary's writing the report is conceptualised as taking place against the presupposed backdrop of the *O*-space, the space in which S represents the scenario of Mary's *not* writing the report.

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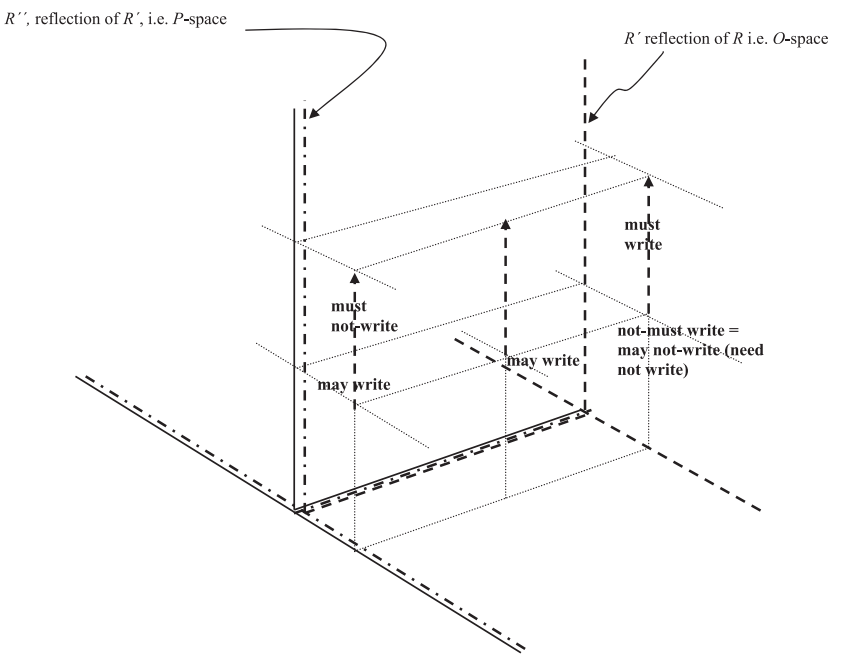


Figure 4. *Permission and exemption, example (10)*

Consider the extreme points of *m″*, the *m*-axis of *R″*, the *P*-space, in Figure 4.

The point at *m″* = counterfactual coincides with *m′* = 0 (i.e. what S wants to be real in *O*) and with *m* = counterfactual (i.e. what S regards as really untrue in the base space *R*). In other words it is presupposed in *R* that Mary is not writing the report. In *R′* (i.e. the *O*-space) S conceptualises a world in which she *will* write it. In *R″* (i.e. the *P*-space) the entire axis system is in turn reversed (reflected) and the obligation is dissolved. Thus at *m″* = counterfactual we have something like *it is counterfactual that Mary must write the report* (or in more logic-oriented terms, *Mary not-must write the report*). This corresponds to (10b (i)) *Mary may not-write the report* or in other words *Mary is permitted not to write the report*—more naturally expressed as 'Mary need not write the report, is not obliged to write the report, is exempt from writing the report, etc.'. This position (i.e. *m″* = counterfactual) in the DSM thus represents the complex conceptual structure of an 'exemption'. In general, *P* presupposes *O* and *O* presupposes its reflected 'opposite'.

At *m″* = 0 we have a different effect. The prohibition *Mary must not write the report* is represented in *R′* (i.e. in *O*), where it is located at the counterfactual end of *m′*. But this point coincides with *m″* = 0, what is entertained as real

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in the second-order reflection *R″* (i.e. *P*). What does this represent? It represents S's conceptualisation of the event of Mary's writing the report occurring in a conceptual space of permission—in which a presupposed prohibition, which in turn presupposes its reflected opposite (i.e. Mary is conceptualised as intending to write the report in *R*), is being lifted. Just as the *O*-space entertains what S desires to impose, so the *P*-space entertains the lifting of the prohibition. In other words, in *P* the speaker S is representing the occurrence of the event of Mary's writing the report: *Mary may*$_{deontic}$ *write the report and she will*. However, there is some conceptual indeterminacy here, for S may not be expecting with epistemic certainty that Mary will write the report if S lifts the prohibition (i.e. gives permission): *Mary may*$_{deontic}$ *write the report—possibly she will in fact do so, possibly she won't*. The DSM should then also show a vector in *P* at *m″* midpoint, as well as at *m″* = 0 as shown in Figure 4. What is interesting about this is then that deontic *may* coincides with its epistemic meaning, as we need, given its polysemy.

What the diagram thus shows us is that conceptualisations in *P* have *two* 'background' conceptualisations, or two kinds of conceptual space. One is the *O*-space in which there is represented the prohibition *Mary must not write the report*. The other is the *R* space, where S knows what is happening in his/her real world and this includes the idea that Mary will engage in writing the report at some point in the future relative to S. This configuration thus matches the linguistic intuition that understanding (10a) *Mary may write the report* raises (i) the notion that there is a will on Mary's part to engage in the action, and simultaneously raises (ii) the notion of an obligation to refrain from engaging in the action in question, and (iii) a conceptual reversal of that obligation, such that it is imagined that Mary will or might perform the action. In this kind of model, then, permission is a complex conceptual structure which rests on conceptualised obligation which in turn rests on a conceptualiser's assumptions about his reality.

There remains the question of the meaning of *Mary may not write the report*, suggested in (10b (ii)) *Mary not-may write the report*), in which the permission-giving meaning of *may* is counterfactual (there is no permission to do *x*), which is tantamount to a prohibition.

If we compare (3b) *Mary must not write the report* and (10b) in the sense of (10b (ii)), both can be understood as prohibitions. This is an apparent problem for Figure 4, since *Mary may not write the report* might be expected, *qua* prohibition, to appear at the counterfactual end of *m″*, but because it seems conceptually similar to *Mary must not write the report* we might also expect it to coincide with the latter. One might argue that this is only a problem if we assume that the *may* form has to remain in *P*. In fact, of course, *may* is polysemous and can appear in *O*—which is the solution proposed here. Nonetheless, though they are logically and conceptually similar, there does seem to

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be some semantic difference between the two prohibition forms *must not* and *may not*.

There is perhaps another way of approaching this problem. Note first that *must*-prohibitions (*Mary must not write the report*) do not have the conceptual form *Mary not-must write the report*: it is the writing of the report that is entertained counterfactually not the deontic force that is negated. By contrast, the *may*-prohibitions have the conceptual form, as we have seen, *Mary not-may write the report*. That is to say, in the latter case, we can regard the entire *P*-space (the coordinate system *R″*) as being reversed (as undergoing yet another reflection transformation) producing a third-order space *R‴*. Now, complicated as it may seem, this does have interesting results, as the DSM in Figure 5 suggests:

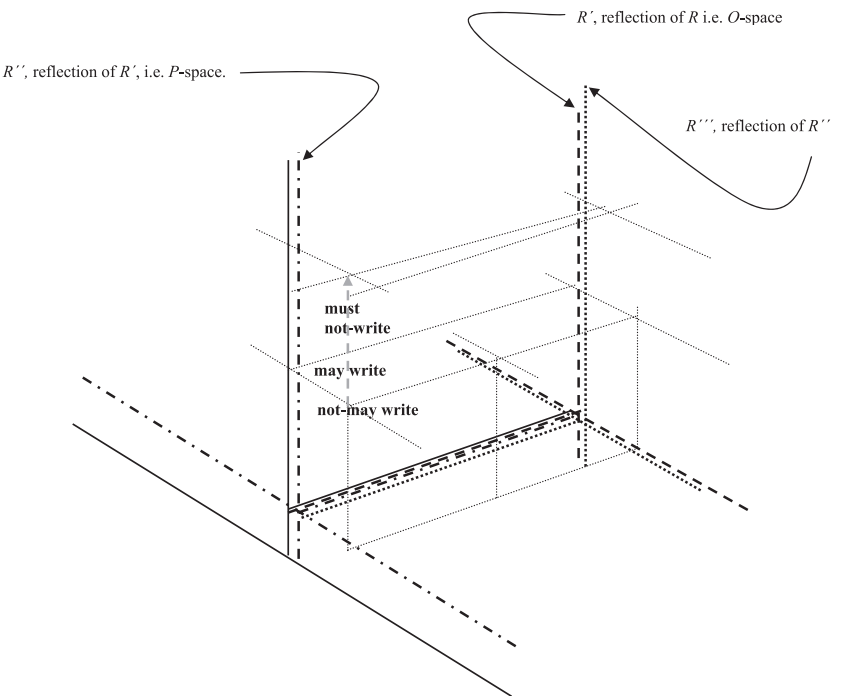


Figure 5. *Conceptual structure of may-prohibition: removal of prohibition*

What we have in Figure 5 is a complex configuration of conceptual spaces in which (i) S takes it as real in *R* that Mary is intending to write the report, (ii) conceptualises an obligation world *R′* (that is, *O*), in which Mary's intention is reversed (it is 'real' in this *O*-world), (iii) *O* is reversed to give *R″* (i.e. the

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P-world) in which obligations are reversed and permission is granted, (iv) *P* is reversed to give *R‴* and it is here that permission is withdrawn. The difference between *must*-prohibitions and *may*-prohibitions then emerges: *may*-prohibitions are withdrawn permissions. *May*-prohibitions sit on top of permissions, which sit on top of obligations, which reverse the real-world expectations. Note also that we get an alignment between the *may*-prohibition in *R‴* and the *must*-prohibition of *R″*, which is desirable since it helps to capture the conceptual similarity between the two. In the process of stacking up these copied reflection copies the conceptual content of each new space (coordinate system), at least for English deontic modal conceptualisations seems to become less dense and more rarefied, and this is perhaps not unexpected. Indeed it is possible that this is the reason why *may not*, once having appeared in English, has tended to become rarer in use.

3.3. *The deontic source*

So far I have attempted to model deontic English models in terms of essentially epistemic contexts. What of the force dynamics account of modal concepts? First, it is worth formally stating a few obvious points about conceptually represented force and actual force in the physical and social world of action.

It is important to distinguish the conceptual representation activated by *must* constructions from their pragmatic effect. In the conceptualisation, there is an ideal normative counterfactual *R′* relative to S in which S or some other source is represented as 'putting pressure' on some discourse referent d_i, causing a represented action in *R′*. No such action has been physically performed at the point when a speaker utters a linguistic expression that conceptually represents it. In the conceptual representation such an action is conceptually counterfactual in *R′* and also counterfactual in the physical world in which S utters the utterance. But of course the intention of S in performing the utterance is to 'put pressure on' the hearer and in some sort of social pragmatic chain ultimately on Mary. This may (or may not) lead to her carrying out the desired action.

Let us now consider how force is modelled in the relevant DSM. The important point here is that we do not need to add any further formal apparatus. The DST framework already includes the geometrical concept of vectors, and vectors can be conventionally understood in terms of 'force', in the metaphorical sense of Talmy, Johnson and Sweetser. Using the geometrical vector notation, rather than ad hoc pictures, is justified since metaphorical force has physical force as its source image schema, and physical force can be conventionally modelled in the sciences and applied sciences in terms of geometric vectors. In this sense, the adoption of the geometric framework of vectors in coordinate systems is well motivated.

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Now in the conceptual representation modelled in DSMs, and in the real socio-physical world, the source of the 'pressure' can be S or some other source in some other conceptual 'location' in the DSM. In the latter case the identity of the source is understood pragmatically among participants in the utterance event. If we wish, we can draw a DSM with a distal coordinate for, say, The Law, Tradition, God, etc. There is another kind of source that can be linked to constitutive rules and Wittgenstein's idea of games as well as ad hoc tasks-in-hand: 'in chess pawns are not allowed to move backwards', 'if you are writing a paper it must have a conclusion', etc. But it is not necessary to pursue this point here. All these kinds of deontic sources are complex cognitive frames and scripts that are not part of the semantics per se of *must*. Such deontic sources belong to a cognitive frame invoked or presupposed in joint communicative action, though not always explicitly.[13]

In this analysis there are some significant differences in relation to Winter and Gärdenfors (1995), who reduce deontic meaning to 'social power'. The problem with this proposal is that, while deontic modals clearly have the potential to be used by powerful social actors, it is not difficult to imagine situations where neither the power of the speaker is evident nor can the sanctioning source the speaker may be indicating be always be treated as 'power'—at least without an extremely broad definition of power. For instance, moral principles do not have to be treated as power sources, at least not in the sense of 'social power', without long and substantial disputation. The range of possible normative sources that a speaker may invoke is indeterminate. Rather than seek to specify the source of deontic force, the DST model simply assumes a deontic source δ, for δέον, *deon*, 'that which is binding'.[14] Some δ is always presupposed in deontic conceptualisations. It is a very abstract concept and it is of some interest that such an abstract generalised 'moral imperative' is coded into presumably all languages.

But what concerns us here is a more technical matter: how to incorporate 'force' into deontic DSMs. Relating the deontic source δ to events in *O* is relatively simple, given the use of vectors in DST, since vectors are readily interpretable as kinds of causal force and are in any case already needed for modelling causative verbs (cf. Wolff and Zettergren 2002; Chilton 2005). Figure 6 below gives an idea of how this can be done.

13. In practice deontic expressions can be exploited by speakers by *not* specifying which among specifiable different deontic sources is being assumed.

14. The Greek word is the neuter form of the present participle of the Greek verb generally translated as 'bind'. Note that the notion of 'that which is binding' is ambiguous in English. We can think of an action being binding per se, i.e. an action 'binds' a person. Or we can think of some source (rules, laws, authorities, etc.) as binding a person to perform (or not) a particular action.

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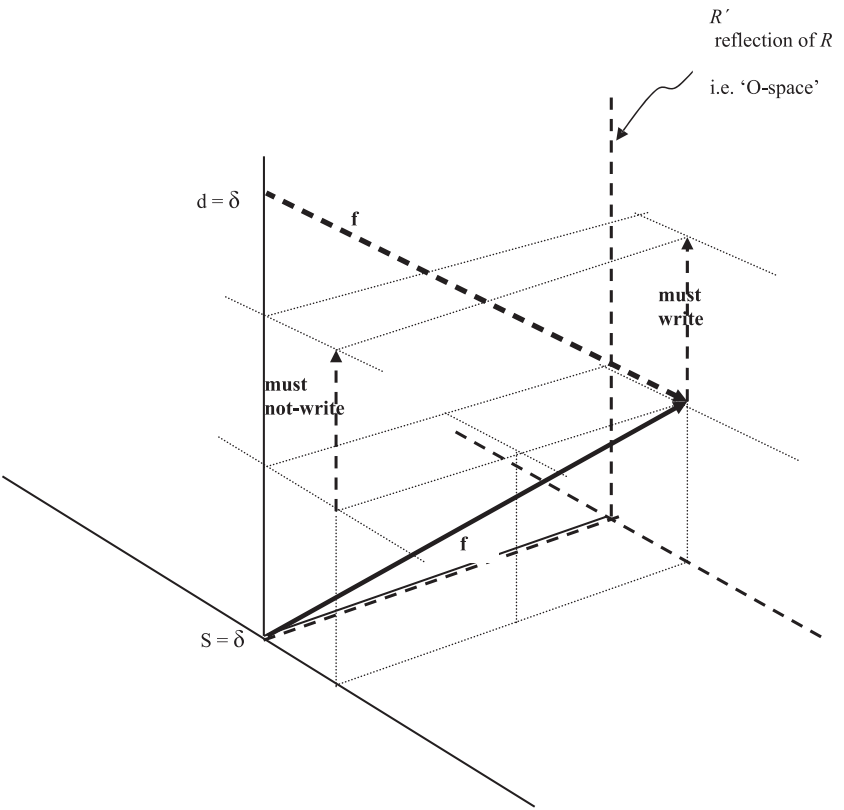


Figure 6. *(3a) Mary must write the report*

The proposal here is that a vector **f** representing deontic force, which is of course a metaphorical concept, has its source at some deontic source. This may be S, as shown by the thick arrow, or some source distal from S, as shown by the thick dashed arrow. The head of such vectors applies the deontic force to a particular discourse entity *d*, which is also the source (*Mary* in our example) of the action or event in the DSM (*write*). What the DSM thus represents is a deontic force acting on Mary and causing her writing of the report. This configuration models the conceptualisation according to which δ is in some way the causal agent of the action desired by δ. The causal vector **f** can, if we wish, be added to the vector representing the event or action subjected to deontic force (*write* in our example), giving a resultant vector from δ to the discourse entity affected by the event or action vector (i.e. *write* here).

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In this model of deontic force in an epistemic universe, the deontic force vector does not itself set up the reflection coordinates *O* but it represents a quasi-causal force resulting in Mary carrying out the action in the desired (but counterfactual) world *O*: the source is real, however, and so is Mary who has coordinates that are labelled in *R*. All coordinates in DST carry through from *R* into other embedded coordinate systems. What we are modelling, then, in Figure 6 is a vector that carries force across to a *desired counterfactual* coordinate space, in which Mary still has a coordinate point on *d′*.

We might ask: how should we consider the deontic force with regard to the second-order reflection coordinate space P? Does it disappear with the reversing of obligation? The vector modelling does not lead to this conclusion. The force vector **f** remains, and this seems to be appropriate, for even when permission is granted and obligation is reversed, the prior existence is assumed of the initial imposing of obligation (the deontic force **f**).

It is important to note that the DSM in Figure 6 does not represent a real-life speaker applying illocutionary force on a real-life hearer. Rather it represents what the communication participants have to jointly represent mentally as a consequence of the form of the utterance, whether or not, for example, Mary does in reality write the report in response to what S utters.

4. Concluding remarks

An implicit claim of this paper has been that the epistemic aspect of conceptualisation is in some way prior to the deontic. What is being tested here is the idea that deontic meanings do in fact presuppose epistemic meanings of the kind we have modelled on the *m*-axis. As it happens, this idea follows from the way the three-dimensional space of DST is initially set up. But it was not set up for the purpose of arguing that epistemic meaning is prior to deontic; it is independently motivated and it explains a wide range of linguistic conceptualisations. What I have done is try to see what happens if we model deontic meanings in terms of DST assumptions, and the resulting analysis is, I believe, logically (and conceptually) consistent within itself. This is not to say that the force-dynamic account is absent from the story of deontics in DST, though it is not used to account for epistemic concepts in the way in which deontic force is used by some cognitive linguists to account for epistemic meanings. It seems entirely plausible to think of deontic meaning in terms of some sort of force concept. This proposal is also already present in the DST framework in the form of vectors viewed as force. It is also worth noting that vectors are indeed also part of our account of epistemic meaning, vectors viewed as position markers relative to S, since epistemic certainty/uncertainty may be related to spatial closeness or remoteness.

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The DST model of deontic meaning is not simply a formalised redescription of what has already been said in the semantic literature, including the Cognitive Linguistic literature, but carries some fundamental new claims. The most important aspect of the DST account of deontic expressions concerns the epistemic, specifically the counterfactual, dimension. The epistemic dimension, rather than the deontic dimension, is taken to be fundamental. In fact, it is taken to be fundamental to all conceptualisations associated with linguistic expressions. The three dimensions of the basic DST integrate the dimensions of language-linked cognition that approximate to Langacker's notion of 'grounding' (Langacker 1991: Ch. 6). Any utterance presupposes that the conceptualizer takes a position with respect to perceived time, relative salience of entities attended to, and degree of realness. Langacker refers to the latter as 'epistemic distance'. And this is precisely what DST attempts to model in a precisely spatial manner.

Where does this leave the Johnson-Talmy-Sweetser account which views epistemic meanings as metaphorical projections of prior 'root' meanings? There are a number of issues that need to be addressed and I shall only outline them for further reflection. The first point to consider is that the classic force-dynamic account is cast in diachronic terms and need not be a cognitively accurate picture of conceptualisation of deontic and epistemic modality in the adult human speaker. Even as a diachronic account the force-dynamic model makes best sense only in relation to lexical change, for we have no grounds to suppose that speakers in some early phase of a language-using culture first had only deontic concepts and expressions and no epistemic ones, only later acquiring epistemic conceptualisations and expressions. We might argue that such a culture did not much use epistemic expressions in its communication and only in a relatively late phase came to need epistemic expressions derived from its earlier deontic ones: but there is no real warrant for that assumption and little if any discussion of the point. Second, evidence is often adduced from first-language acquisition studies that seem to indicate that English-speaking children acquire deontic expressions before epistemic one. Doubts have been raised about the relevance of these findings (Papafragou 1998). Moreover, it is not necessary to conclude that the order of acquisition confirms a supposed priority of deontic cognition over epistemic cognition in the adult cognitive system underlying the use of linguistic expressions.

In any event, the DST account that I have presented is not incompatible with the force-dynamic one, in particular because force itself is naturally incorporated in the vector geometry of DST and is required for the modelling of deontic source, which is inevitably invoked in deontic expressions. What is distinctive about the DST analysis, however, is the claim that it makes for the complex conceptual interplay between epistemic and deontic 'worlds'.

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