Obligations and Permissions

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Abstract

Obligations and permissions are known as deontic expressions. They present something of a challenge when it comes to formulating their meaning and behaviour. This is because they can appear to engage in entailment relations similar to those of classical propositions, but they do not have truth conditions, unlike classical propositions. Historically, much of the descriptive work in this area has been philosophical in outlook, concentrating on questions of morality and jurisprudence. There have been some additional contributions from computer science, in part due to the need to specify normative behaviour. There are a number of formal proposals that seek to account for obligations and permissions, such as Standard Deontic Logic. There has also been discussion of various conundrums and dilemmas that need to be resolved, such as the Good Samaritan, the Knower, the Gentle Murderer, Contrary to Duty Obligations, Ross’s Paradox, Jørgensen’s Dilemma, Sartre’s Dilemma, and Plato’s Dilemma. Even so, there still appears to be no definite consensus about how these kinds of expressions should be analysed, or how all the deontic dilemmas should be resolved. It is possible that obligations themselves, as opposed to their satisfaction criteria, do not directly support a conventional logical analysis. It is possible that a linguistically informed analysis of obligations and permissions may help to resolve some of the deontic dilemmas, and clarify intuitions about how best to formulate a logic of deontic expressions.
1 Introduction

Work on the formal semantics of natural language has often focussed on the propositional interpretation of indicative sentences. Such sentences can be analysed in terms of their truth conditions. This is achieved by translating sentences into propositions of some form of classical logic. The logic may be enriched to make it easier to deal with phenomena such as anaphora and propositional attitudes, like belief and knowledge, and the modalities of necessity and possibility.

Of course, much of language is not indicative in form. There are also questions, answers, commands, obligations and permissions. Any comprehensive analysis of language needs to take these different kinds of expressions into account. This article focuses on aspects of the interpretation of obligations and permissions. These are referred to as deontic expressions.

1.1 Deontic Expressions

Basic examples of deontic expressions include those given in (1). Some more complex cases will be considered later (for example, in §4).

(1) (a) “Peter must close the door.”
(b) “Mary is obliged to find a job.”
(c) “You must pay your taxes.”
(d) “You can walk on the grass.”
(e) “You are permitted to delay payment for up to three months.”
(f) “Evan may go to the beach.”

Deontic expressions do not necessarily include words directly related to “obligation” or “permission”, but instead can employ a model verb, such as “must”, “should”, “can”, “may”, among others. There can be some ambiguity in the precise nature of the meaning of such modal expressions. For example, can may be used to express a physical ability rather than permission.

(2) “John can run very fast.”

And should and ought may be used to express an “epistemic” claim, making a prediction based on our knowledge and belief.

(3) (a) “The coin should fall when released.”
(b) “John ought to be in a lot of pain,”
in the context where John has just suffered an injury.

This issue is discussed by Wyner (2008).
The focus of this paper is on determining how deontic expressions may best be interpreted in the context of formal semantics. We are not so concerned with analysing the ways in which obligations and permissions can be formulated in natural language. Some deontic utterances may describe what is the case. Others may bring obligations and permissions into being, as with a *proclamation*, or *performative* utterance (see Kamp, 1973, 1979; Kempson, 1977; Lemmon, 1962b, for example). We will not consider such issues here.

### 1.2 Formal semantics of natural language

In the paradigm of formal semantics, the objective is to put the interpretation of language on a systematic footing. Usually this is achieved using a systematic translation of natural language into a formal language with a rigorously defined syntax and behaviour. The translation process and formalisation are often targeted at particular aspects of meaning, and usually do not attempt to deal with the full complexity of meaning in all its richness. This can be seen as a form of abstraction.

In this paradigm, we have to have a clear understanding of our intuitions concerning how a given expression should be interpreted. We need to consider whether the behaviour of interest should be captured by the translation process, or the formal language, and whether there may be confounding influences from some other aspect of meaning and interpretation.

### 1.3 Truth conditions and inference

Propositional theories of indicative sentences are concerned primarily with truth. This can involve determining the truth conditions of indicatives, or the legitimate patterns of reasoning from truth to truth.

In the case of obligations and permissions it is not clear whether such notions are relevant. Although we may consider the truth of whether there is an obligation in force, or that permission has been granted, these statements are claims about which obligations and permissions are in force, rather than *expressing* obligations or permissions themselves (Kamp 1973, 1979; Kempson, 1977; Lemmon, 1962b).

As obligations appear to support patterns of entailment, yet they are not themselves true or false, so we may question in what sense they can have a logic. This conundrum was raised by Jørgensen 1937–38 in connection with imperatives, and is known as Jørgensen’s Dilemma. One resolution is to say that any formalisation must either rely on judgements other than truth, or involve truth about patterns of behaviour, rather than of obligations and permissions themselves. We might consider the truth of claims of the form that:
(4) (a) a deontic statement follows from another deontic statement
("You are obliged to mow the lawn and prune the tree" therefore, "you
are obliged to mow the lawn");
(b) two deontic expressions are incompatible with each other
("You must eat all the food" is incompatible with "You must leave some
cake for Mary");
(c) the satisfaction of an obligation is possible
("You must ensure that $1 + 1 = 3$";)
(d) the satisfaction of an obligation implies the satisfaction, or absence of
satisfaction, of some other obligation; (satisfying "You must eat bread
and cheese" also satisfies "You must eat bread")
(e) a particular state of affairs, or action, satisfies an obligation, or is
consistent with a permission.

1.4 Obligation to and Obligation that

We may wonder what kind of things may satisfy an obligation. Obvious candidates
are actions—where an obligation is an obligation to do something—and outcomes,
or states—where an obligation is an obligation that something be the case (Jackson,
1985).

In some analyses, the intended interpretation is not made explicit. The bound-
ary between the two characterisations may be somewhat artificial. An action is
itself could be characterised by the state of affairs that results from its successful
completion.

One approach to this question is, in effect, to ignore it; provided we assume
that there is some way of expressing the satisfaction conditions of an obligation we
can go on to consider facets of their analysis without making specific commitments
as their basic nature.

There are cases where this agnosticism may not always be appropriate, as in
(5).

(5) "…surviving being shot is not something that Kennedy ought to have done,
though it is something that ought to have been." (Jackson, 1985, p179)

1.5 Scope of this article

Here we consider some existing approaches to formalising deontic statements,
including syntax, logical rules and semantic interpretation. Rather than attempt a
rigorous and highly systematic interpretation of natural language examples, we
follow the practice of many working in the field of “intuiting” the representations
of deontic statements. While allowing us to focus on the logical and formal details, there is admittedly some danger in this approach: there may be other aspects of interpretation that confound the proposals analysis, or which, if properly analysed, cast light on apparently problematic examples. As we shall see, it is not unusual for formal accounts to ignore issues such as quantification, predicates and relations, effectively stripping things down to propositional logic for obligations and permissions.

2 Standard Deontic Logic

The formalisation known as Standard Deontic Logic (SDL) represents a classic approach to formalising deontic statements. SDL extends classical propositional logic (see Chapter 5 of Allwood et al., 1977, for example) by adding modal operators (Lemmon and Scott, 1977) for obligation and permissions, together with rules and axioms to govern the behaviour of these new entities (von Wright, 1953). In brief if \( p \) is a proposition, then \( O(p) \) means that \( p \) is obligatory, and \( P(p) \) that \( p \) is permitted.\(^2\)

2.1 Axioms and Rules for SDL

SDL is conventionally presented using rules and axioms as given in (6), where \( a \) and \( b \) are propositions, \( \land \) represents logical conjunction (“and”), \( \lor \) is disjunction (“or”), \( \rightarrow \) is material implication (“if...then...”) and \( \neg \) is negation (“not”). The expression \( \vdash a \) means that \( a \) is a tautology: the truth of \( a \) follows from the rules and axioms of the logic.

\[(6) \quad \begin{align*}
(a) & \text{ All the axioms and rules of classical logic.} \\
(b) & O(a \rightarrow b) \rightarrow (O(a) \rightarrow O(b)) \quad \text{(OB-K)} \\
(c) & O(a) \rightarrow \neg O(\neg a) \quad \text{(OB-D)} \\
(d) & \text{If } \vdash a \text{ then } \vdash O(a) \quad \text{(OB-NEC)}
\end{align*} \]

Rule (6b) says that obligation distributes across implication; (6c), that if something is obligatory, then you cannot also maintain that it is not obligatory; (6d) that all tautologies of the logic are obligatory.

When taken together, it can be shown that if \( b \) follows from \( a \), and \( a \) is obligatory \( (O(a)) \), then \( b \) is also obligatory \( (O(b)) \). This allows the theorems given in (7) to be derived, among other things.

\[(7) \quad \begin{align*}
(a) & \text{If } \vdash a \rightarrow b \text{ then } \vdash O(a) \rightarrow O(b) \quad \text{(OB-RM)}
\end{align*} \]

\(^2\)The precise syntax for the modal operators may vary.
(b) \( O(a \land b) \rightarrow (O(a) \land O(b)) \)  
\( (\text{OB-M}) \)

(c) \( O(a) \rightarrow O(a \lor b) \)

It is conventional to define permission as the ‘dual’ of obligation.

(8) \( P(p) :=_{def} \neg O(\neg p) \)

SDL is not uncontentions. It does not impose constraints on what kinds of propositions can be obligatory, or permitted. Furthermore, concerns have been expressed that it is too strong, leading to counterintuitive conclusions and dilemmas. (see \([4]\) and \([\text{McNamara}, 2006a,b]\) for example). Many authors have expressed concern about \((7a)\) and also \((6c)\), for their role in creating deontic paradoxes and ruling out deontic conflicts, respectively (see \([\text{Goble}, 1990a,b, 1991, 1993]\) \([\text{Hansson}, 1988, 1990, 2001]\), \([\text{Jackson}, 1985]\) \([\text{Schotch and Jennings}, 1980]\) for example). Some of these issues surrounding \((7a)\) are also discussed by \([\text{van der Torre}, 1997]\).

2.2 A Possible Worlds Model for SDL

In addition to a system of rules and axioms, it is useful to consider whether there is a model that can provide a consistent interpretation of the rules. This can help demonstrate that the proposed rules and axiom are formally coherent. Like many modal logics, SDL can be given a possible worlds interpretation. (Kripke, 1959, 1963; von Wright, 1951, 1953). In the standard account, for \( p \) to be an obligation in the current world, it must be true in all accessible “ideal” worlds, where an ideal world is one in which all obligations have been satisfied. For \( p \) to be permitted, it must be true in some such worlds.

3 Other Approaches

SDL is not the only approach. Here we sketch a small selection of alternative proposals. Other proposals are discussed in \( \S 5 \).

3.1 The Andersonian-Kangorian reduction

An alternative approach is to say that a proposition is obligatory if some bad thing, a sanction, arises whenever that proposition is false, or that this sanction is avoided if the proposition is true (\([\text{Anderson}, 1958]\) \([\text{Kanger}, 1971]\) \([\text{Prior}, 1958]\)). This sanction is represented by a distinguished proposition \( S \).

This approach is proposed by \([\text{Prior}, 1958]\) and developed by \([\text{Anderson}, 1958]\), \([\text{Kanger}, 1971]\) gives an equivalent alternative in which the distinguished
proposition represents the absence of a sanction. The sanction is fixed, and does not indicate which obligations are unsatisfied.

A variant of this approach, combined with dynamic deontic logic (§3.3) is proposed by Wyner (2008), but where there are two families of predicates, one indicating compliance the other non-compliance, but indexed with additional information concerning which obligation is involved.

3.2 Input/Output Logic

Another alternative to SDL that is founded on different conceptual assumptions is input/output logic (Makinson and van der Torre, 2000, 2001, 2003a,b). Essentially this takes the perspective of an agent that determines what obligations hold on the basis of facts about the state of the world. On this view, a deontic system is an input/output “transducer” from states to obligations. Natural language deontic statements could be interpreted as “specifications” of the transducer.

3.3 Dynamic Deontic Logic

The final alternative that we will mention here is where obligations, and their satisfaction, is expressed in terms of actions in the framework of dynamic logic (Harel, 1984). We can model actions as things that bring about a state of affairs. Assuming that an action \(\alpha\) can be carried out (i.e. its preconditions are satisfied), then we can write \([\alpha]P\) to indicate that proposition \(P\) is true following the execution of action \(\alpha\). Propositions and actions can be combined in various ways.

Using this paradigm, we can follow Meyer (1988), and have obligations apply to such actions, so \(O(\alpha)\) means that action \(\alpha\) is obligatory. It is claimed that this approach can account for problematic examples, such as the contrary-to-duty obligations of §4.3.4, although there may be other problems with this approach (see Angilberger, 2008, for example).

4 Common Issues and Difficulties

There are many problematic examples which present difficulties for formalisations such as SDL. These may be due to (i) foundational issues concerning whether obligations must be coherent and fulfillable (§4.1), (ii) the use of representations for natural language which have inappropriate consequences (§4.2). (iii) inappropriate inferential behaviour in the representation language (§4.3). The precise nature of these categories may be subjective and open to dispute. They are not entirely

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3 This kind of approach has been considered for the analysis of imperatives (Lascarides and Asher, 2004; Segerberg, 1990). We will not attempt to consider the relationship between deontic statements and imperatives in this article.
independent, and some examples may have aspects that fall into more than one category. Nevertheless this categorisation helps to provide some structure to the exposition.

4.1 Foundational Issues

Any account of obligations and permissions has to address the possibility of conflict, either between obligations, and permissions, or between obligations and our understanding of how the world is.

4.1.1 Conflicting obligations

Examples (9) and (10) indicate two cases where there may be conflicting obligations (Lemmon, 1962a).

(9) (a) “You are obliged to have dinner with your friend.”
(b) “You are obliged to rush your choking child to hospital.”

(10) (a) “You are obliged to return the knife.”
(b) “You are obliged to avoid giving a knife to someone who will commit murder.”

Resolving such conflicts may require some way of prioritising or ordering of the obligations. It could be argued this is **moral** rather than a logical question (Bonevac, 1998, p43). Either way, any formal theory for obligations should be able to accommodate conflicts without resulting in inconsistency of the logic itself. This is one motivation for considering alternatives to SDL (§5).

4.1.2 Unfulfillable obligations

We may also question whether all felicitous obligations should be individually fulfillable. Some obligations, such as (11) under a literal interpretation, are so demanding as to be unreasonable.

(11) “You are obliged to fly me to the moon.”

Others are not possible

(12) “Mary must ensure that 2 + 2 is 5.”

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*Examples of the form (9) and (10) are sometimes refereed to as Satre’s Dilemma—from Sartre (1957/1946)—and Plato’s Dilemma—from Plato’s Republic, Book I—respectively.*
The view that such obligations are infelicitous is characterised by “Kant’s Law”, namely that “ought” implies “can”. This view is not universally accepted (see Martin, 2009 for example). Some argue that it is a conversational implicature rather than a logical rule (Sinnott-Armstrong, 1984).

In general we must account for obligations that conflict with each other, or with the world as we understand it to be, and we should be able to do so without giving rise to a formal inconsistency in the semantic theory itself. This problem of conflict is not confined to deontic statements.

4.2 Representational Issues

There are a number of examples where the most straightforward representations of examples leads to unfortunate consequences. Such issues arise in cases where there is propositional content—perhaps a relative clause or some propositional constraint—that intuitively should lie outside the scope of any obligation.

Some problems might be avoided if the given representations behaved in differently, for example if obligations did not distribute to constituent parts (unlike SDL, §2). Even so, there is still an underlying question about how such examples should be represented.

4.2.1 The Good Samaritan

Given one of the obligations in (13), we do not wish to infer that there is an obligation to rob a man in order to then help him, and thus satisfy the obligation to help a robbed man (Prior, 1958).

(a) “You are obliged to help a man who has been robbed.”
(b) “You are obliged to help a robbed man.”

Such examples are similar to conditional obligations (14a, 14b). Indeed, some argue that all forms of the Good Samaritan are essentially disguised conditionals (Castañeda, 1981; Tomberlin, 1981).

(a) “If a man has been robbed, then you should help him.”
(b) “There is an obligation such that if a man is robbed, you help him.”

Generally, (14a) and (14b) can be formulated in SDL-like languages by an expression of the form

(a) $p \rightarrow O(a)$
(b) $O(p \rightarrow a)$
where \( p \) corresponds to “a man has been robbed” and \( a \) is “you should help him”.

It is not clear whether (15b) really expresses what is desired. Conventional SDL would allow us to infer

\[ (16) \ O(p) \rightarrow O(a) \]

This seems odd; we are only obliged to help in the event that there is an obligation to rob. In the case of (15a), the original conditional obligation (14a) will then be judged “true” in the even that a man has not been robbed.

Various questions can be raised about these representations, such as the desirability of using material implication to represent conditional obligations (cf. §4.3.4 & §5.2), whether obligations should distribute to constituent parts (§5.4), and whether such inferences should be defeasible (§5.5). The difficulty of analysing complex obligations involving conditionals and other constructs arises in other contexts.

### 4.2.2 The Knower

Most moral people would argue that from (17) we should not infer (18), with a deontic interpretation of “ought”.

\[(17) \ “It ought to be the case that A knows his wife is committing adultery.” \]

\[(18) \ It ought to be the case that A’s wife is committing adultery. \]

There appears to be a risk of such entailments in some formulations that combine obligation with knowledge (Åqvist, 1967; Jones and Pörn, 1985). This is sometimes called the Paradox of Epistemic Obligation.

### 4.2.3 The Gentle Murderer

Following Forrester (1984), if we were to utter (19) we probably mean that in the unfortunate event that John murder’s his wife, he ought to do so gently. From this we should not be able to infer (20).

\[(19) \ “John ought to murder his wife gently.” \]

\[(20) \ John ought to murder his wife. \]

Other modalities also appear not to distribute into adverbial expressions (Jackson, 1985). It is unlikely that anyone would claim (22) follows from (21).

\[(21) \ “I want to die a painless death.” \]

\[ ^{5} \text{Some propose a distinct notation for conditional obligation, such as } O(a|p), \text{ as sketched in } §5.2, \text{ which avoids problems relating to } p \rightarrow O(a) \text{ being a consequence of } \neg p, \text{ for example.} \]
(22) I want to die.

Jackson (1985) argues that interpretation must be relative to a set of alternatives (see §5.1) as in (23).

(23) Given \(A\) (“you murder your wife”) it ought to be the case that \(B\) (“you do so gently”).

4.2.4 The Hygienic Cook

Some of the previous conundrums may be avoided if distributive inferences are defeasible when faced with contrary obligations (§5.5). But there are examples where such a proposal does not seem to help, as in the morally neutral example (24) (Fox, 2010).

(24) “You are obliged to use a clean knife.”

This may give rise to an obligation for the knife to be clean, in contrast to the behaviour (13). Furthermore, it could be claimed there is no obligation to use a knife (clean or not), only that in the event we use a knife, it ought to be clean, echoing (23).

This lends weight to the view that obligations be interpreted with respect to relevant alternatives, as has been proposed for the analysis of the pragmatic notions of topic and focus (Rooth, 1993). This appears to correspond to the subjunctive thesis, with relativised interpretation, as discussed in §5.1.

4.3 Behavioural Issues

Finally in this section, we consider examples that raise questions about the basic behaviour of representations of deontic expressions.

4.3.1 Free choice permission

The issue of free choice interpretations arises with deontic expressions involving disjunction (Kamp, 1973; Ross, 1941), such as (25).

(25) “You may go to the beach or watch television.”

Under the free choice interpretation there is a choice as to which permission can be taken advantage of (26).

(26) You may go to the beach or watch television (or neither), the choice is yours.

6This approach has been considered explicitly by Wyner (2008, Section 2.7, pp69–74), in the analysis of the Gentle Murderer.
Such free-choice permission may be exclusive (27); if you go to the beach, you may no longer have permission to watch television.

(27) You may do one of go to the beach or watch television (or neither), the choice is yours.

Free choice permission appears to indicate a space of possibilities—the “paths” that a subject can take without fear of retribution (Dignum et al., 1996). This interpretation could be captured by considering the consistency (or coherence) of a set of obligations. In particular, (25) would be inconsistent with (28) and perhaps even with (29). This is problematic for SDL, where \( P(a \lor b) \) follows from \( P(a) \).

(28) (a) “You are obliged not to go to the beach.”
(b) “You are obliged not to watch the television.”

(29) “You may go to the beach and you may watch television.”

4.3.2 Conjunctive commitments

In some cases it may seem that the force of an obligation should distribute across conjunction. Given (31) it seems reasonable to conclude (31).

(30) “You ought to have a shower and go to bed.”

(31) You ought to have a shower and you ought to go to bed.

But consider (32).

(32) “You are obliged to jump off the bridge and land on the train.”

It might be unfortunate if a subject were then to infer (33).

(33) You are obliged to jump off the bridge.

Indeed, (32) is presumably consistent with

(34) “It is not permitted for you to jump off the bridge and not land on the train.”

Distributive behaviour is enforced by SDL (7b), but is not supported by other accounts (see Goble, 1993; Jackson, 1985; Jones and Pörn, 1985; Lewis, 1973, for example).

Questions about distributive inferences arise with other logical connectives. The identification of an appropriate representation for natural language constructs is dependent on the presence or absence of such inferences (4.2).
4.3.3 Disjunctive Obligations and Ross’s Paradox

Theories that import all valid inferences of classical logic into deontic contexts, like SDL (§2), allow (36) to be inferred from (35).

(35) “You are obliged to post the letter.”

(36) You are obliged to post the letter or burn the letter.

One way to satisfy (36) is to satisfy (37).

(37) You are obliged to burn the letter.

If these notions of validity and satisfaction were conflated, then (37) would follow from (35) (Ross, 1945). This is counter-intuitive outcome is referred to as Ross’s Paradox.

The conclusion we can draw from this ‘paradox’ is that the notion of validity (which obligations follow from existing obligations) should not be conflated with the notion of satisfaction (which other putative obligations may be satisfied when satisfying a given obligation).

Even so, we may wonder whether it is appropriate to be able to infer the obligation (36) from the obligation (35), just as we may question whether the existence of an utterance (or belief) of the form “a ∨ b is the case” can be inferred from an utterance (belief) that “a is the case”. One argument against unrestricted disjunction introduction—exemplified by the move from (35) to (36)—is that there are free-choice connotations associated with the disjunction which may not be intended.

4.3.4 Contrary to Duty Obligations

Difficulties can arise in analysing obligations that specify how we should make amends, or compensate, for a failure to satisfy other obligations. A classic example is due to Chisholm (1963).

(38) (a) “It ought to be that a certain man go to the assistance of his neighbours.”

(b) “It ought to be that if he does go, he tell them he is coming.”

(c) “If he does not go then he ought not to tell them he is coming.”

(d) “He does not go.”

From these we should be able to conclude

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7Ross’s Paradox was originally described in the context of imperatives.
8Tomberlin (1981) gives a detailed account of the problem, and some possible solutions.
He ought not to tell them he is coming.

It turns out that regardless of whether conditional expressions (38b) and (38c) are represented in the form $O(a \rightarrow b)$, or $a \rightarrow O(b)$ (cf. §4.2.1), then apparently faithful representations in SDL are either inconsistent, or one of the obligations follows from another. Both of these outcomes are counter-intuitive. Some proposed solutions are mentioned in §5.1 and §3.3.

5 Alternative Formalisations

Some of the issues mentioned in §4 have motivated alternative proposals for the representing and reasoning with deontic expressions.

In general, given a straightforward interpretation of deontic statements, SDL appears to allow conclusions to be drawn which are counter-intuitive or contradictory. To avoid this, we may reconsider the nature of the interpretation of natural language examples (§5.2 and §5.1), or weaken the logic in some way (§5.4 and §5.5).

5.1 Relativisation of interpretation

It may be possible to avoid inappropriate patterns of entailment for the Good Samaritan (§4.2.1), the Knower (§4.2.2) and the Gentle Murderer (§4.2.3) by evaluating the meaning of deontic expressions with respect to some context. The obligations to help (13), know (17), or murder gently (19) arises in those contexts in which it is given that there has been (or will be) robbery, adultery, and murder, respectively.

This has been proposed by [Jackson (1985); Kratzer (1981); Prakken and Sergot (1996)], for example. Arguably this is related to proposals for the interpretation of focus, where pragmatic interpretation with respect to contextually relevant comparison sets has been suggested (Rooth (1993); Carmo and Jones (2002)) disagree with need to relativise interpretation of deontic expressions in this way, and Zvolenszky (2002) shows there are problems for the relativised account of Kratzer (1981).

5.2 Dyadic modality

The use of dyadic modal operators has been proposed to deal with the conditional forms or interpretations of the Good Samaritan (§4.2.1) (see van Fraassen (1972) for example), and the contrary-to-duty obligations (§4.3.4) (Chisholm (1963)). Instead of “overloading” the notation for material implication, we borrow from the notation

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9 This problem is also a major focus of Wyner (2008).
for conditional probability, and express the obligation to \( b \) given that \( a \) is the case by writing \( \text{O}(b|a) \), and avoid the use of the material implication as in \( \text{O}(a \rightarrow b) \) or \( a \rightarrow \text{O}(b) \) (van Fraassen, 1972; Hansson, 1969; Spohn, 1975; von Wright, 1957). Appropriate patterns of behaviour have to be attributed to dyadic conditionals (Anderson, 1959; Chellas, 1980; van Fraassen, 1972, 1973; von Wright, 1961, 1962), such as (40).

\[
\text{If } \text{O}(a|p) \text{ then } \text{O}(a|p \land q)
\]

We may model this by saying that \( \text{O}(b|a) \) holds if \( b \) is true in the “best” worlds in which \( a \) is true.\(^{10}\) The expression \( \text{O}(b) \) is then equivalent to \( \text{O}(b|\top) \), where \( \top \) is a tautology.

### 5.3 Prioritised obligation

Some dilemmas could be avoided if obligations had different priorities, where higher-level priorities over-rule lower-level priorities (Aqvist, 1967). This could resolve conflicting obligations (§4.1.1), and contrary-to-duty obligations (§4.3.4). The issue then becomes how to determine prioritise, and indeed whether there should be fixed priorities within the logic. As discussed in §5.5, there are alternatives for resolving conflicts that may not need to appeal directly to a fixed priority assignment.

In general we may question whether it is the responsibility of a linguistic theory of meaning to account for such behaviour, or whether this fall within the realms of general, non-linguistic reasoning. The need to resolve conflicts is a general one that also arises with non-deontic utterances.

### 5.4 Weaker logic

Many deontic dilemmas and conflicts could be resolved by weakening the logic in various ways (see Goble, 1999, 2001, 2004; Routley and Plumwood, 1989 for example). For example, difficulties with apparently problematic inferences—as in the Good Samaritan (§4.2.1) and conjunction (§4.3.2)—might be resolved if obligations did not distribute across logical connectives, such as conjunction (4.3.2) (see Jackson, 1985; Jones and Pörn, 1985, for example).

If a logic has OB-RM (7a) as a theorem, as is the case with SDL, then obligations will distribute across conjunction, and disjunction introduction within deontic contexts will also follow (§4.3.3). Given that such inferences are seen as problematic, some propose weakening the logic so that OB-RM does not follow (Goble, 1990a,b, 1991, 1993; Hansson, 1988, 2001; Jackson, 1985).\(^{15}\)

\(^{10}\)There are alternative proposals (Hansen, 2008; Hansen et al., 2007).
Some defend OB-RM on the grounds that it captures the idea of an agent
taking moral responsibility for the logical consequences of her commitments
Nute and Yu (1997); Schotch and Jennings (1989). But to argue that agents need
to understand the consequences of their obligations does not mean that OB-RM
must necessarily be supported [Jackson 1985].

5.5 Weaker inference

An alternative to weaker rules and axioms is to adopt a weaker notion of inference.
On this view, we can still allow obligations to distribute, for example, but take any
problematic entailments to be defeasible [Bonevac 1998; Makinson and van der
Torre 2003b; Nute 1997]. For the Good Samaritan (13) a prior obligation not to
rob overrides the default inference to rob.12 This may be appropriate if distributive
inferences are thought appropriate in “normal” circumstances, and the main issue
with the Good Samaritan, and similar examples, is viewed as residing in a conflict
between primary obligations and derived obligations. Aruguably this is related
to proposals to stratify deontic statements into different levels of priority (§5.3).
There may be both logical and moral issues to resolve in determining the relative
priority of different obligations.

In the case of conflicts, it is also possible to consider paraconsistency, where
reason with maximal consistent obligations [da Costa 1988; Costa and Carnielli
1986; Loparic and Puga 1986].

5.6 Logic-free obligations

An alternative approach sketched by Fox (2009) is to allow entailments between
satisfaction conditions but not between obligations. If an obligation is unsatis-
fied, than a transgression has occurred. The transgression can be specific to the
obligation in question, unlike the notion of a sanction [Anderson 1958; Prior
1958].13

This allows for partial fulfilment, including partial fulfilment of contradictory
and unfulfillable systems of obligations, as well as contrary-to-duty obligations.
In such cases there are simply more unfulfilled obligations (or transgressions) if
an agent fails to comply with any compensating obligations. The satisfaction

11There are proposals for weaker logics that capture salient inferences, such as the “weakened”
OB-RM of Goble (2004), where if $A$ implies $B$, then $O(A)$ implies $O(B)$ provided $A$ is permitted.
12Note that this does not directly address the reading of the Clean Knife example, where any
obligation to clean a knife may only apply when there is a need to use a knife, but that there may be
no unqualified obligation to use a knife. Presumably the comeback to this is that there is permission
not to have to use a knife, which may overrule any inference concerning obligations to use a knife.
13This fine-grained notion of transgression (and compliance) is also adopted by Wyner (2008).
of obligations, conflicting or not, can then considered purely as a question of morality, rather than logic (cf. Bonevac [1998], p43).

A notion of coherence (cf. Makinson and van der Torre [2003b]) can be used in place of logical entailment. Instead of $O(a)$ following from $O(a \land b)$, we can say that a coherent system of obligations will not combine $O(a \land b)$ with $O(\neg a)$, or indeed with any obligation whose satisfaction is at odds with the satisfaction of $O(a \land b)$.

Coherence can be used to analyse permission. If $a$ is permitted, $(P(a))$ then it would be incoherent for there to be obligations whose satisfaction is at odds with $a$. For free choice permission $P(a \lor b)$, if $P(a \lor b)$ then it would be incoherent to have obligations that are at odds with $a$ or $b$. By itself, this approach does not resolve how to identify the specific obligations imposed by the Good Samaritan [13], the Gentle Murderer [19] and the Clean Knife [24] examples. They may merit more analysis of the linguistic data, and the use contextualised interpretations [5.1].

6 Further Reading

McNamara [2006a,b] describes SDL and other approaches, together with discussion of various paradoxes and conundrums and proposals for their resolution. McConnell [2002] discusses some moral dilemmas that any treatment of obligations and permissions should consider. Hansen et al. [2007] presents key philosophical questions about deontic logic from the perspective of input/output logic. Other survey papers include Åqvist [2002]; Carmo and Jones [2002]; Follesdal and Hilpinen [1971]; Hilpinen [1981a]; Meyer and Wieringa [1993a].

References


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14 In the case of exclusive free choice, it would be incoherent to combine $P(a \lor b)$ with $P(a)$ and $P(b)$. 

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