

Deontic Modality in Natural Language

The Obligatory Guide

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Overview

- A Quick Tour of Deontic Modality in Natural Language
- Challenges and Complications

Part I

A quick tour

Different Concerns

- Deontic logic
- Philosophy/Cognitive Science
- AI
- Economics
- Natural language semantics

Natural Language Semantics

- Composition (internal, external)
- Semantics & Pragmatics
- Cross-linguistic
- Diachronic
- Is understaffed

Modal Meanings

- expressivism
- dynamic meanings
- static truth-conditional semantics

Context-Dependency

- (1) [Father to Son]:
- a. You **may** leave the table.
 - b. You **have to** take out the garbage.
 - c. You **ought to** call your grandma.

(2) [Grad school handbook]:

- a. You **may** take up to two undergraduate courses in other fields.
- b. You **have to** finish your thesis within 5 years.
- c. You **ought to** form your dissertation committee in your fourth year.

epistemic *Given all those wet umbrellas, it **has to** be raining.*

deontic *According to the hospital regulations, visitors **have to** leave by six pm.*

bouletic *According to my wishes as your father, you **have to** go to bed in ten minutes.*

circumstantial *Excuse me. *Given the current state of my nose, I **have to** sneeze.**

teleological *Given the choices of modes of transportation and their speeds, to get home in time, you **have to** take a taxi.*

Kratzer's schema

- Modals are sensitive to two contextual parameters:
 - a modal base, determining a set of possible worlds
 - an ordering source, inducing an ordering on the worlds in the modal base
- Modals quantify over the best worlds given those two parameters.

Necessity

$$\llbracket \textit{have to } \phi \rrbracket^{MB} = MB \subseteq \llbracket \phi \rrbracket$$

Note: modal takes a sentence as its argument (prejacent)

Contingency/Iterability

$$\llbracket \textit{have to } \phi \rrbracket^{w, MB} = MB(w) \subseteq \llbracket \phi \rrbracket$$

Why? Iteration, uncertainty:

- (3) You might have to leave at 10 (I don't know what the dorm rules say exactly).

Factual Background

$$\llbracket \textit{have to } \phi \rrbracket^{w, MB, BEST} = BEST(w)(MB(w)) \subseteq \llbracket \phi \rrbracket$$

Or: Ordering

$\llbracket \text{have to } \phi \rrbracket^{w, MB, BEST} =$

$$\forall w' \in f(w): (\neg \exists w'' \in MB(w): w'' \leq_{BEST, w} w') \rightarrow \llbracket \phi \rrbracket (w')$$

Ordering via Sets of Propositions

Kratzer thinks of $BEST(w)$ as a set of propositions

$$\{p \in BEST(w) : p(w')\} \subseteq \{p \in BEST(w) : p(w'')\} \rightsquigarrow \\ w'' \leq_{BEST,w} w'$$

Personal Modalities

- (4) There have to be 50 chairs in the living room by 5pm.
- (5) John has to put 50 chairs in the living room by 5pm.
- (6) [To the babysitter:] John has to be in bed by 7:30pm.

Epistemics under Deontics?

- (7) The evidence ought to point in Miller's direction.
- (8) Miller ought to be the prime suspect.
- (9) It had better be still possible that Miller did it.
- (10) #Miller ought to have to be the murderer.

Part II

Challenges and Complications

Four topics

- Strong vs Weak Necessity
- Professor Procrastinate
- Iffy Oughts
- The Miners



EMPLOYEES
MUST WASH
HANDS.
DEPT. OF HEALTH

NON-EMPLOYEES
REALLY OUGHT
TO WASH THEIR
HANDS, TOO.

C. J.

A Cross-Linguistic Puzzle

(11) everyone ought to wash their hands

(12) *Tout le monde devrait se laver les mains*
everybody **must/COND** REFL wash the hands

ought = *must/have to* + counterfactual

[von Stechow & Iatridou: “How to say *ought* in Foreign”]

The Best of the Best

- *must/have to* $\phi \rightsquigarrow BEST(w)(MB(w)) \subseteq \llbracket \phi \rrbracket$
- *ought* $\phi \rightsquigarrow BEST_2(w)(BEST_1(w)(MB(w))) \subseteq \llbracket \phi \rrbracket$

Professor Procrastinate

- (13) Procrastinate ought to accept and write. \Rightarrow
- (14) Procrastinate ought to accept.

Alternatives

Jackson (1985), anticipated by Sloman (1970):

deontic modals evaluate alternatives to the prejacent

Jackson's version: *ought* ϕ wrt a comparison set C says that the way ϕ would happen (given the factual background) is preferred over the way that any of the alternatives would happen

(15) #Procrastinate ought to accept and write, but he ought not to accept.

Be careful about context shifts!

Iffy Oughts

(16) If that tourist was mugged, we have to help him.

Wide-spread consensus in deontic logic: the *if*-clause modifies the factual background of the “dyadic” deontic operator.

McNamara’s complaint: “a bit of a puzzle about why this apparent composite of a conditional and a deontic operator is actually some sort of primitive idiom involving a modal notion” (SEP 2006)

Kratzer's Thesis

“The history of the conditional is the story of a syntactic mistake.
There is no two-place if ... then connective in the logical forms of natural languages.

If-clauses are devices for restricting the domains of various operators.”

(Kratzer “Conditionals”, 1986)

Restricting Deontics

$$\llbracket \textit{if } \phi, \textit{ have to } \psi \rrbracket^{w, MB, BEST} = \llbracket \textit{have to } \psi \rrbracket^{w, MB^+, BEST}$$

where $MB^+ = \lambda w. MB(w) \cap \llbracket \phi \rrbracket$

(17) If ϕ , have to ϕ .

Zvolenszky's Complaint

“outlandish sentences like those under (18) come out true.”

- (18)
- a. If teenagers drink then teenagers must drink.
 - b. If I file my taxes, then I must file my taxes.
 - c. If children don't eat spinach then children shouldn't eat spinach.

The Flipside

- (19)
- a. If The Dalai Lama is mad, then he should be mad.
 - b. If Yogi Bear works then he has to work
 - c. If Bart Simpson listens to Bartók, then he must do so.

Two Desiderata

- 1 Explain the reading under which *if ϕ , must ϕ* makes a contingent claim
- 2 Explain why we do not perceive the tautological reading

Bare Conditionals

(20) If this dog is approached, he bites.

(21) If John was here on time, he left Cambridge at noon.

Kratzer:

- covert operator restricted by *if*-clause
- covert frequency adverb in (20) (\approx “always”)
- covert epistemic necessity modal in (21) (\approx “must”)

Predicted Ambiguity

- *if*-clause restricting (covert) epistemic modal under which the deontic modal is embedded
- *if*-clause restricting the deontic modal directly

- (22) If Caspar vacuums on Saturday, then Chris has to cook dinner on Sunday. [Sarah Moss]
- (23) If Caspar vacuums on Saturday, then Chris must have to cook dinner on Sunday.

But Why No Tautology?

Two ideas:

- when there is a contingent reading for a sentence, we do not perceive a non-contingent reading, even if the grammar generates it
- modals that employ an ordering source presuppose/implicate that the prejacent is not already trivial wrt the factual background (i.e. there are prejacent and non-prejacent worlds in the factual background)

(24) If he's here, he's here.

(25) A man's gotta do what a man's gotta do.

Finally: The Miners

Kolodny & MacFarlane 2010

Ten miners are trapped either in shaft A or in shaft B, but we do not know which. Flood waters threaten to flood the shafts. We have enough sandbags to block one shaft, but not both. If we block one shaft, all the water will go into the other shaft, killing any miners inside it. If we block neither shaft, both shafts will fill halfway with water, and just one miner, the lowest in the shaft, will be killed.

We should block neither shaft.

at the same time:

If the miners are in shaft A, we should block A.

If the miners are in shaft B, we should block B.

Kolodny & MacFarlane:
give up on modus ponens!

A Semantic Puzzle

(26) We should block neither shaft.

The Ordering of Worlds

$AA, BB < AN, BN < AB, BA$

Recent Attempts

- Nate Charlow (2011 ms)
- Fabrizio Cariani, Stefan Kaufmann & Magdalena Schwager (2011 ms)

Charlow

Charlow: the Miners Puzzle only arises with weak necessity modals

- (27)
- a. They're in A or B.
 - b. If they're in A, we must [have to] block A.
 - c. If they're in B, we must [have to] block B.
 - d. We may block neither shaft.

Coarsen the Ordering

Repurposing von Fintel & Iatridou, Charlow derives a coarsening of the original order:

$$AA, BB < AN, BN < AB, BA \Rightarrow AA, BB, AN, BN < AB, BA$$

“possibilities where we do nothing (and nine are saved) are ranked as highly as those where we block the correct shaft (and all ten are saved)”

Two Problems for Charlow

- Gets *not (ought (A or B))*, but we want *ought (not (A or B))*
- Not restricted to weak necessity

Cariani, Kaufmann & Schwager

- A decision problem partitions the modal base
- All the worlds in a partition stand and fall together for ordering

Partitioning and Reordering

		AB
	<	BB
AN		
BN		
	<	AA
		BA

A Third Way

- Modal propositions in the ordering source
- Rank worlds according to the expected value (# of miners saved)
- cf. “epistemics embedded under deontics”

More

- Performative deontic modals
- Imperatives
- Free choice
- Inquisitive semantics and deontics