

# Kratzer framework and instrumental modality

Deontic modality: linguistic and logical perspectives on oughts  
and ends

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# Kratzer's analysis of modals

## Varieties of modal readings

- (1) Jones must be the murderer.
- (2) Jones ought to be in his eighties now.
- (3) Jones ought to be in jail now (but he enjoys a free life).
- (4) (If the rumours are correct,) Jones ought to be in jail now.
- (5) He should be in his office by now.
- (6) You should be in your office on time!

# Modals and conversational backgrounds

- ▶ In Kratzer's (1981) analysis of modality, modals are interpreted relative to two contextually set parameters, the modal base and the ordering source, both functions from worlds to sets of propositions.
- ▶ The *modal base* specifies a set of relevant background facts.
- ▶ The *ordering source* encodes the ideals in a world, such as lawfulness, goodness, normalcy, an agent's desires or goals, etc.
- ▶ These two parameters allow for the great variability in the observed interpretations of modal expressions to be reduced to one rule of semantic interpretation.

## Some conversational backgrounds

Term	Content	Meaning of “necessity”
Circumstantial	relevant facts	<i>'p is the case'</i>
Epistemic	knowledge	<i>'p is known'</i>
Doxastic	beliefs	<i>'p is believed'</i>
Stereotypical	normal course of events	<i>'p is normal'</i>
Deontic	obligations, laws	<i>'p is required'</i>
Volitive	decisions	<i>'is willing to p'</i>
Dispositional	abilities	<i>'cannot but p'</i>
Buletic/Desiderative	desires, preferences	<i>'wants p'</i>
Teleological	plans, goals	<i>'aims at p'</i>

# Modals and conversational backgrounds

- ▶ We use  $f$  as general symbol for modal bases and  $g$  ordering sources, and distinguish between different kinds with appropriate subscripts.
- ▶ The terms 'modal base' and 'ordering source' will apply both to the functions and to their values at particular worlds.
- ▶ The values of modal bases and ordering sources, e.g. what an agent believes or what the law specifies, generally vary across worlds.

# Some properties of modal statements

**Relativity** Necessary/possible/etc. in view of . . .

**Contingency** The truth of a modal statement can vary from world to world

**Duality** *Can*  $p$  iff  $\neg$ *Must*  $\neg p$  provided *Can* and *Must* are interpreted relative to the same conversational parameters

# Contingency

*That Jockl must have been the murderer (in view of what we know) is a fact of our world, but it is not a necessary truth. Had our knowledge been different, it might not have implied anymore that Jockl is the murderer. (Kratzer 1991:641)*

- ▶ Worlds in which our knowledge (now) is different from what it actually is (now) cannot be the same world as the world we actually inhabit.
- ▶ Similarly, worlds in which Jones' goals (now) are different from what they actually are (now) cannot be the same world as the world we actually inhabit.



# Relativizing to a modal base and an ordering source

- ▶ Basic idea:
  - ▶ Have two bodies of information – two conversational backgrounds – and keep them apart.
- ▶ Premise semantic view:
  - ▶ For necessity modals: check if every way of adding propositions from the ordering source to the modal base without sacrificing consistency results in maximally consistent sets of propositions which entail the prejacent.

## Some properties of conversational backgrounds

- Consistency:** A conversational background  $cb$  is consistent if for any world  $w$ ,  $cb(w)$  constitutes a set of consistent propositions, i.e.,  $\bigcap cb(w) \neq \emptyset$
- Realism:** A conversational background  $cb$  is realistic if for any world  $w$ ,  $cb(w)$  constitutes a set of propositions true at  $w$ , i.e.,  $w \in \bigcap cb(w)$
- Total realism:** A conversational background  $cb$  is totally realistic if for any world  $w$ ,  $cb(w)$  constitutes a set of propositions completely characterizing  $w$ , i.e.,  $\bigcap cb(w) = \{w\}$
- Emptiness:** A conversational background  $cb$  is empty if for any world  $w$ ,  $cb(w) = \emptyset$ , in which case  $\bigcap cb(w) = W$

## From ordering sources to preorders

- ▶ At each world  $w$ , an ordering source  $g(w)$  induces a preorder  $\leq_{g(w)}$  on worlds such that world  $u$  is (at least) as good as world  $v$  iff all the propositions in  $g(w)$  that are true at  $v$  are also true at  $u$ :

$$(7) \quad v \leq_{g(w)} u \iff \{p \in g(w) \mid v \in p\} \subseteq \{p \in g(w) \mid u \in p\}$$

$$(8) \quad v <_{g(w)} u \text{ if } v \leq_{g(w)} u \text{ but not } u \leq_{g(w)} v$$

- ▶ We are usually interested in the ordering  $\leq_{g(w)}$  not throughout the set of worlds but restricted to a subset of worlds  $F$  (those determined by a modal base)

# Optimal worlds

- ▶ *Limit assumption* (Lewis 1973):  $g(w)$  and  $F$  are such that there are maximal worlds relative to  $g(w)$ —optimal worlds—in  $F$
- ▶ The set of optimal worlds relative to  $g(w)$  can vary, depending on the set the ordering is restricted to

$$(9) \quad \text{Opt}(w, F, g) = \{u \in F \mid \neg \exists v \in F : u <_{g(w)} v\}$$

- ▶ If the conversational backgrounds are finite, every chain in the ordering terminates to undominated worlds
- ▶ Each world from the modal base is either one of the optimal worlds or is dominated by an optimal world

# Modal bases and accessibility relations

- ▶ Modal bases play the role of accessibility relations
- ▶ Modal bases are generally consistent
- ▶ Rather than having accessibility relations be basic, they can be derived from a conversational background:
  - ▶ For any conversational background  $cb$  there is a relation which pairs up every world  $w$  with all and only the worlds in  $\bigcap cb(w)$

# The semantics of modals

- ▶ In the analysis of Kratzer, modals are treated as quantifiers over possible worlds, whose domain of quantification depends on the conversational parameters, which in turn depend on context
- ▶  $\llbracket \cdot \rrbracket$  is the interpretation function assigning meaning to (disambiguated) linguistic expressions
- ▶ When the context fixes the value of the two conversational parameters  $f$  and  $g$  associated with a modal on some occasion of use, we can talk of the interpretation of the modal under that particular construal

$$(10) \quad \llbracket \text{OUGHT}_{f,g}(\phi) \rrbracket = \{w \mid \forall v \in \text{Opt}(w, \bigcap f(w), g) : v \in \llbracket \phi \rrbracket\}$$

# Deontic and other 'priority' modals

- ▶ Modal construals with circumstantial modal bases and normative ordering sources
- ▶ Circumstantial modal bases  $f_{circ}$  “map every world to a set of facts of that world” Kratzer (1991:646)

## A quote from Kratzer (1991)

*“Circumstances create possibilities: the set of possible worlds compatible with them. These worlds maybe closer or further away from*

*what the law provides*

*what is good for you*

*what is moral*

*what we aim at*

*what we hope*

*what is rational*

*what is normal*

*what you recommended*

*what we want*

*...*

*To all of those ideals correspond normative conversational backgrounds. Those conversational backgrounds can function as ordering sources for a circumstantial modal base.” (p. 646)*



## Contrary to duty obligations

- ▶ Suppose the law in  $w$  both prohibits speeding and requires that anyone who speeds pays a fine
- ▶ Suppose further that Jones was speeding in  $w$
- ▶ Should he pay a fine or not?

$$(11) \quad f(w) = \{S_J\}, g(w) = \{\neg S, S \supset F\}$$

# Practical inference

- ▶ Kratzer (1981) discusses practical inferences of the form in (12), which she reconstructs as in (13):

- (12)
- a. I want to become mayor
  - b. I will become mayor only if I go to the pub regularly
  - c. Therefore:  
I must go to the pub regularly

- (13)
- a. In  $w$ , all I want to become mayor
  - b. In  $w$ , the relevant circumstances are such that I will become mayor only if I go to the pub regularly
  - c. Therefore:  
Considering the relevant circumstances and what I want, it is necessary in  $w$  that I go to the pub regularly

## Practical inference

- ▶ She then considers the more interesting case in (14): “This is the horrible story of someone who wants something but rejects the necessary means leading to the fulfillment of her desires.” (p. 66)

- (14)
- a. In  $w$ , all I want is two things, namely to become mayor and not to go to the pub regularly
  - b. In  $w$  the relevant circumstances are such that I will become mayor only if I go to the pub regularly
  - c. Therefore:  
Considering the relevant circumstances and what I want,  
Conclusion 1: it is necessary in  $w$  that I go to the pub regularly FALSE  
Conclusion 2: it is necessary in  $w$  that I don't go to the pub regularly FALSE

# Practical inference

$$(15) \quad f(w) = \{\neg(M \wedge \neg P)\}, \quad g(w) = \{M, \neg P\}$$

- ▶ In the scenario above, the preferences are not logically contradictory; they are contradictory in view of the facts.
- ▶ Facts are given priority over norms/ideals.

# Instrumental necessities

## Some dialogues

- ▶ In the dialogues below, *A* expresses a goal of some kind, *B* responds with a modal statement on the basis of which *A* learns something about the circumstances he is in.
- ▶ The truth of *B*'s utterance in each case depends on certain actual facts and the expressed or inferred goals of *A*.

(16)    *A*: I want to be in Harlem by noon.  
       *B*: You should take the train.

(17)    *A*: I need to be at the airport early in the morning.  
       *B*: Then I should give you a ride.

(18)    *A*: Let's try to finish by midnight.  
       *B*: We should split the work then.

# Instrumental necessities

- ▶ The conversational parameters for instrumental modals
  - ▶  $f_{circ}$  = the relevant circumstances (e.g., facts about public transportation, the location of  $A$  and  $B$ , etc.)
  - ▶  $g_{bulA}$  = the relevant agent's desires/goals (e.g.,  $A$  goes to Harlem)
- ▶ The content of  $B$ 's utterance:
  - ▶ In all worlds where the relevant circumstances obtain and which optimally satisfy the relevant agent's desires/goals the prejacent of the modal is true.
  - ▶ For the Harlem sentence: in all worlds where the relevant circumstances obtain and which optimally satisfy  $A$ 's goals  $A$  takes the train.

# Pragmatic reasoning

- ▶ In context, *B*'s utterance is taken to imply some kind of connection between the prejacent of the modal and the content of the desire/goal.
- ▶ For the Harlem sentence, taking the train is inferred to be a necessary or best way of going to Harlem within the desired time frame given the circumstances.
- ▶ The utterance of the necessity places no obligation on the addressee and need not even constitute an inducement to realize the prejacent.



# Modeling instrumental necessities

- ▶ The ordering source of the modal on an instrumental construal consists of the agent's goals, its prejacent specifies what to do.
- ▶ The aim is to derive which actions are to be taken given the hypothesis that all, or as many up to consistency, of the relevant goals are realized.
- ▶ This can also be thought of as the reasoning of the speaker of a modal assertion which specifies how to achieve a salient goal.

## Modeling instrumental necessities

- ▶ Using the Harlem example, let the relevant goals of  $A$  be:  
 $G_1 = A\text{-goes-to-Harlem}$ ,  
 $G_2 = A\text{-goes-to-Harlem-by-noon}$ ,  
 $G_3 = \text{go-to-Harlem-cheaply}$
- ▶ These are all consistent goals, the more specific ones bounding the more general one.
- ▶  $G_1, G_2, G_3$  can be consistently added to the modal base to derive *Train*

$$(19) \quad f(w) = \{G_1 \leftrightarrow \text{Walk} \vee \text{Taxi} \vee \text{Train}, G_2 \leftrightarrow \text{Taxi} \vee \text{Train}, G_3 \leftrightarrow \text{Walk} \vee \text{Train}, \dots\}$$

$$(20) \quad g(w) = \{G_1, G_2, G_3, \dots\}$$