Deontic and Epistemic Modals in Suppositional [Inquisitive] Semantics

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Questions in Discourse
Georg August University at Göttingen

01 Introduction

Aims

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Goals of the talk

- Introduce a suppositional [inquisitive] semantics for a propositional language which contains epistemic modals.
- Add an Andersonian treatment of deontic modals.
- Give a suppositional semantic solution to a Jackson inspired puzzle which involves both types of modals.

Suppositional [inquisitive] semantics

- By suppositional [inquisitive] semantics we mean the reduced version of suppositional inquisitive semantics that results from only considering the fragment of the propositional language that lacks conjunction and disjunction
- In the full inquisitive version, disjunction and conjunction are the only sources of inquisitiveness

Notation for Epistemic and Deontic modals

Epistemic possibility $\Diamond\varphi$

Deontic obligation $\boxed{v}\varphi$

Epistemic necessity $\Box\varphi := \neg\Diamond\neg\varphi$

Deontic permission $\Diamond\!\!\!\!\boxed{v}\varphi := \neg\boxed{v}\neg\varphi$

The situation

A review request: does the following hold?

(1) You ought to accept the request to write a review. $\boxed{v}p$

The situation at Questions in Discourse

A review request: does the following hold?

(2) Should you accept the request to write a review? $?\boxed{v}p$

The situation

An instantiation of a general rule

(3) If you accept the request to write a review, you ought to write it.

$$p \rightarrow \boxed{v} q$$

The situation

Adding a specific rule

(4) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

Paraphrases of (4-b)

(5) a. If it is epistemically possible that you write the review, ...

b. If you might write the review, ...

c. If it is supposable that you write the review, ...

d. Unless it is impossible that you write the review, ...

The situation

Adding a specific rule

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b. If you might write the review, ...
c. If it is supposable that you write the review, ...
d. Unless it is impossible that you write the review, ...

The unproblematic case

Relevant: does (6-c) hold?

(6) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

c. It is possible that you write the review. $\Diamond q$

Desiderata

(7) a. If writing is possible, then you must accept and write.

The unproblematic case

Relevant: does (6-c) hold?

(6) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

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(7) a. If writing is possible, then you must accept and write.

The puzzle

What if (8-c) holds?

(8) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

c. It is not possible that you write the review. $\neg \Diamond q$

Desiderata

(9) a. If writing is possible, then you must accept and write.

b. If writing is not possible, then you must not accept.

The puzzle

What if (8-c) holds?

(8) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

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Desiderata

(9) a. If writing is possible, then you must accept and write.

b. If writing is not possible, then you must not accept.

What goes wrong

The puzzle

(10) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

c. It is not possible that you write the review. $\neg \Diamond q$

What goes wrong

1. When $\neg \Diamond q$ holds, restricting to $\Diamond q$ results in the empty set.
2. From (10-b) and (10-c), $\boxed{v} p$ vacuously holds.

Counter-intuitive predictions

1. Regardless of whether $\Diamond q$ or $\neg \Diamond q$ holds, $\boxed{v} p$ holds.
2. (10-a), (10-b) and (10-c) result in a deontic conflict: when $\neg \Diamond q$ holds, either $\boxed{v} p$ or $p \rightarrow \boxed{v} q$ is violated.

What goes wrong

The puzzle

(10) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

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Solutions

Possible solution

Appealing to pragmatic reasoning regarding vacuous truth.

Goal of this talk

Demonstrate a semantic solution to puzzles concerning dismissals.

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Appealing to pragmatic reasoning regarding vacuous truth.

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Demonstrate a semantic solution to puzzles concerning dismissals.

Required steps

The puzzle

(11) If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

The steps to our solution

- Epistemic *might* - Veltman
- Implication - Ramsey
- Deontic *must* - Anderson

02 Basic notions

Dismissals

Suppositional [Inquisitive] Semantics

Supposability and suppositional dismissal

(12) a. If Abe goes to the party, Bea will go. $p \rightarrow q$
b. No, if Abe goes to the party, Bea will not go. $p \rightarrow \neg q$
c. Well, Abe won't go. $\neg p$

Intuitions for suppositional inquisitive semantics

- (12-a) and (12-b) contradict each other.
- (12-c) dismisses (12-a) and (12-b).

Suppositional dismissal

Conditionals and deontic modals

(13) a. If Abe goes to the party, Bea will go as well. $p \rightarrow q$
b. Well, Abe won't go. $\neg p$

(14) a. You must pass the exam. $\boxed{v} p$
b. I already passed the exam. p

- When (13-b) holds, (13-a) is dismissed.
- When (14-b) holds, (14-a) is dismissed.

Information states

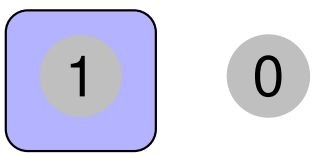
States:

- A state is a set of worlds.
- The empty set is called the absurd state.
- The set of all worlds is called the ignorant state.

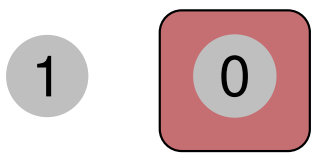
Support, rejection and dismissal

Atomic sentences

- A state σ supports p iff
  1. σ is not absurd, and
  2. all worlds in σ are p worlds.
- A state σ rejects p iff
  1. σ is not absurd, and
  2. no worlds in σ are p worlds.
- A state σ dismisses p iff σ is absurd.



σ supports p



σ rejects p

σ dismisses p

Informativeness and suppositionality

Informative

φ is informative iff the ignorant state does not support φ.

Suppositional

φ is suppositional iff some non-absurd state dismisses φ.

σ supports p

σ rejects p

σ dismisses p

Applying the notions

The atomic sentence p is informative and not suppositional.

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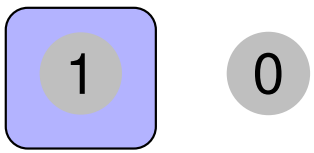

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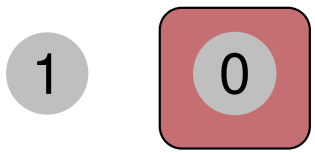

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Applying the notions

The atomic sentence p is informative and not suppositional.

Negation

Negation in suppositional inquisitive semantics

- σ supports $\neg\varphi$ iff σ rejects φ
- σ rejects $\neg\varphi$ iff σ supports φ
- σ dismisses $\neg\varphi$ iff σ dismisses φ.

Double negation

φ is equivalent to $\neg\neg\varphi$

Questions

Questions in suppositional inquisitive semantics

- σ supports $?\varphi$ iff σ supports φ or σ rejects φ
- No state rejects $?\varphi$
- σ dismisses $?\varphi$ iff σ dismisses φ.

Supposability in suppositional [Inquisitive] semantics

Informative content

info(φ) is the union of all states that support φ.
Equivalently in the non-inquisitive case:
the maximal (minimally informed) state that supports φ.

Supposability

φ is supposable in σ iff $\sigma \cap \text{info}(\varphi)$ supports φ

The absurd state in suppositional inquisitive semantics

In the absurd state ($\emptyset$), nothing is supposable, since it does not support or reject any sentence. It dismisses every sentence.

Supposability is not persistent, non-supposability is

As information grows, supposability may get lost, and once it gets lost, it stays lost.

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03 Epistemic modals

Might

Epistemic might in suppositional [inquisitive] semantics

Might as a supposability check

- $\Diamond\varphi$ is treated as a supposability check.
- For basic cases, when φ is not suppositional, this amounts to checking consistency.

Epistemic might in suppositional [inquisitive] semantics

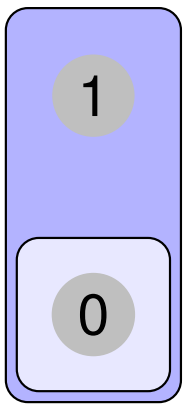
Recall

φ is supposable in σ iff $\sigma \cap \text{info}(\varphi)$ supports φ

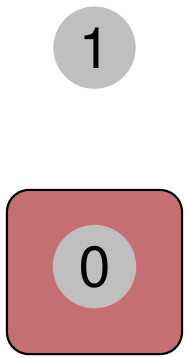
$\Diamond\varphi$ in suppositional [inquisitive] semantics

- σ supports $\Diamond\varphi$ iff φ is supposable in σ
- σ rejects $\Diamond\varphi$ iff
  1. φ is not supposable in σ, and
  2. $\neg\varphi$ is supposable in σ.
- σ dismisses $\Diamond\varphi$ iff φ is not supposable in σ

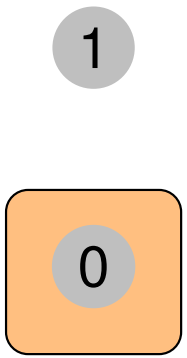
Picture of meaning $\Diamond p$



σ supports $\Diamond p$



σ rejects $\Diamond p$



σ dismisses $\Diamond p$

Informativeness and supposability

- Since the ignorant state supports $\Diamond p$, it is not informative.
- Since a non-absurd state dismisses $\Diamond p$, it is suppositional.

04 Implication

Supposition failure

Implication in suppositional [inquisitive] semantics

Supposing

- φ is supposable in σ iff $\sigma \cap \text{info}(\varphi)$ supports φ
- To suppose φ in σ is to take $\sigma \cap \text{info}(\varphi)$.

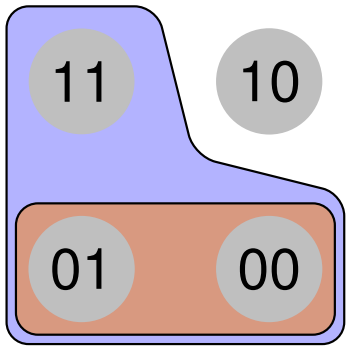
Implication in suppositional [inquisitive] semantics

σ supports $\varphi \to \psi$ iff
(A) φ is supposable in σ, and
(B) if φ is supposed in σ, then ψ is supported.

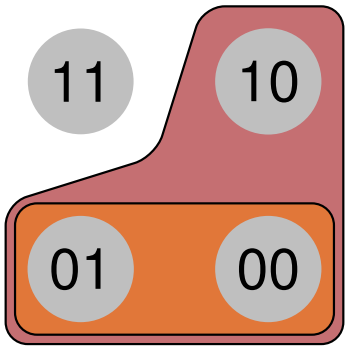
σ rejects $\varphi \to \psi$ iff
(A) φ is supposable in σ, and
(B) if φ is supposed in σ, then ψ is rejected.

σ dismisses $\varphi \to \psi$ iff
(A) φ is not supposable in σ, or
(B) if φ is supposed in σ, then ψ is dismissed.

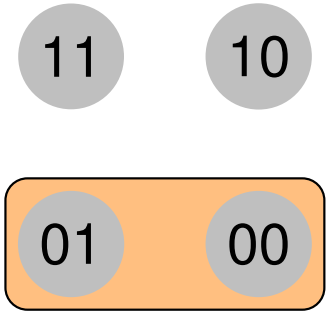
Picture of meaning of $p \rightarrow q$



Supporting $p \rightarrow q$



Rejecting $p \rightarrow q$



Dismissing $p \rightarrow q$

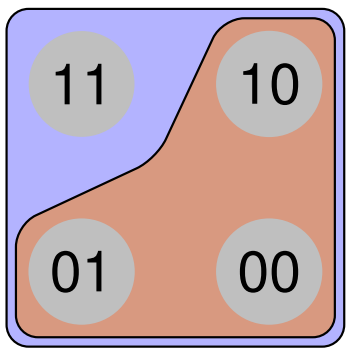
Informativeness and supposability

- Since the ignorant state does not support $p \rightarrow q$, it is informative.
- And, since a non-absurd state dismisses $p \rightarrow q$, it is suppositional.

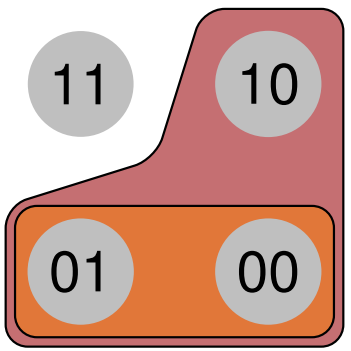
Motivating the rejection clause for might

The rejection clause of $\Diamond\varphi$

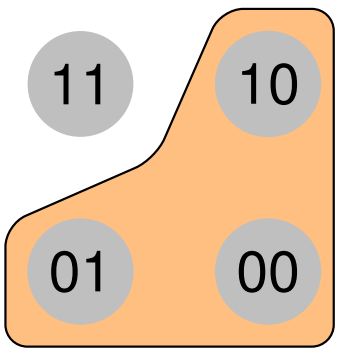
σ rejects $\Diamond\varphi$ iff
1. φ is not supposable in σ, and
2. $\neg\varphi$ is supposable in σ.



Supporting $\Diamond(p \to q)$



Rejecting $\Diamond(p \to q)$



Dismissing $\Diamond(p \to q)$

05 Deontics

Worlds and rulings

Worlds and rulings

Worlds and rulings

- A world w is a valuation function such that for every atomic sentence p: $w(p) = 1$ (true) or $w(p) = 0$ (false).
- A ruling r is a violation function such that for every world w: $r(w) = 1$ (no violation) or $r(w) = 0$ (violation).

Rulings

A set of rulings embodies information on what the rules could be.

Deontic information states

A deontic state σ is a set of world-ruling pairs such that:
$\sigma =$ worlds in $\sigma \times$ rulings in σ.

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Picture of a deontic state

σ_0	w_1	w_2
r_1	1	0
r_2	1	0
r_3	1	0
r_4	1	0

Ignorant state with only 1 atom

Providing world-information

σ_0	w_1	w_2
r_1	1	0
r_2	1	0
r_3	1	0
r_4	1	0

Ignorant state (1 atom)

σ_1	w_1	w_2
r_1	1	0
r_2	1	0
r_3	1	0
r_4	1	0

σ_1 supports $\neg p$

σ_1	w_1	w_2
$r_{1,2}$	1	0
$r_{3,4}$	1	0

σ_1 supports $\neg p$

Obligation

Must in suppositional [inquisitive] semantics

- $\boxed{v}\varphi := \neg\varphi \rightarrow \mathsf{bad}$

Where:

- σ supports bad iff σ is not absurd and according to all rulings in σ all the worlds in σ are violation worlds.
- σ rejects bad iff σ is not absurd and according to all rulings in σ all the worlds in σ are non-violation worlds.
- σ dismisses bad iff σ is absurd.

Providing deontic information

σ_0	w_1	w_2
r_1	1	0
r_2	1	0
r_3	1	0
r_4	1	0

Ignorant state

σ_1	w_1	w_2
r_1	1	0
r_2	1	0
r_3	1	0
r_4	1	0

σ_1 supports $\neg p$

σ_2	w_1	w_2
r_3	1	0
r_4	1	0

σ_2 supports $\neg p$, and
σ_2 supports $\boxed{v}p$

06 A semantic solution

Back to the puzzle

Possible worlds and rulings

Just for economy, we ignore the irrelevant world 01.

σ_0	w_1	w_2	w_3
r_1	11	10	00
r_2	11	10	00
r_3	11	10	00
r_4	11	10	00
r_5	11	10	00
r_6	11	10	00
r_7	11	10	00
r_8	11	10	00

Deontically ignorant state

Adding the general rule

Recall the general rule

(15) If you accept the request to write a review, you ought to write it.

$$p \rightarrow \boxed{v} q$$

σ_0	w_1	w_2	w_3
r_1	11	10	00
r_2	11	10	00
r_3	11	10	00
r_4	11	10	00
r_5	11	10	00
r_6	11	10	00
r_7	11	10	00
r_8	11	10	00

Deontically ignorant state

σ_1	w_1	w_2	w_3
r_1	11	10	00
r_2	11	10	00
r_3	11	10	00
r_4	11	10	00

σ_1 supports $p \rightarrow \boxed{v} q$

Suppositional obligations

The specific rule

(16) If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

σ_0	w_1	w_2	w_3
r_1	11	10	00
r_2	11	10	00
r_3	11	10	00
r_4	11	10	00
r_5	11	10	00
r_6	11	10	00
r_7	11	10	00
r_8	11	10	00

Deontically ignorant state

Recall

$\Diamond q$ is not informative.

σ_2	w_1	w_2	w_3
r_2	11	10	00
r_4	11	10	00
r_6	11	10	00
r_8	11	10	00

σ_2 supports $\Diamond q \rightarrow \boxed{v} p$, and
σ_2 supports $\boxed{v} p$

Adding the specific rule

The specific rule

(17) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

σ_1	w_1	w_2	w_3
r_1	11	10	00
r_2	11	10	00
r_3	11	10	00
r_4	11	10	00

σ_1 supports $p \rightarrow \boxed{v} q$

σ_2	w_1	w_2	w_3
r_2	11	10	00
r_4	11	10	00
r_6	11	10	00
r_8	11	10	00

σ_2 supports $\Diamond q \rightarrow \boxed{v} p$

σ_3	w_1	w_2	w_3
r_2	11	10	00
r_4	11	10	00

σ_3 supports $p \rightarrow \boxed{v} q$,
σ_3 supports $\Diamond q \rightarrow \boxed{v} p$

Desiderata 1

σ_3	w_1	w_2	w_3
r_2	11	10	00
r_4	11	10	00

σ_3 supports $\Diamond q$, and
σ_3 supports $p \rightarrow \boxed{v} q$, and
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σ_3 supports $\boxed{v} p$, and
σ_3 supports $\boxed{v} q$

Desiderata

(18) If writing is possible, then you must accept the request and you must write.

When it is not possible that you write the review

Adding the second rule

(19) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

σ_1	w_1	w_2	w_3
r_1	11	10	00
r_2	11	10	00
r_3	11	10	00
r_4	11	10	00

σ_1 supports $p \rightarrow \boxed{v} q$

The review will not be written

The puzzle

(20) a. If you accept the request to write a review, you ought to write it. $p \rightarrow \boxed{v} q$

b. If it is possible that you write the review, you ought to accept the request to write it. $\Diamond q \rightarrow \boxed{v} p$

c. It is not possible that you write the review. $\neg \Diamond q$

σ_4	w_1	w_2	w_3
r_1	11	10	00
r_2	11	10	00
r_3	11	10	00
r_4	11	10	00

σ_4	w_1	w_2	w_3
$r_{1,3}$	11	10	00
$r_{2,4}$	11	10	00

σ_4 dismisses $\Diamond q$, and
σ_4 supports $p \rightarrow \boxed{v} q$, and
σ_4 dismisses $\Diamond q \rightarrow \boxed{v} p$

Desiderata 2

σ_4	w_1	w_2	w_3
$r_{1,3}$	11	10	00
$r_{2,4}$	11	10	00

σ_4 dismisses $\Diamond q$, and
σ_4 supports $p \rightarrow \boxed{v} q$, and
σ_4 dismisses $\Diamond q \rightarrow \boxed{v} p$
σ_4 supports $\boxed{v} \neg p$

Desiderata

(21) If writing is not possible, then you must not accept.

Summary

Desiderata

(22) a. If writing is possible, then you must accept the request and you must write.
b. If writing is not possible, then you must not accept.

σ_3	w_1	w_2	w_3
r_2	11	10	00
r_4	11	10	00

σ_3 supports $\Diamond q$, and
σ_3 supports $p \rightarrow \boxed{v} q$, and
σ_3 supports $\Diamond q \rightarrow \boxed{v} p$, and
σ_3 supports $\boxed{v} p$, and
σ_3 supports $\boxed{v} q$

σ_4	w_1	w_2	w_3
$r_{1,3}$	11	10	00
$r_{2,4}$	11	10	00

σ_4 dismisses $\Diamond q$, and
σ_4 supports $p \rightarrow \boxed{v} q$, and
σ_4 dismisses $\Diamond q \rightarrow \boxed{v} p$
σ_4 supports $\boxed{v} \neg p$

07 Other puzzles

Free choice, Ross's puzzle, conditional oughts, etc.

A uniform solution

- I proposed a semantic solution to Ross's puzzle, free choice, Dr. Procrastinate, and puzzles involving deontic conflicts in my dissertation (Aher 2013).
- The approach made false predictions when it encountered examples which suppositional inquisitive semantics characterizes as supposition failure.
- The same approach implemented in suppositional inquisitive semantics has the potential to provide a uniform semantic solution to these well-known puzzles.

What about the question in the beginning?

A review request: does the following hold?

(23) Should you accept the request to write a review? $?\boxed{v}p$

The support clause for questions

σ supports $?\varphi$ iff σ supports φ or σ rejects φ

The initial issue:

$\boxed{v}p$ or $\neg\boxed{v}p$ $?\boxed{v}p$

The intuitive issue:

$\boxed{v}p$ or $\boxed{v}\neg p$? $\boxed{v}?p$

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$\boxed{v}p$ or $\boxed{v}\neg p$? $\boxed{v}?p$

The end (Or is it?)

Thank you for listening

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