Conditional Assertion in Commitment Space Semantics

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1. Conditional Propositions vs. Conditional Assertions

(1) a. *If Fred was at the party, the party was fun*.
b. *If 27419 is divisible by 7, I will propose to Mary.*

(2) a. **Conditional proposition (CP):**
i. conditional sentence has a truth value (e.g. Stalnaker, Lewis, Kratzer)
'Fred was at the party > the party was fun'
ii. conditional sentence has a probability (e.g. Adams, Kaufmann)
P('party was fun' | 'Fred was there') > r

b. **Conditional assertions (CA),** suppositional theory, e.g. Edgington, Vanderveken, Starr: Under the condition that Fred was at the party it is asserted that the party was fun.

(3) Arguments for **CP**:

a. Explains embedding of conditionals, as propositions can be embedded:
i. *If Fred was at the party, then if Mary was there too, the party was fun.*
ii. *We all know that if Fred was at the party, the party was fun.*

b. There are established proposals for truth conditions, e.g. Stalnaker 1968:
'if φ then ψ' = $[\varphi > \psi] = \lambda i[\psi(\text{ms}(i, \varphi))]$,
where $\text{ms}(i, \varphi)$ = the index maximally similar to i such that $\varphi(i)$.

(4) Arguments for **CA**:

a. Different speech acts in consequent:
If Fred was at the party, was it fun? / how fun it must have been! / tell me more about it!

b. Plausibility of Peirce / Ramsey analysis of conditionals:

"...[T]he consequent of a conditional proposition asserts what is true, not throughout the whole universe of possibilities considered, but in a subordinate universe marked off by the antecedent." (Peirce in the Grand Logic [1893-4]; CP 4.435)

"If two people are arguing 'If p, will q?' and are both in doubt as to p, they are adding p hypothetically to their stock of knowledge, and arguing on that basis about q; (…) they are fixing their degrees of belief in q given p. (Ramsey [1929] 1990, p. 155)

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c. Straightforward explanation of presupposition projection (Heim 1983):
If Fred is a diver, he will bring his wetsuit.
assume Fred is a diver; divers have wet-suit; Fred has a wet suit.

d. *no* as affirming negative antecedent assertions
S_1: *If Kelly dates John, she will not marry Bill.*
S_2: *No, she won't.* (i.e., if Kelly dates John, she will not marry Bill).

(5) Quine 1950:
"An affirmation of the form 'if p, then q' is commonly felt less as an affirmation of a conditional than as a conditional affirmation of the consequent."

(6) Stalnaker 2009:
"While there are some complex constructions with indicative conditionals as constituents, the embedding possibilities seem, intuitively, to be highly constrained. For example, simple disjunctions of indicative conditionals with different antecedents, and conditionals with conditional antecedents are difficult to make sense of. The proponent of a non-truth-conditional [CA] account needs to explain what embeddings there are, but the proponent of a truth-conditional [CP] account must explain why embedded conditionals don't seem to be interpretable in full generality."

(7) My goals:
a. Develop a formal framework for CA,
this is done within Commitment Space Semantics (Cohen & Krifka 2014, Krifka 2015).
b. Explain (restrictions of) embeddings of conditional clauses
c. Propose a unifying account for indicative and counterfactual conditionals

2. The Simple Dynamic Approach to Conditionals

(8) Assertions as actions that change information state of interlocutors;
modeled as changes of the shared Common Ground
(Stalnaker 1974, 1975, 1978, 2002; cf. also Karttunen 1974).

(9) Information state s often modeled as **context set**,
a set of indices (possible worlds),
update with proposition as intersection: $s + \varphi = s \cap \varphi$

If φ carries a presupposition π,
this has to be satisfied in input information state s, i.e. $s \subseteq \pi$

(10) Update with a conditional sentence (Heim 1983):
$s + [\text{if } \varphi \text{ then } \psi] = s - [[s + \varphi] - [s + \varphi + \psi]]$

Presuppositions of ψ have to be satisfied in information state $s + \varphi$

(11) Is this necessarily a **conditional** update?
No, we would get the same result by update with material implication:
$s + [\varphi \rightarrow \psi] = s + [\neg\varphi \vee \psi]$

(12) Update with tautologies meaningless: s + '27419 is divisible by 7' = s

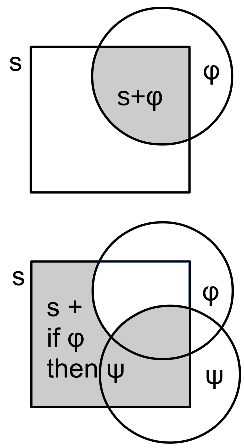

Figure 1: Heimian update with proposition, and with conditional

3. Commitment States and their Updates

(13) Commitment states are **sets of propositions**, the propositions that the participants of a conversation consider to be shared at the current point in conversation.

(14) Commitment states should be **consistent**, i.e. non-contradictory:
a. c is inconsistent iff $c \vDash \varphi$ and $c \vDash \neg\varphi$, for some proposition φ
b. c is consistent iff c it is not inconsistent.

(15) **Update** of commitment states, cf. Figure 2.
a. Update of commitment state c with proposition φ: $c + \varphi = c \cup \{\varphi\}$
b. Consistent update: $c + \varphi = c \cup \{\varphi\}$, if consistent
c. Analytic update: $c + \varphi$, where $c \vDash \varphi$; making φ salient.

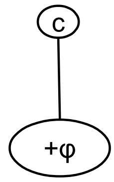

Figure 2: Update of commitment state with f(φ)

(16) Update as function: $c + f(\varphi) = f(\varphi)(c) = \lambda c'[c' \cup \{\varphi\}](c) = c \cup \{\varphi\}$

(17) **Assertion** as expressing commitments to **truth of proposition**:
$c + S_1$ to S_2: *I won the race.* $= f(S_1 \vdash$ 'S_1 won the race'$)(c)$
$= c + S_1 \vdash$ 'S_1 won the race'
$S_1 \vdash \varphi$: S_1 vouches for the truth of φ, accepting social penalties if φ turns out false
cf. Frege 1879: judgement (Urteil), 1918: judgement and assertion (Behauptung),
Peirce on assertion as "an act of exhibition of the fact that one subjects oneself to the penalties visited on a liar if the proposition asserted is not true", CP 8.337

(18) The **proposition φ** enters the commitment state as a **conversational implicature** that can be cancelled: *Believe it or not, Fred was at the party.*

(19) $C + S_1 \vdash \varphi$, after conversational implicature, no objection by S_2: $C + S_1 \vdash \varphi + \varphi$

(20) Allows for meaningful update with tautologies / contradictions:
$c + S \vdash$ '27419 is divisible by 7' $\neq c$

(21) See Krifka (2015) for details, including:
– syntactic structure of assertions: $[_{\text{ActP}} \,.\, [_{\text{CommitP}} \vdash [_{\text{TenseP}}\ \psi]]]$
– how the implicature arises: assumption that speaker avoids penalties; cooperation
– questions as requests to commit to a proposition: $[_{\text{ActP}}\ ?\ [_{\text{CommitP}} \vdash [_{\text{TenseP}}\ \psi]]]$
– confirming and denying reactions: *yes, no, I don't know.*

4. Commitment Spaces and their Updates

(22) Commitment spaces (CS) as commitment states with possible future development
Cohen & Krifka 2014, Krifka 2015

(23) A **single-rooted commitment space** is a non-empty set of commitment states C with $\cap C \in C$.
$\cap C$, written $\surd C$, **the root** of the commitment space C.
For all $c \in C$, it holds that $\surd C \subseteq c$.

(24) Update with a proposition φ, cf. Figure 3:
$F(\varphi) = \lambda C\{c \in C \mid \surd C + f(\varphi) \subseteq c\}$

(25) $C + F(\varphi) = F(\varphi)(C) = \{c \in C \mid \surd C + f(\varphi) \subseteq c\}$,
undefined if $f(\varphi)(\surd C)$ is undefined
(in case this is contradictory)

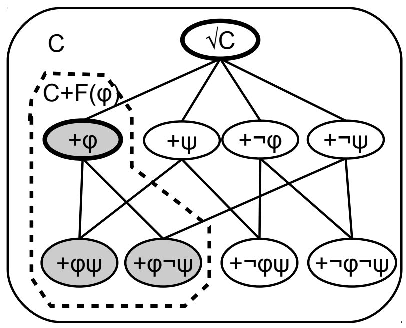

Figure 3: Update of commitment space with F(φ)

(26) Denegation of speech acts, cf. Figure 4:
(cf. Searle 1969, Hare 1970, Dummett 1973)
a. *I don't promise to come.*
b. *I don't claim that Fred spoiled the party.*

(27) Formal representation of denegation:
$C + {\sim}\mathfrak{A} = C - [C + \mathfrak{A}]$
this is dynamic negation in Heim 1983

(28) Speech acts that do not change the root:
meta speech acts (cf. Cohen & Krifka 2014)

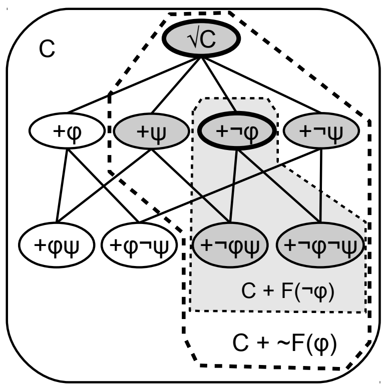

Figure 4: Update with ~F(φ) vs. F(¬φ)

(29) **Revisionary** update rules if regular update (25) is not defined:
Go back to maximally compatible commitment state where update can be defined.
$C +_R F(\varphi) = \{ms(c, \varphi) + f(\varphi) \mid c \in C\}$,
where $ms(c, \varphi)$ = the commitment state maximally similar to c s.th. it can be updated with φ.

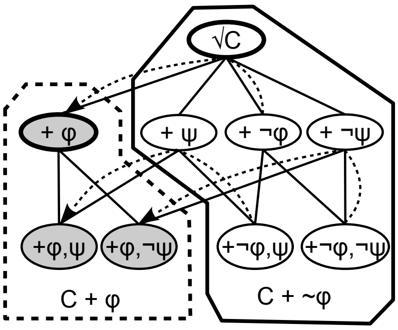

Figure 5: Revisionary update
[C + ~F(φ)] + F(φ)

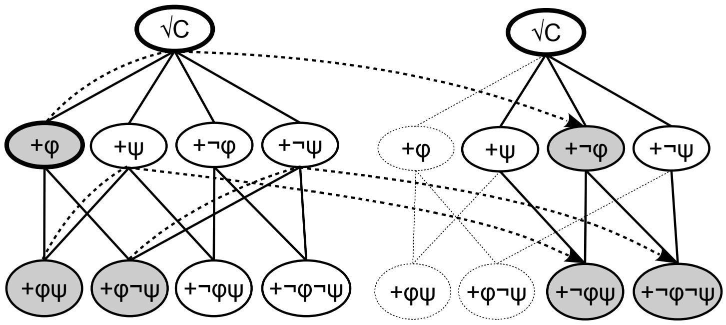

Figure 6: Revisionary update
[C + F(φ)] + F(¬φ)

(30) If c can be updated with φ, $ms(c, \varphi) = \varphi$, revisionary update reduces to ordinary update, (24).

(31) Dynamic conjunction: $[\mathfrak{A} ; \mathfrak{B}] = \lambda C[\mathfrak{B}(\mathfrak{A}(C))]$ (functional composition)

(32) Boolean conjunction and disjunction: a. $[\mathfrak{A} \,\&\, \mathfrak{B}] = \lambda C'[\mathfrak{A}(C') \cap \mathfrak{B}(C')]$
b. $[\mathfrak{A} \vee \mathfrak{B}] = \lambda C'[\mathfrak{A}(C') \cup \mathfrak{B}(C')]$

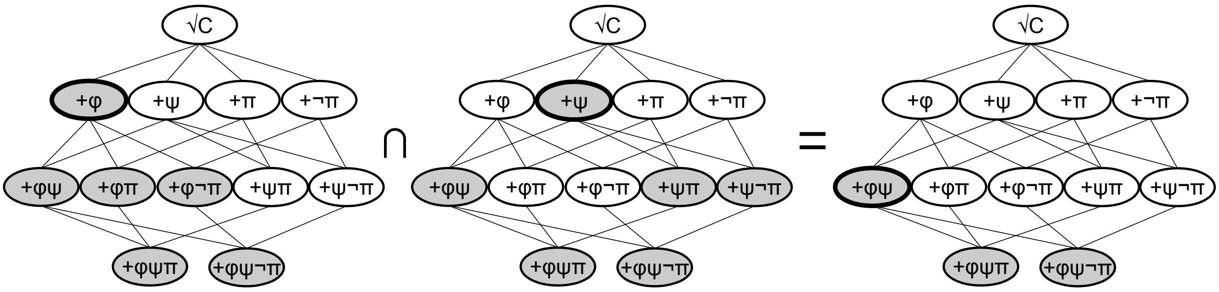

Figure 7: Conjunction C + [F(φ) & F(ψ)] = [C + F(φ)] ∩ [C +F(ψ)]

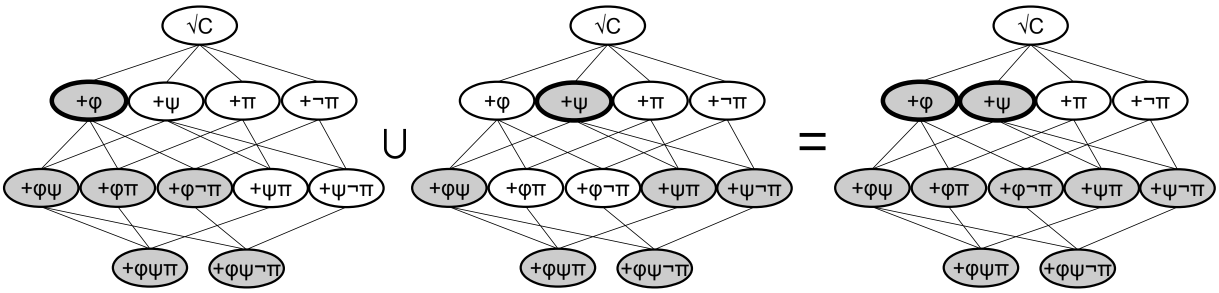

Figure 8: Disjunction C + [F(φ) V F(ψ)] = [C + F(φ)] ∪ [C + F(ψ)]

(33) Disjunction of two regular speech acts does not result in single-rooted CS,
problem of disjunction as speech acts, Dummett, 1973, Gärtner & Michaelis, 2010

(34) Proposal: Commitment spaces do not need to have a single root
a. A **commitment space** is a non-empty set of commitment states C
b. $c \in C$ is **a root** of C iff there is no c' with $c' \subset c$ such that $c' \in C$
c. $\surd C = \{c \in C \mid \neg\exists c' \in C[c' \subset c]\}$ is the **set of roots** of C.

(35) Update affects **all** roots of a commitment space:
$F(\varphi) = \lambda C\{c \in C \mid \exists c' \in \surd C[c' + f(\varphi) = c]\}$

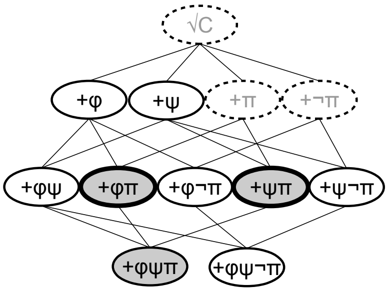

Figure 9:
$C + [F(\varphi) \vee F(\psi)] + F(\pi)$

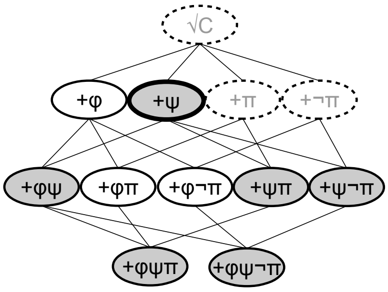

Figure 10:
$C + [F(\varphi) \vee F(\psi)] + F(\psi)$

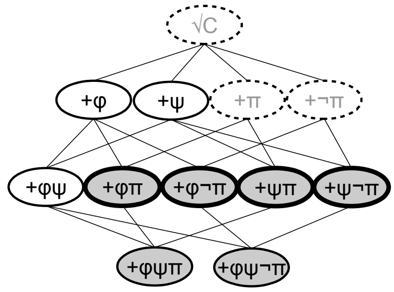

Figure 11:
$C + [F(\varphi) \vee F(\psi)] + [F(\pi) \vee F(\neg\pi)]$

(36) Boolean laws, e.g. double negation, excluded middle, de Morgan
a. $C + {\sim}{\sim}\mathfrak{A} = C - [C + {\sim}\mathfrak{A}] = C - [C - [C + \mathfrak{A}]] = C + \mathfrak{A}$
b. $C + [\mathfrak{A} \vee \neg\mathfrak{A}] = [C + \mathfrak{A}] \cup [C - [C + \mathfrak{A}]] = C$
c. $C + {\sim}[\mathfrak{A} \vee \mathfrak{B}] = C + [{\sim}\mathfrak{A} \,\&\, {\sim}\mathfrak{B}]$

(37) Questions as metalinguistic speech acts (Krifka 2015):
a. Basic form of question: $C + ?(\varphi) = \surd C \cup C + F(\varphi)$
b. Monopolar question by S_1 to S_2 whether π: $C + ?(S_2 \vdash \varphi)$, initiated by S_1,
e.g. *Will it rain?*
b. Question by S_1 to S_2 whether π or $\neg\pi$: $C + ?(S_2 \vdash \varphi) \cup ?(S_2 \vdash \neg\varphi)$
e.g. *Will it rain, or not?*

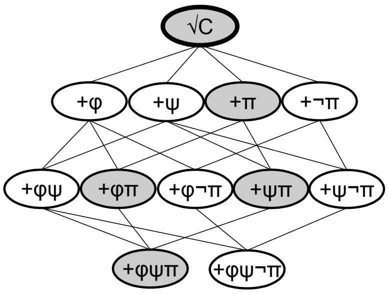

Figure 12a: Monopolar question π?
$C + [?(\pi) \vee ?(\pi)]$

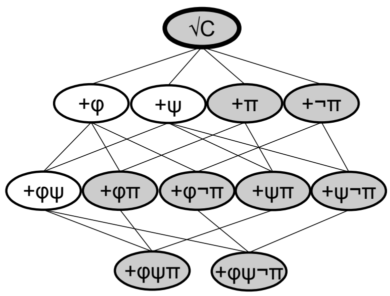

Figure 12b: Bipolar question π? or $\neg\pi$?
$C + [?(\pi) \vee ?(\pi)]$

5. Conditional Assertions

5.1 Representation of conditional sentences

(38) Idea: Conditionals express a conditional update of a commitment space
that is effective in possible future developments of the root,
cf. Krifka 2014 for biscuit conditionals,
hypothetical conditionals in Hare 1970,
where *if φ then ψ*: If we are in a position to affirm φ, we can also affirm ψ.

(39) Proposal for conditionals (to be revised): $[\varphi \Rightarrow \psi] = \lambda C\ \{c \in C \mid \varphi \in c \rightarrow \psi \in c\}$

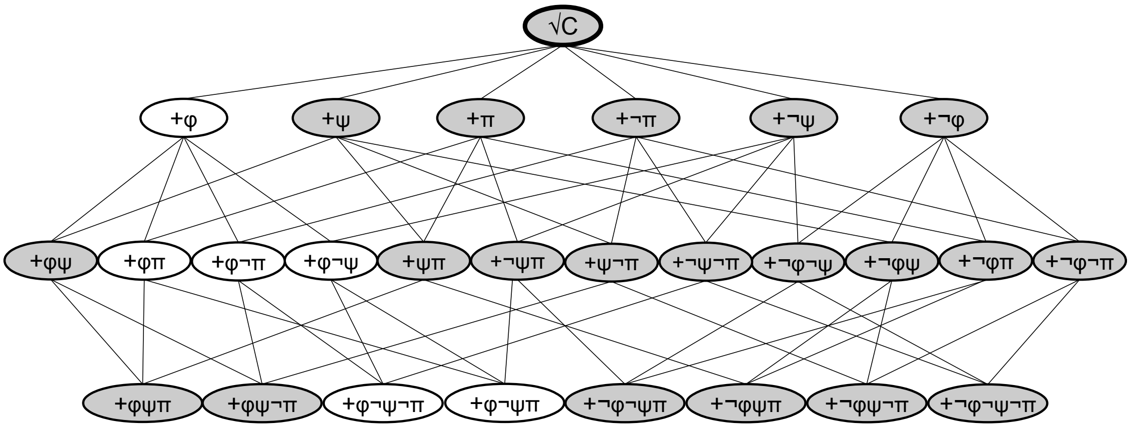

Figure 13: $C + [\varphi \Rightarrow \psi] = \{c \in C \mid \varphi \in C \rightarrow \psi \in C\}$
$C + [F(\varphi) \Rightarrow F(\psi)] = C + [[F(\varphi) ; F(\psi)] \vee {\sim}F(\varphi)] = C + [{\sim}F(\varphi) \vee F(\psi)]$

(40) Conditionals in terms of updates:
a. $C + [\mathfrak{A} \Rightarrow \mathfrak{B}] = \{c \in C \mid c \in C + \mathfrak{A} \rightarrow c \in C + \mathfrak{A} + \mathfrak{B}\}$
b. $[\mathfrak{A} \Rightarrow \mathfrak{B}] = [[\mathfrak{A} ; \mathfrak{B}] \vee {\sim}\mathfrak{A}]$ (cf. Peirce / Ramsey condition)
c. $[\mathfrak{A} \Rightarrow \mathfrak{B}] = [{\sim}\mathfrak{A} \vee \mathfrak{B}]$ (in case there are no anaphoric bindings between $\mathfrak{A}$ and $\mathfrak{B}$)

(41) Antecedent itself is not a speech act (cf. Hare 1970); *if/wenn* updates without commitment;
cf. verb final order in German, typical for embedded clauses without illocutionary force:
Wenn Fred auf der Party war, [*dann war die Party lustig*].
cf. lack of speech act operators in antecedent
*If Fred (*presumably) was at the party, then the party (presumably) was fun.*

(42) *if/wenn* take a proposition, turns it into an update function:
$[\![[_{ActP}\ [_{CP}\ \textit{if}\ \varphi]\ [\textit{then}\ [_{ActP}\ .\ [_{CommitP} \vdash [_{TP}\ \psi]]]]]\!]^{S} = [F(\varphi) \Rightarrow S\vdash\psi]$, S: speaker

(43) Conditional assertion analysis of conditionals:
$C + S$: *if φ then ASSERT ψ* $= C + [[F(\varphi) ; F(S\vdash\psi)] \vee {\sim}F(\varphi)]$

(44) Requirements for $[\mathfrak{A} \Rightarrow \mathfrak{B}]$: Grice 1988, Warmbröd 1983, Veltman 1985:
a. Update of C with $\mathfrak{A}$ must be pragmatically possible — i.e. informative and
b. Update of $C + \mathfrak{A} + \mathfrak{B}$ must be pragmatically possible — not excluded

(45) Allows for other speech acts, e.g. imperatives, exclamatives; questions:
$C + S_1$ to S_2: *if φ then QUEST ψ* $= C + [[F(\varphi); ?(S_2\vdash\psi)] \vee {\sim}F(\varphi)]$

(46) Conversational theory of conditionals;
if φ becomes established in the common ground, then Speaker vouches for truth of ψ;
not: if φ is true, then speaker vouches for truth of ψ

If Goldbach's conjecture holds, then I will give you one million euros.
'If it becomes established that Goldbach's conjecture holds, I will give you one million euros'

Requires that speakers can be forced to accept truth, that independent referees can decide
S_1: *You said if I dice a six, I get 10 euros.* – S_2: *But I don't see that you diced a six.*

(47) We will look at the following cases of embedded conditionals:
a. Conjunction of conditionals: ✓
b. Disjunction of conditionals: %
c. Negation of conditionals: %
d. Conditional consequents: ✓
e. Conditional antecedents: %
f. Conditionals in propositional attitudes: (✓)

5.2 Conjunction of conditionals: ✓

(48) Conjunction of conditionals
$[[\mathfrak{A} \Rightarrow \mathfrak{B}] ; [\mathfrak{A}' \Rightarrow \mathfrak{B}']] = [\mathfrak{A} \Rightarrow \mathfrak{B}] \,\&\, [\mathfrak{A}' \Rightarrow \mathfrak{B}'] = [\mathfrak{B} \vee \neg\mathfrak{A}] \,\&\, [\mathfrak{B}' \vee \neg\mathfrak{A}']$

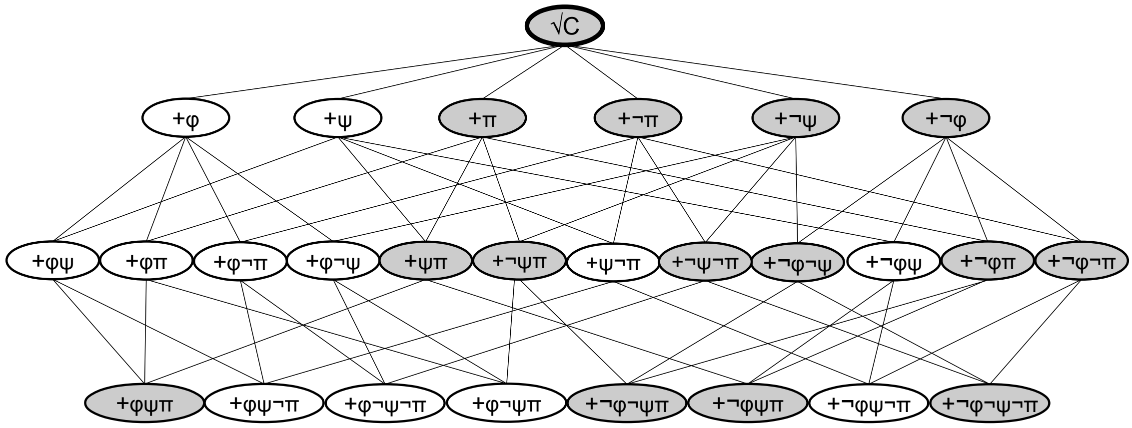

Figure 14: $C + [[F(\varphi) \Rightarrow F(\psi)] \ \& \ [F(\psi) \Rightarrow F(\pi)]] = C + [F(\varphi) \Rightarrow F(\psi)] \cap C + [F(\psi) \Rightarrow F(\pi)]$

(50) Transitivity: $[C + [\mathfrak{A} \Rightarrow \mathfrak{B}] \ \& \ [\mathfrak{B} \Rightarrow \mathfrak{C}]] \subseteq C + [\mathfrak{A} \Rightarrow \mathfrak{C}]$

(51) For CP analysis, transitivity needs stipulation about ms relation:
$[\varphi > \psi] \wedge [\psi > \pi] = \lambda i[\psi(ms(i,\varphi)) \wedge \pi(ms(i,\psi))]$,
$[\varphi > \pi] = \lambda i[\pi(ms(i,\varphi))]$,
$[\varphi > \psi] \wedge [\psi > \pi] \subseteq [\varphi > \pi]$ if $ms(i,\varphi) = ms(i,\psi)$

(52) Not designed to handle default rules, nonmonotonic reasoning, e.g.
If Tweety is a bird, it can fly;
If Tweety is a penguin, it is a bird;
But: *If Tweety is a penguin, it cannot fly.*
cf. Veltman 1996 for default rules in dynamic semantics, to be adapted here

5.3 Disjunction of conditionals: %

(53) Disjunction of conditionals often considered problematic
(cf. Barker 1995, Edgington 1995, Abbott 2004, Stalnaker 2009).

(54) A good offer with which you only can gain, not loose?
If you open the green box, you'll get 10 euros,
or if you open the red box you'll have to pay 5 euros.

But we have the following equivalence (also for material implication)
$[[\mathfrak{A} \Rightarrow \mathfrak{B}] \vee [\mathfrak{A}' \Rightarrow \mathfrak{B}']] = [[\sim\mathfrak{A} \vee \mathfrak{B}] \vee [\sim\mathfrak{A}' \vee \mathfrak{B}']]$
$= [[\sim\mathfrak{A} \vee \mathfrak{B}'] \vee [\sim\mathfrak{A}' \vee \mathfrak{B}]] = [[\mathfrak{A} \Rightarrow \mathfrak{B}'] \vee [\mathfrak{A}' \Rightarrow \mathfrak{B}]]$

Equivalent to: *If you open the **green** box, you'll pay five euros,*
*or if you open the **red** box, you'll get 10 euros.* (!)

(55) Typically the two antecedents are understood as mutually exclusive, resulting in a tautology:
a. $[[\mathfrak{A} \Rightarrow \mathfrak{B}] \vee [\mathfrak{A}' \Rightarrow \mathfrak{B}']] = [[\sim\mathfrak{A} \vee \sim\mathfrak{A}'] \vee [\mathfrak{B} \vee \mathfrak{B}']]$
$= [\sim[\mathfrak{A} \ \& \ \mathfrak{A}'] \vee [\mathfrak{B} \vee \mathfrak{B}']] = [[\mathfrak{A} \ \& \ \mathfrak{A}'] \Rightarrow [\mathfrak{B} \vee \mathfrak{B}']]$
b. if $C + [\mathfrak{A} \ \& \ \mathfrak{A}'] = \emptyset$, this is pragmatically excluded, or results in tautology,
but antecedents of disjunctions are easily understood as mutually exclusive
c. Following Gajewski (2002), systematic tautology results in ungrammaticality.

(56) Jackson, 1979 for material implication, here adapted to commitment states:
$[[\mathfrak{A} \Rightarrow \mathfrak{B}] \vee [\mathfrak{B} \Rightarrow \mathfrak{C}]] = [\mathfrak{B} \vee \sim\mathfrak{B}] \vee [\sim\mathfrak{A} \vee \mathfrak{C}]$,
as $[\mathfrak{B} \vee \sim\mathfrak{B}]$ is a tautology, the formula itself is,
again: systematic tautology results in ungrammaticality.

(57) For the CP theory, conditionals should not be difficult to disjoin;
$[\varphi > \psi] \vee [\varphi' > \psi']$ is not equivalent to $[\varphi > \psi'] \vee [\varphi' > \psi]$,
$[\varphi > \psi] \vee [\psi > \pi]$ is not a tautology.

(58) Some disjoined conditionals are easy to understand, cf. example by Barker 1995:
a. *Either the cheque will arrive today, if George has put it into the mail, or it will come with him tomorrow, if he hasn't*.
b. Parenthetical analysis:
The cheque will arrive today (if George has put it into the mail) or will come with him tomorrow (if he hasn't).
d. [ASSERT(ψ) V ASSERT(π)]; [F(φ) $\Rightarrow$ ASSERT(ψ)]; [F($\neg\varphi$) $\Rightarrow$ ASSERT(ω)]
(conjunctive analysis of conditionals cf. Meyer 2015)
e. Entails correctly that one of the consequents is true, not an entailment in CP theory.

(59) Johnson-Laird & Savary 1999: (a) and (b) intuitively entail (c)
a. *If there is a king in the hand then there is an ace in the hand, or else if there is a queen in the hand then there is an ace in the hand.*
b. *There is a king in the hand.*
c. *There is an ace in the hand.*

But this does not hold for material implication or for conditional assertions as modeled here:
As [$\mathfrak{A} \Rightarrow \mathfrak{B}$] V [$\mathfrak{A}' \Rightarrow \mathfrak{B}$] = [$\sim\mathfrak{A}$ V $\sim\mathfrak{A}'$ V $\mathfrak{B}$], asserting $\mathfrak{A}$ gives us [$\sim\mathfrak{A}'$ V $\mathfrak{B}$],
hence from (a) and (b) we can just conclude:
d. *If there is a queen in the hand then there is an ace in the hand.*

Explanation: Focus *on king / queen* leads to interpretation:
there is a king in the hand or there is a queen in the hand,
it follows then that there is an ace in the hand.

5.4 Negation of conditionals: %

(60) Regular syntactic negation does not scope over *if*-part:
If Fred was at the party, the party wasn't fun.
The party wasn't fun if Fred was there.

(61) Contrasts with other clauses, where negation in main clause can scope over adjunct clause:
The party wasn't fun because Fred was there (but because there was not enough beer).
'It is not the case that the party was fun because Fred was there, but...'

(62) Predicted by CA theory, as conditional clause is a (conditional) speech act, not a proposition.

(63) The closest equivalent to negation that could apply is denegation:

a. $\sim$[$\mathfrak{A} \Rightarrow \mathfrak{B}$] = $\sim$[$\sim\mathfrak{A}$ V $\mathfrak{B}$] = [$\mathfrak{A}$ & $\sim\mathfrak{B}$]
b. But the following clauses are not equivalent
(i) *I don't claim that if the glass dropped, it broke*.
(ii) *The glass dropped and/but I don't claim that it broke*.
c. Reason: Pragmatics requires that $\mathfrak{A}$ is informative,
hence (i) implicates that it is not established that the glass broke, in contrast to (ii).
d. Another reason: (ii) establishes the proposition *the glass dropped* without any assertive commitment, just by antecedent.

(64) How is negation interpreted? Example by Barker (1995):
a. *It's not the case that if God is dead, then everything is permitted*.
'The assumption that God is dead does not license the (assertion of) the proposition that everything is permitted.'
b. Barker suggests an analysis in terms of metalinguistic negation.

(65) Punčochář 2015 suggests as negation of *if φ then ψ*:
a. *Possibly: φ but not ψ*,
i.e. it might be the case that the antecedent is true and the consequent is false;
cf. Hare 1970 for this type of negation.
b. Worked out in a framework of dynamic interpretation.

(66) Implementation in Commitment Spacee Semantics:
a. $C + \Diamond\mathfrak{A} =_{def} C$ iff $C + \mathfrak{A}$ is defined , i.e. leads to a set of consistent commitment states.
b. Punčochář's weak negation corresponds to $\Diamond\sim$
it is not the case that.../one cannot say that as 'the following act cannot be performed'
c. Cf. assertability of assertional speech act in (82)
d. Use of *no* to express this kind of negation:
i. S_1: *If God is dead, then everything is permitted.* – S_2: *No.*
ii. S_1: *This number is prime.*
S_2: ***No**, there is no evidence for it. It might have very high prime factors.*

(67) Applied to conditionals:
a. $C + \Diamond\sim[\mathfrak{A} \Rightarrow \mathfrak{B}] = C$ iff $C + \sim[\mathfrak{A} \Rightarrow \mathfrak{B}] \neq \emptyset$
iff $C + [\mathfrak{A} \,\&\, \sim\mathfrak{B}] \neq \emptyset$
i.e. in C, $\mathfrak{A}$ can be assumed without assuming $\mathfrak{B}$

(68) Égré & Politzer 2013 assume three different negations:
a. neg $[\varphi \rightarrow \psi] \Leftrightarrow \varphi \wedge \neg\psi$, if speaker is informed about truth of φ
b. neg $[\varphi > \psi] \Leftrightarrow \varphi > \neg\psi$, if speaker has sufficient evidence that φ is a reason for $\neg\psi$
c. neg $[\varphi > \psi] \Leftrightarrow \neg [\varphi > \psi] \Leftrightarrow [\varphi > \neg\Box\psi]$, basic form
Reason: Different elaborations of the negation of conditionals,
S_1: *If it is a square chip, it will be black.*
S_2: *No* (negates this proposItion) (i) *there is a square chip that is not black.*
(ii) *(all) square chips are not black.*
(iii) *square chips may be black.*
However, we do not have to assume different negations;
(c) is the only negation, (i), (ii) and (iii) give different types of contradicting evidence.

(69) This explanation can be transferred to the analysis of negation here:
S_1: $C + [F(\varphi) \Rightarrow F(\psi)]$.
S_2: *No* (rejects this move), (i) $C + [F(\varphi) \,\&\, F(\neg\psi)]$
(ii) $C + [F(\varphi) \Rightarrow F(\neg\psi)]$
(iii) $C + \Diamond\sim[F(\varphi) \Rightarrow F(\psi)]$

5.5 Conditional consequents: ✓

(70) Conditional consequents are easy to interpret, example: Barker (1995)
If all Greeks are wise, then if Fred is Greek, he is wise.

(71) $[\mathfrak{A} \Rightarrow [\mathfrak{B} \Rightarrow \mathfrak{C}]] = [\sim\mathfrak{A} \vee [\sim\mathfrak{B} \vee \mathfrak{C}]]$
$= [[\sim\mathfrak{A} \vee \sim\mathfrak{B}] \vee \mathfrak{C}]$
$= [\sim[\mathfrak{A} \,\&\, \mathfrak{B}] \vee \mathfrak{C}] = [[\mathfrak{A} \,\&\, \mathfrak{B}] \Rightarrow \mathfrak{C}]$

(70) entails: *If all Greeks are wise and Fred is a Greek, then he is wise.*

(72) CP analysis achieves this result under stipulation:
a. $[\varphi > [\psi > \pi]] = \lambda i[[\psi > \pi](ms(i, \varphi))]$
$= \lambda i[\lambda i'[\pi(ms(i', \psi)](ms(i, \varphi))]$ Necessary assumption:
$= \lambda i[\pi(ms(ms(i, \varphi), \psi))]$ $ms(ms(i, \varphi), \psi)$
b. $[[\varphi \wedge \psi] > \pi] = \lambda i[\pi(ms(i, [\varphi \wedge \psi]))]$ $= ms(i, [\varphi \wedge \psi])$

(73) Barker (1995) mentions a possible counterexample to the rule of conjoining antecedents:
a. *If Fred is a millionaire, then even if if he <u>does</u> fail the entry requirement, we should (still) let him join the club.*
b. Problem: scope of *even* cannot extend over conditional after conjunction of antecedents

5.6 Conditional antecedents: %

(74) Conditional antecedents are difficult to interpret (cf. Edgington, 1995, Gibbard, 1981)
If Kripke was there if Strawson was there, then Anscombe was there.

(75) Syntactic problem, as antecedent is not a CP / TP, but an ActP:
$[_{ActP}\ [_{CP}\ if\ [_{TP}\ \varphi]]\ [then\ [_{ActP}\ .\ [_{CommitP} \vdash [_{TP}\ \psi]]]$,
where $\varphi = [_{ActP}\ [_{CP}\ if\ [_{TP}\ \varphi_{antecedent}]]\ [then\ [_{ActP}\ .\ [_{CommitP} \vdash [_{TP}\ \varphi_{conseequent}]]]$,
as a result, F cannot apply to $[\![\varphi]\!]$ – but see section 5.7 for possible coercion

(76) If we assume in spite of that the following analysis:
$[[\mathfrak{A} \Rightarrow \mathfrak{B}] \Rightarrow \mathfrak{C}] = [\sim[\mathfrak{A} \Rightarrow \mathfrak{B}] \vee \mathfrak{C}] = [\sim[\sim\mathfrak{A} \vee \mathfrak{B}] \vee \mathfrak{C}]$
$= [[\mathfrak{A} \,\&\, \sim\mathfrak{B}] \vee \mathfrak{C}] = [[\mathfrak{A} \vee \mathfrak{C}] \,\&\, [\sim\mathfrak{B} \vee \mathfrak{C}]]$
$= [[\mathfrak{A} \vee \mathfrak{C}] \,\&\, [\mathfrak{B} \Rightarrow \mathfrak{C}]]$
$= [[\mathfrak{A} \,\&\, [\mathfrak{B} \Rightarrow \mathfrak{C}]] \vee [\mathfrak{C} \,\&\, [\mathfrak{B} \Rightarrow \mathfrak{C}]]]$

a. 1^{st} disjunct problematic, as antecedent $\mathfrak{A}$ introduces proposition without speaker commitment.
b. 2^{nd} disjunct problematic, as it states consequent $\mathfrak{C}$ without conditionalization.

(77) Sometimes conditional antecedents appear fine (Gibbard):
If the glass broke if it was dropped, it was fragile.
a. Read with stress on *broke*, whereas *if it was dropped* is deaccented
b. This is evidence for *if it was dropped* to be topic of the whole sentence.
c. Facilitates reading *If the glass was dropped, then if it broke, it was fragile*; this is a conditional antecedent.

(78) For CP theorists, conditional antecedents should be fine:
a. $[[\varphi > \psi] > \pi] = \lambda i[\pi(ms(i, \lambda i'[\psi(ms(i', \varphi)))]$.
b. True at an index i when π is true at the index i′ that is maximally similar to i such that the proposition $[\varphi > \psi]$ is true.
c. Paraphrase of (74): *If it holds that if Strawson was there, then Kripke was there, then Anscombe was there.*
d. Paraphrase for (77): *If it holds that if the glass was dropped, then it broke, then the glass was fragile.*
e. The CP account does not explain why (74) is hard to understand, and why (77) require deaccenting of the embedded *if*-clause.

5.7 Conditionals as complements of propositional attitudes: (✓)

(79) Conditionals occur as arguments of propositional attitudes:
a. *Bill thinks / regrets / hopes / doubts that if Mary applies, she will get the job.*
b. *Bill thinks / regrets / hopes / doubts that Mary will get the job if she applies.*
c. S_1: *If Mary applies, she will get the job.* S_2: *I believe that, too. / I doubt that.*

(80) $[_{CP}$ *that* $[_{TenseP}$ …]] suggests CP analysis of conditionals, not compatible with CA analysis.

(81) Wide scope interpretation of antecedent not generally feasible:
a. *Bill thinks that if Mary applies, she will get the job.*
≈ *If Mary applies, Bill thinks that she will get the job.*
b. *Bill thinks that if 27419 is divisible by 7, he will propose to Mary.*
≉ *If 27419 is divisible by 7, Bill thinks that he will propose to Mary.*

(82) Proposal, cf. Krifka 2014: **Coercion of assertion to proposition,** $\mathfrak{A} \rightsquigarrow$ '$\mathfrak{A}$ is assertable'

(79)(a) $\rightsquigarrow$ Bill thinks / regrets / hopes / doubts
– that it is **assertable** that if Mary applies, she will get the job,
– that whenever it is established that Mary applies,
it is assertable that she will get the job

(83) Assertability of $\mathfrak{A}$ at a commitment space C:
A speaker S is justified in initiating C + $\mathfrak{A}$,
a speaker S that initiates C + $\mathfrak{A}$ has a winning strategy, i.e. can ultimately defend this update.

(84) Similar with: *It is (not) the case that if Mary applies, she will get the job*;
'it is (not) assertable that if Mary applies, she will get the job'

(85) Evidence for this coercion: discourse / speech act operators in *that* clauses
they thought that, frankly, they made more complex choices every day in Safeway than when they went into the ballot box

(86) As other cases of coercion, required by selection of lexical operator, e.g. *think, doubt* …,
cf. *Bill drank the bottle* → the liquid content of the bottle,
coercion to conditional proposition is not freely available.

5.8 Intermediate Conclusion

(87) There is a coherent formal account of conditionals for CA theories.

(88) CA fares better in explaining which semantic operations can be applied to conditionals.

(89) Conditionals in propositional attitudes are fine for CP but problematic for CA,
but there are strategies for a solution (coercion to proposition)

6. Counterfactual Conditional Assertions

(90) Indicative conditionals considered so far:
The antecedent can be informatively added to the commitment space.
In particular, C + *if φ then ASSERT ψ* pragmatically implicates that $C + F(\varphi) \neq \emptyset$

(91) This is systematically violated with counterfactual conditionals:
a. *If Mary had applied, she would have gotten the job.*
b. *If 27413 had been divisible by 7, Fred would have proposed to Mary.*

(92) Proposal:
a. The counterfactual conditional requires "thinning out" the commitment states at the root of the commitment space C so that the antecedent F(φ) can be assed.
b. This requires "going back" to a hypothetical larger commitment space in which the actual commitment space is embedded.
c. Notion of a **generalized** commitment space, with a **background** part and an **actual** part.

(93) A **generalized commitment space** is a pair of commitment states $\langle C_b, C_a \rangle$, where
a. $C_a \subseteq C_b$
b. $\forall c \in C_b [c < C_a \rightarrow c \in C_a]$, where $c < C_a$ iff $\exists c' \in C_a [c \subseteq c']$, i.e. C_a is a "bottom" part of C_b

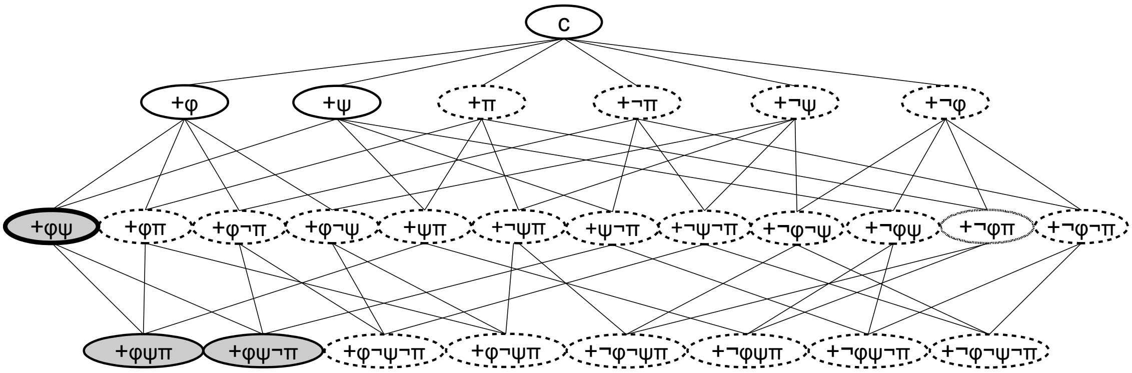

Figure 15: Generalized Commitment Space $\langle C, C + F(\varphi) + F(\psi)\rangle$
with root (fat border), actual commitment space (grey area),
commitment states above the actual (solid border) and commitment states beside the root (dotted border)

(94) Regular update of a general commitment space:
$\langle C_b, C_a\rangle + \mathfrak{A} = \langle\{c\in C_b \mid \neg [C_a + \mathfrak{A}] < c\}, [C_a + \mathfrak{A}]\rangle$

(95) Update with denegation "prunes" the background commitment space C_b:

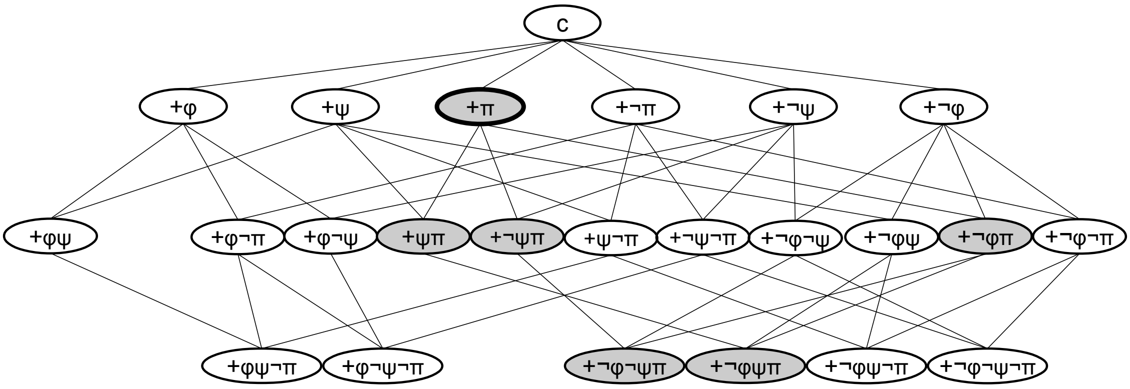

Figure 16: Update wit denegation: $\langle C, C + F(\pi)\rangle + {\sim}F(\varphi)$

(96) Conditional updates involve denegation and prune C_b as well:

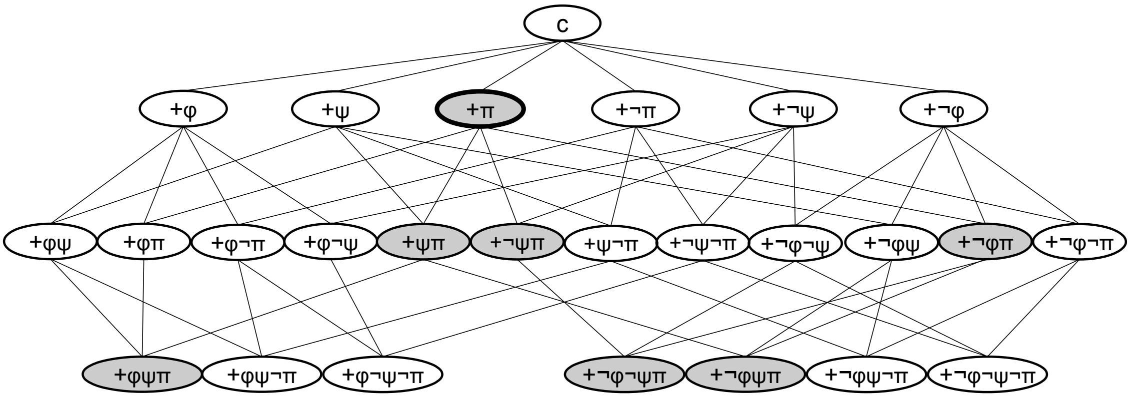

Figure 17: Update of $\langle C, C + F(\pi)\rangle$ with $[F(\varphi) \Rightarrow F(\psi)]$, i.e. with $[{\sim}F(\varphi) \vee F(\psi)]$

(97) Counterfactual conditionals: $[F(\varphi) \Rightarrow F(S\vdash\psi)]$
a. Simple update $C_a + [[F(\varphi); F(S\vdash\psi)] \vee {\sim}F(\varphi)]$ not possible, as $C_a + F(\varphi)$ not defined
b. Hence resort to **revisionary** update, (29): $C_a +_R F(\varphi) + F(S\vdash\psi) \cup [C_a - C_a +_R F(\varphi)]$
c. This leads to pruning of the background commitment space only.

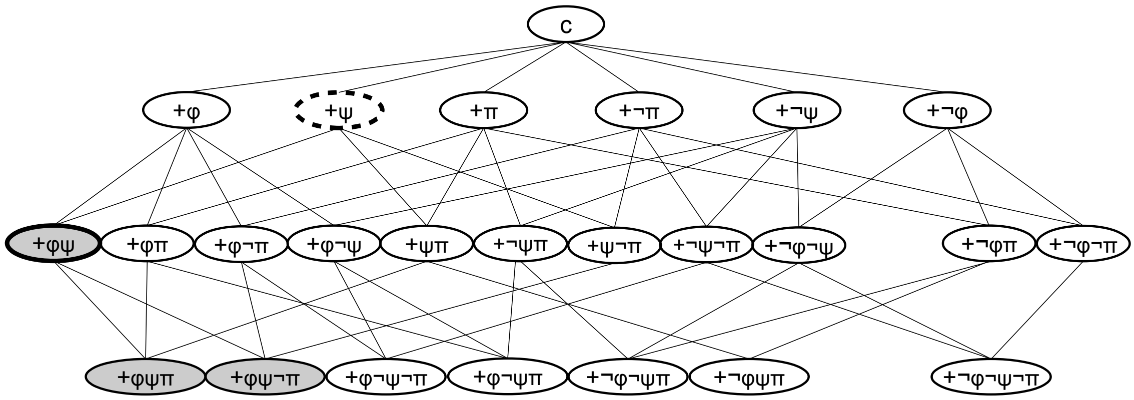

Figure 18: Counterfactual update:
⟨C, C + F(ψ) + F(φ)⟩ + [F(¬φ) ⇒ F(π)], involving interpretation at the next compatible root C + F(ψ)

(98) Counterfactual conditional informs about hypothetical commitment states, which may have an effect under revisionary update, cf. (29)

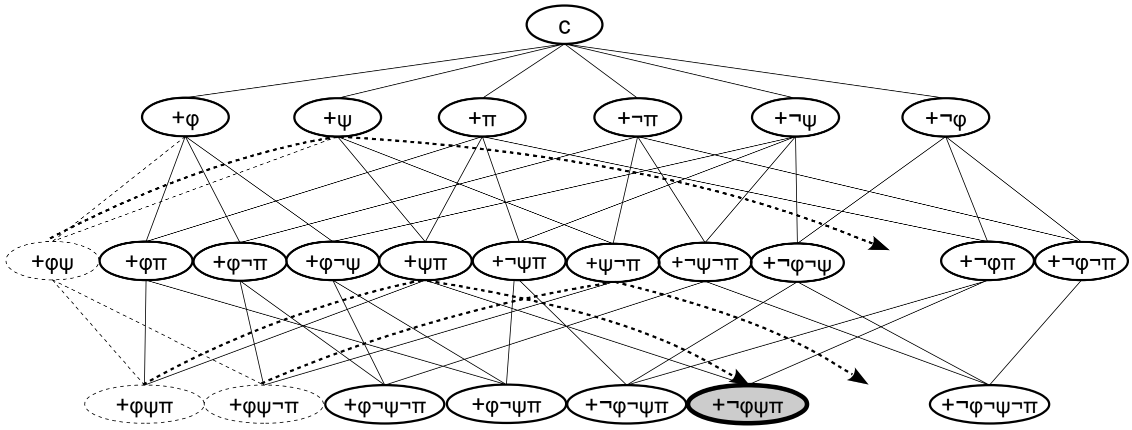

Figure 19: Revisionary update of generalized commitment space of Figure 18 with +F(¬φ) leading to new commitment space that respects the counterfactual information.

(99) Explaining of "fake past tense" in counterfactual conditionals (cf. Dudman 1984, Iatridou 2000, Ritter & Wiltschko 2014, Karawani 2014, Romero 2014).
a. Past tense shifts commitment space from actual to a "past" commitment space; this does not have to be a state that the actual conversation passed through, but might be a hypothetical commitment space.
b. As conversation happens in time, leading to increasing commitments, this is a natural transfer from the temporal to the conversational dimension.

(100) Ippolito 2008 treats "fake tense" as real tense
– going back in **real** time where the counterfactual assumption was still possible.
Problem with time-independent clauses:
If 27413 <u>had</u> been divisible by 7, I would have proposed to Mary.
If 27419 <u>was</u> divisible by three, I would propose to Mary.

(101) Going from c to a commitment state c′ ⊂ c with fewer assumptions to make a counterfactual assertion may involve going to different worlds for which a commitment state c′ is possible. See Krifka 2014 for a model with branching worlds.

(102) Other instances of temporal talk applied to common grounds:
a. *I remember you. Your name was Fred, right?*
b. *What was your name again?,* cf. Sauerland & Yatsushiro 2014.

7. Conclusion

(103) The paper developed a framework for conditional clauses as conditional assertions (to be extended to other conditional speech acts)

(104) This was done within the framework of Commitment Space Semantics, which incorporates information about the possible future developments of the common ground in conversation.

(105) It was argued that this explains the limited semantic combinations of conditional sentences than the analysis as conditional propositions.

(106) The analysis was tentatively extended to counterfactual conditionals, where past tense indicates a shift from the actual commitment space to a past commitment space.

(107) Some more general points:

Conditionalization is a phenomenon of conversation (if φ is the case, then I assert ψ), not of truth-conditional semantic content (I assert the proposition ‘if φ then ψ’).

Conjunction and disjunction can also be seen as a phenomenon of conversation:
a. Commitments after F([φ ∧ ψ]) and F(φ) & F(ψ)] are the same
b. Commitments after F([φ ∨ ψ]) and F(φ) V F(ψ) are the same
c. Commitments after F(¬φ) are stronger than commitments after ~F(φ)

Commitment operations &, V, ~, ⇒
are partially mirrored by propositional operations ∧, ∨, ¬, >

Primacy of operations on commitments, “trickling down” to propositions?

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