Conditionals and Conditionality

Some conditionals ‘express more conditionality’ than others.

- **Conditional perfection (cp):**
  
  (1)  
  a. If you mow the lawn, I’ll give you five dollars.
  b. ¬ If you don’t mow the lawn, I will not give you five dollars.
  c. ⊤ I’ll give you five dollars.

- **Unconditional readings (uc):**

  (2)  
  a. There are biscuits on the sideboard if you want them.
  b. ⊤ If you don’t want them, there are no biscuits on the sideboard.
  c. ¬ There are biscuits on the sideboard.
Today’s Agenda

• What kind of pragmatic enrichment is this?

• My claim:
  • mostly commonsense reasoning
    • commonly shared expectations about ‘relatedness’ of events
    • formally: constrain models on which conditionals are interpreted
  • but also —to a small part— genuine pragmatic reasoning
    • reasoning about alternative answers to topical questions
Language

- $A, B, C, X$ – propositions
- $\Box X$ – “must $X$”
- $\Diamond X$ – “might $X$”
- $A \implies B$ – “if $A$, must $C$”
- $A \nleftrightarrow C$ – “if $A$, might $C$”

Enriched Modal Models

$\mathcal{M} = \langle W, R, V, \{\leq\}_w \rangle$:

- $W$ – set of worlds
- $R_w \subseteq W$ – set of worlds accessible from $w$
- $V : \mathcal{P} \rightarrow \mathcal{P}(W)$
- $\leq_w$ – an ordering on $R_w$ (assume: well-founded)

Notation: (where $X \subseteq W$)

$$
\text{Min}_w(X) = \{ v \in R_w \cap X | \neg \exists v' \in R_w \cap X : v' <_w v \} \\
\text{Min}_w = \text{Min}_w(W)
$$
**Semantics**

Define truth in pointed models $\mathcal{M}, w$:

\[
\begin{align*}
\mathcal{M}, w \models X & \iff w \in V(X) \\
\mathcal{M}, w \models \Box C & \iff \text{Min}_w \subseteq C \\
\mathcal{M}, w \models \Diamond C & \iff \text{Min}_w \cap C \neq \emptyset \\
\mathcal{M}, w \models A \implies C & \iff \text{Min}_w(A) \subseteq C \\
\mathcal{M}, w \models A \iff C & \iff \text{Min}_w(A) \cap C \neq \emptyset
\end{align*}
\]

**Entailment: General**

$\varphi_1, \ldots, \varphi_n \models \psi$ iff for all pointed models $\langle \mathcal{M}, w \rangle$:

\[
\text{if } \mathcal{M}, w \models \varphi_i \text{ for all } 1 \leq i \leq n, \text{ then } \mathcal{M}, w \models \psi.
\]

**Entailment: Strict Implication**

$\varphi_1, \ldots, \varphi_n \models_s \psi$ iff for all pointed models $\langle \mathcal{M}, w \rangle$ with trivial ordering information:

\[
\text{if } \mathcal{M}, w \models \varphi_i \text{ for all } 1 \leq i \leq n, \text{ then } \mathcal{M}, w \models \psi.
\]
Interpretation of $\langle R_w, \preceq_w \rangle$

Depends on to-be-evaluated conditional:

- **“If the butler didn’t do it, the gardener did.”** (epistemic)
  - $R_w$: possibilities not ruled out by evidence and true information
  - $\preceq_w$: biases, prejudices, implicit assumptions
- **“If you strike this match, it will light.”** (predictive)
  - $R_w$: all future possibilities
  - $\preceq_w$: normal courses of events, natural causality
- **“If you groom me, I’ll groom you.”** (commissive)
  - $R_w$: all future possibilities
  - $\preceq_w$: commonsense social behavior, rational agency
- **“If I were you, I’d marry him.”** (counterfactual)
  - $R_w$: all metaphysical possibilities
  - $\preceq_w$: similarity with actual world $w$
Properties of $\langle R_w, \leq_w \rangle$

- special assumptions about $\langle R_w, \leq_w \rangle$ could implement various classical semantics (Stalnaker, Lewis, Veltman, Kratzer, \ldots):
  - linear vs. partial order
  - lattice structure
  - \ldots

- I will assume:
  
  **Well-Foundedness:** $\forall X \subseteq R_w \text{ Min}_w(X) \neq \emptyset$
  
  **Non-Triviality:** $R_w \cap A \neq \emptyset$
  
  **Weak Centering:** $w \in \text{ Min}_w$ (for counterfactuals only)
Weak CP, Strong CP & UC

(3)  a. If I bum around, I will miss my deadline. \((A \Rightarrow C)\)
    
    b. If I don’t, I will not miss my deadline. \((\overline{A} \Rightarrow \overline{C})\)
    
    c. If I don’t, I might not miss my deadline. \((\overline{A} \diamond \overline{C})\)
    
    d. Even if I don’t, I will miss my deadline. \((\overline{A} \Rightarrow C)\)

\((3a) + (3b)\) is a **strong CP**-reading
\((3a) + (3c)\) is a **weak CP**-reading
\((3a) + (3d)\) is an **unconditional** reading

All compatible with standard semantics

“Only”-CP

(4) I will miss my deadline *only* if I bum around.

- maybe different CP-reading \((\text{van Canegem-Ardijns and van Belle (2008)})\)
- neglect here, because it requires a workable theory of “*only*”
My Claims about CP

(C1) there are two kinds of cp-readings, weak and strong
(C2) there are two sources of cp:
   (i) (shared) normality assumptions
   (ii) pragmatic reasoning about possible answers to a question under discussion
(C3) no previous account gets it right completely

Previous Accounts

- I-implicature
- Q-implicature
- Exhaustive interpretation

(see van der Auwera 1997b, for overview)
CP as I-Implicature

- Most explicitly by Horn (2000):
  - inference “if $\sim$iff” is lexical strengthening
  - mainly diachronic process

My Claim

- $\text{CP}$ has nothing to do with the lexical properties of *if*, because
  - this cannot explain the variability/context-dependence of $\text{CP}$
  - this cannot explain the universality (?) of $\text{CP}$ across languages
- but $\text{CP}$ may arise as an I-implicature as pragmatic strengthening by world knowledge
  - $\text{CP}$ derived from normality assumptions:
    \[ A \square \Rightarrow C \text{ and } \square \lnot C \text{ (“normally } \lnot C”) \text{ implies } \text{CP} \]
Winter in Amsterdam

(5) a. If the canals freeze, the city sends out icebreaker boats to drive through the major canals, but . . .
   
b. . . . if it snows, the city does not send out snowplows to drive through the streets.

Normality Expectations

(6) a. If the canals are not frozen, the city does not send out icebreaker boats.
   
b. If it does not snow, the city does not send out snowplows.
Perfection from Normality

(7)  a. If John leans out of that window any further, he’ll fall.

    b. John will *normally* not just fall out of the window.

    c. If John does not lean out of that window any further, he will not fall.

Claim 1
$A \Rightarrow C$ and “normally $\overline{C}$” implies strong cp:

$A \Rightarrow C, \Box \overline{C} \models \overline{A} \Rightarrow \overline{C}$

Natural (Causal) Connection

- empirical study on cp by Newstead et al. (1997)
- where “natural (causal) connection” between $A$ and $C$ is obvious, strong cp is attested
- my point: other sufficient conditions for $C$ are “abnormal”
Normality Expectations?

(8) a. Bogart: Will you marry me? ?C
b. Lillie: If I have to. A ⊢ C
c. ¬ If I don’t have to, I won’t marry you. \( \overline{A} \rightarrow \overline{C} \)

My Suggestion

We also need a genuine pragmatic explanation for some cases of cp.
CP as a Quantity Implicature

- different authors assume different expression alternatives

Background: Quantity Implicatures

- utterance of $\varphi$ is compared with expression alternatives $Alt(\varphi)$
- utterance of $\varphi$ implicates that all stronger alternatives in the set $Alt(\varphi)$ are not true
- e.g.:
  - alternatives: {“some $A$ are $B$”, “all $A$ are $B$”}
  - utterance: “some $A$ are $B$”
  - implicature: “not all $A$ are $B$”
CP as Scalar Implicature

- **Cf:** Horn (1972), Boër and Lycan (1973)
- **Matsumoto (1995):**
  - scalar alternatives of $A \rightarrow C$:
    - $(A \lor B_1) \rightarrow C$
    - $(A \lor B_1 \lor B_2) \rightarrow C$
    - $\vdots$
  - by scalar reasoning: non-sequitur!
    $$\bigwedge_i \neg(B_i \rightarrow C)$$
  - “from set $\{A, B_1, B_2, \ldots\}$ only $A$ is sufficient for $C$”
CP as Scalar Implicature

• Cf: Horn (1972), Boër and Lycan (1973)
• van der Auwera (1997a):
  • scalar alternatives of $A \sqsubseteq C$:
    
    $A \sqsubseteq C$ and $B_1 \sqsubseteq C$
    $A \sqsubseteq C$ and $B_1 \sqsubseteq C$ and $B_2 \sqsubseteq C$
    
    \[ \vdots \]
  
    • by scalar reasoning: non-sequitur!
    \[
    \bigwedge_i \neg (B_i \sqsubseteq C)
    \]
    
    • “from set $\{A, B_1, B_2, \ldots \}$ only $A$ is sufficient for $C$”
CP as Scalar Implicature

• Cf: Horn (1972), Boër and Lycan (1973)
• Patch:
  • scalar alternatives of $A \Box \Rightarrow C$:
    
    $A \Box \Rightarrow C$ and $B_1 \Box \Rightarrow C$
    $A \Box \Rightarrow C$ and $B_2 \Box \Rightarrow C$
    
    $\ldots$

  • by familiar scalar reasoning derive implicature:

    $\bigwedge_i \neg (B_i \Box \Rightarrow C)$

  • “from set \{A, B_1, B_2, \ldots\} only A is sufficient for C”
Assessment of Scalar Account

Three questions:

1. Why this (non-standard) scale?
   - why not:
     \[
     \begin{align*}
     A \iff C & \text{ and } A \iff B_1 \\
     A \iff C & \text{ and } A \iff B_2 \\
     \vdots
     \end{align*}
     \]
   - apparently topical qud: “under which circumstances C?”

2. Which $B_i$?
   - relevant & salient alternatives (Hirschberg 1985)

3. Does $\bigwedge_i \neg (B_i \iff C)$ capture cp?
   - depends on the set $\{B_i\}$
Claim 2: Entailment Weak-CP

Let \( \{B_i\} \) contain at least one non-empty set. Then:

(i) \( A \implies C, \bigwedge_i \neg(B_i \implies C) \models_s \overline{A} \iff \overline{C} \)

(ii) \( A \implies C, \bigwedge_i \neg(B_i \implies C) \not\models \overline{A} \iff \overline{C} \)

(iii) \( A \implies C, \bigwedge_i \neg(B_i \implies C) \models \overline{A} \iff \overline{C} \) if

for all \( \langle \mathcal{M}, w \rangle \), there is a \( B_i \) such that: \( \text{Min}_w(B_i) \subseteq \text{Min}_w(\overline{A}) \)

Open Issue

- sufficient and relevant conditions for entailment?
Upshot

- $cp$ follows only for $\{B_i\}$ with some special logical property or other
- the most plausible sufficient condition is $\bar{A} \in \{B_i\}$
- curious: why do we need any other salient and relevant alternatives $B_i$ in the first place?

My Suggestion

- $cp$ from comparison to alternative answers to qud:
  - $A \Rightarrow C$ and $\neg \Box C$ implies (weak) $cp$
CP depends on QUD

(9)  a. Q: Is Cathy coming to the party?  
    b. A: If Aron is.  

(10) a. Q: Is Cathy coming to the party if Aron is?  
     b. A: Yes. If Aron is coming, Cathy is coming too.  

(11) a. Q: Is Aron coming to the party?  
     b. A: If Aron is coming, Cathy is coming too.  

cp in (9), but not in (10) and (11)  
  • derive cp from exhaustive interpretation of answers
Exhaustification

(12) a. Who (of John and Mary) came to the party?
    b. John did.
    c. Mary didn’t.

- assume the answer is true
- minimize extension of question predicate
Exhaustification Operator

- $\varphi$ - expression of first order language with predicate symbols $\mathcal{P}$
- $w(\varphi)$ - extension of $\varphi$
  - tuple of domain elements
  - truth-value
- $T \in \mathcal{P}$ - topic question
- $v \equiv_T w$ - $T$-comparable
  - iff $v(P) = w(P)$ for all $P \in \mathcal{P} \setminus \{T\}$
- $v \leq_T w$ - $T$-smaller-or-equal
  - iff $v \equiv_T w$ and $v(T) \subseteq w(T)$
- $exh(A, T) = \{ w \in \llbracket A \rrbracket \mid \neg \exists v \in \llbracket A \rrbracket \; v <_T w \}$
Topic \( ?\text{Come}(x) \)
Perfection from Exhaustification

- quod is either \(?C\), or \(?A\), or \(? (A \leftrightarrow C)\)
- answer is always \(A \leftrightarrow C\)
- quod \(? (A \leftrightarrow C)\) is trivial
  - no exhaustification
  - just semantics
  - no cp

- for \(?C\) and \(?A\) Groenendijk and Stokhof compare truth-values:

\[
w(T) = \begin{cases} 
\{\emptyset\} & \text{if } T \text{ is true in } w \\
\emptyset & \text{if } T \text{ is false in } w
\end{cases}
\]
Topic $\mathcal{C}$

$\mathcal{w}_1 : \{A, C\}$
$\mathcal{w}_2 : \{C\}$
$\mathcal{w}_3 : \{A\}$
$\mathcal{w}_4 : \emptyset$

$\Rightarrow$ material biconditional
(good)
Topic ?A

$w_1 : \{A, C\}$

$w_2 : \{C\}$

$w_3 : \{A\}$

$w_4 : \emptyset$

$[A \iff C]$  

$\Rightarrow A$ is not true  
(bad)
Which Question under Discussion?

- von Fintel (2001):
  - \( \text{cp} \) arises under \( \text{qd} \) “under which conditions \( C \)?”
  - \( \text{cp} \) doesn’t arise under \( \text{qd} \) “what if \( A \)”
- problem:
  - classical exhaustification not ready to tackle minimizing propositions
  - brings us back to scalar account

My Suggestion

- consider \( \text{qds} \):
  - “is it the case that \( C \)?”
  - “is it the case that \( A \)?”
- under polar question \( ?T \ (=?C \text{ or } =?A) \), \( A \rightarrow C \) is an indirect answer
  - \( \text{cp} \) under topic \( T =?C \)
  - no \( \text{cp} \) under topic \( T =?A \)
- Why not a direct answer “yes” or “no”?
- Rule out from \( \llbracket A \rightarrow C \rrbracket \) all worlds where direct answer is true
  \[
  \text{Intpr}(A \rightarrow C, T) = \{ w \in \llbracket A \rightarrow C \rrbracket \mid \text{“yes” and “no” not true in } w \}\]
Modalized “Yes” and “No”

- Meaning of “yes” and “no” depends on $\mathcal{T}$
- Doesn’t work:
  \[
  \text{Intpr}'(A \quad C, T) = \{ w \in [\models A \quad C] \mid T \text{ and } \overline{T} \text{ not true in } w \}
  \]
  \[
  = \emptyset
  \]
- Does work:
  \[
  \text{Intpr}^\Box(A \quad C, T) = \{ w \in [\models A \quad C] \mid \Box T \text{ and } \Box \overline{T} \text{ not true in } w \}
  \]

Claim 3
\[
\text{Intpr}^\Box(A \quad C, C) \text{ derives weak } \text{cp}:
\]
\[
A \quad C, \neg \Box C, \neg \Box \overline{C} \models \overline{A} \quad \overline{C}
\]

Claim 4
\[
\text{Intpr}^\Box(A \quad C, A) \text{ does not derive weak } \text{cp}:
\]
\[
A \quad C, \neg \Box A, \neg \Box \overline{A} \nmodels \overline{A} \quad \overline{C}
\]
Summary

- Some cases of cp by normality expectations
- Some cases by genuine reasoning about topic alternatives:
  - modalized answer yield “scale-like” reasoning
- From weak to strong cp:
  - coarse-grained distinctions for representational economy
  - cf.: conditional excluded middle
Unconditional Readings

(2a) There are biscuits on the sideboard if you want them.

(2c) \(\sim\) There are biscuits on the sideboard.

My Claims about UC

(Cl 1) uc-readings beyond “biscuit conditionals”

(Cl 2) mainly derived from “conditional independence”

(Cl 3) but also from “normality” and other inferences
Intuition

(2a) There are biscuits on the sideboard if you want them.

- whether $C$ is true does not depend on whether $A$ is true
- whatever one believes about $C$, will not change when learning or assuming $A$

Conditional Independence

Say that $C$ is independent of $A$ iff

$$\forall X \in \{A, \overline{A}\}, \forall Y \in \{C, \overline{C}\} : \Diamond Y \text{ implies } X \iff Y$$

Claim 9

If $C$ is conditionally independent of $A$, then $A \iff C$ implies $\square C$.

Argument

Suppose that $\Diamond \overline{C}$. Then by independence $A \iff \overline{C}$. This contradicts $A \iff C$. 
“Monkey’s Uncle” Conditionals

(13) If that’s true, I’m a monkey’s uncle.

- no uc despite conditional independence
- from *modus tollens* and *C*
Implicit “Even”

(14)  

a. This match is wet. If you strike it, it won’t light.  
   $A \square \rightarrow \overline{C}$

b. Bij gladheid wordt niet gestrooid.  
   In case of slipperiness be-Passive not spread.  
   ‘When icy, this road will not be salted.’  
   $A \square \rightarrow \overline{C}$

- uc despite conditional dependence
- from “normality” and world knowledge
Echoic Conditionals

(15) If the wine bottle is half-empty, you are a pessimist.

- uc and conditional independence
- uc from *modus ponens* and presupposed A
“Biscuit Word Order”

(16) If you need me, I’ll stay at home all day.

(17)  a. Wenn du mich brauchst, ich bleibe den ganzen Tag daheim.
       If you me need, I stay the whole day at home.

       b. Wenn du mich brauchst, bleibe ich den ganzen Tag daheim.
          If you me need, stay I the whole day at home.

Köpcke and Panther (1989)

- argue that “Biscuit-WO” not decisive for uc
- backed up by empirical study
UC despite V2

(18)  a. Wenn du auch nur in die Nähe meines Autos kommst, spuck ich dir in deine Suppe.
    If you also only in the vicinity of my car come, spit I you in your soup.

    b. Wenn du auch nur in die Nähe meines Autos kommst, ich spuck dir in deine Suppe.
    If you also only in the vicinity of my car come, I spit you in your soup.

    ‘If you come anywhere close to my car, I’m going to spit in your soup.’
No UC despite V1

(19) a. Wenn Sie mich fragen, es schneit bald.
    If you me ask, it snow soon.

b. Wenn Sie mich fragen, schneit es bald.
    If you me ask, snow is soon.

c. Wenn Sie mich fragen, dann schneit es bald.
    If you me ask, then snow it soon.
    ‘If you ask me, it’ll snow soon.’  (Köpcke and Panther 1989, (48))
No UC despite V1

(20)  a. Wenn du meine Meinung hören willst, die Aktien fallen bald.
    If you my opinion hear want, the stocks go-down soon.

    b. Wenn du meine Meinung hören willst, fallen die Aktien bald.
    If you my opinion hear want, go-down the stocks soon.

    c. Wenn du meine Meinung hören willst, dann fallen die Aktien bald.
    If you my opinion hear want, then go-down the stocks soon.

    ‘If you want to hear my point of view, the stocks will go down soon.’
    (Köpcke and Panther 1989, (49))
Counterfactual Biscuits

(21)   a. If you had needed some money, there was some in the bank.  
       (Johnson-Laird 1986, (51))

       b. If you would have wanted a beer, there were some in the fridge.
UC Beyond Counterfactual Biscuits

(22) a. Bonnie: Are you hungry?

b. Clyde: No, I’m not.

c. Bonnie: Ah, that’s a shame.

d. Clyde: Why is that?

e. ? Bonnie: If you had been hungry, there would have been pizza in the fridge.

Open Issue

- empirical testing of acceptability counterfactual biscuits
Check your Intuitions

(23) Wenn du Hunger gehabt hättest, ... 
If you hunger have-PART-PERF have-KONJ-2 ...

a. ... es wäre noch Pizza im Kühlschrank gewesen. 
   ... it be-KONJ-2 still pizza in the fridge be-PART-PERF.

b. ... wäre noch Pizza im Kühlschrank gewesen. 
   ... be-KONJ-2 still pizza in the fridge be-PART-PERF.

c. ... dann wäre noch Pizza im Kühlschrank gewesen. 
   ... then be-KONJ-2 still pizza in the fridge be-PART-PERF.

d. ... es ist noch Pizza im Kühlschrank. 
   ... it be-IND still pizza in the fridge.

e. * ... ist noch Pizza im Kühlschrank. 
   ... be-IND still pizza in the fridge.

f. * ... dann ist noch Pizza im Kühlschrank. 
   ... then be-IND still pizza in the fridge.


