Conditional Questions Revisited

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Inquisitiveness Below and Beyond the Sentence Boundary

Outline

Conditional Questions and Statements

(1) a. If it is raining, the party will be cancelled.
b. If it is raining, will the party be cancelled?

Isaacs & Rawlins (2008)

Combine

- stack-model of conditionals (Kaufmann, 2000)
- partition semantics of questions (Groenendijk, 1999)

Goal

- To show that I&R's (2008) implementation does not derive the result that they claim to.
- To amend the system by
  - employing inquisitive semantics (Ciardelli et al., 2015) and
  - redefining some notions, especially Percolation.

Outline

a context C

Context C

An equivalence relation on a fixed set W of possible worlds.

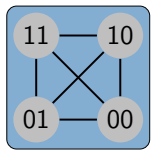


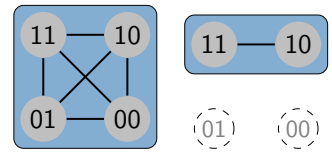
Figure: The initial ignorant and indifferent context

The initial ignorant and indifferent context is the total relation on W

Assertive Update of C

Assertive Update

$C \oplus \varphi := \{\langle w, v\rangle \in C \mid w(\varphi) = 1 \text{ and } v(\varphi) = 1\}$

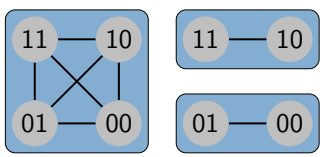


(a) C (b) $C \oplus p$

Inquisitive Update of C

Inquisitive Update

$C \oslash \psi := \{\langle w, v\rangle \in C \mid w(\psi) = v(\psi)\}$



(a) C (b) $C \oslash p$

Stack-model of conditionals

(2) a. If it is raining, the party will be cancelled.
b. If it is raining, will the party be cancelled?

"Ramsey test" intuition

When we ask 'if p, q?', we first hypothetically update our stock of beliefs with p and then entertain the truth/faulsity of q in the adjusted beliefs.

Three-step procedure

1. A hypothetical context is created by updating the speech context with the antecedent.
2. The hypothetical context is updated with the consequent.
3. The original context learns the effects of the second step.(Percolation)

Macro-contexts

macro-context τ

- a stack or list of contexts.
- $\tau = \langle C_0, \ldots, C_n \rangle$

τ_0	C_0
$\vdots$	$\vdots$
τ_n	C_n

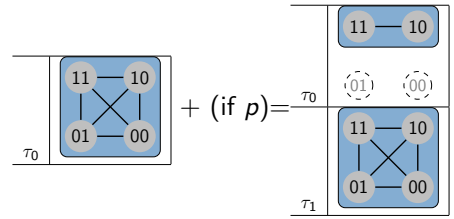
- Utterances are treated as operations on macro-contexts
- Macro-Context Change Potential (MCCP)

Antecedent

(3) If it is raining, will the party be cancelled?

Macro-Context Change Potential (MCCP) of the *if*-clause

$\tau + (\text{if } \varphi) := \langle \tau_0 \oplus \varphi, \tau \rangle$

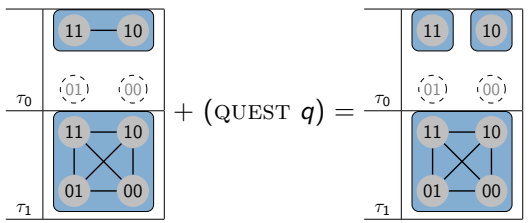


Consequent Question

(4) If it is raining, will the party be cancelled?

Macro-Context Change Potential (MCCP) of QUEST

$\langle C, \tau' \rangle + (\text{QUEST } \psi) := \langle C \oslash \psi, \tau' \rangle$.



Answer

(5) a. If it is raining, will the party be cancelled?
b. Yes(, if it's raining, it'll be cancelled).

Macro-Context Change Potential (MCCP) of ASSERT

$\tau + (\text{ASSERT } \psi) := \langle \tau_i[\tau_0 \vdash \psi] \rangle_{0 \leqslant i < n}$, where $|\tau| = n$.

- $C[C' \vdash \psi]$ (Percolation):
  learning in a context C that a context C' supports ψ

Percolation (I&R version)

$C[C' \vdash \psi] :=$
$\{\langle w, v \rangle \in C \mid \exists z \in W.(\langle w, z \rangle \in C' \text{ or } \langle z, v \rangle \in C') \text{ implies } \langle w, v \rangle \in C' \oplus \psi\}$

Problem 1: Conditional Statement

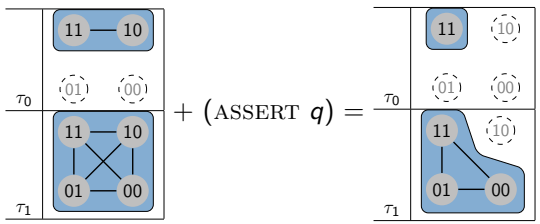
I&R's problem 1

Updating a macro-context with a conditional statement yields an inquisitive context. (pointed out by Sano & Hara, 2014)

(6) If it's raining, the party will be cancelled.

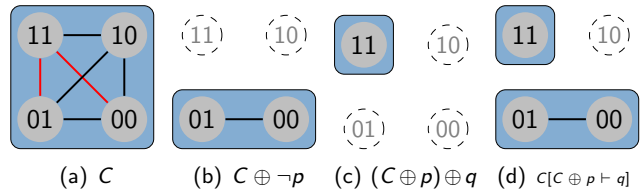
(7) $\tau + (\text{if } p) + (\textsc{assert}\ q) = \langle \tau_i[\tau_0 \oplus p \vdash q] \rangle_{0 \leqslant i \leqslant n}$.

What Isaacs & Rawlins (2008, (59); p. 301) claim that (7) derives:



Problem 1: Conditional Statement

(8) $C[C \oplus p \vdash q] =$
$\{\langle w, v \rangle \in C \mid \langle w, v \rangle \in C \oplus \neg p$ **or** $\langle w, v \rangle \in (C \oplus p) \oplus q\}$.

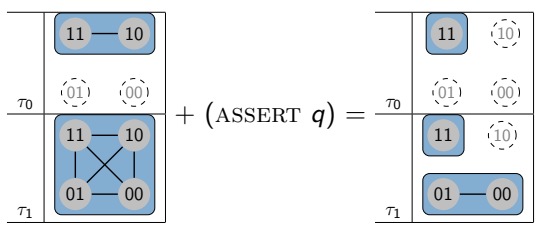


(a) C (b) $C \oplus \neg p$ (c) $(C \oplus p) \oplus q$ (d) $C[C \oplus p \vdash q]$

$\langle w_{11}, w_{01} \rangle$, $\langle w_{01}, w_{11} \rangle$, $\langle w_{11}, w_{00} \rangle$ and $\langle w_{00}, w_{11} \rangle$ should be removed.

Problem 1: Conditional Statement

What I&R's analysis actually derives:



I&R's problem 1

Updating a macro-context with a conditional statement yields an inquisitive context.

Problem 2: Conditional Question

I&R's problem 2

Percolating a question yields a tripartite partition.

Macro-Context Change Potential (MCCP) of QUEST

$\langle C, \tau' \rangle + (\textsc{quest}\ \psi) := \langle C \oslash \psi, \tau' \rangle$.

Macro-Context Change Potential (MCCP) of ASSERT

$\tau + (\textsc{assert}\ \psi) := \langle \tau_i[\tau_0 \vdash \psi] \rangle_{0 \leqslant i < n}$, where $|\tau| = n$.

Inquisitive Constraint

An inquisitive update cannot percolate down the stack.

Motivation If it percolated, it would yield a non-partition, i.e., not a legitimate question.

Problem 2: Percolating a Question

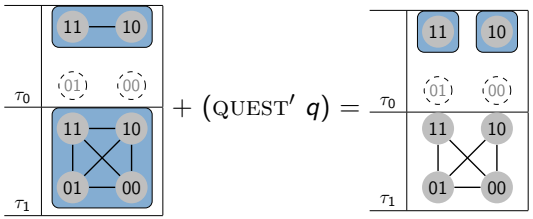
(9) If it's raining, will the party be cancelled?

If a question percolated, ...

(10) $C[C' \vdash_{\mathrm{Q}} \psi] :=$
$\{\langle w, v\rangle \in C \mid \exists z \in W.(\langle w, z\rangle \in C' \text{ or } \langle z, v\rangle \in C') \text{ implies } \langle w, v\rangle \in C' \oslash \psi\}$

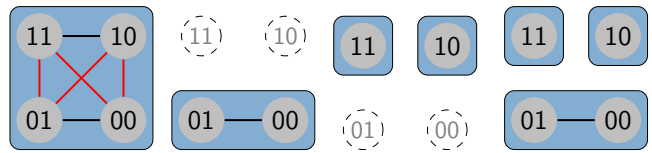
(11) $\tau + (\text{if } p) + (\textsc{quest}'\ q) = \langle \tau_i[\tau_0 \oplus p \vdash_{\mathrm{Q}} q]\rangle_{0 \leqslant i \leqslant n}$, provided $|\tau| = n$.

What I&R claim that (11) derives:



Problem 2: Percolating a Question

(12) $C[C \oplus p \vdash_{\mathrm{Q}} q] =$
$\{\langle w, v\rangle \in C \mid \langle w, v\rangle \in C \oplus \neg p$ **or** $\langle w, v\rangle \in (C \oplus p) \oslash q\}$.

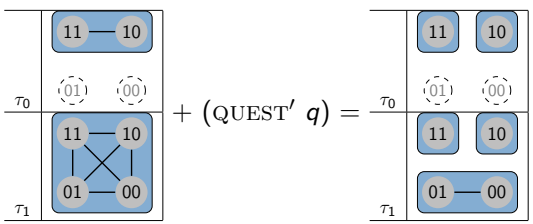


(a) C (b) $C \oplus \neg p$ (c) $(C \oplus p) \oslash q$ (d) $C[C \oplus p \vdash_{\mathrm{Q}} q]$

The pairs that connect w_{11} to w_{01} and w_{00}, and w_{10} to w_{01} and w_{00} should be removed.

Problem 2: Percolating a Question

What I&R actually derives:



I&R's problem 2

Percolating a question yields a tripartite partition.

- I&R's implementation fails to motivate Inquisitive Constraint

Summary

I&R's problem 1

Updating a macro-context with a conditional statement yields an inquisitive context.

I&R's problem 2

Percolating a question yields a tripartite partition.

The main source of the problems:

- How Percolation is defined.
  - pair semantics

(13) $C[C \oplus p \vdash q] =$
$\{\langle w, v\rangle \in C \mid \langle w, v\rangle \in C \oplus \neg p \text{ or } \langle w, v\rangle \in (C \oplus p) \oplus q\}$.

Outline

Proposal

The problems will disappear if we

- employ inquisitive semantics for the syntax of propositional logic and
- redefine the notion of percolation

Inquisitive Semantics

Information state s

$s \subseteq W$ is a set of possible worlds

Issue I

A non-empty, downward closed set of information states.

- An inquisitive model M for a set P of atomic sentences: $M = \langle W, V \rangle$
  - W is a set of *possible worlds*,
  - $V : P \to \wp(\mathrm{W})$ is a *valuation map* that specifies for each atomic sentence in P, which worlds make the sentence true.

Inquisitive Semantics

The satisfaction relation $s \models \varphi$ is defined inductively:

$$
\begin{array}{lcl}
s \models p & \iff & s \subseteq V(p), \\
s \models \varphi \vee \psi & \iff & s \models \varphi \text{ or } s \models \psi, \\
s \models \varphi \to \psi & \iff & \text{for all } t \subseteq s\text{: } t \models \varphi \text{ implies } t \models \psi, \\
s \models \neg\varphi & \iff & \text{for all non-empty } t \subseteq s\text{: } t \not\models \varphi.
\end{array}
$$

Inquisitive Semantics

The proposition expressed by a sentence φ

$[\varphi]_M := \{s \subseteq W \mid s \models \varphi\}$

- $[\varphi]_M$ is an issue.

Interrogative sentence

$?\varphi := \varphi \vee \neg\varphi$,

Adding updates

Context $\mathcal{C}$

An issue, a downward closed set of information states.

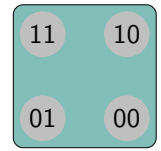


Figure: The initial ignorant context

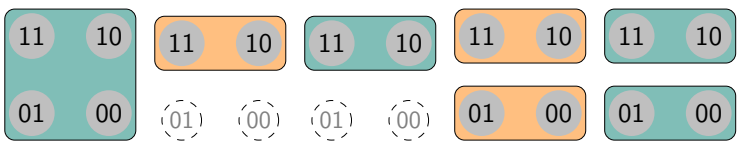
The initial ignorant context is a trivial issue $\wp(W)$.

Adding updates

- Declarative and interrogative updates are uniformly defined as intersection.

Update

$\mathcal{C} \star \varphi := \mathcal{C} \cap [\varphi]_M$.



(a) $\mathcal{C}$ (b) $[p]_M$ (c) $\mathcal{C} \star p$ (d) $[?p]_M$ (e) $\mathcal{C} \star ?p$

Stack-model conditionals

(14) a. If it's raining, the party will be cancelled.
b. If it's raining, will the party be cancelled?

macro-context

- $\tau = \langle \mathcal{C}_0, \ldots, \mathcal{C}_n \rangle$

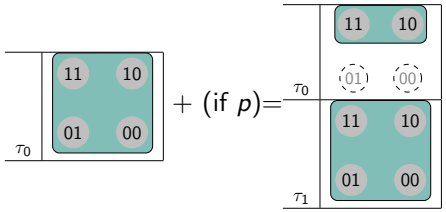
τ_0	$\mathcal{C}_0$
$\vdots$	$\vdots$
τ_n	$\mathcal{C}_n$

Conditional Statement

(15) If it's raining, the party will be cancelled.

MCCP of an *if*-clause

$\tau + (\text{if } \varphi) := \langle \tau_0 \star \varphi, \tau \rangle$



Redefining Percolation

(16) If it's raining, the party will be cancelled.

MCCP of default UPDATE

$\tau + (\text{UPDATE } \psi) := \langle \tau_i[\tau_0 \vdash \psi] \rangle_{0 \leqslant i < n}$

Percolation (InqSem version)

$\mathcal{C}[\mathcal{C}' \vdash \psi] := \{ s \in \mathcal{C} \mid \text{for all } t \subseteq s,\ t \in \mathcal{C}' \text{ implies } t \in \mathcal{C}' \star \psi \}$

- a natural extension of Kaufmann's Percolation (Conclude).

Compare:

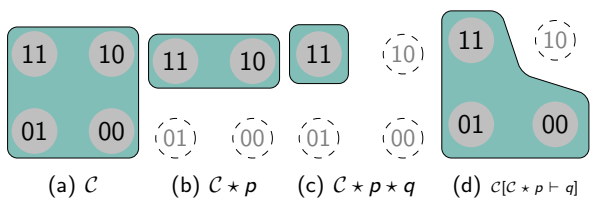
Percolation (I&R version)

$C[C' \vdash \psi] :=$
$\{\langle w, v \rangle \in C \mid \exists z \in W.(\langle w, z \rangle \in C' \text{ or } \langle z, v \rangle \in C') \text{ implies } \langle w, v \rangle \in C' \oplus \psi\}$

Consequent Assertion

(17) If it's raining, the party will be cancelled.

(18) $\mathcal{C}[\mathcal{C} \star p \vdash q] =$
$\{ s \in \mathcal{C} \mid \text{for all } t \subseteq s,\ t \in \mathcal{C} \star p \text{ implies } t \in \mathcal{C} \star p \star q \}$



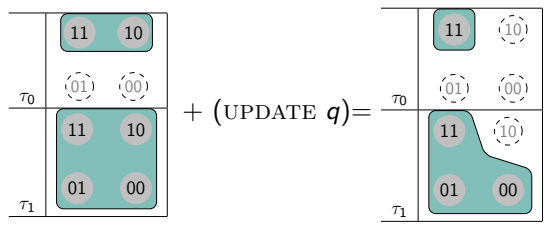
- All and only sets that contain w_{10} are removed.
- $\{w_{11}, w_{01}\}, \{w_{11}, w_{00}\}, \{w_{11}, w_{01}, w_{00}\}$ are NOT removed.

(18) $= \mathcal{C} \star (p \to q)$

Consequent Assertion

(19) If it's raining, the party will be cancelled.

(20) $\tau + (\text{if } p) + (\text{UPDATE } q) = \langle \tau_i[\tau_0 \star p \vdash q] \rangle_{0 \leqslant i \leqslant n}$



I&R's problem 1 solved

Updating a macro-context with a conditional statement correctly yields a non-inquisitive context.

Conditional Question

(21) If it's raining, will the party be cancelled?

I&R's proposal

- A root-level question only affects the topmost context
- The effect of the update does not percolate down the stack.

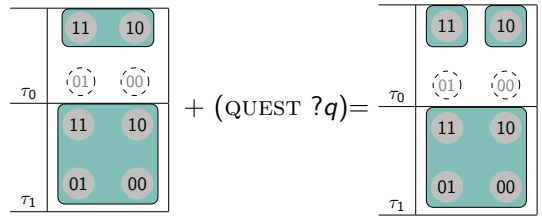
MCCP of QUEST

$\langle \mathcal{C}, \tau' \rangle + (\text{QUEST } ?\psi) := \langle \mathcal{C} \star ?\psi, \tau' \rangle$.

Consequent Question

(22) If it's raining, will the party be cancelled?

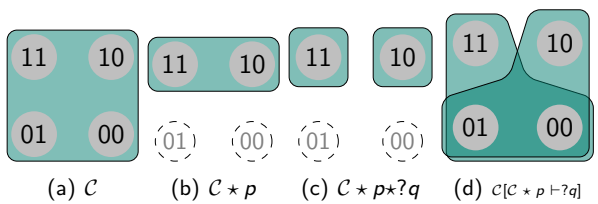
(23) $\tau + (\text{if } p) + (\text{QUEST } ?q) = \langle \tau_0 \star p \star ?q, \tau_1 \rangle$



Percolating a question?

What would happen if the effect of QUEST percolated?

(24) $\mathcal{C}[\mathcal{C} \star p \vdash ?q] =$
$\{ s \in \mathcal{C} \mid \text{for all } t \subseteq s,\ t \in \mathcal{C} \star p \text{ implies } t \in \mathcal{C} \star p \star ?q \}$



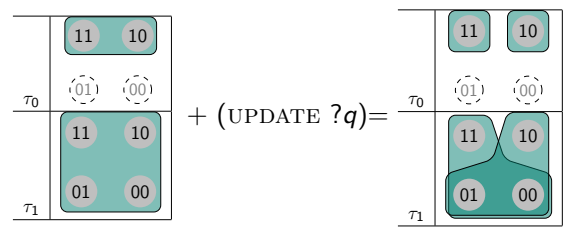
(a) $\mathcal{C}$ (b) $\mathcal{C} \star p$ (c) $\mathcal{C} \star p \star ?q$ (d) $\mathcal{C}[\mathcal{C} \star p \vdash ?q]$

All and only sets that contain $\{w_{11}, w_{10}\}$ as their subsets are removed.

$(24) = \mathcal{C} \star (p \rightarrow ?q)$

Percolating a question?

(25) $\tau + (\text{if } p) + (\text{UPDATE } ?q) = \langle \tau_i[\tau_0 \star p \vdash ?q] \rangle_{0 \leqslant i \leqslant n}$



I&R's problem 2 solved

Percolating a question correctly yields a non-partition (overlapping issues).

- We can motivate INQUISITIVE CONSTRAINT

Outline

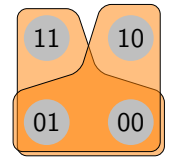


Figure: $[p \rightarrow ?q]_M$

InqSem does not rule out overlapping issues as illegitimate.

Questions

- Do we need Inquisitive Constraint?
- Do we need to disallow overlapping issues?
- Do we need quest? Can we just have update for both statements and questions?

Motivation 1: the Ramsey test and Modal Subordination

"Ramsey test" intuition

When we ask 'if p, q?', we first hypothetically update our stock of beliefs with p and then entertain the truth/faulsity of q in the adjusted beliefs.

Modal Subordination:

(26) If a thief comes in, would he steal a silver? Would you be upset?

Motivation 2: Unconditional Questions

- Hara (in revision)

Unconditional statement:

(27) Whether or not the party is at Emma's place, it will be fun.

Rawlins (2013)

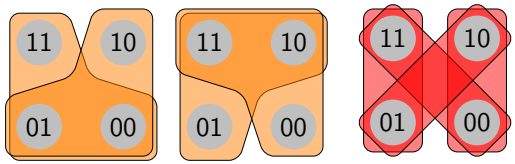
An unconditional construction '*whether or not p*, *q*' semantically encodes a conjunction of 'if p, q' and 'if not p, q'.

$$\left(\begin{array}{c}\text{[If the party is at Emma's place, it will be fun.]}\\ \text{and}\\ \text{[If the party is not at Emma's place, it will be fun.]}\end{array}\right)$$

Motivation 2: Unconditional Questions

(28) *Whether or not the party is at Emma's place, will it be fun?

$$\left(\begin{array}{c}\text{[If the party is at Emma's place, will it be fun?]}\\ \text{AND}\\ \text{[If the party is not at Emma's place, will it be fun?]}\end{array}\right)$$



(a) $[p \rightarrow ?q]_M$ (b) $[\neg p \rightarrow ?q]_M$ (c)

Outline

Redefined Percolation

Percolation (I&R version)

$C[C' \vdash \psi] :=$
$\{\langle w, v\rangle \in C \mid \exists z \in W.(\langle w, z\rangle \in C' \text{ or } \langle z, v\rangle \in C') \text{ implies } \langle w, v\rangle \in C' \oplus \psi\}$

Percolation (InqSem version)

$\mathcal{C}[\mathcal{C}' \vdash \psi] := \{s \in \mathcal{C} \mid \text{ for all } t \subseteq s,\ t \in \mathcal{C}' \text{ implies } t \in \mathcal{C}' \star \psi\ \}$

I&R's problems solved

I&R's problem 1 solved

Updating a macro-context with a conditional statement correctly yields a non-inquisitive context.

I&R's problem 2 solved

Percolating a question correctly yields a non-partition (overlapping issues).

- Inquisitive Constraint can be motivated.
- But InqSem doesn't disallow overlapping issues.
- Maybe there is a linguistic constraint that disallows overlapping issues?

Acknowledgement

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