What ifs

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Conditionals at the crossroads
11th November, 2016, University of Konstanz

Hypothetical *what if*s

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(2) A: What if cats could text?

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The internet provides:

Hypothetical *what if*s

Many examples on XKCD's 'what if' site:

(3) a. What if I tried to re-enter the atmosphere in my car? (a 2000 VW Jetta TDI).

b. What if you built a siphon from the oceans on Europa to Earth? Would it flow once it's set up?

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Intuition

What would the world be like if...?

Key points

- Data: ‘what if’s are extremely flexible and often used for much more specific questions.
- Compare ‘what if’s to conditional questions (Rawlins 2010b,a).
- New proposal: ‘what if’s are purely suppositional questions that rely on an existing ‘Question Under Discussion’ (QUD; Roberts 1996, Ginzburg 1996) in context.
- Will need to generalize the notion of QUD a bit.

Outline

Hypothetical flexibility

‘What if’ syntax

‘What if’s as suppositional questions

Generalizing to decision problems

Conclusions

Hypothetical flexibility

Challenging *what if*s

(Rawlins 2010a: Conversational Backoff)

(4) A: I'm not going to go the party.
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(5) The boy came right over and boldly proposed that, since they were both there at the same time every week, they could start sharing a paper and save a tree. "**What if we both want the same section?**" Pip said with some hostility. (COCA)

(6) "If I can't talk to you without feeling played, I've got to go for the gun." "**What if you don't have a gun?**," I asked. (COCA)

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(7) "Push it open, then step away." "What if it's locked?" Peggy said.

(8) "Hey, maybe the squirrel is underneath those trash bags. Stir it up a bit." "Not funny, what if it attacks?" (COCA)

Challenging *what if*s

- Respond to an assertion (or other informational contribution), imperative.
- Cross-speaker.
- Prevent acceptance of a claim. (Rawlins 2010a: conversational backoff)

Consequential *what if*s

(9) I heard that Alfonso's going to the party – what if Joanna is there?

(10) A: Alfonso's going to the party.
B: Uh oh, what if Alfonso's there?

Consequential *what if*s

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(10) A: Alfonso's going to the party.
B: Uh oh, what if Alfonso's there?

(11) Is Alfonso going to the party? What if Joanna is there?

(12) Now there's just a VW between Adam and her. What if he sees her? (COCA; narrative text)

Consequential *what if*s

- Respond to an accepted assertion (or other informational contribution).
- Same-speaker or cross-speaker.
- Ask about consequences of some information.

Suggestive *what if*s

(13) A: How do I get to Konstanz?
B: What if you fly to Zurich?

(14) A: Who should we invite to give a talk?
B: What if we invite Joanna?

(15) A: Who could possibly be the murderer?
B: What if the butler lied about his alibi?

Suggestive *what if*s

- Respond to a question that is either:
    1. A ‘planning’ question, or a question with collaborative planning in the background.
    2. A ‘collaborative brainstorming’ question.
- Typically cross-speaker.
- Offer a suggested resolution of some question.

Summary: four *what if*s

Type / function	antecedent	antecedent speaker
Hypothetical (‘stoner’ question)	none	N/A
Challenging (‘but have you considered?’)	informational	cross
Consequential (‘what would happen if’)	informational	cross/same
Suggestive (‘how about...’)	question	cross

How to capture all this??

‘What if’ syntax

Idiosyncratic ‘what’

Restricted to just ‘what’:

(16) What if we invite Joanna?

(17) *{who, when, how, why, where} if we invite Joanna?

Idiosyncratic 'what'

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(16) What if we invite Joanna?

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Compare:

(18) {What, how} about if we invite Joanna?

(19) *{Who, when, why, where} about if we invite Joanna?

Idiosyncratic 'what' II

'What' can't undergo normal modification:

(20) a. *What else if we invite Joanna?
b. *What the hell if we invite Joanna?

(21) a. What else would happen if we invite Joanna?
b. What the hell would happen if we invite Joanna?

The ‘if’-clause, externally

Only if conditionals (von Fintel 1994, Herburger, a.o.)

(22) What would happen only if we invite Joanna?

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Unconditionals (Rawlins 2013 a.o.)

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Other complementizers:

(26) *What when a farmer owns a donkey?

(27) *What if and when we invite Joanna?

An ‘if’-clause is required:

(28) Suppose we invite Joanna. *What?

Compare:

(29) a. Suppose we invite Joanna. Then what?
b. Suppose we invite Joanna. What would happen?
c. If we invite Joanna, then what? (n.b. different meaning than ‘what if’)

(Not to say that bare ‘what??’ doesn’t have its uses.)

The ‘if’-clause, internally

The internals of the ‘if’-clause are characteristic of ‘if’-clause adjuncts.

Counterfactuals, subjunctive:

(30) What if it {had snowed / were to snow}?

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Fake past tense (Iatridou 2000, Schulz 2008, 2014):

(31) a. If Peter left in time, he would be in Frankfurt this evening. (Schulz 1-b)

b. How could Peter get to Frankfurt this evening? What if he left by two?

(32) What if you flew to Zurich?

The whole *what if*, externally

Unembeddable:

(33) a. *Alfonso wondered what if it rained.
b. Alfonso wondered, ‘what if it rained?’
c. Alfonso wondered what would happen if it rained.

Summary

What to make of all this?

1. ‘What if’s are questions (they license answers).
2. ‘What if’s are syntactically root-clause-sized idiom chunks. (Speculation: ‘what’ realizes interrogative marking?)
3. The internals of the ‘if’-clause appear as normal TP syntax.
4. The ‘what if’ sub-sequence is completely fixed.
5. ‘What if’s are iffy.

‘What if’s as suppositional questions

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Sketch of the proposal

'What if' questions are like conditional questions.

- Rawlins (2010a): involve re-asking the QUD under a supposition. E.g 'what if ϕ':

  "Suppose ϕ. Then how is the QUD resolved?"
- New proposal: they simply pose a question by introducing a supposition. Just: "Suppose ϕ?
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- Starting point: conditional questions in a variant of Isaacs & Rawlins (2008). Cf. Hulstijn 1997, Velissaratou 2000, Ciardelli et al. 2013.
- Framework: a Stalnakerian (Stalnaker 1978, 1984, 2014) update semantics. Context represents mutual public information, assumptions, etc.

First target: conditional questions

Where c is a context, how to interpret: (Isaacs & Rawlins 2008)

$$c + \ulcorner \text{if } \phi, \psi? \urcorner =$$
$$c + \ulcorner \text{Assume}(\phi) \urcorner + \ulcorner \text{Question}(\psi) \urcorner$$

(Suppositional accounts of conditionals: Ramsey 1931, Adams 1965, Mackie 1973, Heim 1983, Edgington 1995 a.m.o)

Contexts

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b. v_c is a set of worlds (the view).

c. Q_c is a stack of issues (the topic stack).

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c. Q_c is a stack of issues (the topic stack).

cs_c: straightforward Stalnakerian context set.

v_c: a temporary window onto part of the context set.

Q_c: a QUD stack in the style of Roberts (1996).

Utility updates

Where c is a context:

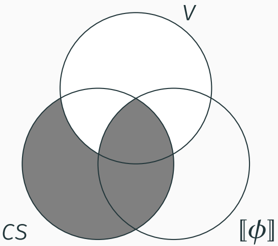
(36) $c + \ulcorner\text{Pop}\urcorner = \langle cs_c, \mathscr{W}, Q_c \rangle$ (clear the view)

(37) $c + \ulcorner\text{Dispel}\urcorner = \langle cs_c, v_c, \text{pop}(Q_c) \rangle$ (dispel a topic)
defined only if $Q_c \neq \langle\rangle$

- These don't directly correspond to any particular linguistic form or move.

Informative update

(38) Domain-restricted veridical update: Where cs and v are sets of worlds, $cs \oplus_v \ulcorner\phi\urcorner = (cs - v) \cup (cs \cap v \cap [\![\phi]\!])$.



(Cf. support in Kaufmann 2000, percolation in Isaacs & Rawlins 2008.)

Assertion

(39) Fact: if $cs \subseteq v$, then $cs \oplus_v \ulcorner \phi \urcorner = cs \cap [\![\phi]\!]$.

In other words, informative updates for $\langle cs, \mathscr{W}, Q \rangle$ behave as standard Stalnakerian updates.

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In other words, informative updates for $\langle cs, \mathscr{W}, Q\rangle$ behave as standard Stalnakerian updates.

(40) Assertion: where c is a context,
$c + \ulcorner\text{Assert}(\phi)\urcorner = \langle cs_c \oplus_{v_c} \ulcorner\phi\urcorner, v_c, Q_c\rangle$

- Because of the previous fact, if $v_c = \mathscr{W}$, this is just a standard Stalnakerian update.

Assumptions

(41) $c + \ulcorner \text{Assume}(\phi) \urcorner = \langle cs_c, v_c \cap [\![\phi]\!], Q_c \rangle$
defined only if $cs_c \cap v_c \cap [\![\phi]\!] \neq \emptyset$

- The effect of subsequent assertions is constrainted to only impact a subset of the context set.

I will assume that interrogative denotations are compositionally constructed as alternative sets in the style of Hamblin (1973), Kratzer & Shimoyama (2002).

- Polar questions are singleton sets: (Biezma & Rawlins 2012)
  ⟦Is it raining?⟧= $\{\lambda w_s\,.$ it is raining in $w\}$
- Alternative questions are the union of the disjuncts:
  ⟦Is it raining↑ or snowing↓?⟧=
  $\{\lambda w_s\,.$ it is raining in $w, \lambda w_s\,.$ it is snowing in $w\}$
- Constituent questions are constructed pointwise based on the wh-item.
  ⟦What's the weather like?⟧ =
  $\{\lambda w_s\,.$ raining in $w, \lambda w_s\,.$ snowing in $w, \lambda w_s\,.$ sunny in $w, \ldots\}$

Questions: answerhood

Roberts (1996):

(42) A partial answer to a question q is a proposition which contextually entails the evaluation – either true or false – of at least one element of q's alternative set.

(43) A complete answer to a question q is a proposition which contextually entails the evaluation for all of q's alternative set.
(Where p contextually entails p' in context $c \subseteq \mathscr{W}$ just in case $p \cap c$ entails p'.)

I will implement this in a dynamic setting.

Questions: dynamics

Questioning is simply putting a question on the topic stack:

(44) Questioning
$c' = c + \ulcorner \text{Question}_a(\phi) \urcorner = \langle cs_c, v_c, \text{push}(Q_c, [\![\phi]\!]) \rangle$
Felicity conditions: appropriate in c only if
a. c' is inquisitive (details TBD),
b. $top(Q_{c'})$ is relevant (details TBD), and
c. a can't resolve $top(Q_{c'})$ (details TBD).

Topics and the QUD

The present system makes a distinction between a question as the topic of discourse, and the QUD at a particular context.

What do I mean by that?

Questions: dynamics II

Topics are interpreted through the lens of the current context.

- I will do this in a somewhat complicated way.
  Payoff: clarify two distinct aspects of 'QUD's.
- Work with equivalence relations over (sets of) worlds constructed from issues – subject matters (Lewis 1988). Cf. Groenendijk & Stokhof 1984, Groenendijk 1999.

Not the only way to implement the core idea. Subjects matters represent exclusive alternative sets.

Questions: dynamics II

Topics are interpreted through the lens of the current context.

Some useful utility functions.

(45) Where p is a set of worlds, $matter(p) = \{\langle w, v\rangle \mid w, v \in p\}$.

(46) Where q is a subject matter, $alts(q) = \{p \mid \forall w, v \in p : \langle w, v\rangle \in q\}$

(47) Where q is a subject matter, $inf(q) = \{w \mid \langle w, w\rangle \in q\}$

Questions: dynamics II

Topics are interpreted through the lens of the current context.

(48) Polar QUDs: Where q is a subject matter and p a proposition,
$q \oslash p = q \cap \{\langle w, v \rangle \mid w \in p \leftrightarrow v \in p\}$ (Groenendijk 1999)

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Suppose it's raining in w_1, w_2, sunny in w_3, snowing in w_4.

$matter(\{w_1, w_2, w_3, w_4\}) \oslash \{w \mid \text{it's raining in } w\}$

$$\left\{ \begin{array}{llll} \langle w_1, w_1\rangle, & \langle w_1, w_2\rangle, & & \\ \langle w_2, w_1\rangle, & \langle w_2, w_2\rangle, & & \\ & & \langle w_3, w_3\rangle, & \langle w_3, w_4\rangle, \\ & & \langle w_4, w_3\rangle, & \langle w_4, w_4\rangle \end{array} \right\}$$

Questions: dynamics II

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Generalize this to arbitrary sets of propositions:

(49) Current QUDs: where c is a context,

$$CQUD(c) = \begin{cases} \bigcap\{matter(cs_c \cap v_c) \oslash p \mid p \in top(Q_c)\} & \text{if } |Q_c| \geq 1 \\ inq(cs_c \cap v_c) & otherwise \end{cases}$$

The intersection of polar QUDs for every proposition $top(Q_c)$.

- Intersection of equivalence relations is an equiv. relation.
- Implementation of Roberts (1996) partial answers.
- Can define relevance for assertions in terms of eliminating alternatives in the CQUD.

Suppose it's raining in w_1, w_2, sunny in w_3 and snowing in w_4.

$[\![\text{What's the weather like?}]\!] = \{\{w_1, w_2\}, \{w_3\}, \{w_4\}\}$.

$\bigcap \left\{ \{w_1, w_2, w_3, w_4\} \oslash p \mid p \in [\![\text{what's the weather like}]\!] \right\} =$

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(50) Questioning

$c' = c + \ulcorner \text{Question}_a(\phi) \urcorner = \langle cs_c, v_c, \text{push}(Q_c, [\![\phi]\!]) \rangle$

Felicity conditions: appropriate in c at w only if

a. $|Alts(CQUD(c'))| > 1$,

b. if $|Q_c| \geq 1$, then $CQUD(c) \subseteq CQUD(c')$, and

c. $Dox_a(w) \cap cs_{c'} \cap v_{c'}$ does not resolve $CQUD(c')$.

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(51) Automatic dispelling

At any point c_n in a conversation, if $|Alts(CQUD(c_n))| = 1$ and $|Q_c| \geq 1$, by default:

a. adjust c_n to $c'_n = c_n + \ulcorner \text{Pop} \urcorner + \ulcorner \text{Dispel} \urcorner$

Conditional questions

(52) Where ψ includes a force operator,
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If ψ is a question:

1. Assume the antecedent.
2. Raise a QUD relative to the temporary domain restriction. The question needs to be resolved before the assumption can be popped.

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$$c_0 + \ulcorner \text{Assume}(\neg S) \urcorner + \ulcorner \textit{Question}(\ulcorner \text{What's the weather} \urcorner) \urcorner$$
$$= \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}, \langle [\![\text{what's the weather}]\!], \langle\rangle\rangle\rangle$$

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$$c_0 = \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3, w_4\}, \langle\rangle\rangle$$

$$CQUD(c_0) = \left\{ \begin{array}{llll} \langle w_1, w_1 \rangle, & \langle w_1, w_2 \rangle, & \langle w_1, w_3 \rangle, & \langle w_1, w_4 \rangle, \\ \langle w_2, w_1 \rangle, & \langle w_2, w_2 \rangle, & \langle w_2, w_3 \rangle, & \langle w_2, w_4 \rangle, \\ \langle w_3, w_1 \rangle, & \langle w_3, w_2 \rangle, & \langle w_3, w_3 \rangle, & \langle w_3, w_4 \rangle, \\ \langle w_4, w_1 \rangle, & \langle w_4, w_2 \rangle, & \langle w_4, w_3 \rangle, & \langle w_4, w_4 \rangle \end{array} \right\}$$

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(53) If it's not snowing, what's the weather like?

$$c_0 + \ulcorner \text{Assume}(\neg S) \urcorner + \ulcorner \textit{Question}(\ulcorner \text{What's the weather} \urcorner) \urcorner$$
$$= \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}, \langle [\![\text{what's the weather}]\!], \langle\rangle \rangle \rangle$$

$$c_1 = c_0 + \ulcorner \text{Assume}(\neg S) \urcorner = \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}, \langle\rangle \rangle$$

$$CQUD(c_1) = \left\{ \begin{array}{lll} \langle w_1, w_1 \rangle, & \langle w_1, w_2 \rangle, & \langle w_1, w_3 \rangle, \\ \langle w_2, w_1 \rangle, & \langle w_2, w_2 \rangle, & \langle w_2, w_3 \rangle, \\ \langle w_3, w_1 \rangle, & \langle w_3, w_2 \rangle, & \langle w_3, w_3 \rangle \\ & & \end{array} \right\}$$

Suppose it's raining in w_1, w_2, sunny in w_3, snowing in w_4.

(53) If it's not snowing, what's the weather like?

$$c_0 + \ulcorner \text{Assume}(\neg S) \urcorner + \ulcorner \textit{Question}(\ulcorner \text{What's the weather} \urcorner) \urcorner$$
$$= \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}, \langle [\![\text{what's the weather}]\!], \langle \rangle \rangle \rangle$$

$$c_2 = c_1 + \ulcorner \textit{Question}(\ulcorner \text{What's the weather} \urcorner) \urcorner$$
$$= \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}, \langle \{\{w_1, w_2\}, \{w_3\}, \{w_4\}\}, \langle \rangle \rangle \rangle$$

$$CQUD(c_2) = \left\{ \begin{array}{lll} \langle w_1, w_1 \rangle, & \langle w_1, w_2 \rangle, & \xcancel{\langle w_1, w_3 \rangle}, \\ \langle w_2, w_1 \rangle, & \langle w_2, w_2 \rangle, & \xcancel{\langle w_2, w_3 \rangle}, \\ \xcancel{\langle w_3, w_1 \rangle}, & \xcancel{\langle w_3, w_2 \rangle}, & \langle w_3, w_3 \rangle \end{array} \right\}$$

Suppose it's raining in w_1, w_2, sunny in w_3, snowing in w_4.

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$= \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}, \langle [\![\text{what's the weather}]\!], \langle\rangle\rangle\rangle$

$c_2 = c_1 + \ulcorner \mathit{Question}(\ulcorner \text{What's the weather} \urcorner) \urcorner$

$= \langle \{w_1, w_2, w_3, w_4\}, \{w_1, w_2, w_3\}, \langle \{\{w_1, w_2\}, \{w_3\}, \{w_4\}\}, \langle\rangle\rangle\rangle$

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New analysis of 'what if':

What-ifs are purely suppositional questions.

(54) $c' = c + \ulcorner \text{what if } \phi \urcorner = c + \ulcorner \text{Assume}(\phi) \urcorner$

Felicity conditions:

a. $|Alts(CQUD(c'))| > 1$ (inquisitivity)

b. $Dox_a(w) \cap cs_{c'} \cap v_{c'}$ does not resolve $CQUD(c')$.

Challenging ‘what if’s revisited

(55) A: Are you going to the party?
B: No, I don't think so.
A: What if Joanna is there?

Challenging ‘what if’s revisited

(55) A: Are you going to the party?
B: No, I don’t think so.
A: What if Joanna is there?

Sketch (Rawlins 2010a, Bledin & Rawlins 2016):

- B issues a proposal for updating the common ground, as in Farkas & Bruce (2010).
- A does not accept the proposal, but uses the ‘what if’ to resist B’s proposal.
- Supposition draws attention to the possibility that Joanna is there, which may have been ignored or forgotten before.

Revisiting hypothetical/consequential ‘what if’s

Generalization

Hypothetical and consequential ‘what if’s occur when the local overtly triggered QUD is closed, or there is no obviously immediate open QUD at all.

- Proposal: when the topic stack is empty, can accommodate an implicit ‘big quesiton’.

What is the world like?

Hypothetical/consequential ‘what if’s: force accommodation of an implicit ‘big question’.

What is the biggest question possible?

- Hypothetical ‘what if’s: evidence that it can be quite big. Worst case: $\{\langle w, w\rangle \mid w \in cs_c \cap v_c\}$??

What is the world like?

Hypothetical/consequential 'what if's: force accommodation of an implicit 'big question'.

- Constraint 1: often, but not necessarily, anchored at a particular time. (Partition on historical alternatives anchored at the 'if'-clause's time in the sense of Kaufmann & Schwager 2009).

What is the world like?

Hypothetical/consequential 'what if's: force accommodation of an implicit 'big question'.

- Constraint 2: Bledin & Rawlins (2016): a lower bound on the current QUD is attention – can only 'see' alternatives at the granularity you are attending to.
- Account for forgotten/unlikely possibilities, uncertainty about domain in the style of Yalcin (2008). (See also Lewis 1979, Stalnaker 1984, Rawlins 2008, de Jager 2009, Rawlins 2010a, Klecha 2014, Fritz & Lederman 2015, for related ideas.)

What is the world like?

Contrast with ‘what about if’ questions – allow implicit antecedents, but must be ones that have been plausibly raised in discourse.

(56) #What about if I entered the atmosphere in my car?

(57) A: Alfonso’s going to the party.
B: ??Uh oh, what about if Joanna is there?

Generalizing to decision problems

Two unfinished puzzles

1. What, exactly, to do with suggestion uses?
2. What to do about the intuition that ‘what if’s are collaborative?

Why suggestion uses are a problem

Toy scenario: we invite Alfonso in w_1, w_2 and Joanna in w_3, w_4.

$cs_c = \{w_1, w_2, w_3, w_4\}$

(58) A: Who should we invite?

$$CQUD(c + \ulcorner \text{A} \urcorner) = \left\{ \begin{array}{ll} \langle w_1, w_1 \rangle, \langle w_1, w_2 \rangle, & \\ \langle w_2, w_1 \rangle, \langle w_2, w_2 \rangle, & \\ & \langle w_3, w_3 \rangle, \langle w_3, w_4 \rangle, \\ & \langle w_4, w_3 \rangle, \langle w_4, w_4 \rangle \end{array} \right\}$$

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B: What if we invite Joanna?

Why suggestion uses are a problem

Toy scenario: we invite Alfonso in w_1, w_2 and Joanna in w_3, w_4.

$CS_c = \{w_1, w_2, w_3, w_4\}$

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B: What if we invite Joanna?

$$CQUD(c + \ulcorner A \urcorner + \ulcorner B \urcorner) = \left\{ \begin{array}{l} \langle w_3, w_3\rangle, \langle w_3, w_4\rangle, \\ \langle w_4, w_3\rangle, \langle w_4, w_4\rangle \end{array} \right\}$$

Failure: felicitous only if $CQUD(c + \ulcorner A \urcorner + \ulcorner B \urcorner)$ is inquisitive.

More on suggestion uses

Simple idea 1

Drop the inquisitive requirement (keep non-resolvedness). Problem: answers to suggestion ‘what if’s.

More on suggestion uses

Simple idea 1

Drop the inquisitive requirement (keep non-resolvedness).
Problem: answers to suggestion 'what if's.

(59) What if we invite Joanna?

a. That's a great idea, let's do it.
b. She would give a good talk.
c. Her talks are too mathematical for this audience.
d. ok / sure.
e. #yes / #no.

More on suggestion uses

Simple idea 2

Current prediction (with a bit more about accommodation): felicitous only if there's an implicit sub-QUD that renders the suppositional context inquisitive.

More on suggestion uses

Simple idea 2

Current prediction (with a bit more about accommodation): felicitous only if there's an implicit sub-QUD that renders the suppositional context inquisitive.

Intuition:

(60) A: What if we invite Joanna?
implicit: (How would that meet our goals for this talk series?)

More on suggestion uses

Simple idea 2

Current prediction (with a bit more about accommodation): felicitous only if there's an implicit sub-QUD that renders the suppositional context inquisitive.

Problem: too unconstrained, not just any QUDs are available.

(61) A: I wasn't there, who gave the best talk?
B: #What if Joanna did?
e.g.: (What makes a talk good?)

(62) A: I can't see the window, what's the weather like?
B: #What if it's raining?
e.g.: (Where should we go for lunch if it is?)

Generalizing topics

Key intuition

Questions can be asked not just to get information, but to help resolve a salient decision problem about actions faced by agents in discourse. (van Rooy 2003)

- ‘What if’s can indicate an unresolved decision problem. (Not just an inquisitive context.)
- Decision problem is typically an implicit super-question.
- Implementation converges with Roberts (1996, 2012): need to represent both domain goals and conversational goals.

Generalizing topics

(63) Goal structures are tuples $G = \langle M, S, U \rangle$, where

a. $M, S \subseteq \mathscr{P}(\mathscr{W})$. (wrong on handout)

b. M characterizes a set of possible moves.

c. S characterizes a set of possible states.

d. U is an ordinal utility function $M \times S \rightarrow \mathscr{R}$.

What is a move?

I’m not going to try to pin this down, but large literature exists on planning etc. Some examples:

- opening a window.
- not opening a window.
- making an assertion in discourse.
- changing beliefs.
- …

Utilities

We take *U* to represent the ordering of some agent(s) preferences.

- No indication of strength or intensity.
- (Cf. Condoravdi & Lauer 2012 preference structures, which don't distinguish between moves/states in the same way.)

Interrogative goals

(64) A purely interrogative goal is a goal structure G_c determined entirely by a context c as follows:

a. $M_c = \{p \mid \exists P \subseteq Alts(CQUD(c)) : p = \{w \mid \text{agents reach } c' \text{ in } w : cs_{c'} \subseteq \bigcup P \wedge cs_{c'} \subseteq cs_c\}\}$

b. $S_c = Alts(CQUD(c))$

c. $U_c(m,s) = \left\{ \begin{array}{l} 1 \text{ if } m \subseteq s \\ 0 \text{ otherwise} \end{array} \right\}$

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The set of possibilities for how cs_c could evolve w.r.t. the CQUD. (cf. Gunlogson's 'reduction set')

b. $S_c = Alts(CQUD(c))$

c. $U_c(m,s) = \left\{ \begin{array}{l} 1 \text{ if } m \subseteq s \\ 0 \text{ otherwise} \end{array} \right\}$
A simple Quality-based utility function that rewards only true complete answers.

Best moves

What is the best move to make in pursuit of a goal?

(65) Best move sets (cf. van Rooy 2003)
Given a goal structure $G = \langle M, S, U \rangle$:
$Q_G = \{\bigcup\{s : U(m,s) \geq U(m',s) \text{ for all } m' \in M\} \mid m \in M\}$

Paraphrase: the states where utility of moves is optimal.

Interrogative goals

Fact: for a purely interrogative goal G_c determined by c, $Q_{G_c} = Alts(CQUD(c))$

- Intuition: utility function rewards just the complete true answers to the CQUD.

Decision problems

- Van Rooy's proposal: Some questions can pose not just purely interrogative goals, but more complex decision problems that involve jointly deciding actions and states.

'What if's

'What if's are appropriate only if there is an unresolved decision problem. They ask about information that is needed to resolve this decision problem.

Resisting imperatives

(66) A: Open the window.
B: What if it's still raining?

Suppose that imperatives indicate a speaker's effective preference for their content (Condoravdi & Lauer 2012). B adopts A's preference in cases where it is not raining, but resists otherwise:

Resisting imperatives

(66) A: Open the window.
B: What if it's still raining?

Suppose that imperatives indicate a speaker's effective preference for their content (Condoravdi & Lauer 2012). B adopts A's preference in cases where it is not raining, but resists otherwise:

B's goal structure *G*

	rain, A prefers open	rain, A prefers ¬ open	no rain
action: open	1	0	1
action: keep closed	0	1	0

Resisting imperatives

Best move set in this context:

$$Q_G = \left\{ \begin{array}{l} \{w \mid \text{rain, A prefers open in } w\} \cup \{w \mid \text{no rain in } w\}, \\ \{w \mid \text{no rain, A prefers } \neg\text{open in } w\} \end{array} \right\}$$

- The 'what if' poses the question: supposing it is raining, what are your preferences? Set of alternatives for the best move is non-singleton.
- N.b. this scenario assumes enough authority that B adopts A's preferences, leading to action.

Suggestion responses

(67) A: Who should we invite?
B: What if we invite Joanna?

- Suppose that the core goal(/decision problem) is defined by the following utilities:

	state: good talk	state: bad talk
action: invite Alfonso	1	-1
action: invite Joanna	1	-1

Suggestion responses

(67) A: Who should we invite?
B: What if we invite Joanna?

- Suppose that the core goal(/decision problem) is defined by the following utilities:

	state: good talk	state: bad talk
action: invite Alfonso	1	-1
action: invite Joanna	1	-1

- 'Who should we invite' is a subquestion relative to the best move set for this goal.
- To resolve this decision problem under B's supposition, one needs information about whether we are in worlds where Joanna gives a good talk or worlds where she gives a bad talk.

Suggestion responses

Summary:

- Suggestive 'what if's would be trivial under a purely interrogative goal.
- They are appropriate to the extent that agents can infer a salient non-pure decision problem (/entriched goal structure) which would lead to non-triviality under supposition.

Final proposal

(68) Let the topic stack Q_c now be a stack of goal structures.

(69) Questioning by default pushes interrogative goals constructed from the content of an interrogative clause. Enrich with salient non-linguistic moves, depending on question type. ⌊This is a promissory note.⌋

(70) Reminder: $Q_{top(Q_c)}$ now stands for the best move set relative to context c.

(71) Current QUDs: where c is a context,

$$CQUD(c) = \begin{cases} \bigcap\{matter(cs_c \cap v_c) \oslash p \mid p \in Q_{top(Q_c)}\} & \text{if } |Q_c| \geq 1 \\ inq(cs_c \cap v_c) & otherwise \end{cases}$$

Paraphrase: all the ways of positively and negatively resolving the best move set for the current topic.

Conclusions

Main points

1. 'What if's are purely suppositional questions.
2. New analysis of 'what if's without a 're-asking' component. Crucial to separate discourse topic from the QUD in a specific context.

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3. Support for a suppositional analysis of conditionals: there is no consequent.

Main points

1. ‘What if’s are purely suppositional questions.
2. New analysis of ‘what if’s without a ‘re-asking’ component. Crucial to separate discourse topic from the QUD in a specific context.
3. Support for a suppositional analysis of conditionals: there is no consequent.
4. To account for the full range of cases, need to generalize regular informational QUD to encompass joint actions / information states.

Future work

- Further licensing constraints on ‘what if’ responses: (I claim) follow from interaction of other felicity conditions.
- Many more details of this notion of goal structure remain to be worked out!
- Other morphology that interacts with decision problems? (Davis 2009, ...)
- ‘What about’s:

  (72) A: Who should we invite?

  B: What about Joanna?
- Other discourse conditionals: ‘and if’, ‘even if’, ...

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Extra slide: biscuit ‘what if’s?

(73) A: What if I’m hungry?
B: There’s pizza in the fridge.

(74) A: What if they ask how old I am?
B: You’re 19.

The ‘normal’ biscuit conditional antecedents license non-subordinate answers for ‘what if’ questions. (Franke’s ‘intelligibility’ biscuit antecedents don’t tend to work.)

Extra slide: generalizing the view

More general would be to have a stack of context sets. Closer to Isaacs & Rawlins 2008, with a cleaner treatment of questions.

(75) Let a context c be $\langle CS_c, Q_c \rangle$ where CS_c is a stack of sets of worlds, never empty.

(76) $c + \ulcorner \text{Assume}(\phi) \urcorner = \langle \text{push}(CS_c, top(CS_c) \cap [\![\phi]\!]), Q_c \rangle$

(77) $c + \ulcorner \text{pop} \urcorner = \langle pop(CS_c), Q_c \rangle$, requires $|CS_C| > 1$

(78) Instead of $\oplus$ use $\boxplus$:

$$CS_c \boxplus_v \ulcorner \phi \urcorner = \begin{cases} \langle\rangle & \text{if } |CS_c| = 0 \\ \langle top(CS_c) \oplus_v \ulcorner \phi \urcorner, pop(CS_c) \boxplus_v (\ulcorner \phi \urcorner) \rangle & \text{otherwise} \end{cases}$$

(Use the top of the stack as a view for updating everything.)

Otherwise, use $top(CS_c)$ where previous defs use v_c or cs_c.

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