Krifka (2011): Questions

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Overview

1. The functional approach
2. The proposition set approach
3. The partitional approach
4. Inquisitive semantics

The functional approach

Essence

- Questions are incomplete/open propositions
- Functions from the missing piece of the proposition to the whole proposition
- 'Suggestive' of wh-movement

Constituent question radicals

(1) *Which novel Bill read*

a. $\lambda x \in \text{NOVEL}[\text{READ}(x)(\text{BILL})]$ extensional

b. $\lambda i.\lambda x \in \text{NOVEL}_i[\text{READ}_i(x)(\text{BILL})]$ intensional

(2) *When Bill read 'War and Peace'*

a. $\lambda i_1.\lambda R \in \text{TEMPORAL SPECIFICATION}_{i1}$
$[R(\lambda i_2[\text{READ}_{i2}(w\&p)(\text{BILL}))])(i_1)]$

(3) *Who read what*

a. $\lambda i.\lambda x \in \text{PERSON}_i.\lambda y \in \text{NOVEL}_i\ [\text{READ}_i(y)(x)]$

Alternative question radicals

(4) *Whether Bill read 'War and Peace' or 'Anna Karenina'*
$\lambda i \lambda x \in \{\text{W\&P}, \text{AK}\}\ [\text{READ}_i(x)(\text{BILL})]$

Polarity question radicals

(5) *Whether Bill read 'War and Peace'*
$\lambda i \lambda f \in \{\lambda t.t, \lambda t.\neg t\}\ [f(\text{READ}_i(\text{W\&P})(\text{BILL}))]$

- The 'radicals' can be grown into full-blown questions
- with the help of the questions operator (QUEST)

(6) QUEST(radical)

- Request the addressee to specify the value-range of the indicated function, i.e., for which arguments the value is Truth.

(7) Which novels by Tolstoy did Bill read?
QUEST(λi.λx$\in$NOVELS BY TOLSTOY$_i$ [READ$_i$(x)(BILL)])

Answerhood

- **Term/fragment answers** are arguments for the question radicals, which are functions

(8) *Which book did Bill read?*
QUEST(λi.λx$\in$BOOK [READ$_i$(x)(BILL)])

(9) *'War and Peace.'*
ANSW(λi.W&P)

(10) Applying question radical Q to answer radical A
λi[Q(i)A(i)]:
λi[λx$\in$BOOK$_i$ [READ$_i$(x)(BILL)](W&P)]
= λi[READ$_i$(W&P)(BILL)]

- **Non-elliptical, propositional answers** are related to the questions more indirectly, facilitated by the focus feature of the answer
- A propositional answer is partitioned into the focus part and the background part

  (11) *Bill read* [$_F$ *'War and Peace'*]
  ASSERT(λi.λx[$\textsc{read}_i$(x)($\textsc{bill}$], $\textsc{w\&p}$)

- The background part corresponds to the question radical meaning; the focus part correspond to the term answer
- Redefining answerhood: Congruence
- An answer is congruent iff (a) for every index i, Q(i) $\subseteq$ B(i), and (b) Q(i)(F) is defined.

Embedded questions

(12) *John knows which book Bill read.*
$\textsc{know}(\lambda i.\lambda x{\in}\textsc{book}_i[\textsc{read}_i(\textsc{w\&p})(\textsc{bill})])(\textsc{john})$
"John knows for each x in the domain of the function whether its value is Truth or Falsity"

Exhaustivity

(13) $\textsc{know}_{i0}(Q)(x)$ iff

a. $\forall y[Q(i_0)(y) \rightarrow \textsc{know}_{i0}(\lambda i[[Q(i)(y)](x)]]$ exhaustive

b. $\exists y[Q(i_0)(y) \wedge \textsc{know}_{i0}(\lambda i[[Q(i)(y)](x)]]$ non-exhaustive

Strengths

- Fine-grained
  - Distinguish between polar questions and *or not*-alternative quetions
  - specifies the different contributions of different parts of a question.
    - A wh-phrase forms the domain of the function, the rest specifies the value of its argument
- Can be used to derive the proposition set representation

Shortcomings

- Non-uniformity of logical types
  - Constituent questions are of the type $< e, st >$
  - Polar questions are of the type $<< st, st >, st >$
  - Conjoining two kinds of questions is possible

    (14) *Mary knows what Bill read and whether he fell asleep.*

Potential solution:

- Lifted Boolean operators

The proposition set approach

Essence

- Questions are sets of propositions that are answers to them
- 'Suggestive' of wh-in situ

Constituent questions

(15) *Who read 'War and Peace'*

a. $\{\lambda i[\textsc{read}_i((\textsc{w}\&\textsc{p})(x)] \mid x \in \textsc{person}\}$

b. $\lambda p \exists x[p = \lambda i[\textsc{person}_i(x) \wedge \textsc{read}_i(\textsc{w}\&\textsc{p})(x)]]$

Alternative questions

(16) *Whether Bill read 'War and Peace' or 'Anna Karenina'*
$\{\lambda i[\textsc{read}_i(x)(\textsc{bill})] \mid x{=}\textsc{w\&p} \vee x{=}\textsc{ak}\}$

Polar questions

(17) *Whether Bill read 'War and Peace'*
$\{\lambda i[\textsc{read}_i(\textsc{w\&p})(\textsc{bill})], \lambda i\neg[\textsc{read}_i(\textsc{w\&p})(\textsc{bill})]\}$

Answerhood

- Full answers are members of the proposition sets of questions
- Elliptical answers can be modeled as the remnants of full answers with deletion
- Focus can be modeled using alternative semantics

(18) *Bill read* [*'War and Peace'*]$_F$
Meaning: $\lambda i[\text{READ}_i(\text{W\&P})(\text{BILL})]$
Alternatives: $\{\lambda i[\text{READ}_i(x)(\text{BILL})] \mid x \in \text{ALT}(\text{W\&P})\}$

- An answer is congruent iff Q $\subseteq$ A, where Q is the question meaning and A the set of alternatives to the focus of the answer.

Embedded questions

- Question embedding *know* is reducible to proposition-embedding *know*.

(19) *Mary knows which novel by Tolstoy Bill read.*
$\textsc{know}_{i0}(\{\lambda i[\textsc{read}_{i0}(x)(\textsc{bill})] \mid x \in \textsc{book by tolstoy}\})(\textsc{Mary})$

(20) $\forall p \in \{\lambda i[\textsc{read}_{i0}(x)(\textsc{bill})] \mid x \in \textsc{book by tolstoy}\}[p(i_0) \rightarrow \textsc{know}_i(p)(\textsc{mary})]$

Strengths

- Uniformity of types—constituent questions and polarity questions are of the same type and conjunction can be done without too much trouble.
- Though conjunctive *and* has to be treated as set union rather than intersection.

(21) *Mary knows what Bill read and whether he fell asleep.*
$\textsc{know}_{i0}(\{\lambda i[\textsc{read}_i(x)(\textsc{bill})] \mid x \in \textsc{thing}\} \cup \{\lambda i[\textsc{fell asleep}_i(\textsc{bill})], \lambda i \neg [\textsc{fell asleep}_i(\textsc{bill})]\})(\textsc{mary})$

Connecting the functional approach and the proposition set approach

- A functional representation can be turned into a proposition set representation but not the other way round.
- If F is a FR of a question, then $\{F(X) | X \in DOMAIN(F)\}$ is its PSR.

Shortcomings

- Short answers (*yes*, *no*) to polarity questions cannot be captured directly. (Remnant analysis is required?)
- Cannot distinguish between polarity questions and *or not*-alternative questions.
- Q $\subseteq$ A is too weak to rule out over focusing

(22) *Who ate beans?*
Mary$_F$ *ate rice*$_F$

The partitional approach

Three steps to the partitional theory

- Functional representation (FR)
- Equivalence relation (ER)
- Partition

(23) *Which novel Bill read*

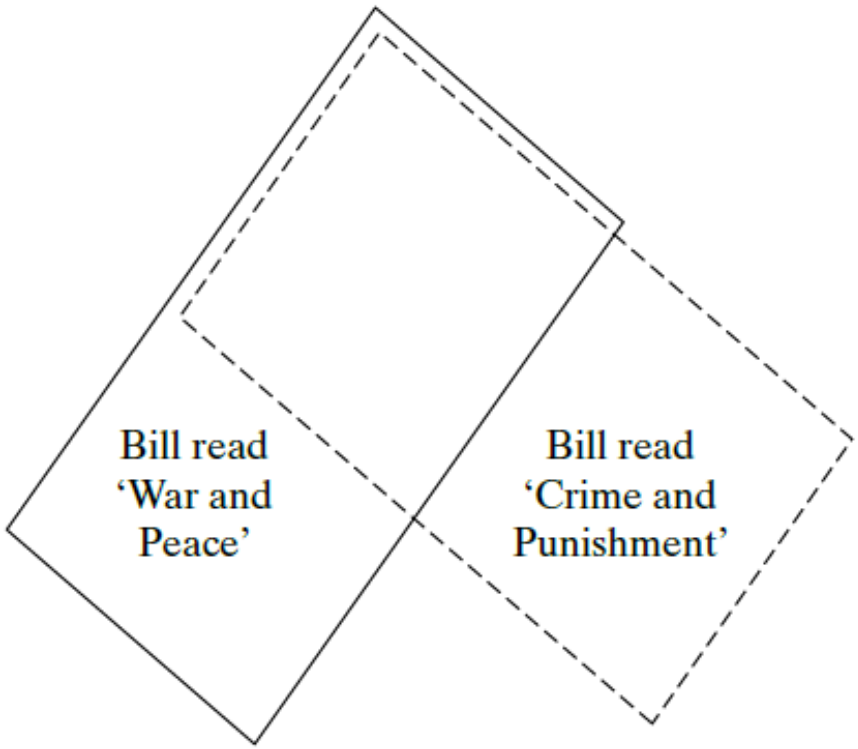
a. $\lambda i.\lambda x[\textsc{novel}_i(x) \wedge \textsc{read}_i(x)(\textsc{bill})]$ FR

b. $\lambda j.\lambda i[FR(i) = FR(j)]$ ER
$= \lambda j.\lambda i[\lambda x[\textsc{novel}_i(x) \wedge \textsc{read}_i(x)(\textsc{bill})] = \lambda x[\textsc{novel}_j(x) \wedge \textsc{read}_j(x)(\textsc{bill})]]$

c. $\{p \mid \forall i \forall j[i,j \in p \text{ iff } ER(j)(i)]\}$ Partition

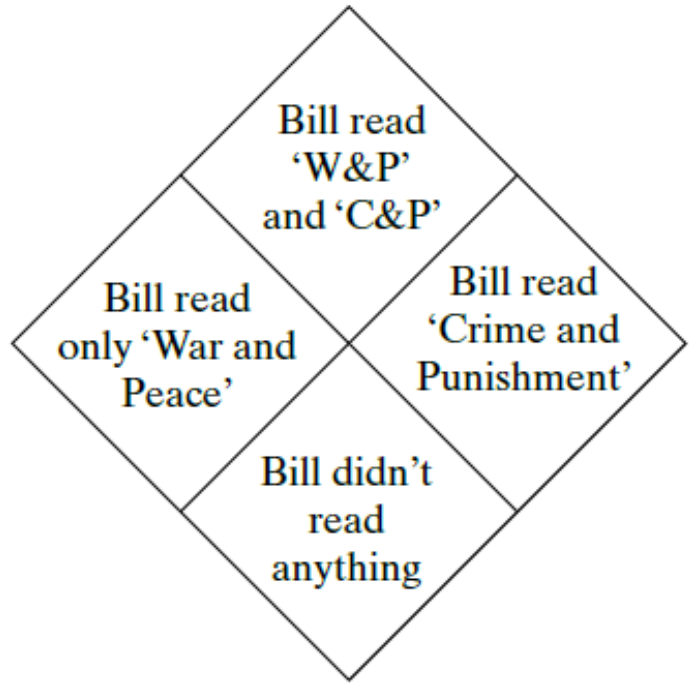
Assuming that there are two books W&P and C&P, *Which book did Bill read* can be represented in the following ways...

Proposition set theory



- 2 propositions
- Overlapping
- Not exhausting all indices

Partitional theory



- 4 propositions
- Non-overlapping
- Exhausting all indices

Answerhood

- Exhaustive answers are the default, facilitated by a covert ‘only’
- Focus indicates where exhaustification has to be applied.
- Negative answers are congruent answers

Embedded questions

- Question-embedding predicates like *know* apply to the extension of a question meaning

  (24) *Mary knows who came.*
  $\textsc{know}_{i0}(\lambda j.\lambda i[\lambda x[\textsc{came}_i(x)] = \lambda x[\textsc{came}_j(x)]](i_0))(\textsc{mary})$
  $= \textsc{know}_{i0}(\lambda i[\lambda x[\textsc{came}_i(x)] = \lambda x[\textsc{came}_{i0}(x)]](\textsc{mary})$
  "Mary knows in which cell of the partition the real world i_0 is"

- Question-embedding predicates like *wonder* apply to the intension of a question meaning

  (25) *Mary wonders who came.*
  $\textsc{wonder}_{i0}(\lambda j.\lambda i[\lambda x[\textsc{came}_i(x)] = \lambda x[\textsc{came}_j(x)]](\textsc{mary})$
  "Mary would like to know in which cell of the partition the real world i_0 is"

- intensional questions and extensional questions are of different types

Strength: Uniformity of types

- Constituent questions and polar questions are of the same type.
- *and* can be treated as a Boolean intersective operator when conjoining two different kinds of questions

(26) *Mary knows who came and whether John left.*

B & M came.
B came.
M came.
Nobody came.

$\cap$

J left.	J did not leave.

$=$

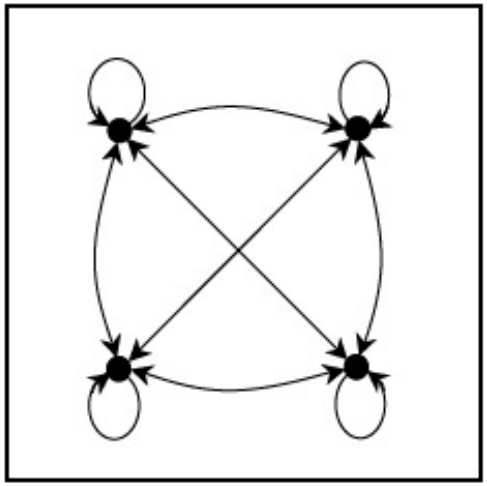
B & M came and J left.	B & M came and J did not leave.
B came and J left.	B came and J did not leave.
M came and J left.	M came and J did not leave.
Nobody came and J left.	Nobody came and J did not leave.

Shortcomings

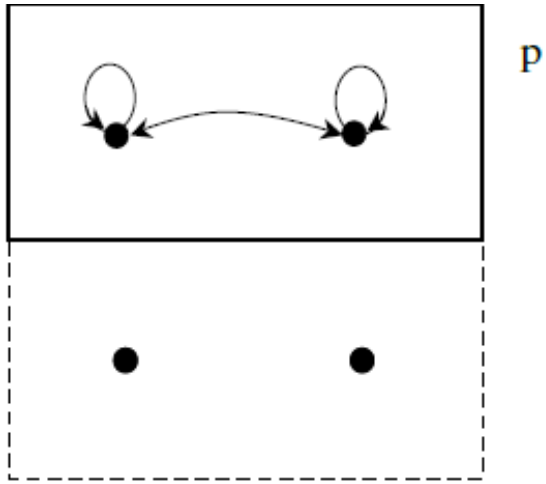
- Under-generate non-exhaustive answers
- Not distinguishing Polarity-Qs and *or not*-Alt-Qs.

Inquisitive semantics

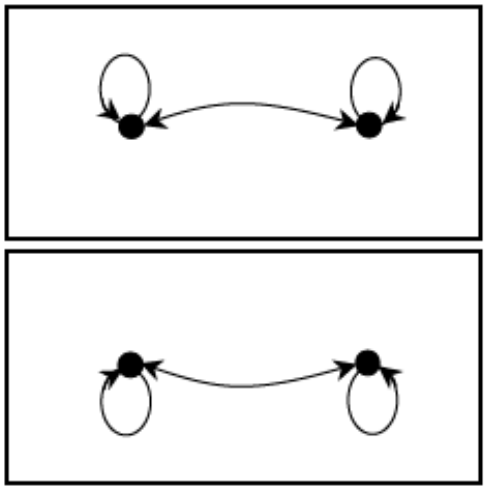
- Inquisitive Semantics assumes relations between indices that are reflexive and symmetric, but not necessarily transitive.
- Indices in this relation form an information state (state, s)

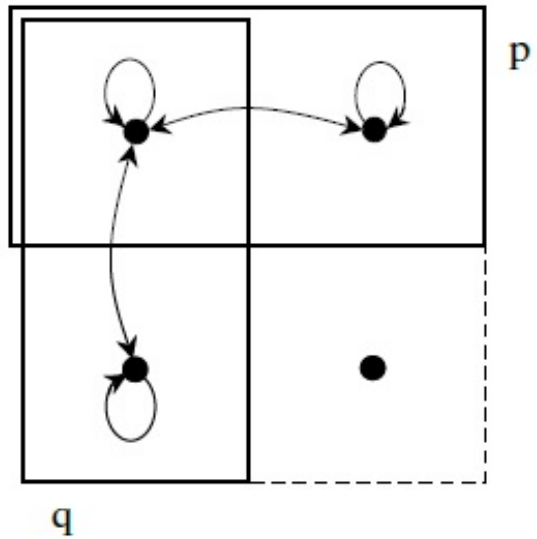


- s_0: Ignorance state
- None of the indices are distinguished



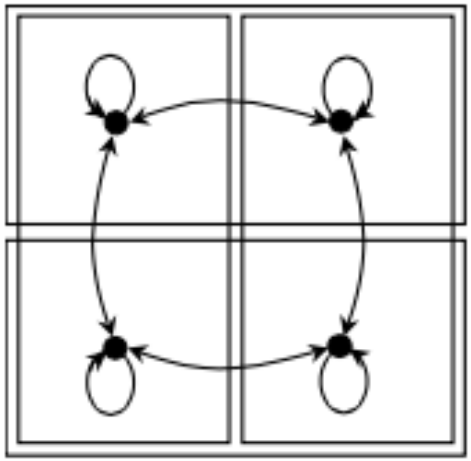
- $s_1 = s_0[p]$ ($p =$ *It's raining.*)
- Informative ($S_1 \subset S_0$)
- Indifferent
- Transitive



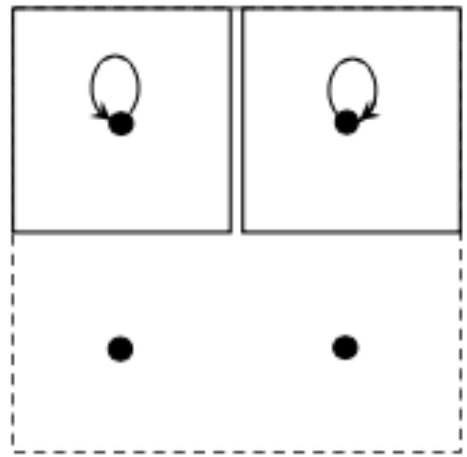


- $s_2 = s_0[?p]$ ($?p$ = *Is it raining?*)
- Not indifferent
- Transitive

- $s_3 = s_0\ [p \vee q]$ ($p \vee q$ = *Is it raining or snowing?*)
- Not indifferent
- Not transitive



- $s_4 = s_0[?p \wedge ?q]$
- John knows whether it is raining and whether the newspaper will be delivered.



- $s_5 = s_0[p \wedge ?q]$
- John knows that it is raining and whether the newspaper will be delivered.

The End