Remarks on Questions and Disjunction

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1. **Remarks on Certain Embedded Questions**
2. **Remarks on Type Shifting Boolean Disjunction**

1. Remarks on certain embedded questions

Factives

John knows who Mary invited.

John is surprised [at] who Mary invited.

John knows that Mary invited Sue and Harry.

John is that Mary invited Sue and Harry.

Pure vs. emotive factives

John knows whether Mary invited Sue and Harry.

*John is surprised whether Mary invited Sue and Harry.

John knows whether Mary invited Sue or Harry.

[disjunctive & alternative reading]

*Mary was surprised [at] whether Mary invited Sue or Harry.

[neither reading]

Standard solution (Grimshaw 1979)

The *wh*-complements of emotive factives [*surprise, amaze, disappoint,…*] are exclamatives, not interrogatives.

Objection (Lahiri 1991)

Who came to the party is not an exclamative (matrix). Neither is: *Which men love which women.*

AND YET:

It is a amazing which men love which women

is fine.

Alternative solution

The *wh*-complements of emotive factives [*surprise amaze, disappoint,…*] are sub-interrogatives (λ-abstracts) denoting properties

(… as in "naïve" question semantics à la Cresswell 1973).

Problems

- Emotive factives would have to be type-polymorphic.
- The connection to their proposition-embedding uses would be lost. [Romero, p.c.]

Type-polymorphism in *wh*-clauses

has a respectable tradition

… from Groenendijk & Stokhof (1982) …

to Kotek (2015) …

though not in the lexicon.

4 ways of reducing sub-interrogative *surprise* [of type (*s*(e^n*t*))(*et*)] to propositional *surprise* [Σ of type (*st*)(*et*)]:

$\lambda i.\, \lambda R.\, \lambda x.\, \ldots$

weak: $\ldots\ (\exists \vec{y})\ [R_i(\vec{y}) \wedge \Sigma_i(x, \lambda j.\, R_j(\vec{y}))]$

intermediate: $\ldots\ \Sigma_i(x, \lambda j.\, (\forall \vec{y})\ [R_i(\vec{y}) \rightarrow R_j(\vec{y})])$

strong: $\ldots\ \Sigma_i(x, \lambda j.\, (\forall \vec{y})\ [R_i(\vec{y}) \leftrightarrow R_j(\vec{y})])$

epistemic:

$\ldots\ \Sigma_i(x, \lambda j.\, (\forall \vec{y})\ [\mathrm{K}_i(x, \lambda k.\, R_k(\vec{y})) \rightarrow R_j(\vec{y})])$

Coordination problem (G&St 1982)

Mary was surprised how many people showed up and that John did not.

Solution (in the spirit of Ginzburg 1995)

Shift abstract to proposition before coordinating with right conjunct.

$$R \quad \longmapsto \lambda j.\, (\forall \vec{y})\, [\mathrm{K}_i(x, \lambda k.\, R_k(\vec{y})) \rightarrow R_j(\vec{y})])$$

$$\boldsymbol{e^n t} \longmapsto \boldsymbol{st}$$ (*epistemic version*)

As a consequence, the polymorphism is dumped on the coercion operator!

2. Remarks on Type Shifting Boolean Disjunction

Varieties of *and*:

- Boolean conjunction [$\wedge$] *teacher and friend*
- Group formation [$\oplus$] *John and Mary*
- Addition [+] *One and one*
- Dynamic conjunction [;] *A man bought a fish and he ate it*

Varieties of *or*:

- Boolean disjunction [$\vee$] *girlfriend or wife*
- Free choice [?] *You may eat an apple or* ***you may*** *eat a pear*
- Alternative [?] *Are you hungry or not?*
- ~~Dynamic disjunction~~ *A man bought a fish or he ate it*

Types in dynamic semantics

Indefinites as variables

A farmer owns a donkey

$$(\exists x)\ (\exists y)\ [F(x) \wedge \mathrm{D}(y) \wedge \mathrm{O}(x,y)]$$

$$[F(x) \wedge \mathrm{D}(y) \wedge \mathrm{O}(x,y)]$$

≈ Sentences as predicates

$$[\![\varphi]\!] \subseteq U^n$$

$$\underbrace{U \times \ldots \times U}_{n\text{–}mal}$$

Pardon my German

$$B^A = \{f \subseteq (A \times B) \mid f\colon A \text{–>} B\}$$

$$n = \{m \in \omega \mid m < n\} = \{0, \ldots, n\}$$

$$\{f \subseteq (n \times U) \mid f\colon n \text{–>} U\}$$

$$U^n \cong \{f \subseteq (\mathrm{X} \times U) \mid f\colon \mathrm{X} \text{–>} U\} \Leftrightarrow |\mathrm{X}| = n$$

$$[F(x) \wedge \mathrm{D}(y) \wedge \mathrm{O}(x,y)]$$

$\approx$

$$\lambda x.\, \lambda y.\, [F(x) \wedge \mathrm{D}(y) \wedge \mathrm{O}(x,y)]$$

$\boldsymbol{e(et)}$

Cf. Zimmermann (1993)

$$[(\mathrm{F} \times \mathrm{D}) \cap \mathrm{O}]$$

Dynamic conjunction …

A farmer owns a donkey. He beats it

$$[F(x) \wedge D(y) \wedge O(x,y) \wedge B(x,y)]$$

≈

$$\lambda x.\ \lambda y.\ [F(x) \wedge D(y) \wedge O(x,y) \wedge B(x,y)]$$

$$[\ \underbrace{(F \times D) \cap O}_{\text{A farmer owns a donkey}}\ \underbrace{\cap}_{\text{[AND]}}\ \underbrace{B}_{\text{He beats it}}\ ]$$

… as intersection

Dynamic conjunction …

$$[F(x) \wedge D(y) \wedge O(x,y) \wedge B(u,v) \wedge u = x \wedge v = y]$$

$$[[\underbrace{(F \times D) \cap O}_{\textit{A farmer owns a donkey}} \; \underbrace{\times}_{[AND]} \; \underbrace{B}_{\textit{He beats it}}] \cap C]$$

… as Cartesian production

Type-shifting binary connectives

Standard:

$$f \quad \mapsto \lambda P.\ \lambda Q.\ \lambda x. f(P(x), Q(x))$$

$$\boldsymbol{t(tt)} \mapsto \boldsymbol{et} \quad \boldsymbol{et} \quad \boldsymbol{e} \quad \boldsymbol{t}$$

Cf. van Benthem (1995)

$$f \quad \mapsto \lambda R.\ \lambda S.\ \lambda \vec{x}. f(R(\vec{x}), S(\vec{x}))$$

$$\boldsymbol{t(tt)} \mapsto \boldsymbol{e}^n\boldsymbol{t} \quad \boldsymbol{e}^n\boldsymbol{t} \quad \boldsymbol{e}^n\boldsymbol{t}$$

Alternative:

$$f \quad \mapsto \lambda R.\ \lambda S.\ \lambda \vec{x}. \lambda \vec{y}.\ f(R(\vec{x}), S(\vec{y}))$$

$$\boldsymbol{t(tt)} \mapsto \boldsymbol{e}^n\boldsymbol{t} \quad \boldsymbol{e}^m\boldsymbol{t} \quad \boldsymbol{e}^n \quad \boldsymbol{e}^m \quad \boldsymbol{t}$$

Type-shifting Boolean conjunction

Intersection:

$$\wedge \quad \mapsto \lambda P.\ \lambda Q.\ [P(x) \wedge Q(x)]$$

$$\boldsymbol{t(tt)} \mapsto \boldsymbol{et \quad et \quad t}$$

Quine (1960)

Product formation:

$$\wedge \quad \mapsto \lambda R.\ \lambda S.\ \lambda \vec{x}.\ \lambda \vec{y}.\ [P(\vec{x}) \wedge Q(\vec{y})]$$

$$\boldsymbol{t(tt)} \mapsto \boldsymbol{e^{n}t \quad e^{m}t \quad e^{n} \quad e^{m} \quad t}$$

… vs. Bernays (1957)

$$\wedge^{d} = \lambda R.\ \lambda S.\ \lambda \vec{x}.\ \lambda \vec{y}.\ [P(\vec{x}) \wedge Q(\vec{y})]$$

Q: If dynamic conjunction is product formation, what would dynamic disjunction be?

A:

$$\vee \quad \mapsto \lambda R.\ \lambda S.\ \lambda \vec{x}.\ \lambda \vec{y}.\,[P(\vec{x}) \vee Q(\vec{y})]$$

$$\boldsymbol{t(tt)} \quad \mapsto \boldsymbol{e^{n}t \quad e^{m}t \ e^{n} \quad e^{m} \quad t}$$

$$\vee^{d} = \lambda R.\ \lambda S.\ \lambda \vec{x}.\ \lambda \vec{y}.\,[P(\vec{x}) \vee Q(\vec{y})]$$

Comparing dynamic conjunction and disjunction

$\wedge^+$ is …

- injective as a function with domain $e^n t$
- injective as a function with domain $e^n \times e^m$
- if restricted to non-empty sets

$\vee^+$ is …

- injective as a function with domain $e^n t$
- injective as a function with domain $e^n \times e^m$
- if restricted to non-trivial sets

Comparing dynamic conjunction and disjunction

$\wedge^{+}$ is …

- injective as a function with domain $e^{n}t$
- injective as a function with domain $e^{n} \times e^{m}$
- if restricted to non-empty sets

$\vee^{+}$ is …

- injective as a function with domain $e^{n}t$
- injective as a function with domain $e^{n} \times e^{m}$
- if restricted to non-trivial sets

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