Ordering in Disjunctive Statements: Brackets and Disjunctions

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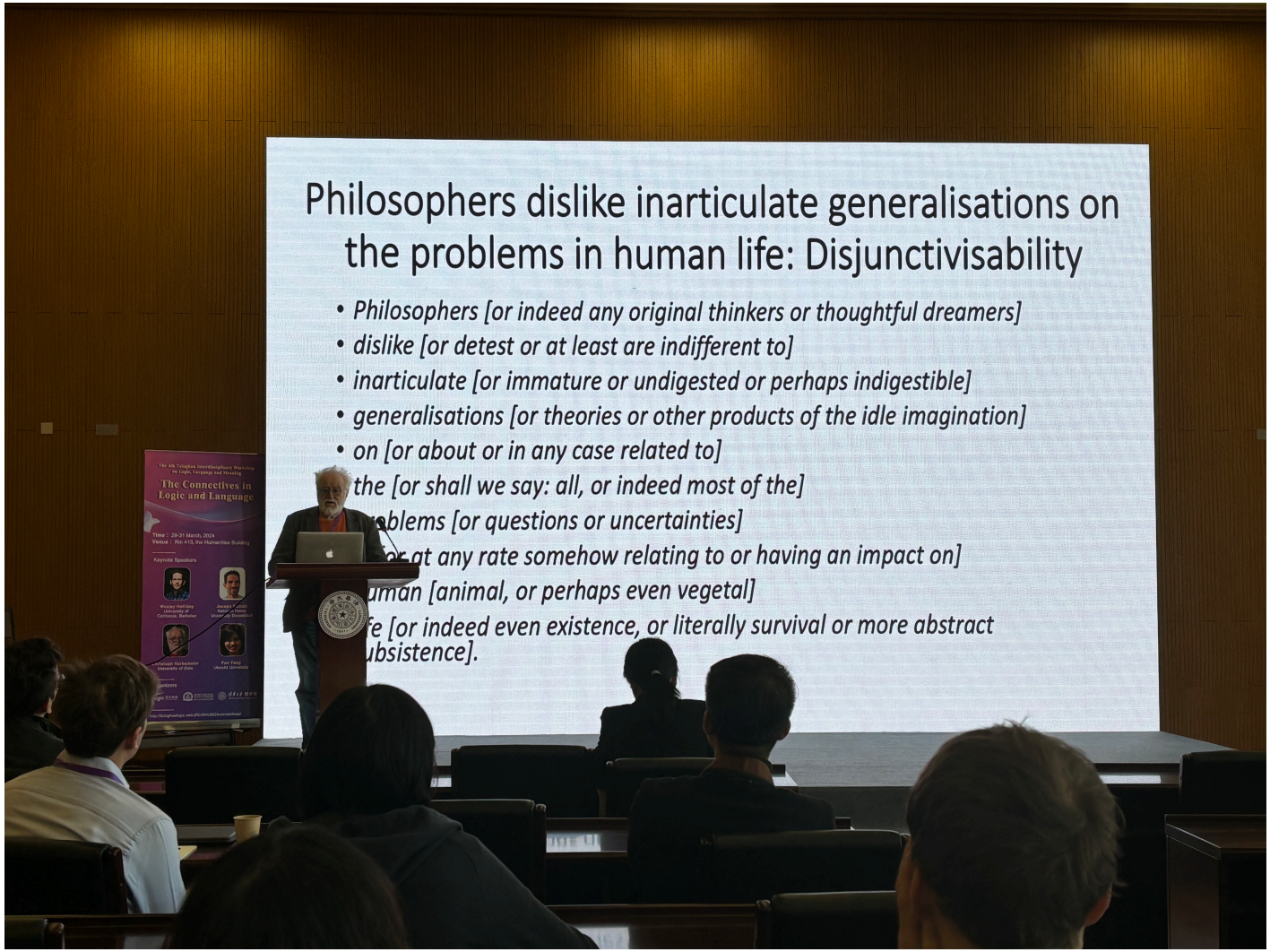


Figure: shot on 2024.03.30

Outline

Ordered reading of disjunctive statements

Ordered reading of ‘or’

(1) This room is for studying or socializing.

- Standard boolean interpretation

Ordered reading of ‘or’

(2) This room is for studying or socializing.

- Standard boolean interpretation
- Ordered interpretation

Ordered reading of disjunctive statements

This is a course description for a seminar course.

(3) This course is for graduate students or high-level undergraduate students.

Ordered reading of disjunctive statements

In China, students are more familiar with Chinese-style names. And now Prof. Westerståhl is in China.

(4) He is called as 魏达格 or Dag.

Question: In what case, the ordered reading of disjunctive statements can be explicit?

Ordered reading of disjunctive statements

Question: In what case, the ordered reading of disjunctive statements can be explicit?

Answer: When we apply brackets to a disjunctive statement.

(5) This room is for studying (or socializing).

(6) This course is for graduate students (or high-level undergraduate students).

(7) He is called as 魏达格 (or Dag).

We observed that the 'either... or...' structure and 'between ... or ...' structure cannot have an ordering interpretation.

(8) You can choose **between tea or coffee** for breakfast.

(9) Please select **either the blue or red shirt**.

Grounds for ordered interpretation of disjunctions

Syntactic role of parentheses

- The key characteristic of parentheses is **disruption**.
- Discourse function
- the notion of *Phatic* (Schneider 2015): Denoting or relating to language used for general purposes of social interaction, rather than to convey information or ask questions.
- Phatic signals serve to attract the attention of the interlocutor or to confirm his continued attention. (Jakobson 1981)

Comparison: *'a little pause'-or* VS *Bracketed-or*

(10) I can chair the conference 'a little pause' or Ms. Zhu can.

(11) You should take a jacket 'a little pause' or jumper.

⇒ The ordering is not fixed.

$$F \times G \stackrel{\text{def}}{=} F \vee (\neg F \wedge G) \text{ (Cabalar 2010)}$$

Our ordered interpretation is different from the *Ordered Disjunction operation* $\times$ developed by (Brewka et al. 2004), as in the following:

BUT... this cannot capture what we have observed.

- ~~Alternative reading~~, but Suggestive/Preference reading.
- e.g. This room is for studying (or socializing).

Characteristics of A (or B)

As observed, the disjunct outside the brackets shown to be more desirable to the speaker, while that within the brackets is additional and less desirable. This suggests an ordering between disjuncts. Thus, there is no commutative rule for *bracketed-or*.

(12) I will take a subway (or walk) to the campus in winter.

$\not\Leftrightarrow$ I will walk (or take a subway) to the campus in winter.

- $A(\vee B) \not\Leftrightarrow B(\vee A)$.

Disjunctive statements that involves intentional violation of the condition for rhetorical effect.(Simons 2001)

(13) (a) It will rain or it will pour. (Simons 2001)

(b) # It will rain (or it will pour).

- FC principle ($\Box$-FC)
  - For disjunctive statements :
    $\Box(A \vee B) \Rightarrow \Diamond A \wedge \Diamond B$.

(14) You must finish all the sample tests or take the final test.

$\Rightarrow$ You can finish all the sample tests, and you take the final test.

(15) To cure cancer, you ought to take surgery (or take some medicine).

⇒ You ought to take surgery, and you can also take some medicine.

(16) You should take a topic from the list (or write a proposal on your own topic).

⇒ You should take a topic from the list, and you can write a proposal on your own topic.

- FC with brackets
  - For disjunctive statements with brackets: $\Box(A(\vee B)) \Rightarrow \Box A \wedge \Diamond B$.

A formal semantics for bracketed disjunction based on BSML

Bilateral State-Based Modal Logic (BSML, Aloni 2022; Anttila et al. 2022) proposes *neglecting-zero* effects to account for free choice inferences and other pragmatic inferences triggered by disjunctive statements.
In BSML, free choice inferences can be derived **only** for pragmatically enriched formulas:

$$[\Diamond(\phi \vee \psi)]^{+} \vDash \Diamond\phi \wedge \Diamond\psi$$

- $\vee$: $\mathcal{M}, s \vDash \phi \vee \psi$ iff *there are* $t, t' : t \cup t' = s$ and $\mathcal{M}, t \vDash \phi$ and $\mathcal{M}, t' \vDash \psi$.
- $[\cdot]^{+}$: e.g. $[p]^{+} = p \wedge \mathtt{NE}$
- $\mathtt{NE}$: $\mathcal{M}, s \vDash \mathtt{NE}$ iff $s \neq \varnothing$

Ordering in BSML model

Betterness relations (van Benthem & Liu 2006)

$\preceq$ is a reflexive and transitive relation (the 'betterness' pre-order) over possible worlds.

For every possible worlds w_1 and w_2, $w_1 \preceq w_2$ can be read as 'w_2 is at least as good as w_1'. In addition, if $w_1 \preceq w_2$ but not $w_2 \preceq w_1$, then w_2 is strictly better than w_1, written as $w_1 \prec w_2$.

State-based constraints on $\preceq$

- An accessibility relation R is state-based in $(\mathcal{M}, s)$ iff $\forall w \in s : R[w] = s$
- $\preceq$ is state-based in $(\mathcal{M}, s)$ iff $\forall w, v \in s : w \preceq v$ or $v \preceq w$

Semantics for *Bracketed-or*

- Bracketed-or: $\phi \,(\!(\vee)\!)\, \psi$, which read as "$\phi$ (or ψ)".

- $\mathcal{M}, s \vDash \phi \,(\!(\vee)\!)\, \psi$ iff $\mathcal{M}, s \vDash \phi$ and there is a subset $s' \subset s$: $\forall\, v \in s'$, $\forall\, w \in s \setminus s'$, $v \prec w$, s.t. $s' \vDash \psi$.

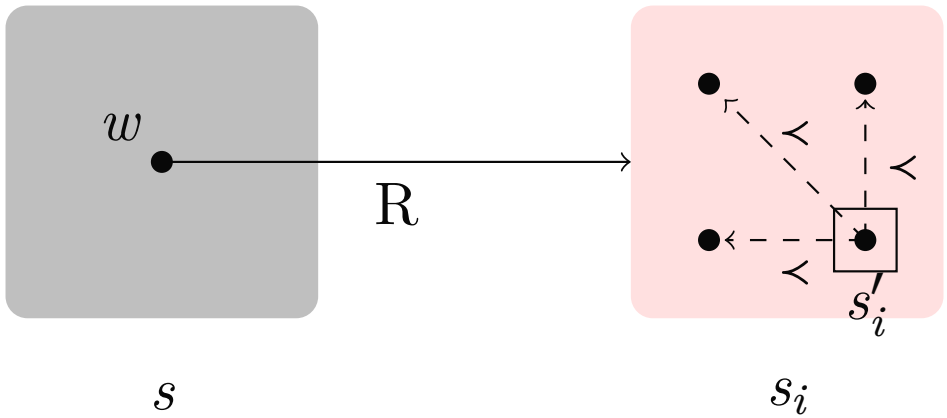
- $\mathcal{M}, s \nvDash \phi \,(\!(\vee)\!)\, \psi$ iff $\mathcal{M}, s \nvDash \phi$ and $s \nvDash \psi$

Application: free choice with *Bracketed-or*

- Pragmatic enrichment of $\phi \,(\!(\vee)\!)\, \psi$:

$$[\phi \,(\!(\vee)\!)\, \psi]^+ = ([\phi]^+ \,(\!(\vee)\!)\, [\psi]^+) \wedge \texttt{NE}$$

- $[\Box(\phi \,(\!(\vee)\!)\, \psi)]^+ \vDash \Box\phi \wedge \Diamond\psi$
  where $\Box$ is a deontic operator.



Summary & Future work

Summary

- Ordered reading of disjunctive statements
- Grounds for ordered interpretation of disjunctions
  - Syntactic role of parentheses
  - Usages of brackets
  - Compared with *Ordered Disjunction* under the answer set semantics
- Characteristics of *Bracketed-or*
  - Uncommutable
  - $A(orA)$ does not hold.
  - A special free choice: $\Box(A(\vee B)) \Rightarrow \Box A \wedge \Diamond B$
- A formal semantics for bracketed disjunction based on BSML

Future Work

- How to formalize the other direction of ordered interpretation between disjunctive statements.
  - As we mentioned earlier in the talk, the effect of *'a little pause'-or* is different from the effect of *Bracketed-or*.
  - e.g. I can chair the conference 'a little pause' or Ms. Zhu can.
- What about '*Bracketed-and*'
  - e.g. 'The Ups and Downs of Ignorance (and Distributivity)'