Disjunctive Mention-all Answers

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1. Introduction

- ◇-questions admit both mention-some (MS) and mention-all (MA) answers (Groenendijk & Stokhof 1984). In particular, the MA answer can take either a conjunctive form or a disjunctive form.

1.1 Where can we get gas?

\(w: \text{there are only two accessible stations, A and B.}\)

a. Station A. MS

b. Station A and Station B. Conjunctive MA

c. Station A or Station B. Disjunctive MA

In absence of can, or if the wh-complement is singular, a disjunctive answer can only be a partial answer.

1.2 At which station can we get gas?

Station A or station B. (I don’t know which one exactly) Partial only

1.3 Where did John get gas?

Station A or station B. (I don’t know which one exactly) Partial only

- **Goal:** to derive disjunctive MA answers in ◇-questions via a novel exhaustifier \(O_{dou}\), a covert counterpart of the Mandarin particle dou.

- **Key data of dou:**
  - Presence of dou above the weak modal blocks MS.
  - Dou+◇ licenses the \(\forall\)-FC uses of pre-verbal disjunctions.

1.4 Wo dou keyi zai nali mai kafei?

I dou can at where buy coffee

‘Where can I buy coffee? (\(^{\text{OK}}\)MA, # MS)’

1.5 [Yuehan huozhe Mali] dou keyi jiao hanyu.

John or Mary dou can teach Chinese

Intended: ‘Both John and Mary can teach Chinese.’

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**Roadmap:**

- Basics of MS/MA ambiguity
- Disjunctive answers
- Mandarin particle dou: an exhaustifier on pre-exhaustified sub-alternatives
- Deriving disjunctive MA answers via a covert dou

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\(^{1}\)I thank Gennaro Chierchia, Danny Fox, and Jim Huang for helpful comments and discussions. All errors are mine.
2. Basics of MS/MA ambiguity

2.1. Fox (2013)

- Earlier works treat MS/MA ambiguity as a pragmatic phenomenon.
- Fox (2013) proposes a semantic approach to capture the MS/MA ambiguity of $\Diamond$-questions:
  
  $\text{Ans}(Q)(w)$ returns the set of maximally informative (MaxI) true answers of $Q$ in $w$, each of which is a good answer. A true answer is MaxI iff it is not asymmetrically entailed by any true answers. A question admits MS iff it can have multiple MaxI true answers (i.e. the answer space is not closed under conjunction)

  \[(6)\text{ Ans}(Q)(w) = \{ p : w \in p \land q \land (Q \rightarrow q \neq p) \}\]

- In German, presence of *alles* above the weak modal blocks MS. (Manuel Križ and Martin Hackl p.c. to Fox 2015)

  \[(7)\text{ MS possible } (\Diamond > \text{*alles*}) \quad (8)\text{ MA only } (\text{*alles*} > \Diamond)\]

  \[\text{Was kann ich *alles* mit 3 Euros kaufen?} \quad \text{Was *alles* kann ich mit 3 Euros kaufen?}\]
  \[\text{What can I all with 3 Euros buy} \quad \text{What alles can I with 3 Euros buy}\]

  The *wh*-trace $X$ has a covert distributor $\text{each}$ as a phrase-mate. A $\Diamond$-question can have multiple MaxI true answers (i.e. not closed under disjunction) when $\Diamond > [X\text{ each}]$.

  \[(9)\text{ Who can chair the committee?} (w: \text{ only John and Mary can chair the committee; one chair only.})\]
  \[\text{a. } Q = \{ \Diamond\text{each}(X) : X \in *\text{person'} \}\]
  \[\text{b. } Q = \{ \text{each}(X) : X \in *\text{person'} \}\]

- But, there should be other ways to capture MS/MA ambiguity: first, (7) can still take MA; second, this analysis cannot derive disjunctive MA answers grammatically.

2.2. Local exhaustification

- Puzzle: ([10][b]), which is intuitively a good MS answer (cf. [10][a]), is asymmetrically entailed by [10][c].

  \[(10)\text{ Who can serve on the committee?} (w: \text{ the committee can be made up of either Gennaro+Danny or Gennaro+Danny+Jim})\]
  \[\text{a. } \#\text{ Gennaro.} \quad \Diamond[\text{serve'}(g)]\]
  \[\text{b. } \sqrt{\text{Gennaro and Danny.}} \quad \Diamond[\text{serve'}(g+d)]\]
  \[\text{c. } \sqrt{\text{Gennaro, Danny, and Jim.}} \quad \Diamond[\text{serve'}(g+d+j)]\]

  I assume (i) that the question goal restricts the teleological modal base as ([11], and (ii) the weak modal *can* embeds an exhaustivity operator $O$ associated with the *wh*-trace.

  \[(11)\text{ } M = \{ w: \text{there is a group of individuals } X \text{ s.t. } X \text{ form the committee in } w \}\]

  \[(12)\text{ } O(p, Q) = p \land \forall q \in \text{NW}(p, Q)[\neg q], \text{ where NW}(p, Q) = \{ q : q \in Q \land p \not\subset q \}\]

  - ([10][h]) is false. $\Diamond_w M[\text{serve'}(g)]$ means “among the accessible world to $w$ where some $X$ forms the committee, there is a world $w'$ s.t. only Gennaro serves on the committee in $w'$.”

  - $O$ creates a non-monotonic environment w.r.t. the *wh*-trace; thus both ([10][b-c]) are MaxI true answers. $\Diamond_M O[\text{serve'}(g+d+j)] \not\Rightarrow \Diamond_M O[\text{serve'}(g+d)]$
3. Disjunctive answers

- □-questions admit elided disjunctive answers as complete answers. (Spector 2007, 2008)

  (13) “What does John have to read?”

  “Semantics or Pragmatics.”

  a. John either has to read S or has to read P.
  b. John can read S or P, and he has to read one of them.

But in a singular □-question, a disjunctive answer can only take an ignorance reading. (Fox 2013)

  (14) “Which book does John have to read?”

  “Semantics or Pragmatics.”

  ⇒ Bare wh-words like what (and plural wh-phrases like which books) also quantify over generalized quantifiers like \( s \lor p \), yielding higher-order disjunctive answers; while singular wh-phrases like which book only quantify over atomics.

  (15) \( s \lor p = \lambda f_{est}. \lambda w. f_w(s) \lor f_w(p) \)

  \( \Box f(s \lor p) = \Box [f(s) \lor f(p)] \)

- Fox (2013): an answer \( p \) can be a complete answer of \( Q \) iff it is possible that \( p \) is true while no answer stronger than \( p \) is true: \( \exists w[p(w) \land \neg\exists q \in Q[q \subset p \land q(w)]] \)

  In Fig. 1, the disjunctive answer being true ⇒ one of the individual answers being true;

  In Fig. 2, the disjunctive answer being true \( \not\Rightarrow \) one of the individual answers being true;

  ∴ a disjunctive answer can be a complete answer to a □-question but not to a non-modalized question.

  \[ f(a) \lor f(b) \]
  \[ \downarrow \quad \downarrow \]
  \[ f(a \lor b) \]

  Fig. 1

  \[ \Box f(a) \lor \Box f(b) \]
  \[ \downarrow \quad \downarrow \]
  \[ \Box f(a \lor b) \]

  Fig. 2

- Spector (2007): an answer \( p \) can be a complete answer of \( Q \) iff \( O_Q(p) \) isn’t contradictory.

  (16) a. \( O f(a \lor b) = f(a \lor b) \land \neg f(b) \land \neg f(a) \land \ldots = \bot \)
  b. \( O \Box f(a \lor b) = \Box f(a \lor b) \land \neg \Box f(b) \land \neg \Box f(a) \land \ldots \neq \bot \)

  **Puzzle:** Why is that a disjunctive answer can be a complete answer of a ◇-question?

  \[ \Box f(a) \lor \Box f(b) \]
  \[ \downarrow \quad \downarrow \]
  \[ \Box f(a \lor b) \]

  Fig. 3

  \[ \Diamond f(a) \lor \Diamond f(b) \]
  \[ \downarrow \quad \downarrow \]
  \[ \Diamond f(a \lor b) \]

  Fig. 4

  In Fig. 3-4, the disjunctive answer being true ⇒ one of the individual answers being true.

  (17) \[ \Diamond O f(a) \lor \Diamond f(b) \]
  \[ = \Diamond O f(a) \lor [f(a) \lor f(b)] \land \neg f(c) \]
  \[ = \Diamond O f(a) \lor [f(a) \land \neg f(b) \land \neg f(c)] \lor [f(b) \land \neg f(a) \land \neg f(c)] \]
  \[ = \Diamond O f(a) \lor O f(b) \]
  \[ = \Diamond O f(a) \lor \Diamond O f(b) \]
4. Mandarin particle *dou*

4.1. Mandarin *dou* in *wh*-questions

- In *wh*-questions, *dou* forces MA. Like *alles*, presence of *dou* above the weak modal blocks MS. Under this use, *dou* must c-command the *wh*-item; but it appears after the subject if the subject isn’t interrogative.

  (18) (# *Dou*) [shui] lai -le? Ju ji-ge lizi jiu xing.
  
  ‘(#All) who came? Showing (me) some examples is enough.’

  (19) Wo *dou* keyi zai [nali] mai kafei?
  
  ‘Where all can I buy coffee?’ (♦MA; # MS)

- *Dou* cannot be used in a singular question.

  (20) Dou [na -xie/*-ge ren] lai -le?
  
  ‘Who all came?’/”*Which person all came?”

- I argue that the meaning of *dou* is very different from that of *alles*, and that *dou* is the source of disjunctive MA answers in ◇-questions.

4.2. Mandarin *dou* in declaratives

- The Mandarin particle *dou* has various uses: ∀-quantifier & distributor, scalar indicator, ∀-FCI licenser, minimizer-licenser; but German *alles* and Southern English *all* only have the quantifier & distributor use.

  – ∀-quantifier & distributor

  (21) a. [Tamen] *dou* mai -le fangzi.
  
  ‘They *dou* bought houses.’ (# collective)

  b. [ABC/*AB] *dou* shi pengyou.
  
  ‘ABC/*AB are all friends.’

  – Scalar marker

  (22) a. Ta *dou* lai -guo [SAN] -ci -le.
  
  ‘He has been (here) three times.’

  ⇒ Being here three times is a lot.

  b. *Dou* [WU] dian -le.
  
  ‘It is five o’clock.’

  ⇒ Being five o’clock is a bit late.

  – ∀-FCI licenser

  (23) a. [Yuehan huozhe Mali] *dou* *(keyi) jiao hanyu.
  
  ‘Both John and Mary can teach Chinese.’

  # Only John and Mary can teach Chinese.

  # It is not allowed to let John and Mary both teach Chinese.

  
  ‘From both Starbucks and McDonalds, you can get coffee.’
4.3. Defining *dou* as a pre-exhaustification exhaustifier

- Xiang (2015b) defines *dou* as a presuppositional exhaustifier that (i) operates on sub-alternatives and (ii) has a pre-exhaustification effect.

\[
\begin{align*}
\text{(24) a. } & \text{[dou [J and M came]] = J and M came, not only J came, not only M came.} \\
\text{b. } & \text{[dou [ABC are friends]] = ABC are friends, not only AB are friends, not only BC ...} \\
\text{c. } & \text{[dou [it’s five o’clock]] = it is five o’clock, not just four, not just three, ...} \\
\text{d. } & \text{[dou [J or M can teach]] = J or M can teach, not only J can teach, and not only M can teach.}
\end{align*}
\]

- **Quantifier & Distributor:**

\[
\begin{align*}
\text{(25) a. } & \text{dou}(p, Q) = \exists q \in \text{Sub}(p, Q). p \land \forall q \in \text{Sub}(p, Q)[\neg O(q)] \\
\text{ i. Presupposition: } & \text{p has at least one sub-alternative.} \\
\text{ ii. Assertion: } & \text{p is true, the exhaustification of each p’s sub-alternative is false.} \\
\text{b. } & \text{Sub}(p, Q) = \{q : q \in Q \land p \subseteq q\} \text{ (the set of weaker alternatives) (To be revised)}
\end{align*}
\]

The presupposition of *dou* captures the distributivity effect (cf. Lin 1996): to generate sub-alternatives, the prejacent of *dou* must be monotonic wrt the position associated with *dou*.

\[[21\text{h}^\prime]
\text{‘abc dou bought houses.’}
\]

\[
\begin{align*}
\text{a. } & \times abc \text{ together bought houses.} \not\Rightarrow ab \text{ together bought houses.} \\
& \text{Sub(abc together bought houses) = } \emptyset \\
\text{b. } & \sqrt{\text{Cov(abc)}} \text{ each bought houses. } \Rightarrow D \text{ each bought houses, where } D \subset \text{Cov(abc)} \\
& \text{Sub(Cov(abc) each bought houses) = } \{D \text{ each bought-houses : } D \subset \text{Cov(abc)}\}
\end{align*}
\]

\[[21\text{b}^\prime]
\text{‘abc*ab dou are friends.’}
\]

\[
\begin{align*}
\text{a. } & \text{[are friends] = } \lambda x. \text{singular}(x) = 0. \text{be-friends}(x) \\
\text{b. } & \text{Sub(abc are friends) = } \{ab \text{ are friends, bc are friends, ac are friends}\} \\
\text{c. } & \text{Sub(ab are friends) = } \emptyset
\end{align*}
\]

- **∀-FCI licenser:** Applying *dou* to a disjunction negates the pre-exhaustified domain (D)-alternatives, yielding a ∀-FC inference.

\[
\begin{align*}
\text{(26) [John or Mary] dou can teach Chinese.} \\
\text{a. } & \text{Sub(} \bowtie f(j) \lor \bowtie f(m)\text{) = } [\diamond f(j), \bowtie f(m)] \\
\text{b. } & \text{[dou[} \bowtie f(j) \lor \bowtie f(m)\text{]] = } [\diamond f(j) \lor \bowtie f(m)] \land \neg O\diamond f(j) \land \neg O\bowtie f(m) \\
& \text{= } [\diamond f(j) \lor \bowtie f(m)] \land [\diamond f(j) \rightarrow \bowtie f(m)] \land [\bowtie f(m) \rightarrow \diamond f(j)] \\
& \text{= } \diamond f(j) \lor \bowtie f(m) \\
& \text{= } \diamond f(j) \land \bowtie f(m)
\end{align*}
\]

**Problem:** But the D-alternatives are stronger than the disjunction, how could they be sub-alternatives?

\[
\begin{align*}
\text{(27) Innocently (I)-excludable alternatives (Fox 2007)} \\
\text{IExcl}(p, Q) = \{q : q \in Q \land \exists q' \in \text{NW}(p, Q)[p \land \neg q \rightarrow q']\} \\
\text{(\{q: affirming p and negating q doesn’t entail any non-weaker alternative of p\})}
\end{align*}
\]

E.g. The D-alternatives are not I-excludable to the disjunction: [\bowtie f(j) \lor \bowtie f(m)] \land \neg \bowtie f(j) \rightarrow \bowtie f(m)

\[
\begin{align*}
\text{(28) Sub-alternatives (final version)} \\
\text{Sub}(p, Q) = Q - \text{IExcl}(p, Q) - \{p\} \\
\text{(the set of alternatives excluding innocently excludable alternatives and the prejacent)}
\end{align*}
\]
5. Deriving disjunctive MA via covert *dou*

5.1. Disjunctives in ◇-questions

- I propose that the MS/MA ambiguity is attributed to the absence/presence of a covert *dou*:

\[(29) \quad O_{dou}(p, Q) = p \land \forall q \in \text{Sub}(p, Q)[\neg O(q)]\]

\[(30) \quad \text{Where can I get gas?}\]

a. From station A. MS/Partial
b. From station A or station B. Partial/MA

\[\begin{align*}
\text{CP} & \quad \lambda \pi \\
\text{where} & \quad \text{p} \\
\text{IP} & \quad (O_{dou}) \\
\text{can} & \quad O \\
\text{VP} & \quad \pi \quad \text{<est>\{AX_e. I get gas from x\}}
\end{align*}\]

\[\text{(w: there are only two accessible gas stations: A and B; both of them have enough gas for me)}\]

\[\begin{align*}
\Diamond O f(a) & \quad \land \quad \Diamond O f(b) \\
\Downarrow & \quad \Downarrow \\
\Diamond O f(a \lor b) & \quad \implies \quad O_{dou} \Diamond O f(a \lor b) \\
\Downarrow & \quad \Downarrow \\
O_{dou} \Diamond O f(a) & \quad \land \quad O_{dou} \Diamond O f(b)
\end{align*}\]

Fig. 5: MS (without \(O_{dou}\))

Fig. 6: MA (with \(O_{dou}\))

- Without \(O_{dou}\),
  i. **MS is available**: the answer space is not closed under conjunction;
  ii. **the disjunctive answer is partial**: it is asymmetrically entailed by the individual ones.

- With \(O_{dou}\), the disjunctive answer equals to the conjunction of the individual answers, as in (31).
  i. **MS is unavailable**: the answer space closed under conjunction;
  ii. **the individual answers are partial**: they are asymmetrically entailed by the disjunctive answer.

(31) a. The embedded \(O\) uses up the scalar alternative and the focus alternatives.
\[\Diamond O[f(a) \lor f(b)] = \Diamond[[f(a) \lor f(b)] \land \neg[f(a) \land f(b)] \land \neg f(c)]\]
\[= \Diamond[[f(a) \land \neg f(b) \land \neg f(c)] \lor [f(b) \land \neg f(a) \land \neg f(c)]]\]
\[= \Diamond[O f(a) \lor O f(b)]\]

b. Applying \(O_{dou}\) uses up the D/sub-alternatives, yields an FC inference:
\[O_{dou} \Diamond O[f(a) \lor f(b)] = \Diamond[O f(a) \lor O f(b)] \land \neg O \Diamond O f(a) \land \neg O \Diamond O f(b)\]
\[= \Diamond[O f(a) \lor O f(b)] \land [\Diamond O f(a) \rightarrow \Diamond O f(b)] \land [\Diamond O f(b) \rightarrow \Diamond O f(a)]\]
\[= \Diamond[O f(a) \lor O f(b)] \land [\Diamond O f(a) \leftrightarrow \Diamond O f(b)]\]
\[= \Diamond O f(a) \land \Diamond O f(b)\]

\[\pi \quad \text{<est>\{AX_e. I get gas from x\}}\]
• Puzzle: why is that disjunctives cannot be complete answers of non-modalized questions?

(32) “Where did John get gas?”
“Station A or station B.” Partial only

(33) $O_{dou}(a \lor b) = [f(a) \lor f(b)] \land \neg O f(a) \land \neg O f(b) = f(a) \land f(b)$

• For any possible answer $p$, there are two conditions for $p$ being a complete answer:

(i) “$p$ is true” $\not\Rightarrow \exists q \subseteq p [q$ is true]” (Fox 2013)

(ii) $O(p) \neq \bot$ (Spector 2007)

(33) does not pass condition (ii): the scalar alternative hasn’t been used; exhaustifying (33) affirms the FC inference and negates the scalar alternative, yielding a contradiction.

(34) $O[O_{dou}(a \lor b)] = O_{dou}(f(a) \lor f(b)) \land \neg [f(a) \land f(b)] \land \neg f(c)
\quad = [f(a) \land f(b)] \land \neg [f(a) \land f(b)] \land \neg f(c)
\quad = \bot$

5.2. Other questions

• In singular questions: $O_{dou}$ is vacuous; $dou$ is undefined.

A singular $wh$-phrase lives on a set consisting of only atomic elements (Fox 2013). Singular answers have no sub-alternatives, thus $O_{dou}$ is vacuous.

(35) a. $\text{Sub}(f(a)) = \emptyset$

b. $O_{dou}(f(a)) = f(a)$

The overt $dou$ cannot be used in a singular question because of the presupposition failure.

(36) $\text{Doux [na -xie/*-ge ren] lai -le?}$
$\text{dou what -cl_pl/-cl_sg person come -asp}$
‘Who all came?/*Which person all came?’

• In basic $\square$-questions: $O_{dou}$ is vacuous; $dou$ is defined but vacuous

The D-alternatives of a $\square$-disjunction are innocently excludable and thus are not used by $O_{dou}$.

(37) $\square(p \lor q) \land \neg \square p \not\leftrightarrow \square q$

(38) a. $\text{Sub}(\square[p \lor q]) = \emptyset$

b. $O_{dou}(\square(p \lor q)) = \square[p \lor q]$

Unlike singular answers, conjunctive and plural answers have sub-alternatives, which support the presupposition of $dou$. Therefore $dou$ can be used in non-singular $\square$-questions.

(39) a. $\text{Sub}(\square[f(a) \land f(b)]) = \{ \square f(a), \square f(b) \}$

b. $O_{dou}(\square[f(a) \land f(b)]) = \square[f(a) \land f(b)] \land \neg O \square f(a) \land \neg O \square f(b) = \square[f(a) \land f(b)]$
6. Conclusions

- MS/MA ambiguity of □-questions can be attributed to the absence/presence of $O_{dou}$.
  - $dou/O_{dou}$ is an exhaustifier operating on pre-exhaustified sub-alternatives.
    
    (40) a. $dou(p, Q) = \exists q \in \text{Sub}(p, Q). p \land \forall q \in \text{Sub}(p, Q)[\sim O(q)]$
    
    b. $O_{dou}(p, Q) = p \lor \forall q \in \text{Sub}(p, Q)[\sim O(q)]$
    
    c. $\text{Sub}(p, Q) = Q - \text{IEExcl}(p, Q) - \{p\}$

- The answer space of a basic wh-question includes higher-order disjunctives (Spector 2007, 2008).
- In a ◇-question, $O_{dou/dou}$ strengthens disjunctives into FC statements, making the answer space closed under conjunction and therefore blocking MS.
    
    (41) $O_{dou} \diamond O f(a \lor b) = \diamond O f(a) \land \diamond O(b)$

- □-disjunctives and strengthened ◇-disjunctives satisfy both conditions, while strengthened non-modalized disjunctions do not satisfy (ii).

Appendix I: Cf. extending Fox (2007)

- One may suggest to analyze $dou$ as Fox’s (2007) recursive exhaustification operator $O_R$: (i) exhaustification negates only innocently excludable alternatives; (ii) exhaustification applies recursively.

In (42), 1st exhaustification negates scalar alternatives and focus (F)-alternatives; domain (D)-alternatives are not innocently excludable. 2nd exhaustification negates the pre-exhaustified D-alternatives.

(42) $O_R \diamond [f(a) \lor f(b)]$
  a. First exhaustification:
    
    $O \diamond [f(a) \lor f(b)] = \diamond [f(a) \lor f(b)] \land \sim \diamond [f(a) \land f(b)] \land \sim \diamond f(c) \land \sim f(a) \land \sim f(b)$
  b. Second exhaustification:
    
    $O'O \diamond [f(a) \lor f(b)] = O \diamond [f(a) \lor f(b)] \land \sim O \diamond f(a) \land \sim O \diamond f(b)$
    
    $= O \diamond [f(a) \lor f(b)] \land \sim [f(a) \lor f(b)] \land \sim f(a) \land \sim f(b)$
    
    $= O \diamond [f(a) \lor f(b)] \land \sim [f(a) \leftrightarrow f(b)]$
    
    $\sim f(a) \land \sim f(b)$
    
    $= \sim f(a) \land \sim f(b) \land \sim [f(a) \lor f(b)] \land \sim f(c)$

- $O_R$ makes the answers mutually exclusive. Thus $O_R \diamond [f(a) \lor f(b)]$ can be a complete answer.

(43) “What is John allowed to read?” “Book A or Book B.”
  
  a. $Q = \{O_R \diamond \pi(\lambda x. \text{read}'(x)) : x \in \text{phone}'\}$
  
  b. $Q_w = \{O_R \diamond f(a \lor b)\}$
  
  c. $\text{Ans}_f(Q)(w) = \{O_R \diamond f(a \lor b)\}$

- But, exhaustifying with $O_R$ yields a strongly exhaustive reading, which is too strong. A more common MA reading is the intermediately exhaustive reading (Klinedinst & Rothschild 2011; Cremer & Chemla 2014; Uegaki 2014; Xiang 2015a).²

E.g. “John predicated who came:“

Strongly exhaustive: $\forall x [\text{[x came } \rightarrow \text{ J pred x came}] \land \forall x [\text{[x didn’t come } \rightarrow \text{ not [J pred x came]]}]$

Intermediate exhaustive: $\forall x [\text{[x came } \rightarrow \text{ J pred x came}] \land \forall x [\text{[x didn’t come } \rightarrow \text{ J pred x didn’t come}]]$

²One might suggest to insert an $O$ below the weak modal so as to use up the F-alternatives locally: $O_R \diamond O f(a \lor b)$. But local exhaustification is not available in a non-modalized question.
Appendix II: Spector’s (2007) puzzle

- Given the contrast in (44a-b), Spector (2007) claims that $\diamond$-questions cannot take disjunctions as complete answers: for (44b) being true, there must be some $X > 3$ s.t. $``\diamond$[Jack read $X$ many books]” is true, which is stronger than (44b).

\[ (44) \]

<table>
<thead>
<tr>
<th>a.</th>
<th>i. What novels is Jack required to read?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ii. Jack is required to read [more than three novels by Balzac]$_F$.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b.</th>
<th>i. What novels is Jack allowed to read?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ii. Jack is allowed to read [more than three novels by Balzac]$_F$.</td>
</tr>
</tbody>
</table>

- In the present analysis, for any $X > 3$, “$\diamond$(J read $X$ books)” is a sub-alternative of “$\diamond$(J read $> 3$ books)”.

\[ (45) \]

\[ O_{dou}[\diamond f(> 3)] = \diamond f(> 3) \land \forall X > 3[\neg O \diamond f(X)] \]
\[ = \diamond f(> 3) \land \forall X > 3[\diamond f(X) \rightarrow \diamond f(X + 1)] \]
\[ = \diamond f(> 3) \land \forall X > 3[\diamond f(X) \rightarrow \diamond f(X + 1)] \land \exists X > 3[\diamond f(X)] \]
\[ = \diamond f(\infty) \]

\[ (46) \]

\[ O_{dou}[\diamond f(> 4)] = \diamond f(\infty) \]

(45) is bad because of replacing “3” with any number doesn’t change the output meaning $\diamond f(\infty)$, yielding a grammatical (G)-triviality (Gajewski 2002): “$O_{dou}\diamond f(> n)$” receives the same value regardless of how the lexical terminal $n$ is replaced in the structure.

Appendix III: Modal obviations of $\forall$-FCI licensing

- The English polarity item any is licensed as a $\forall$-FCI when appearing over a weak modal, but not when it appears in an episodic statement or over a strong modal.

\[ (47) \]

<table>
<thead>
<tr>
<th>a.</th>
<th>*Anyone came in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>b.</td>
<td>Anyone can/*must come in.</td>
</tr>
</tbody>
</table>

Likewise in Mandarin:

\[ (48) \]

[A huozhe B] dou *(keyi)*bixu jiao jichu hanyu.

A or B dou *(can)*must teach introductory Chinese

- Explanation:
  - The $\forall$-FC implicature evoked by dou contradicts the scalar implicature of the disjunction.

\[ \forall$-FC: f(a) \land f(b) \]
\[ SI: \neg[f(a) \land f(b)] \]

- But in a dou+$\diamond$-sentence, there is a salvaging way to avoid this contradiction, i.e. assessing SI within the modal base: only the worlds that satisfies the SI are accessible.

\[ (49) \]

[A or B] dou can teach Chinese.

We are only considered with cases where only one person will teach Chinese.

- Not that both John and Mary will teach Chinese.

  a. SI pre-restricts the modal base $M$:

  If $f = \langle w1,\{a\},< w2,\{b\},< w3,\{a,b\} >\rangle$, then $M = \{w1,w2\}$

  b. Prejacent of dou: $\diamond f(a) \lor \diamond f(b)$

  c. Applying dou yields a $\forall$-FC implicature: $\diamond f(a) \land \diamond f(b)$ (True under $M$)

- This option doesn’t work for dou+$\square$-sentences: the $\forall$-FC implicature $\square f(a) \land \square f(b)$ is false under $M$.  

References


