Functional Quantification in Distributivity and Events: A View From Chinese

Q.-P. LUO

ESSLLI 2008 workshop 'What Syntax Feeds Semantics'
August 4-16, 2008, Hamburg

August 12, 2008

qiong-peng.luo@let.uu.nl

The major claims of this talk

Distributive quantification (over individuals as well as events) involves a portmanteau semantic structure. There are two steps in the creation of this portmanteau semantic quantification: a universal quantification plus a matching functional quantification. This paves the way for a unified account for distributivity over individuals (DOI) and distributivity over events (DOE). One locus of semantic variation in this respect is the role played by implicit domain restriction and how it interacts with the canonical semantics of quantifiers.

Major evidence will be drawn from Chinese, but supporting evidence can also be found in German, Korean and Georgian...

Distributivity in natural languages

(1) a. The boys ^{D} walked home.

   b. $\forall$y [y $\in$ ιboy$\rightarrow$ y $\in$ walked home]

   c. Die Kinder bekamen *je* einen Apfel. 'The children received an apple each.' (Link 1998: 129)

   d. $\forall y$ [$y \leq$ children $\rightarrow \exists$y [apple (y) & received (x, y)]]

   e. The vegetables ^{D} are too heavy for the gray scale and too light for the black scale. (Schwarzschild 1996: 70)

   D-Operator: **[[D]]** = λPλX$\forall$y [y$\in$X $\rightarrow$P(y)]

- (cf. Scha (1981); Dowty & Brodie (1984); Schwarzschild (1996); Lasersohn (1998); Link (1991, 1998); Brisson (2003); to name only a few)

Dou-Distributiviy in Chinese

It has been argued that Chinese has an overt, lexically realized D-operator, namely, *dou*:

(2) a. *Tongxue men dou mai-le zhe-ben shu.*

    Students   dou buy-Asp Dem-cl book

   'The students {all, each} bought this book.'

  b. *Tongxue men dou zhongwu jianmian.*

    students   dou at noon meet

   'The students {all, *each} meet at noon.

  c. *Mei-ge tongxue dou mai-le   zhe-ben shu.*

    Every-cl student dou buy-Asp Dem-cl book

What is the distributable domain of *dou*?

- (3) a. * *[Zhe-xie xuesheng] xihuan dou dianying.*

    Dem-pl. students   like   dou movies

    b. * *[wo] dou jian-guo zhexie xuesheng.*

    I   dou meet-Asp Dem-pl. Students

    c. * *Dou lai-le zhe-xie xuesheng.*

    Dou came-Asp Dem-pl. Students

    d. * *[Zhe-ge xuesheng] dou xuan-le jufaxue.*

    Dem-sing. student dou choose-Asp syntax

(a) *dou* must occur pre-verbally

(b) the distributable domain of *dou* must be located to its left side (within
    its m-commanding domain)

(c) *dou* can only quantify over plural denotation

The lexical entry of *dou*: standard analysis

$[[\text{Dou}]] = \lambda P \lambda X \forall y[y \subseteq X \ \& y \subseteq \|\text{Cov}\| \rightarrow P(y)]$, where $P \in D_{<e,t>}$

NB: (1) This cover-based D-operator analysis is actually over-generating. But thisis

not the issue we are going to discuss today.

    (2) Reminder: *dou* is different from English *each* and *all*:

(4) a. The students {each, all} bought the book.

    b. The students {all, *each} meet at noon.

    c. Every student {*all, *each} meets at noon.

    d. The students {all, *each} are alike to each other.

A challenge from adverbial quantification

(5) a. Wo dou mai ni-zi   de yi-fu.

     I   dou   buy woolen NOM clothes

    Approx. 'I always buy woolen clothes.'

    b. Wo dou shuo yingyu.

      I   dou speak English

   Approx. 'I always speaks English.'

  c. Wo dou shang Google.

     I   dou visit Google

 Approx. 'I always visit Google.'

The problems

(a) there is no plural denotation within *dou*'s m-commanding domain;

(b) they are not distributivity over individual (DOI) in canonical sense:

(6) a. # $\forall$x (x∈I→ x∈ buy woolen clothes)

  b. # $\forall$x (x∈I →x∈ speak English)

  c. # $\forall$x (x∈I→ x∈ visit Google)

Adverbial dou-quantification over events

A. *Dou*-quantification and the stage-level vs. individual-level predication

(7) a. * Zhang San dou hen gao.　　'Zhang San is always tall.'
　　　　Zhang San dou very tall
　　b. ? Zhang San dou hen congming.
　　　　Zhang San dou very intelligent
　　　　'Zhang San is always intelligent.'

☞ The stage-level predicates are incompatible with *dou*

NB: (7b) is acceptable unless it is interpreted as 'Zhang San always behaves intelligently', a stage-level one.

B. Once-only predicates and *Dou*

(8) a.* *Zhe-li dou guafeng de rizi dapo yikuaiboli.*

      Here-Loc dou wind N. day break one-cl glass

    'Here one piece of glass is always broken on windy days.'

   b. *Zhe-li dou guafeng de rizi dapo boli.*

    'Here the glass is always broken on windy days.'

☞ The once-only predicates are incompatible with *dou*

C. Episodic vs. non-episodic contexts and *dou*

(9) a. *Wo dou <u>mai</u> ni-zi   de   yi-fu*. (non-episodic)

     I dou buy woolen NOM clothes

   b. * *Wo dou <u>mai-guo</u>   nizi   de yifu* .(episodic)

     I   dou   buy-EXP woolen GEN clothes(s)

(10) a. *Wo dou <u>du</u> Qiaomusiji de   shu*. (non-episodic)

     I dou read Chomsky NOM book(s)

   b. * *Wo dou <u>kan-guo</u> Qiaomusiji de shu*. (episodic)

     I dou read-EXP Chomsky NOM book(s)

☞ *Dou* is allowed in non-episodic contexts but not in episodic contexts

D. Episodic vs. non-episodic distinction and 'all-the-time' modification

(11) a. *Wo yizhi   dou mai ni-zi   de   yi-fu*. (non-episodic)

I all-the-time dou buy woolen NOM clothes(s)

b. * *Wo yizhi dou mai-guo   nizi de   yifu*. (episodic)

I all-the-time   dou buy-EXP woolen NOM clothes(s)

(12) a. *Wo yizhi   dou du Qiaomusiji de shu*. (non-episodic)

I   all-the-time dou read Chomsky NOM book(s)

b. * *Wo yizhi dou kan-guo Qiaomusiji de shu*. (episodic)

I all-the-time   dou read-EXP Chomsky NOM book(s)

Interim conclusion and research questions

☞ Conclusion: beside the DOI *dou*, there is a DOE *dou*.

☞ Q1: Is it possible to render the DOE as a special case of DOI?

☞ Q2: Could the challenge be overcome by extending the DOI *dou* to events?

☞ Q3: If the answers to Q1 and Q2 is negative, how is a unified analysis possible?

The existing analyses: some attempts to render the DOE as a special case of DOI

(13) a. *Wo dou   mai ni-zi   de yi-fu.*

 b. *Wo dou shuo yingyu.*

(14) a. $\forall$x (clothes (x) & I buy x $\rightarrow$ x = woolen-clothes]

 b. $\forall$x (I speak x $\rightarrow$ x = English)

(14a-b) are argued to be the semantics of 13(a-b) respectively.
 Jiang (1998): contextual presuppositional accommodation;
 Pan (2006): topic-focus articulation.

The problem

- **The buying-clothes scenario**

- I go shopping every Saturday. Over the past ten weeks, I bought clothes every time. I bought woollen clothes eight times and for the other two weeks, I bought woollen clothes plus cotton shirts.

- The semantics would predict the sentences to be false under the above scenario. But most of my informants judge the sentences to be true.

- To render the DOE as a special case of DOI simply fails to capture the correct semantics.

The extension of DOI-*dou* to events: sounds good, but...

(15) a. *Wo dou mai ni-zi de yi-fu.*

 b. $\forall e$ (I buy clothes (e) $\rightarrow$ I buy woolen clothes (e))

(15b) says for all the event of my buying clothes, I buy woolen clothes. The two (set of) events in the <u>Restriction</u> and <u>Nuclear Scope</u> are identical.

Is the extension to events that straightforward?

Three arguments against this view

A. *Dou* and *Zhi* 'only'

(16) a. *Wo zhi mai ni-zi   de yi-fu.*

      I   only buy woolen Nom clothes

    b. $\forall$e (I buy clothes (e) $\rightarrow$ I buy woolen clothes (e)) (= 15(a))

In the framework of event semantics, (16a) might be represented by the same logical form as (15a). But there is empirical evidence to believe that *dou* is different from *zhi* 'only' in this respect (cf. B & C (2003) for the difference between *always* and *only*).

Continued

(17) a. ? *Zhang San dou xihuan [Lin Meimei]F*,

　　　 Zhang San dou like   Lin Meimei

　　　 Zhang San ye dou xihuan [Xue Baochai]F.

　　　 Zhang San also dou like   Xue Baochai

　　'Zhang San <u>dou </u>likes Lin Meimei, and Zhang San also

　　 <u>dou</u> likes Xue Baochai.'

　 b.* *Zhang San zhi xihuan [Lin Meimei]F*,

　　　 Zhang San only like Lin Meimei

　　　 Zhang San ye zhi xihuan [Xue Baochai]F.

　　　 Zhang San also only like Xue Baochai

　　 'Zhang San only likes Lin Meimei, and Zhang San also only likes

　　 Xue Baochai.'

Continued

(18) a. ∀x (person(x) & Zhang San_like(x) → x = Lin Meimei) &
    ∀x (person(x) & Zhang San-like(x) → x = Xue Baochai)
  b. ∀e (∃x (person (x) & Zhang San likes a person (x))(e) →
    Zhang San like Lin Meimei (e)) &∀e (∃x (person (x) &
    Zhang San like a person (x))(e) → Zhang San like Xue
    Baochai (e))

(18a) and (18b) are truth-conditionally equivalent. They either
state Zhang San likes nobody or Lin Meimei is Xue Baochai.
This (contradictory) semantics correctly rules out (17b), but (17a)
is not that odd is unexpected.

B. Adverbial quantification with an overt antecedent

(19) a. *(Dang) Zhang San diudiao-le   shenme dongxi de shihou,*
   When   ZS   lose-ASP   what thing   Rel time
   *ta *(dou) shi yitianhou cai zhidao.*
   he dou   be one-day-later   know
   'When John loses something, he doesn't realize it until one day
   later.'
   b. # ∀e (ZS lose something (e) → (he realizes it (e) & one day later
(e, e))

(19) says the identical event occurs one day later, an ill-formed one.

Continued

(20) a. *(Dang) zhanghu bei   zema de shihou*,

     When husband Passive rebuked Rel time

     qizi *(dou) toutou-di ku.

     wife   dou   secretly cry

     'When the husband is being rebuked, the wife cries

     secretly.'

    b. # ∀e (the husband is being rebuked (e) → (the wife

      cries (e) & secretly (e))

Problem: If the two events are taken to be identical, then we expect the manner adverb 'secretly' also modifies the antecedent event, viz., the husband is being rebuked secretly. (20a) is true under the situation that the husband isn't being rebuked secretly.

C. (Un)selective quantification and Parsons' event semantics

(21) a. *Wo mai nizi de yifu.* 'I buy woolen clothes.'

$\exists$e (buy(e) & Agent(e) = I & Theme (e) = woolen-clothes)

b. *Wo dou mai nizi de yifu.*

$\exists$e (buy(e) & Agent(e) = I & Theme (e) = woolen

clothes & *dou* (e)) (in conflict with the unselective idea)

$\forall$e ((I buy clothes (e) $\rightarrow$ I buy woolen clothes (e))

(empirically problematic and in conflict with Parsons'

event semantics)

Parsons (1990) claims that at sentence level, we receive an existential closure over the event variable, and the adverbials are modifiers of the events.

Interim Conslusion

- We have shown that it hasn't been successful to render the DOE a special case of DOI;

- It has also been shown that the extension to events couldn't be that straightforward;

- The surface syntax alone doesn't provide enough information for semantic interpretation.

Compositionaity issue: what syntax feeds semantics

- Chinese is a scope-freezing language, i.e. the semantic scope argued to be isomorphic to the surface syntax. Returning to the adverbial quantification of *Dou*, we have shown that surface syntax alone doesn't provide enough information for semantics. Two options are available: a richer LF involving complex covert movement or a complex semantic operation (including limited contextual information, perhaps).

- The decision between them is empirical.

What are missing?

- Implicit domain restriction

> Yes. But...not enough

- Matching function

> Yes :) That is it!!

- We envision a picture: in the discourse-prominent languages like Chinese, context alone could provide the domain of quantification for quantifiers, and there is a matching function incorporated into the semantics of the quantifiers. The matching function is responsible for distributivity effects.

Choosing an appropriate model

My model for distributivity within an event semantics is a sextuple:
M =<E1, E2, D, IN, ≤, π> (cf. Link, Krifka, etc.)

- E1 and E2 are domains of events with parametric variables e1, e2, e3, … and e1', e2' amd e3' respectively.

- D is the domain of individuals with parametric variables x, y, z, u, v, w, etc. D contains atoms and sums ($^{*}D - DAT = {}^{\star}D$)

(c) IN is an unspecified predicate that relate the individuals to events (it can be thematic roles, spatial-temporal relations, etc.)

(d) '≤' is the partial order defined on E and D:

$$x ≤ y ⇔ x ∨ y = y ⇔ x ∧ y = y$$

$$e1 ≤ e2 ⇔ e1 ∨ e2 = e2 ⇔ e1 ∧ e2 = e1$$

(e) π is the matching function that maps E1 into E2.

Event semantics

The event semantics

John swims = swim (John) (e)

NB: 'e is a swim by John' ≠ 'e is an event that contains a swim by John' or 'e is an event in which John swims' (There is a built-in minimality requirement.)

Toy example

Let D = {a, b, c}, then * D = {a, b, c, a⊕b, b⊕c, a⊕c, a⊕b ⊕c}, *D = {a⊕b, b⊕c, a⊕c, a⊕b⊕c}, D_{AT} = {a, b, c}

(21) a. Xiaohaizi-men dou lai   le. (distributive predicate)
        child-pl.   dou came PER
      'The children all came.'
      ∀x (x Πσx *child(x)→ x came) ≡ a came(e1) ⊕ b came (e2) ⊕ c came (e3)
       ∀e' (e'Πe → came (σx *child(x)) (e')
    b. Xiaohaizi men dou zhongwu jianmian. (collective predicate)
      'The students all meet at noon.'
      ∀x (x Π*child → x meet at noon) ≡ {e: x meet at noon (x Π *child)}   ∀e'(e'Πe → meet (σx ★ child(x)) (e'))

The Matching function

(22) Let A and B be two sets, $\pi: \wp(A) \times \wp(B)$ is a matching function iff

(a) $\forall x \in A \; \exists! y \in B \rightarrow \pi(x) = y$ (distinct condition)

(b) For any subsets A' and A'' of A, A' • A'' $\Rightarrow \pi(A') \bullet \pi(A'')$,
   where '•' stands for '$\subset, \cap, \cup$, or $\angle$'. (π preserves $\subset, \cap, \cup$ and $\angle$)

(c) $\forall x1, x2 \in A : x1 \neq x2 \Rightarrow \pi(x1) \neq \pi(x2)$ (one-to-one mapping)

(d) Undefined otherwise

(Implicit) domain restriction is restricted

(Implicit) domain restriction is regulated by the following rule:

(23) PROP (E)

$\exists E(E$ is a proper E for e$) \Leftrightarrow \forall e' \leq \min (e) (e' \leq E \rightarrow e' = e)$

Semantic composition: a toy example

Two steps are involved in the creation of portmanteau semantic structure:

Wo dou mai nizi de yifu.

(a) [[mai nizi de zifu]] =λxλe(buy (e) &Th(e)=woolen-clothes & Ag(e) = x)

(b) [[dou]] ([[mai niyi de yifu]]) = λxλe∀e (PROP(E) →∃e'(buy (e')
&Th(e')=woolen-clothes & Ag(e') = x & π(e') =e))

(c) = λe∀e (PROP(E) →∃e'(buy (e') &Th(e')=woolen-clothes &

Ag(e') = I &π(e') =e))

The antecedent event is contextually provided, thus we have

(d) ∀e (PROP(E) →∃e'(buy (e') &Th(e')=woolen-clothes & Ag(e') = I

& π(e') =e))

Returning to the buying-woollen clothes scenario

There is no exhaustivity requirement on the domain in individuals; only a
matching effect in the domain of events;

(24) I buy woolen clothes and cotton shirts $\Rightarrow$ I buy woolen clothes

Thus, (24a) is expected to be true even if I bought cotton shirt sometimes.

Dou and *Only* again

(25) a. ? *Zhang San dou xihuan [Lin Meimei]F, Zhang San ye dou xihuan [Xue Baochai]F.*

    b. $\forall$e ((PROP (E) & IN (e, Zhang San)$\rightarrow$$\exists$e' (Zhang San_like_Lin Meimei (e') $\land$ π (e)= e'))) $\land$ $\forall$e ((PROP (E) & IN (e, Zhang San)$\rightarrow$ $\exists$e' (Zhang San_like_Xue Baochai (e') $\land$ π (e)= e')))

If the PROP(E) is parameterized (say, Zhang San likes Lin Meimei at a specific time T_1 and he likes Xue Baochai at a specific time T_2, and T_1 is different from T_2, so are their respective PROP(E)) then (22b) isn't contradictory, and (25a) is expected to be acceptable. However, to assign different values in a discourse is not easy, if not totally impossible. This explains the oddness of (25a).

A unified account for DOE and DOI

- A unified account for DOE and DOI is in order. The only difference between them lies in domains of the mapping. If the matching function is a mapping from E into D, then we obtain the canonical DOI effects; if the mapping is from E into E, we obtain the DOE effects.

  (26) *Tongxue-men dou tai-le yi-jia gangqin.*

    Student-pl.   dou   carry-Asp one-cl piano

- Although the verb 'carry' allows both the collective reading and individual reading, (26) only has the individual reading, i.e., each student is involved in a distinct event of carrying a piano. This (only) individual reading follows for free in a matching function-based analysis:

  $\forall y\ (y \leq \iota student \rightarrow \exists e\ (carry\text{-}a\text{-}piano(e)\ \&\ \pi(e) = x))$

Cross-linguistic evidence 1: Georgian

(27) a. *orma   k'acma   sam-sami   canta   c'aigo*

    Two-erg   man-erg three-dist-abs suitacase-abs carried-3sg

    'two men carried three suitcases (each /each time).'

    b. *or-orma k'acma sami   canta c'aigo*

    twp-erg man-erg threedist-abs   suitcase carried-3sg

    'three suitcases were carried by two men (each /each time).'

- In Georgian, numerals can be reduplicated to express distributivity. In (27a), when the numeral of the absolutive NP gets reduplicated, it has a reading that each of the two men carried three suitcases. However, both (27a) and (27b) are ambiguous between internal distribution reading and event reading. (Gil 1988, 1995)

Cross-linguistic evidence 2:
Korean distributivity: -ssik

(28) a. *[ai-tul]-i [phwungsen-hana]-rul sa-ess-ta*   (collective)

    Child-pl-nom balloon-one-acc   bought

    'The children bought a balloon.'

    b. *[ai-tul]-i [phwungsen-hana-<u>ssik</u>]-rul sa-ess-ta.*   (distributive)

    Child-pl-nom balloon-one-dist-acc   bough

    'The children bought a balloon.'

    c. *na-nun [phwungsen-hana-<u>ssik</u>]-rul sa-ess-ta.*   (event reading)

    I-top   balloon-one-dist-acc   bought

    'I bought a balloon (at several occasions).'

Cross-linguistic evidence 3: German *je*

(29) a. *Je eine Apfel war faul.*   (event reading only)

   'An apple was rotten each time.

   b. *Je eine Apfel lag in den Korben.*   (internal distribution)

   'An apple each was in the baskets.'

   c. *Je drei Apfel lagen in den Korben.*   (ambiguous)

   'Three apples each were in the baskets.'

- Like 'ssik', German distributive particle 'je' not only triggers distribution in the same way as Korean, but can also induce an event interpretation if no plural NP is present in the sentence to provide an internal antecedent. (Link (1998: 224-225))

Conclusion

(i)   Fresh semantic data of *dou*'s adverbial quantification has subjected the standard analysis based on distributivity operator to scrutiny;

(ii)   An adequate semantic treatment of *dou*-distributivity in Chinese requires taking into consideration the (larger) role played by domain restriction and matching function. A portmanteau semantic structure for distributive quantification has henceforth been proposed.

(iii)   DOE is more context-sensitive than DOI (in DOE, the domain restriction alone could provide the domain of quantification for the quantifiers). But a unified account based on functional quantification for DOI and DOE is still possible. Evidence from a Georgian, Korean and German has been shown to be in favor of the proposed analysis.

Thank you!