Unifying Three Uses of *dou* in Event Semantics

Zhuo Chen, The Graduate Center, CUNY

Introduction In this abstract, I propose an event-based semantics for *dou* on the basis of two largely ignored readings: First, *dou* can give rise to frequency readings as in (1) (henceforth occasion reading following Champollion 2016); second, *dou* can give rise to cumulative readings over individuals in (2), apart from the more familiar distributive readings over individuals in (3). The traditional analysis of *dou* treats it as a generalized distributor in the sense of Schwarzschild (1996) with the semantics in (4) (Lin 1998, a.o.). This analysis can capture the distributive use, but cannot capture the occasion reading or the cumulative reading. The event semantics on dou proposed in this abstract will give a unified account for these three readings.

(1) John dou zaoshang youyong
John DOU morning swim
John swims in the morning.

(2) xueshengmen ba wu-ge-pingguo dou chi-le
the students BA five-CL-apple DOU eat-Asp
The students between them ate the five apples.

(3) tamen dou mai-le yi-ben-shu
they DOU buy-Asp one-CL-book
They each bought a book.

(4) $[\![dou]\!] = \lambda P_{\langle et,t\rangle}\lambda Q_{\langle et\rangle}\lambda x.\forall y[(y \in P \wedge y \subseteq x) \rightarrow Q(y)]$

Proposal I argue that *dou* always distributes through the mediation of events. Its entry is shown in (5). Following Champollion's (2016) analysis of distance distributive items (DDIs), I assume that *dou* is indexed with a thematic function θ which informs *dou* of the element it distributes over. When θ is contextually resolved to a thematic role function, *dou* distributes over the individuals having that thematic role. Whether the distribution is down to atoms or to nonatomic entities depends on the contextually determined cover Cov_i. When θ is contextually resolved to a temporal or spatial trace function, *dou* distributes over the temporal intervals or spatial locations in the cover. Moreover, thematic cumulativity is assumed, as in (6).

(5) $[\![DOU_\theta]\!]^g = \lambda Cov_i\lambda P_{\langle\epsilon,t\rangle}\lambda e_\epsilon.\exists E_{\langle\epsilon,t\rangle}[\forall e' \in E \rightarrow Cov_i(\theta(e')) \wedge P(e') \wedge e = \bigoplus E]$

(6) Thematic cumulativity
$\theta(\bigoplus E) = \bigoplus(\lambda x.\exists e \in E[\theta(e) = x])$

Composition In neo-Davidsonian event semantics, thematic arguments are not treated as arguments to the verb, but are introduced by independent thematic role heads (Parsons 1990). Verbs are one-place predicates of events and are combined with the thematic arguments via a generalized predicate modification rule. The composition of (2) and (3) are straightforward. In (2), the object of the verb *ate* is born as the outermost object in the structure and does not leave a trace post-verbally (C.-T. Huang, T.-H. Li and Y. Li, 2009). A consequence is that *dou* only scopes over the verb with the object outside of the scope of *dou*. The composition results in the object serving as the theme of the mereological sum event, as in (7). Since the agent in each sub-event is unspecified, how the five apples were eaten by the students has multiple possibilities. Both the distributive reading on the object and the cumulative reading on it will be true by this truth condition. It is not an undesirable result to lump the distributive reading and the cumulative reading, though. Kratzer (2008) adopted the ellipsis test for ambiguity to show that the distributive reading, collective reading and cumulative reading are not separate. The test is replicated in (8), which is true if John and Mary individually lifted four boxes, but Bill and Sue cumulatively did so.

(7) $[\![(2)]\!] = \exists e.Ag(e) = \bigoplus \textit{the-students} \wedge Th(e) = \bigoplus \textit{the-five-apples} \wedge \exists E[\forall e' \in E \rightarrow (Th(e') \in g(i) \wedge ate(e'))] \wedge e = \bigoplus E$

(8) John and Mary lifted four boxes. Bill and Sue did too.

Some intuitive evidence The intuition that *dou* is related to events has been shared by some linguists (S.-Z. Huang 1995, X.-G. Li 1998, Luo 2016, a.o.). Apart from the occasion reading in (1), two other pieces of evidence seem to support this intuition. First, *dou* always precedes the VP (Lee 1986), same as the other frequency adverbs. When the NP associated with *dou* is embedded in an island, *dou* has to be separated from its associate to precede the VP, seen in (9). Second, the plurality requirement of *dou* previously said to be on the NP associate is actually on the events. If we have a plural NP associate with two people and a symmetric predicate, the sentence turns out to be bad, as in (10). The reason is that *meet* is a symmetric predicate that requires at least two people in one meeting event. The subject in (10) contains only two people and thus only one event is possible. *Dou*'s plurality requirement on events is failed. Hence the ungrammaticality.

(9) Tamen xie de shu dou maidehao
they write comp book DOU sell good
Each of them wrote books that sell well.

(10) *Yuehan he mali dou jianlemian
John and Mary DOU met
John and Mary both met.

Stage-level vs. individual-level predicates It has been claimed in other languages that DDIs are incompatible with individual-level predicates since they require a set of events as input (Zimmermann 2002, Oh 2001). However, the following data on *dou* show that DDIs are only incompatible with individual-level predicates when the occasion reading is forced, i.e. when no plural thematic arguments are available for the DDI to distribute over. The current analysis provides a natural explanation. In (11), *dou* is co-indexed with the thematic agent role and distributes over the subject. In (12), all thematic arguments are singular and *dou* is forced to distribute over the sub-events of the event denoted by the VP. Individual-level predicates, however, denote sets of states that do not have subparts varying with time or location (Kratzer 1995). Hence the ungrammaticality of (12).

(11) Yuehan he Bi'er dou xihuan Mali
John and Bill DOU like Mary
John and Bill both like Mary.

(12) *Yuehan dou xihuan Mali
John DOU like Mary
John likes Mary each time/at each place.

Other DDIs in Chinese Another form of DDIs in Mandarin is reduplicated numeral+classifier phrases (RedNums). (13) is a revised example from Donazzan and Müller (2015), in which the RedNum *two-CL-two-CL* distributes over the theme argument *peanuts*. RedNums are modifiers of NPs, and therefore distribute over thematic arguments only. *Dou*, however, can distribute over either thematic arguments or events, as we already see in (1) and (3). This difference predicts that in a sentence like (14) where both *dou* and RedNum are present, they can distribute over different elements in the sentence and live together happily. In (14), the RedNum contains a classifier that dictates its distribution over the theme argument. *Dou* can then distribute over either the plural agent or the occasions, leading to a participant reading and an occasion reading.

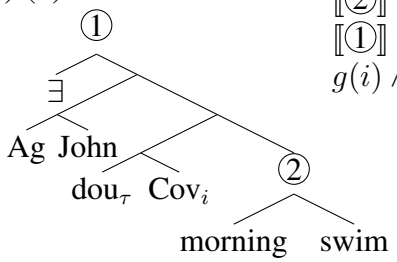
(13) haizi liang-ke-liang-ke de chi-wan-le huashengdou
child two-CL-two-CL DE eat-finish-Asp peanuts
The child ate the peanuts two by two.

(14) Xueshengmen dou liang-zhi-liang-zhi de mai bi
the students DOU two-CL-two-CL DE buy pens
The students (together) bought two pens each time/at each place. occasion reading
The students each bought pens two by two. participant reading

Conclusion This paper gives an event-based semantics on *dou* that unifies its distributive use over individuals, distributive use over events and cumulative reading over individuals.

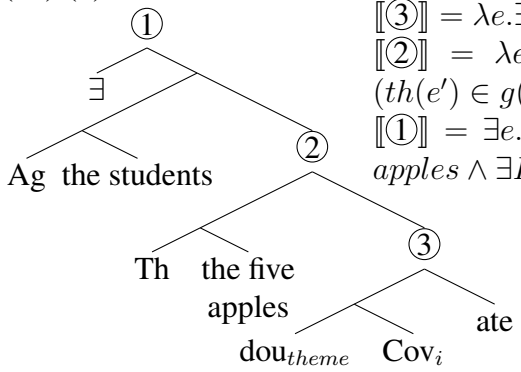
Composition

(15)/(1)



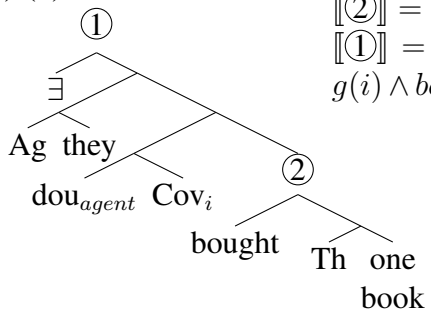
$[\![②]\!] = \lambda e.\tau(e) \sqsubseteq morning \wedge swim(e)]$
$[\![①]\!] = \exists e[Ag(e) = john \wedge \exists E[\forall e' \in E \rightarrow (\tau(e') \in g(i) \wedge \tau(e') \sqsubseteq morning \wedge swim(e')] \wedge e = \bigoplus E]$

(16)/(2)



$[\![③]\!] = \lambda e.\exists E[\forall e' \in E \rightarrow (th(e') \in g(i) \wedge ate(e'))] \wedge e = \bigoplus E$
$[\![②]\!] = \lambda e.Th(e) = \bigoplus the\text{-}five\text{-}apples \wedge \exists E[\forall e' \in E \rightarrow (th(e') \in g(i) \wedge ate(e'))] \wedge e = \bigoplus E$
$[\![①]\!] = \exists e.Ag(e) = \bigoplus the\text{-}students \wedge Th(e) = \bigoplus the\text{-}five\text{-}apples \wedge \exists E[\forall e' \in E \rightarrow (th(e') \in g(i) \wedge ate(e'))] \wedge e = \bigoplus E$

(17)/(3)



$[\![②]\!] = \lambda e.bought(e) \wedge \exists x[book(x) \wedge th(e) = x]$
$[\![①]\!] = \exists e[Ag(e) = \bigoplus they \wedge \exists E[\forall e' \in E \rightarrow (ag(e') \in g(i) \wedge bought(e') \wedge \exists x[book(x) \wedge th(e') = x])] \wedge e = \bigoplus E]$

Selected Reference

Champollion, L. 2016. Overt distributivity in algebraic event semantics. *S&P*.
Donazzan, M. and Müller, A. L. 2015. Reduplicated numerals as pluractionals: distributivity as a window to the individuation of events. *Journal of Portuguese Linguistics*.
Huang, S. Z. 1995. *Dou* as an existential quantifier. *Proceedings of NACCL 6*.
Kratzer, A. 1995. Stage-level and individual-level predicates. *The Generic Book*.
Li, X. G. 1998. *Dou* as event quantifier. *Proceedings of NACCL 7*.
Lin, J. W. 1998. Distributivity in Chinese and its implications. *NLS*.
Schwarzchild, R. 1996. *Pluralities*. Dordrecht: Kluwer Academic Publishers.