

## Chinese ‘dou’ and Cumulative Quantification

Yanyan Sui & Lucas Champollion University of Pennsylvania {yanyans, champoll}@ling.upenn.edu

**Summary:** We explore configurations in which *dou* in Chinese is compatible with cumulative readings involving numeral quantifiers. Such readings pose *prima facie* problems for a view that uniformly translates *dou* as Link’s (1983) \* operator similar to English *each*.

**Data:** The Chinese particle *dou* has often been claimed to be a distributivity marker (Lin 1998 and references therein). For example, while (1) has only the cumulative reading (3a), (2) only has the distributive reading (3b). Here,  $X \in *P$  iff  $X$  is the sum of one or more elements of  $P$  (Link, 1987), and  $\langle X, Y \rangle \in **R$  iff  $\langle X, Y \rangle$  is the sum of one or more pairs in  $R$  (Sternefeld, 1998).

- (1) san-ge haizi chi-le shi-ge pingguo (2) san-ge haizi **dou** chi-le shi-ge pingguo  
three-CL kid eat-ASP ten-CL apple three-CL kid DOU eat-ASP ten-CL apple  
(3a)  $\exists X [3\text{-kids}(X) \wedge \exists Y [10\text{-apples}(Y) \wedge \langle X, Y \rangle \in **\text{ate}]]$  ‘3 kids between them ate 10 apples.’  
(3b)  $\exists X [3\text{-kids}(X) \wedge X \in *[\lambda x \exists Y [10\text{-apples}(Y) \wedge \text{ate}(x, Y)]]]$  ‘3 kids each ate 10 apples.’

But in the causative *ba*-construction, in which both subject and object come before the verb, only a cumulative reading, but not a distributive reading, is available when *dou* is absent (4a) and also when it is present before the verb (4b). When *dou* occurs between the two quantifiers (4c), only a distributive reading is available. The compatibility of *dou* with cumulative readings is unexpected if *dou* is a one-place distributivity marker.

- (4a) san-ge haizi ba shi-ge pingguo chi-le (4b) san-ge haizi ba shi-ge pingguo **dou** chi-le  
three-CL kid BA ten-CL apple eat-ASP three-CL kid BA ten-CL apple DOU eat-ASP  
‘Three kids between them ate 10 apples.’ ‘Three kids between them ate 10 apples.’  
(4c) san-ge haizi **dou** ba shi-ge pingguo chi-le  
three-CL kid DOU BA ten-CL apple eat-ASP ‘Three kids each ate 10 apples.’

**Analysis:** Our analysis uses a Neo-Davidsonian framework, in which verbs, VPs, and IPs denote predicates over events. We view *dou* as a theta role modifier. A theta role modified by *dou* causes its bearer to take distributive scope over the event predicate it c-commands, including any quantifiers it may contain. To allow *ba* to introduce an external argument higher up, *dou* places the event and the theta role bearer into a cumulative relation and leaves the sum event accessible:

- (5)  $[[\text{dou}]] = \lambda \theta_{\langle \text{ve} \rangle}. \lambda P_{\langle \text{et} \rangle}. \lambda V_{\langle \text{vt} \rangle}. \lambda E. \exists X. P(X) \wedge \langle E, X \rangle \in **\lambda e \lambda x. [\text{ATOM}(x) \wedge \theta(e) = x \wedge V(e)]$

Finally, we present some facts that are surprising on our analysis as well as others. First, for some speakers, *ba* can be left out from (4b) in informal speech, and by removing it, a distributive reading becomes available in addition to the cumulative reading. Second, the passive-like *bei* construction allows (in fact, forces) quantifiers to escape the scope of *dou* (6).

- (6) shi-ge pingguo dou bei san-ge haizi chi-le  
ten-CL apple DOU BEI three-CL kid eat-ASP ‘Three kids between them ate 10 apples.’

**References:** Lin, J.-W. 1998. Distributivity in Chinese and its implication. *NLS* 6: 201-243.  
Link, G. 1998. *Algebraic Semantics in Language and Philosophy*. Stanford: CSLI.  
Sternefeld, W. 1998. Reciprocity and cumulative predication. *NLS* 6:303-337.