

## ***Long-chong* – a distributive and anti-distributive operator in Taiwanese**

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This study presents data and preliminary analysis on the Taiwanese expression *long-chong* ‘all’, which has two tonal patterns that are associated with a distributive and an anti-distributive interpretation respectively (Chen, 2000). By ‘anti-distributive’, I refer to the possibility of having either the collective or the cumulative reading. The goal of analysis is to unify the two interpretations with a core lexical entry, a distributive operator, to model the fact that these two interpretations come from the same expression whose tonal differences follow a general phonological rule, tone sandhi, in Taiwanese. The basic patterns for the two interpretations are shown in (1).

- (1) a. *sann*<sup>7</sup> *e*<sup>3</sup> *lang*<sup>5</sup> ***long*<sup>1</sup>-*chong*<sup>1</sup>** *iau*<sup>7</sup>-*chhiann*<sup>1</sup> *si*<sup>2</sup> *e*<sup>3</sup> *cha*<sup>7</sup>-*bou*<sup>2</sup>  
 three CL people **all** invite four CL women  
 Distributive: ‘Each of the three people invited a possibly different set of four women’
- b. *sann*<sup>7</sup> *e*<sup>3</sup> *lang*<sup>5</sup> ***long*<sup>1</sup>-*chong*<sup>2</sup>** *iau*<sup>7</sup>-*chiann*<sup>1</sup> *si*<sup>2</sup> *e*<sup>3</sup> *cha*<sup>1</sup>-*bou*<sup>2</sup>  
 three CL people **all** invite four CL women  
 Anti-distributive: ‘Between three people, a total of four women were invited.’

It should be noted that, without *long-chong*, the sentence in (1) can have either a distributive or an anti-distributive reading. In other words, the two versions of *long-chong* force the sentence to have either one of the available readings. Crucially, *long-chong* affects the scoping interpretations between the arguments linearly flank it. This is more obvious in sentences with three arguments. I demonstrate this with sentences where the prepositional phrase precedes the verb. In sentence (2a), where *long-chong* occurs between the subject and the PP, it constrains the scopal interpretation between them. In sentence (2b), when *long-chong* appears between PP and the verb, it constrains the scopal interpretation between PP and the object.

- (2) a. *sann*<sup>7</sup> *e*<sup>3</sup> *lang*<sup>5</sup> ***long-chong*** *tih* *si*<sup>2</sup> *e*<sup>3</sup> *sou*<sup>1</sup>-*chai*<sup>7</sup> *be* *gou*<sup>3</sup> *e*<sup>3</sup> *leng*<sup>1</sup>-*goh*<sup>4</sup>  
 three CL people **all** in four CL places buy five CL apples

Scoping with the distributive *long*<sup>1</sup>-*chong*<sup>1</sup>:

three people > (four places ≥ five apples); 12 places and 15 apples or 12 places and 60 apples

Scoping with the anti-distributive *long*<sup>1</sup>-*chong*<sup>2</sup>:

three people = (four places ≥ five apples); 4 places and 5 apples or 4 places and 20 apples

- b. *sann* *e*<sup>3</sup> *lang*<sup>5</sup> *tih* *si*<sup>3</sup> *e*<sup>5</sup> *sou*<sup>2</sup>-*chai*<sup>7</sup> ***long-chong*** *be* *gou*<sup>7</sup> *e*<sup>5</sup> *leng*<sup>1</sup>-*goh*<sup>4</sup>  
 three CL people in four CL places **all** buy five CL apples

Scoping with the distributive *long*<sup>1</sup>-*chong*<sup>1</sup>:

three people ≥ (four places > five apples); 4 places and 20 apples or 12 places and 60 apples

Scoping with the anti-distributive *long*<sup>1</sup>-*chong*<sup>2</sup>:

three people ≥ (four places = five apples); 4 places and 5 apples or 12 places and 15 apples

I use one more example to illustrate that the distribution of these two versions of *long-chong* is limited to available scopal interpretations: In sentences with the prepositional phrase follows the verb and the direct object, the direct object cannot scope over the prepositional phrase. The only possible scopal relationships between the object the the PP are symmetric scope and inverse scope. Consequently, the distributive *long-chong* cannot appear between the direct object and the prepositional phrase, as shown in (3). One possible syntactic account is that the distributive *long-chong* can only be attached before a VP. However, the fact that the distributive *long-chong* can appear before a prepositional phrase in (2a) shows that it is not simply an issue of surface syntactic configuration.

- (3) \**sann*<sup>7</sup> *e*<sup>3</sup> *lang*<sup>5</sup> *cheng*<sup>2</sup> *sann*<sup>7</sup> *chiong*<sup>3</sup> *leng*<sup>1</sup>-*goh*<sup>4</sup> ***long*<sup>1</sup>-*chong*<sup>1</sup>** *tih* *si*<sup>2</sup> *e*<sup>3</sup> *sou*<sup>1</sup>-*chai*<sup>7</sup>  
 three CL people plant three kind apples **all** in four CL places

I propose a basic lexical entry for *long-chong*, namely a distributive operator following Champollion's (2016) formulation, as shown in (4). The operator distributes the (sub)events to a thematic role ( $\theta$ ) such as agent and theme, and down to a certain level of granularity ( $C$ ), such as atoms. Consequently the denotation of sentences is modeled in the event semantics framework (e.g., Parsons, 1990). The two possible readings of *long-chong* are accounted for by different settings in the *granularity* parameter: The distributive reading is derived when granularity is set to atoms, as illustrated in (5).

$$(4) \quad \llbracket \text{long-chong/Part}_{\theta,C} \rrbracket \stackrel{\text{def}}{=} \lambda V \lambda e [e \in * \lambda e' (V(e') \wedge C(\theta(e')))]$$

(5) Composition for (2a), the distributive reading

- a.  $\llbracket \text{in four places bought five apples} \rrbracket = \lambda e [* \text{buy}(e) \wedge 4\text{-places}(* \text{loc}(e)) \wedge 5\text{-apples}(* \text{th}(e))]$
- b.  $\llbracket \text{long-chong}_{\text{agent, atom}} \text{ in four places bought five apples} \rrbracket = \lambda e [e \in * \lambda e' (* \text{buy}(e') \wedge 4\text{-places}(* \text{loc}(e')) \wedge 5\text{-apples}(* \text{th}(e')) \wedge \text{Atom}(\text{agent}(e'))]$
- c.  $\llbracket \text{Three people long-chong}_{\text{agent, atom}} \text{ in four places bought five apples} \rrbracket = \exists e [3\text{-people}(* \text{agent}(e)) \wedge e \in * \lambda e' (* \text{buy}(e') \wedge 4\text{-places}(* \text{loc}(e')) \wedge 5\text{-apples}(* \text{th}(e')) \wedge \text{Atom}(\text{agent}(e'))]$

The anti-distributive reading is derived when granularity is set to the maximum set, illustrated in The anti-distributive *long-chong* shares the same compositional path, with the granularity parameter set to 'maximal set'. The composition is shown in (6). The crucial difference is that when in distributing to the maximal set in the dimension of the agent, which contains only one set ( the set of three people), it only distributes once, thus deriving the reading where the three people as a group visited four places in total, consistent with a collective or a cumulative reading.

(6) Composition for (2a), the cumulative/collective reading

$$\llbracket \text{Three people long-chong}_{\text{agent, maximal set}} \text{ in four places bought five apples} \rrbracket = \exists e [3\text{-people}(* \text{agent}(e)) \wedge e \in * \lambda e' (* \text{buy}(e') \wedge 4\text{-places}(* \text{loc}(e')) \wedge 5\text{-apples}(* \text{th}(e')) \wedge \text{Maximal\_set}(\text{agent}(e'))]$$

This proposal makes subtle predictions on the grammaticality of sentences with the distributive *long-chong*. For the sentence in (3), it predicts a reading where the PP scopes over the direct object, as shown in (7a). For a sentence where the distributive *long-chong* follows the verb, it predicts a symmetric distributive, thus a cumulative reading, as shown in (7b). These are not the interpretations of the distributive *long-chong* in other contexts, and the occurrences of the distributive *long-chong* in these configurations happen to be ungrammatical. The anti-distributive *long-chong* are possible in these configurations and the composition would result a non-distributive reading.

(7) Predicted interpretations for the distributive *long-chong* in ungrammatical configurations

- a.  $\llbracket \text{Three people planted four kinds of trees long-chong}_{\text{agent, atom}} \text{ in five places} \rrbracket = \exists e [3\text{-people}(* \text{agent}(e)) \wedge 5\text{-places}(* \text{loc}(e')) \wedge e \in * \lambda e' (* \text{plant}(e') \wedge 4\text{-kinds-of-trees}(* \text{th}(e')) \wedge \text{Atom}(\text{agent}(e'))]$
- b.  $\llbracket \text{Three people invite long-chong}_{\text{agent, atom}} \text{ four women.} \rrbracket = \exists e [3\text{-people}(* \text{agent}(e)) \wedge 4\text{-women}(* \text{theme}(e)) \wedge e \in * \lambda e' (* \text{invite}(e') \wedge \text{Atom}(\text{agent}(e')))]$

One dimension that the present account has not touched upon is the anti-distributive *long-chong*'s restriction in distribution: it has to be licensed either by a measurement expression, such as the numerals in the examples of the current object, or certain types of expressions that implies a judgment on measurement and quantity. (e.g., 'These men *long-chong* only brought this chair'). Similar patterns are also observed for *together* in English. It remains to be seen whether a measurement-based analysis that has been proposed for *together* (e.g., Moltmann, 2004) is compatible with the goal to unify both interpretations of *long-chong*.

**References** • Champollion, L. (2016). Covert distributivity in algebraic event semantics. *Semantics and Pragmatics*. • Chen, M. Y. (2000). *Tone sandhi: Patterns across Chinese dialects*. Cambridge University Press. • Moltmann, F., 2004. The semantics of together. *Natural language semantics*. • Parsons, T. (1990). *Events in the semantics of English*. MIT Press.