Mandarin classifiers in the verbal domain

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OVERVIEW This talk aims to give a formal analysis for count words in the verbal domain (i.e. verbal classifiers) that show up in Mandarin Chinese, which accounts for both the obligatoriness of such words and the possibility of having them on different structural levels. The analysis analyzes these verbal classifiers (CL_V) as measure functions instead of sort-shifting operators, the classical explanation of nominal classifiers (cf. Chierchia 1998). This account obtains syntax-semantics isomorphy for CL_V in all positions. It also cruciallh relies on a Ionin & Matushansky (2006) style semantics for numerals (i.e. instead of a standard et type numeral semantics as in Landman 2006) to extend to nominal-countings; this theory connection is attributed to, eventually, the cumulative nature of event predicates.

DATA CL_Vs in Mandarin Chinese are words following the numeral when counting the event expressed by the predicate VP. They are obligatory in such counting constructions and may be found in four positions in a given sentence (1-4):

(1) You **san ci** Yuehan kan le shu.
there-be three CL_V John read ASP book
'Three times, John read a book.' (external -topic position)

(2) Yuehan you **san ci** kan le shu. (internal-topic position)

(3) Yuhan kan le **san ci** shu. (pre-object position)

(4) Yuehan kan le shu **san ci**. (adverbial position)

Additionally, we can have more than one numeral-CL_V stacking in a sentence:

(5) Yuehan you **liang ci** ba zhe ben shu kan le **san bian**.
John there-be two CL_V BA this CL_N book see ASP three CL_V
'Twice, John read this book three times.'

PROBLEMThe standard theory for nominal classifiers (Chierhia 1998) takes them to be overt sort-shifting operators that shift the denotation of a noun from a kind to a set of individuals. However, the empirical pattern of CLV as shown above cautions us when trying to extend this standard theory to the verbal domain: i) how can a sort-shifting operator be structurally closer to the numeral rather than the argument it shifts, as a CL_V is often to the right of the event predicate (4)? ii) how can a sort-shifting operator apply recursively (i.e. generating the stacking case, (5))? iii) what would the correspondence of kinds be in the verbal domain, that is applicable on so many levels?

ANALYSIS **Core semantics** The relevant difference between predicates of events and predicates of type e individuals is that event predicates never have atoms naturally available in their domain. In fact, event predicates are born as cumulative (cf. Krifka 1992, a.o.) because they are multi-dimensional. This is witnessed by the fact that the plural reading of an event predicate can be induced by picking out any dimension it has time, space, participants, etc.:

(6) (a) John read books. (complicate the object)

(b) John read a book on Saturdays in the past year. (complicate the time)

(c) John read a book in every country he visited. (complicate the location)

This means an atomic event is only defined when a dimension is selected; hence for counting to be possible, partitions have to be brought over to give structure and make countable atoms. **Necessitated by this peculiarity of the event domain, a CL_V is essentially a measure function that provides the individualization criteria for the event being counted.** We have evidence that directly supports this explanation, namely CL_Vs picking out the time dimension (ci) is not compatible with counting constructions that crucially requires the space dimension to be picked out. Suppose people in five American cities marched yesterday, all from 8 a.m. to 12 p.m.:

(7) #Zuotian meiguoren gao le wu ci youxing.
yesterday Americans make ASP five CL_V march
Intended meaning: 'Yesterday Americans marched five times.'

Formally, the numeral in event-counting is assumed to be the simple integer type; the CL_V forms a complex counting expression with the numeral first and together they draw on a partition of events, making them countable. These are detailed below (where S is the partition defined as in Ionin & Matushansky (2006), basically a set of non-overlapping subsets whose sum is the original set):

(8) (a) $[\![liang]\!]$: 2

(b) $[\![ci]\!]$: $\lambda n \lambda E_{vt} \lambda e_v \exists S[\prod S(e) \wedge \forall s \in S[E(s) \wedge \mathbf{CI}(s)] \wedge |S| = n]$

(c) $[\![\textit{liang ci}]\!]$: $\lambda n \lambda E_{vt} \lambda e_v \exists S[\prod S(e) \wedge \forall s \in S[E(s) \wedge \mathbf{CI}(s)] \wedge |S| = 2]$

The closeness between the numeral and the CL_V is part of the analysis, and the stacking pattern of CL_V phrases naturally resolves since the individualization is done without sort-shifting. CL_V phrases dont combine with kinds but property of events.

Extension: indirect event-counting CL_V phrases in the external or internal topic position and the pre-object position are believed to take a non-VP argument and count events indirectly. For the ones occupying a topic position, be it internal or external, evidence shows they are higher than vP: they can scope over a quantified object, which is known to obligatorily scope over the event closure:

(9) You san ci Yuehan kan le mei ben shu.
There-be three CL_V John read ASP every CL_N book
'Three times, John read every book.' every ¿ 3 times

This variant of CL_V phrases is taken to locate above the Perfective head proposed by Kratzer (1998). According to Kratzer, the Perfective head existentially closes the event and shifts the property of event into a property of time. Hence the topical CL_V phrase is able to count events indirectly by counting the time periods they are in. The current analysis easily extends to this situation, provided with type neutrality in formal details:

(10) $[\![\text{CL}_{\text{V-topical}}]\!] = \lambda n \lambda T_{\langle it \rangle} \lambda t_{\langle i \rangle} \exists S[\prod S(t) \wedge |S| = n \wedge \forall s \in S[T(s) \wedge \mathbf{CL}(s)]]$

CL_V phrase in the pre-object position, while often taken to be an adverb of the whole VP in semantic interpretation (cf. Huang 2008), shows idiosyncratic features that suggests it is a different kind: many pre-object CL_Vs cant go into an adverb position in the surface structure, and quantified objects or indefinite objects are only incompatible with the pre-object CL_V phrase:

(11) *Yuehan kan le **san ci** mei ben shu.
John read ASP three $_V$ every $_N$ book
Inteded meaning: 'John read every book three times.' (pre-object CL_V)

(12) Yuehan kan le mei ben shu **san ci**. (adverbial CL_V)

Therefore here it is analyzed as an adnominal modifier and the event-counting it obtains a case of DP-external reading, similar to four thousand in Four thousand ships passed through the lock last year. Formally this is done by letting the pre-object CL_V phrase subsume a thematic head, thereby map the individual property it combines with into an event property automatically, as shown below (is the theta role variable that needs to be parametrized in specific sentences):

(13) $[\![\text{CL}_{\text{V-adnominal}}]\!] = \lambda n \lambda P_{et} \lambda e_v \exists S_{vt}[\prod S(e) \wedge \forall s \in S[P(\Theta(s)) \wedge \mathbf{CL}(s)] \wedge |S| = n]$

DISCUSSION Ionin & Matushanksys (2006) semantics for numerals in nominal counting constructions can be decomposed into an integer part and a partitioning part, strikingly similar to the numeral-CLV phrase in current analysis:

(14) $[\![\text{two}]\!]$: $\lambda P_{et} \lambda x_e \exists S[\prod S(x) \wedge \forall s \in S[P(s)] \wedge |S| = 2] \equiv 2(\lambda n \lambda P_{et} \lambda x_e \exists S[\prod S(x) \wedge \forall s \in S[P(s)] \wedge |S| = n])$

Crucially, I&Ms semantics requires things being counted to be atoms only. This now suggests the possibility that the CLV is the overt realization of the built-int measuring potential (i.e. the partitioning part) of numerals across domains, that only surfaces in the event domain (which seems to hold cross linguistically, cf. Doetjes 2008) because due to the cumulative nature of event predicates, here the atomicity requirement can only be fulfilled with the help of an overt CLV. However, evidence of this proposal will have to be left to future.

Selected References **Chierchia, G.** (1998). Reference to kinds across languages. *Natural language semantics*, 6(4), 339-405. **Kratzer, A.** (1998). More structural analogies between pronouns and tenses. In *Proceedings of SALT* (Vol. 8,pp.92-110). **Krifka,M**.(1992).Thematicrelationsaslinksbetweennominalreferenceandtemporalconstitution. *Lexical matters*, 2953. Huang, C. T. (2008). On Ta De Laoshi Dang-de Hao He Teaches Welland Related Problems. *Yuyan Kexue* (Language Science), 2008(5). **Ionin, T., & Matushansky, O.** (2006). The composition of complex cardinals. *Journal of Semantics*, 23(4), 315-360. **Landman, F**. (2006). Indefinite time-phrases, in situ-scope, and dual-perspective intensionality. *Non-definiteness and Plurality* , 95, 237.