A unified analysis of classifiers and reduplication across nominal and verbal domains*

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Abstract

This paper discusses the use of classifiers and reduplication in Cantonese. I propose a unified account for the syntax-semantics of both nouns and verbs, based on two functional layers: individuation and quantification. I demonstrate an abstract semantics that handles the interaction between classifiers and reduplication without reference to syntactic categories. Quantification (reduplication) and individuation (classifiers) can be treated as general semantic functions that subsume category-specific functions. The analysis also separates quantification from individuation to provide a natural explanation of durative readings of reduplicated unbounded events.

Keywords: semantics, cross-categorial behaviors, classifier, reduplication

1 Introduction

In Cantonese, both classifiers and reduplication can occur with nouns and verbs. The surface word orders are similar, but their interpretations vary, including universal quantification (for nouns), and durative events and iterative events (for verbs). This study investigates the mechanism for both phenomena, and attempts to provide a generalized explanation to their occurrence across the nominal and verbal domains.

I propose a unified account for the syntax-semantics of both N and V domains based on two functional layers, individuation and quantification. The organization of this paper is as follows: Section 2 explains how classifiers and reduplication work in Cantonese. Section 3 outlines the proposal that reduplication represents quantification and classifiers represent individuation, following previous studies. Section 4 makes a few predictions, both for Cantonese data as well as cross-linguistic data. Section 5 discusses the theoretical implication borne out from the current proposal.

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2 Data

This section makes observations on the behaviors of classifier and reduplication as linguistic forms. I will generalize that each of the two constructions can be treated as manifestations of quantification and individuation. The end of this section provides a summary of the various interpretations for both classifier and reduplication in N and V, which suggests a category-neutral formulation that captures the data.

2.1 Classifiers with Nominals

English does not have a classifier system. The mass/ count distinction is made apparent by the co-occurrence of the indefinite article and plural morphology with count nouns, but not with mass, as shown in (1) and (2). Mass nouns require some sort of measure word, as in (2). For example, 'puff' makes it possible for speakers to count or quantify air.

(1)   a cup / cups

(2)   *an air / *airs / a puff of air

Unlike English, Cantonese nominals require classifiers. The examples in (3) show the obligatory use of classifiers in nouns like *bui* 'cup'. Although cups are naturally atomic, they are grammatically unindividuated objects (Rothstein 2010a, Barner & Snedeker 2005), and thus require a classifier. What's more, the use of classifiers can alter the unit of counting. Compare the two examples in (3). The minimal difference in the choice of classifier makes the difference in meaning between one cup in (3a) and one stack of cups in (3b). The plurality of in (3b) is encoded in the group classifier meaning 'stack', and crucially not in the morphology of the noun.

(3)   a.   jat1 go3   bui1
              one Clf$_{unit}$ cup
              'a cup'[1]
        b.   jat1 dung6   bui1
              one Clf$_{group}$ cup
              'a stack of cups'

For objects that are not naturally atomic, such as water, Cantonese requires classifiers as well. Examples in (4) show a few different classifiers and their corresponding meanings.

(4)   a.   jat1 dik6 seoi2
              one drop water
              'a drop of water'
        b.   jat1 bui1 seoi2
              one cup water
              'a cup of water'

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[1]Abbreviations: Clf: classifier (following subscripts show further sub-categorization of the classifier), sg: singular pronoun, pl: plural pronoun, Asp: aspect marking, Perf: perfect aspect marking, Dur: durative marking, Neg: negation

    c.   jat1 gung1sing1 seoi2
           one liter   water
           'a liter of water'

Notice that the examples in (4) differ minimally in their classifier or measure word, similar to the alternation of measurements in the English translation. Such an alternation shows that classifiers in Cantonese apply to both naturally atomic and non-atomic nouns. Following previous studies (Rothstein 2010a, b, Zhang 2013) on classifiers in Mandarin, I adopt the analysis that classifiers function to individuate nouns. The behavior of Cantonese nouns is similar to Mandarin in this particular regard[2]. Bare nouns (i.e. without classifiers) in Cantonese are unindividuated in nature[3]. This means that bares nouns do not always denote individual objects. Instead, they can denote substances, which are unbounded. Such a property can be understood in a similar way to bare mass nouns in English, e.g. 'air' or 'furniture'. Bare nouns can occur in generic statements (5a), or objects of unspecified quantity (5b).

(5)   a.   Air is important.
        b.   We went to buy furniture.

From our experience in the real world, we know that furniture comes in pieces and hence 'furniture' is naturally atomic. The English grammatical system, however, takes nouns like 'furniture' as non-atomic and requires a measure word in count environments. (Bale & Barner 2009) observe that some lexical roots denote individual objects (e.g. 'furniture' in English) and some do not (e.g. 'water'), and show that applying a mass-count dichotomy to nouns cannot capture this distinction. By teasing apart the notions of count/mass in syntax and individuation in the semantics of lexical roots, their account explains the unacceptability of examples in (3) and (4) above. That is, regardless of individuation of the lexical root, nouns on their own in Cantonese are grammatically non-count (regardless of their natural atomicity) and classifiers are required in all cases.

    Keeping in mind the function of classifiers for nominals, the next section will discuss classifiers (used in conjunction) with verbs and argue that nominal classifiers should be treated on a par with verbal classifiers.

2.2   Classifier with Verbs

    Though rarely discussed in the literature (see Wu (2004), Xie (2012) for Mandarin), Cantonese classifiers can occur with verb phrases and provide a bounded reading to an event[4]. Example (6a) shows an uninflected form of the verb 'jog' in Cantonese. Example (6b) includes the classifier *go3* and is interpreted similarly to 'take a look' or 'give (it) a try' in English, i.e. they denote bounded,

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[2]The difference between classifiers in Mandarin and Cantonese is well studied. Cf. Cheng (2012), Zhang (2013) for recent studies.

[3]There are several exceptions to this generalization. I will address this issue in section 4.2.

[4]There are other constructions that convey a similar meaning, such as adverbial modification (e.g., *jat1-ci3* 'once') or aspectual marking (e.g., *zo2* or *haa5*). Analysis of these other constructions and how similar they are to each other, semantically or syntactically, compared to classifiers is out of the scope of this study.

delimited events. This claim is supported by the fact that these delimited events cannot be modified by frequency or duration adverbials, as shown in (6c).

(6)   a.   ngo5 zung1ji3 heoi3 paau2 bou6
          1sg   like   go   run   step
          'I like jogging.'
       b.   ngo5 heoi3 paau2 go3 bou6 zau6 faan1 lai4
          1sg   go   run   Clf step   then   return come
          'I'll be back after going for a jog.'
       c.   ngo5 heoi3 paau2 go3 bou6 *{ loeng5 ci3   / loeng5go3zung1 } zau6 faan1 lai4
          1sg   go   run   Clf step   two   time / two.hours   then   return come
          'I'll be back after going for a jog (twice / for two hours).'
       d.   loeng (*go3) bou6
          two   Clf   step
          Intended: 'two steps'

Syntactically, there are three observable differences between N-associated classifiers (discussed in 2.1) and VP-associated classifiers:

First, classifiers in the verbal environment do not show the same lexical agreement as the nominal environment. The noun *bou6* 'step', as a nominal in (6d), and not part of a lexical verb, does not allow a classifier. However, in the verbal environment, the occurrence of *go3* is acceptable. This contrast shows that (6a)-(6c) are different from (6d), although the classifier immediately preceeds the noun in both cases.

Second, the lexical choice of the classifier must agree with the noun in the nominal environment. As shown in (7a), the lexical meaning of an object determines the choice of classifier. Only the agreeing classifiers *woon2* 'bowl' or *lap1* 'grain/ tiny piece' are acceptable, while *zi1* or *go3* are not. VP-associated classifiers, on the other hand, are restricted in a different way: the general classifier *go3* is used in most cases, regardless of the lexical meaning or size and shape of the noun. The verbal environment in (7b) shows subtle difference in interpretations from the choice of classifiers. With the classifier *woon2* 'bowl', the interpretation of VP *sik6 faan6* 'eat rice' must be literal as in (i), i.e. the consumption of bowls of rice. With the classifier *go3* 'unit', the same VP *sik6 faan6* is interpreted as 'to have a meal' in (ii)[5].

(7)   a.   jat1 { woon2 / lap1   / *zi1   / *go3} faan6
          one Clf_{bowl} / Clf_{grain} / Clf_{stick} / Clf_{unit} rice
          'a { bowl / grain / *stick / *piece} of rice'
       b.   keoi5dei6 heoi3 sik6 { woon2 / go3   } faan6
          3pl   go   eat Clf_{bowl} / Clf_{unit} rice
          (i) 'They went and had a bowl of rice.' (only with *woon2*)
          (ii) 'They went to have a meal.' (only with *go3*)

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[5]The meal interpretation can be verified, for example, if the speaker chooses to further explain that they are having noodles instead of rice.

Third, example (8) shows that numeral specification is odd for VP-associated classifiers, while this is possible with NP-associated classifiers. The fact that (8) is odd shows that the classifier-noun sequence *go3 faan6* is not a regular nominal. Though it is not clear why the verbal environment resists numeral specification, we do see that the nominal and verbal environments are different in significant ways.

(8)   ? hai2 jat1 go3 jyut6 noi6,   keoi5dei6 heoi3 sik6 sap6m5 go3 faan6
         in   one Clf month within, 3pl   go   eat fifteen Clf rice
       Intended: 'They went to have 15 meals in a month.'

The difference in lexical selection shows that VP-associated classifiers have a different distribution than N-classifiers, despite their identical surface word order (the classifier is immediately before the noun in both NP and VP classifiers): the verbal classifier links directly to the V-projection, not NP. In section 3, I will argue that the same element, namely the classifier, functions to delimit the modified VP or NP in the respective environments.

2.3   Reduplication in nominals

This section makes two observations about nominal reduplication in Cantonese. First, nominal reduplication only takes the form of [Clf-Clf-N]. The [N-N] form is not grammatical, as shown in (9) and (10).

(9)   a.   zek3 zek3 gau2
            Clf   Clf   dog
            'every dog'
       b.   *gau2 gau2
            dog   dog
            Intended: 'every dog'

(10)   a.   bui1 bui1 seoi2
            Clf$_{cup}$ Clf$_{cup}$ water
            'every water'
       b.   *seoi2 seoi2
            water water
            Intended: 'every cup/drop of water'[6]

Recall that nominal classifiers function to individuate nouns from grammatically unindividuated elements, regardless of their natural atomicity. This can be seen from (9) and (10) where dogs have natural units but water does not. Nouns in Cantonese do not undergo reduplication without a classifier. There are several exceptions where the nouns resist classifiers and undergo reduplication on their own. I will argue that these nouns are inherently individuated, similar to English count nouns, in section 4.2.

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[6]A reviewer asked whether this example would alternatively provide an 'all the water' interpretation. This is, however, not the case. The only place one finds the reduplication in [N-N] form is when the noun is inherently individuated. More details will be given in section 4.1.

Second, the reduplicated form [Clf-Clf-N] always gives the universal quantification reading, 'every'. More specifically, it shows a distributive, and not a collective reading. In example (11), each single member in the stack of books must be heavy.

(11) bun2 bun2 syu1 dou1 hou2 cung5
      Clf   Clf   book all   very heavy
      'Every book is heavy.'

The collective reading (i.e. 'Altogether the books are heavy') is not available in (11). The difference between collective and distributive readings is that the collective reading does not imply that each single member of the books is heavy. A case of books that contains some heavy books and some very light books would still be considered heavy altogether. Again, this is not a possible reading for (11).

2.4 Reduplication in verbs

Verbal reduplication has two possible readings in Cantonese: it denotes either a series of iterative events (as shown in (12a)) or a longer, durative event (as shown in (12b)). This makes the behavior of verbal predicates different within the same syntactic category.

(12) a. haau1 haau1 haa5 mun4
          knock knock Asp door
          'knocking on the door'   *Bounded V → Iterative event*
      b. cung1 cung1 haa5 loeng4
          wash wash Asp cool
          'taking a shower'   *Unbounded V → Durative event*

The boundedness of the verbs 'knock' and 'wash' happens to be the same as their English counterparts. This can be shown by modification by 'for a long time', without reduplication[7].

(13) a. keoi5 haau1 mun4 haau1 zo2 hou2 loi6
          3sg   knock door knock Perf very long-time
          'S/he knocked on the door for a long time'
      b. keoi5 cung1 loeng4 cung1 zo2 hou2 loi6
          3sg   wash cool   wash Perf very long-time
          'S/he showered for a long time'

Example (13a) entails that there must be more than one knock. It would be infelicitous if a speaker follows to say 'but s/he only knocked once (= s/he only made contact with the door once).' This is typically predicted for semelfactive verbs (Comrie 1976). On the contrary, (13b) would still hold

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[7]In examples (13a) and (13b), the two occurrences of the verbs are not contiguous. This is often called 'verb copying' in the literature and is different from reduplication as discussed in this paper. Crucially, verb copying may occur in a matrix predicate (and may stand alone), but reduplication may not. Also, verb copy allows other modifications like frequency (e.g. 'once', 'twice' and so on) or manner (e.g. 'slowly', 'happily') in the same position as 'for a long time' in (13a) and (13b), whereas reduplication does not allow this.

when a speaker follows with 's/he only showered once.' This contrast shows that *haau1 mun4* 'knock door' and *cung1 loeng4* 'wash cool' differ in their temporal boundedness. Also notice that sentences in (13) do not contain any determiners or numerals (crucially not with *mun4* 'door.') Thus the bounded effect of the predicate does not come from quantifying elements, but is inherent to the verbal predicates.

Externally, the reduplicated VP can only be an adverbial and not a matrix predicate when it is put in a sentence. Adding a subject directly to (12) above would not make grammatical sentences; another predicate must be present to make the sentence complete. Sentences in (14) are acceptable only when a main predicate is present.

(14)   a.   keoi5 haau1 haau1 haa5 mun4 *** (gin3-dou2 zek1 maau1**)
           3sg   knock knock Asp door   see   Clf cat
           'S/he saw the cat while knocking on the door'
    b.   keoi5 cung1 cung1 haa5 loeng4 *** (gin3-dou2 zek1 maau1**)
           3sg   wash wash Asp cool   see   Clf cat
           'S/he saw the cat while taking the shower'

The non-finite, subordinate nature of reduplicated VPs indicates that these VP adverbials do not include functional elements like TP or AspP, which are generally assumed to be present for finite clauses. Similarly, no temporal or aspectual marking is allowed for verbal reduplication. This observation has some implications on the syntax of both nominal and verbal reduplication as well as the general theory of the role of determiners and tense-aspect. This will be further explored in section 5.

Table (14) shows the summary of predictions on the interpretations of the various types of reduplication (Lam 2013).

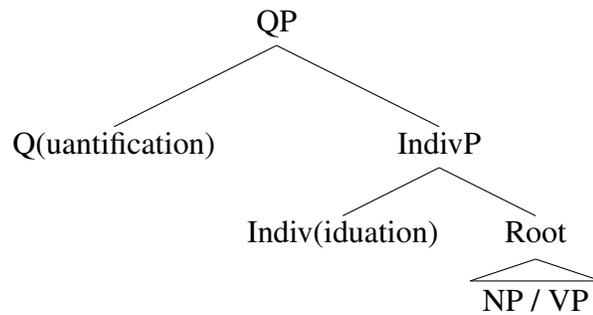| Category	Interpretation	
Cl-N	universally quantified noun	e.g. 'every dog'
$V_{bounded}$	iterative event	e.g. 'knocking'
$V_{unbounded}$	durative event	e.g. 'running'

Table 1: Summary of interpretations of reduplication

We can see that the interpretations vary. In the next section, I will seek for a unified account to relate the meanings of the base forms to their reduplicated forms, based on their boundedness properties.

3 Analysis: Quantification and Individuation

This study proposes a two-tiered analysis that applies to both the nominal and verbal domain. The two tiers are quantification and individuation, which are represented by the hierarchical structure below.

(15)

```
                              QP
                      ┌────────┴────────┐
              Q(uantification)        IndivP
                              ┌─────────┴─────────┐
                      Indiv(iduation)           Root
                                              ┌────┴────┐
                                                NP / VP
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In short, this section aims to demonstrate the following claim: Structure (15) shows a generalized structure that subsumes both NP and VP structures. The root-XP represents the lexical item, which may come bounded or unbounded. The individuation layer represents functional elements such as classifiers (which appear across categories). The quantification layer represents reduplication and other quantificational elements such as numerals and quantifiers.

In what follows, I will apply this analysis to three cases: nominal (classifier) reduplication, verbal reduplication resulting in iterative events, and verbal reduplication resulting in durative events.

3.1 Classifier Reduplication

In the nominal domain, we observe that the classifier is reduplicated and the reduplication results in a set of individuated members, such as (16).

(16)   zek3 zek3 gau2
       Clf   Clf   dog
       'every dog'

Following previous studies (Rothstein 2010a, Zhang 2013), nominal classifiers function to individuate grammatically unbounded substance to countable objects[8]. In typical cases, grammatically unbounded substances, such as water, are naturally unbounded and belong to the traditional notion of 'mass'. In some cases, however, grammatically unbounded substances can also be naturally atomic, such as 'furniture' or 'footwear' in English [9].
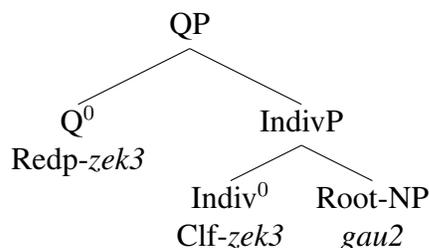
In an experimental study, Barner & Snedeker (2005) show that mass nouns can be further divided into two sub-classes: substance-mass nouns (e.g. *mustard*, *ketchup*) and object-mass nouns (e.g. *furniture*, *jewellery*). They propose that such a difference is due to the specification of grammatical features in these nouns and that there is no evidence for one-to-one mapping between the syntax and semantics of the 'count-mass distinction'. Their findings echo the data presented in

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[8]Both Rothstein (2010a) and Zhang (2013) discuss the measure reading (e.g., 'three bottles of wine'.) They show that the NP structure under the measure reading is different from the typical, non-measure one. The present study does not rely crucially on the existence of two possible NP structures, and therefore we will not discuss the measure reading here.

[9]In English, naturally atomic mass nouns often occur to be collective terms. The Quantification/Individuation theory proposed here does not bear on why this is the case.

section 2. That is, despite the same syntactic distribution external to the NP (e.g. *much wa-ter/furniture*, the two classes have different semantic behavior: some items are inherently individuated and some are not. Hence, it is necessary to posit a functional layer that specifies the individuation. Based on structure (15), example (16) can be explained directly by (17), where the individuation is realized by classifier *zek3* and the lexical root by the noun *gau2* 'dog'. The quantification is realized by head-to-head copying of the classifier.

(17)

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                          QP
                        /    \
                     Q⁰       IndivP
                 Redp-zek3    /    \
                         Indiv⁰    Root-NP
                        Clf-zek3     gau2
```

This analysis captures the fact that individuation does not have to follow natural atomicity, as observed by Barner & Snedeker (2005). Example (18) shows that changing the classifier changes the unit of counting.

(18) a. **go3 go3** kau4jyun4
          Clf Clf player
          'every player'
      b. **deoi6 deoi6** kau4jyun4
          Clf$_{team}$ **Clf**$_{team}$ player
          'every team of players'

While *kau4jyun4* '(ball-game) player' is naturally atomic (based on our real world knowledge), the grammar allows it to be individuated or grouped in at least two ways. Using the classifier *go3*, one can refer to individual players; using *deoi6* as a classifier, one can refer to teams as units.

    Under this analysis, the two functional layers sufficiently explain the distribution and the interpretation of classifier reduplication. Crucially, classifier reduplication in Cantonese always refers to a set and the set consists of individuated members, which is predicted by quantification and individuation as formulated here, respectively.

3.2   Verb Reduplication with the Iterative Reading

    Similar to nominal reduplication, the reduplication of bounded verbal predicates involves quantification as well as individuation. As discussed in section 2, the boundedness of a predicate can be independently tested based on its behavior with regard to durative modification (see example (13)). I propose that this boundedness distinction represents individuation in the verbal domain.

    We first look at how the iterative readings, as in example (12a) (repeated here as (19)), are interpreted:

(19)   haau1 haau1 haa5 mun4
        knock knock Asp door

'knocking on the door'

The verb *haau1* 'knock' itself is bounded (i.e. the verb denotes a quantized element that forms a unit of 'knocking,' with no proper subpart of knocking being considered 'knocking'). This is the case when we consider that part of a knock would typically include raising one's arm, moving the fist and fingers towards the door, and making a noise through the contact between the finger(s) and the door. Within a single event 'knock', the subparts of it cannot be considered 'knocking' when occurring alone. We therefore believe that *haau1* 'knock' is a quantized predicate Krifka (1998).

With this in mind, then, we can formulate the QP straightforwardly in (20), where the individuation level is realized by a bounded verbal predicate and the reduplication (i.e. a copy in syntax) occupies Q^0. Most importantly, this structure predicts the iterative interpretation, since the individuation level says the event is individuated and the quantification level is realized through reduplication, which denotes universal quantification.

(20)
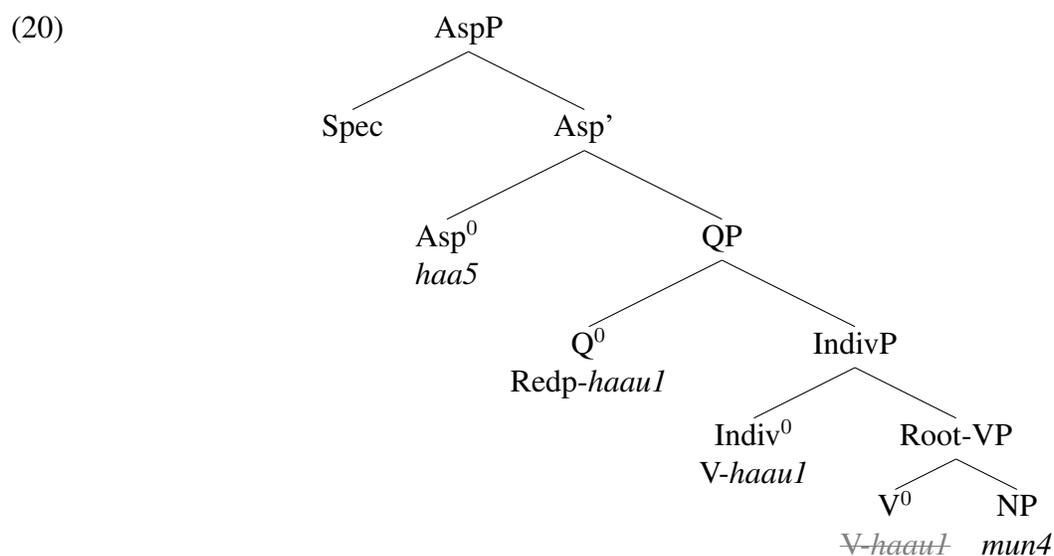
I follow the general assumption that Aspect occupies a higher position than little-vP (and thus VP), and that Cantonese is head-initial in general. Notice that the aspectual element *haa5* is base-generated in a higher position. This creates a problem for deriving the attested surface order, where the aspectual element *haa5* comes between the lexical verb and the accusative object.

There are two possibilities to derive the surface order: either via movement of some head element (e.g. V^0 moving cyclically to Asp^0), or via affix-lowering for the aspect marking to show up adjacent to the verb. The choice between the two possibilities involves the more general treatment of aspect. However, it is not crucial to the data presented here, as long as that choice is kept consistent across the two types of verbs described in this and the next sections.

There is another alternative to the theory of Aspect altogether. Sybesma (1997) argues that Mandarin *-le*, contrary to common belief, should be analyzed as a functional category deeply embedded inside the VP. On the surface, his proposal is compatible with the data presented here. However, his proposal focuses on Mandarin *-le* as a marker for realization of events, which denotes the inception of an event. This might not directly transfer to the aspect marker *haa5* in Cantonese.

In short, the status of *haa5* is a topic larger than what this paper can handle, and we must leave this for future research.
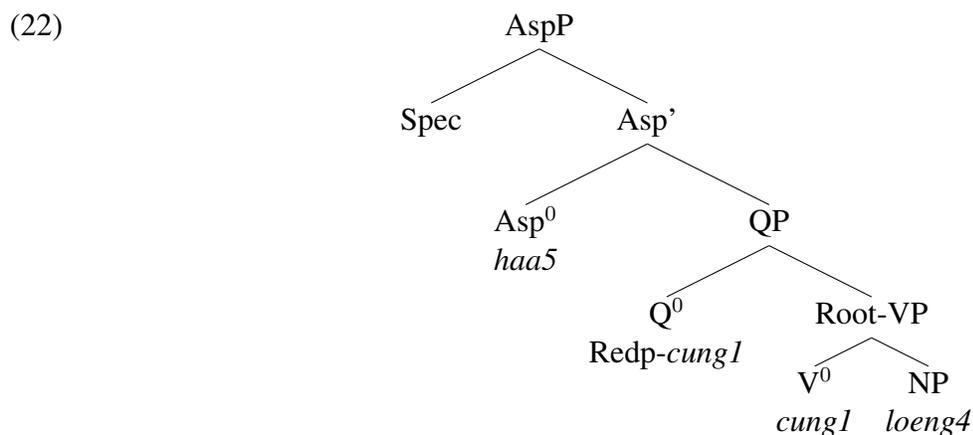
3.3 Verb Reduplication with the Durative Reading

Verbal reduplication with a durative reading has the same surface order as the verbal reduplication with an iterative reading. Therefore analyses based on syntactic category would not be able to make a distinction between the two kinds of interpretations. This difference in interpretation can, however, be predicted based on the eventuality types of the verbal predicate. In Lam (2013), I argue that the reduplication of bounded VPs results in an iterative reading and the reduplication of unbounded VPs results in an durative reading. By classifying VPs by boundedness, VP-reduplication in Cantonese can then be formulated with a unified notion of the sum operation (see Champollion & Krifka (to appear, 2014) for an overview of mereology).

Recall that verbal reduplication looks like (21). The only difference between the durative interpretations and the iterative ones comes from the choice of lexical item.

(21)   **cung1 cung1** haa5 loeng4
        wash wash   Asp cool
        'taking (a) shower'[10]

We have established in section 2 that the boundedness of these verbs can be probed by temporal modification, and showed that *cung1 loeng4* 'take shower' in Cantonese is unbounded and thus unindividuated. This indicates that there is no Individuation function present in the structure, resulting in structure (22).

(22)
```
                        AspP
                       /    \
                    Spec    Asp'
                           /    \
                        Asp⁰     QP
                        haa5    /   \
                              Q⁰    Root-VP
                          Redp-cung1   /    \
                                      V⁰    NP
                                    cung1  loeng4
```

Notice that it is also possible to posit an alternative structure exactly identical to (20), which I argued for for the iterative reading in section 3.2. Such a structure with covert marking for Individuation (say, a null morpheme that is posited to denote 'unindividuation') would, however, forbid the head movement account that enables the reduplication in Q^0 to share the phonological form as V^0. Had there been a null morpheme in an Individuation layer between Q and Root-VP,

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[10]The English translation adds a sense of boundedness to the phrase, which is not present in the Cantonese example.

reduplication would then make a copy of the null morpheme due to the head movement constraint. Such an account would therefore fail to explain the data we have seen so far. Therefore, with respect to durative interpretations, I argue for a structure where Q immediately dominates the Root-XP and contend that Individuation is not in the picture at all.

4 Predictions

This section makes a few predictions that are borne from the analysis given above. Firstly, this analysis predicts the behavior of pluractionality in additional Cantonese examples presented in section 4.1. Secondly, for Cantonese, the proposed analysis explains the behavior of a certain class of nouns that are inherently individuated (section 4.2). Thirdly, I explore the possiblity to extended the proposed theory to a language that is not genetically related to Cantonese or any Sinitic languages. A preliminary analysis of Bangla/Bengali will be discussed in 4.3.

4.1 Plurality/Pluractionality of Cantonese data

Consider the following pair:

(23)   ngo5 **haau1 haau1** haa5 dou6 mun4 keoi5 zau6 ceot1 lai4
        1sg **knock knock** Asp Clf door 3sg   then out   come
        'S/he came out while I was knocking on the door.'   (*multiple knocks*)

(24)   ngo5 haau1 **dou6 dou6** mun4 dou1 mou5 jan4
        1sg knock **Clf Clf** door all   Neg person
        'I knocked on every door and no one (answered).'   (*multiple doors*)

On the surface, the two sentences differ minimally in which element is reduplicated. Their interpretations can be predicted by the analysis given in section 3. That is, whenever the base element is individuated, the reduplicated form must denote a set with plural members.

In the case of (24), the collection contains multiple doors[11]. Therefore, the prediction is borne out from the current analysis that the speaker received no answer from each and every single of the door s/he knocked on in (24).

4.2 Behavior of Individuated Nouns in Cantonese

Section 2 mentioned there are several exceptional nouns that cannot take classifiers even with numerals:

(25)   a.   sei3 (*go3) nin6
              four Clf   year
              '4 years'

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[11]Notice that one may also infer that there are multiple knockings. This is true, but it only comes via the additional real world knowledge that knocking involves physical contact, and that it is impossible to knock on multiple doors with the same knock by one hand. This inference can be cancelled if we switch to other verbs like *tai2* 'see' from *haau1* 'knock'

b.　sap6 (*go3) jat6
　　ten　Clf　　day
　　'10 days'

I argue that this behavior indicates that these nouns in Cantonese are inherently individuated and therefore resist classifiers. The proposal of this study is that all individuated nouns will become a universally quantified plural noun when reduplicated. This is exactly what happens to these nouns. Nouns like 'year' or 'day' can undergo reduplication without classifiers and still achieve a distributive reading[12].

(26)　a.　nin6 nin6
　　　　　year year
　　　　　'every year'
　　　b.　*go3 go3 nin6
　　　　　Clf　Clf　year
　　　　　Intended: 'every year'　　　　　　　　　(*other classifiers are equally unacceptable*)

These special nouns in Cantonese behave similarly to count nouns in English. They do not allow classifiers or any individual-denoting measure words, and are directly adjacent to numerals. This class of nouns are both naturally atomic and grammatically individuated. Since most of them are units (either of time or other kinds), it is not surprising that these unit words indeed denote a bounded entity.

As for individuation, if reduplicated elements show universal quantification over multiple instances (e.g. 'every student'), the bare form of the element must be individuated. In short, this class of count nouns in Cantonese should not be seen as challenge to the proposal given here. Rather, these nouns confirm that the restriction on classifier reduplication (i.e. that it is the classifier and not the lexical noun that undergoes reduplication) does come from individuation, which is what this study has argued for. If the restriction on classifier reduplication exists for purely syntactic reasons, one would not expect the noun reduplication pattern seen in (26b).

4.3　Bangla/Bengali

A similar pattern of reduplication can be found in Bangla / Bengali. (Chakraborty & Bandyopadhyay 2009) report a variety of interpretations involving different syntactic categories. We can also see reduplication in nouns in example (27) and verbs in example (28)[13], giving the 'every N' interpretation and durative event interpretation, respectively[14].

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[12]Cantonese *jyut6* 'month' does not follow the same pattern. A classifier is required in *jat1 *(go3) jyut6* 'a month'. A speculative explanation is that *jat1 jyut6* means the first month, i.e. January, in Cantonese and the inclusion of a classifier is for disambiguation.

[13]The paper by Chakraborty & Bandyopadhyay (2009) focuses on computational application and does not provide word-by-word glossing. The transcriptions and translations here are cited directly from Chakraborty & Bandyopadhyay (2009). A Bangla informant provided me with the glosses. He disagrees with some of the transcriptions, but they do not affect the (overall) interpretation.

[14]Bangla/ Bengali verbal reduplication shows partial phonological reduplication, which has no bearing on the current analysis.

(27) **bachar bachar** ek-kaj   kara
    year   year   the.same do
    'Do the same **every year**.'

(28) **Kheye Deye** Ami Shute Jaba
    eat   eat   1sg sleep shall
    'After **eating**, I shall go to sleep.'   (partial reduplication)

Reduplicated forms in Bangla/ Bengali are strikingly similar to those in Cantonese, even though the languages are not genetically related and have had no systematic contact. Following the analysis presented here, we would expect *bachar* 'year' to be individuated. Since Bangla does have a classifier system (Dayal 2014), then the present analysis predicts *bachar* 'year' in Bangla to be an exception, in similar ways as its Cantonese counterpart *nin4* 'year'. Further investigation is required in the behavior of Bangla noun roots in general and potential exceptions (e.g. *bachar* 'year'), in order to advance or falsify the current analysis.

Moreover, Dayal (2014) discusses the semantics of plural classifiers denoting groups of objects. The existence of plural classifiers in Bangla shows that individuation does not have to strictly follow the natural atomicity of the object (though individuation might still be constrained by atomicity, in the sense that we do not observe classifiers like 'half' or 'one-third'). Dayal did not mention any reduplication behavior with regard to the use of classifiers. Again, independent data collection of Bangla is outside the scope of this study, so future research on the behavior of Bangla nominals and verbs will be necessary, in order to further verify how similar the reduplication strategies are between Cantonese and Bangla.

5   Implications

5.1   Parallelism between N & V

This study has argued for a uniform treatment to both nominals and verbs in their semantics. Specifically, I argued that both nominal and verbal 'substances' must undergo individuation first and then quantification to become a legal argument (of verbs and aspect, respectively). On the one hand, this analysis draws a parallel between counting in nominals and iterative readings in events. When individuated atoms undergo reduplication, a set is formed and the expression is interpreted as multiple instances. On the other hand, for elements that are not individuated (either lexically or compositionally), reduplication creates a set, but such a set would not be interpreted as having distinguishable atoms due to the absence of individuation. This gives rise to the durative reading in events and potentially a measuring reading for nominals (the latter is not attested in Cantonese). The analysis here reduces the number of grammar rules that learners have to posit and thus makes language more easily learnable.

5.2   Reduplication and Singularity

Reduplication is predominantly found in plural contexts. The discussion on durative events denoted by verbal reduplication in this study has shown that this does not have to be the case.

The present approach shows that it is possible to have a reduplicated form denoting a singular entity, as long as the non-reduplicated form of that entity is not bounded. Although the singular interpretation is only attested in verbal reduplication in Cantonese, the present approach does not exclude the possibility that that other languages could have a singular interpretation of reduplicated nominals that denotes a larger amount of a substance. That is, these reduplicated nominals would not denote multiple instances of an object (similar to 'much water' English), provided that the base form denotes an unbounded substance.

Although we only see reduplication of bare nouns in Cantonese for a restricted set of (like 'year' or 'day'), the present analysis does not rule out the possibility for other languages to have N-reduplication systematically. Instead, the current study predicts that if a language allows reduplication of bare nouns to mean 'every N', then these nouns would be inherently individuated. This language either does not have classifiers at all, or these individuated nouns cannot have classifiers even in contexts other than reduplication.

6 Conclusion

This study adopts two functional layers, Individuation and Quantification, to explain the behavior and interaction of classifiers and reduplication. Individuation can either be manifested by a classifier or encoded within a lexical item itself. Quantification, when manifested by reduplication in Cantonese, denotes universal quantification like 'every'. Whether or not universal quantification results in grammatical plurality (as opposed to natural plurality) depends on the individuation of the reduplicated element: Without Individuation, the sum of the unbounded elements would result in a larger mass, but not a set with plural members, as evidenced in reduplication of unbounded events. With Individuation, the sum of the bounded elements would result in a set containing plural entities, as shown in classifier reduplication or the reduplication of bounded events.

The analysis explains the behavior of three cases of reduplication in Cantonese: classifier reduplication, which is always bounded, and the reduplication of bounded and unbounded verbal predicates. Furthermore, it predicts the interpretation of sentences involving reduplicated elements (section 4.1) and the behavior of bare noun reduplication (section 4.2) in Cantonese. The current analysis also seems to be compatible with the Bangla data discussed in section 4.3.

Finally, this paper also discussed two implications of the current proposal. First, the current proposal advocates a syntax-semantics that handles both nominal and verbal domains without relying on lexical categories. Also, the different interpretations between bounded and unbounded verbs demonstrate that reduplication does not necessary mean plurality in the general sense, which implicates that a finer distinction of boundedness should be made on top of the generally accepted mass-count distinction.

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