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A Unified Account of Three Uses of *Dou*[*]

Zhuo Chen
The Graduate Center
The City University of New York

Abstract I argue that *dou* is a distributor that always distributes through events, based on the following three pieces of evidence: (a) *dou* has an occasion reading; (b) the occasion reading is obligatory when the NP outside the scope of *dou* is semantically singular; (c) two NP pluralities outside of the scope of *dou* generate a cumulative reading. Among these three, the first one is often ignored in the literature. The second one directly debunks the mystery of the incompatibility between *dou* and collective predicates and the third one poses a challenge to the current popular theories on *dou* on the market. Following Champollion's (2016) analysis of overt distributors cross-linguistically, I analyze *dou* as a distributor over events. What's inside the scope of *dou* is the description of the subevents and what's outside its scope is the description of the mereological sum event. This analysis can give a unified account of the distributive use, occasion use and cumulative use of *dou*.

Keywords: *Dou*, distributivity, cumulativity, event semantics

1 Introduction

1.1 Background

The Chinese particle *dou* has attracted immense interest due to its multi-function. The classical analysis treats *dou* as an overt counterpart of the covert *dist* proposed in Schwarzschild 1996 (Lin 1998). Subsequent research analyzes *dou* as a maximality operator which basically functions as English *the* (Xiang 2008; Cheng & Giannakidou 2013). More recent research takes the *even* use of *dou* as the starting point and extends the analysis to the distributive use by releasing the task of distribution to an invisible element in the sentence (Liao 2011; Liu 2017).

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Another line of research that does not draw much attention relates *dou* to event quantification. Two representative proposals are Huang (1996) and Li (1995). Huang (1996) argues that a set of quantifiers including *every* and *most* require an existential quantifier in their scope to facilitate distribution. Assuming that predicates introduce a variable (Higginbotham 1985, 1989), she argues *dou* serves as an existential closure (Heim 1982) to existentially bind the event variable. Li (1995) also proposes that *dou* is an event quantifier, but he preserves the universal quantificational force of *dou* and locates the event variable to the left of it in order to maintain the Leftness Condition on *dou*.[1]

1.2 Data and questions

The data that will be discussed in the current paper are confined to the following. *Even* reading of *dou* is set aside for now.

(1) Wo dou du le Laozhongshi
I DOU bet Asp Old Faithful
I bet on Old Faithful every time. Occasion reading only[2]

(2) Yuehan he Mali dou jianmian le
John and Mary DOU meet Asp
John and Mary met each other each time/at each place.
Occasion reading only[3]

(3) Tamen dou taiqi le wu jia gangqin
they DOU lift Asp five CL piano
They each lifted five pianos. ✓Distributive reading
They lifted five pianos each time/at each place. ✓Occasion reading

(4) Yuehan he Mali dou xihuan Bier
John and Mary DOU like Bill
John and Bill both like Bill. Distributive reading only

(5) *?Yuehan dou xihuan Bier
John DOU like Bill
John likes Bill every time/at each place. *Occasion reading[4]

1 The Leftness Condition (Cheng 1994): *dou* always quantifies over the element to its left.
2 This datum is from Li (1995). In a context where the speaker is talking about the multiple horse races he bet on last week, this sentence means he bet on Old Faithful in all those races.
3 'John and Mary' is semantically singular, in the sense of Landman (2000), where a morphologically plural NP with a collective predicate will be turned into a semantic impure atom by the ↑ operator.
4 Note that the *even* reading of *dou* is felicitous here, but as I said, this use is set aside for now.

(6) *?Yuehan/Yuehan he Mali dou dapo le na ge beizi
John/John and Mary DOU break Asp that CL cup
John broke that cup every time/at every place. *Occasion reading
John and Mary each broke that cup. *Distributive reading

(7) San ge xuesheng ba wu ge pingguo dou chi le
three CL students BA five CL apple DOU eat Asp
Three students ate all of the five apples. ^{OK}Distributive reading
✓Cumulative reading

Observation of these data leads us to ask the following questions:

- When the NP outside of the scope of *dou* is semantically singular, why is the occasion reading obligatory, for example, in (1) and (2)?
- When the NP outside of the scope of *dou* is semantically plural and the VP denotes pluralizable events, why are distributive reading and occasion reading both possible, for example, in (3)?
- When the NP outside of the scope of *dou* is semantically plural and the VP is an individual-level predicate, why is distributive reading the only possible reading, for example, in (4)?
- When the NP outside of the scope of *dou* is semantically singular and the VP is an individual-level predicate, why is the occasion reading prohibited, for example, in (5)?
- When the VP denotes non-pluralizable events, why is the sentence bad on both the occasion reading and the distributive reading, for example, in (6)?
- When both the subject NP and object NP are outside of the scope of *dou* and both are semantically plural, how do we get the cumulative reading, for example, in (7)?

Several parameters emerge from the data whose interaction determines the grammaticality and possible readings of the examples, including the semantic singularity/plurality of the NP, the stage/individual level of the predicate and if the predicate is stage-level, whether it denotes pluralizable events. Putting aside the cumulative reading, the interaction between the different settings and the resulting reading they lead to are shown in Table 1.

NP semantically plural	Stage-level pluralizable predicates	Stage-level non-pluralizable predicates	Reading
+	+	-	distributive, occasion
+	-	+	ungrammatical
+	-	-	distributive only
-	+	-	occasion only
-/+	-	+	ungrammatical
-	-	-	ungrammatical

Table 1 Data

As for the cumulative reading, we need to answer: when the object is in the scope of *dou*, why do we only get a distributive reading on the subject NP or an occasion reading? When the object is outside the scope of *dou*, how does the cumulative reading become available? Compare (8) to (3).

(8) Tamen ba wu jia gangqin dou taiqi le
they BA five CL piano DOU lift Asp
They lifted all the five pianos. ✓Cumulative reading

1.3 The scope and organization of this paper

The modest goal of this paper is to revive the idea of *dou* as an event quantifier (Huang 1996; Li 1995). In section 2, I will show that the cumulative use poses a challenge to Lin's (1998) and Liu's (2017) analyses. Two attempts to defend their analyses will be discussed and problems with these attempts are pointed out. In section 3, I propose that *dou* is a distributor that always distributes through events. A semantic entry will be given to *dou* that adds it to the category of distance distributive items surveyed in Champollion 2016. This semantic analysis is shown to be able to unify the distributive use, occasion use and cumulative use of *dou*. The questions that arise from the data in section 1 will also find their answers in this analysis. Section 4 concludes.

2 Cumulative use of *dou*

Despite the huge literature on *dou*, the cumulative use of it has been largely ignored. Sentence (7), repeated here as (9), is an example. In the given scenario where the three students stand in a cumulative relationship with the five apples, (9) is true.

(9) San ge xuesheng ba wu ge pingguo dou chi le
three CL students BA five CL apples DOU eat Asp
Three students ate all the five apples.

(10) Scenario: John, Mary and Bill are three students. On the table there were five apples. John ate two, Bill ate two and Mary ate one.

If the previous semantic analyses of *dou* can be successfully extended to account for the cumulative use of *dou*, examples like (9) are positive evidence to support them. If they cannot explain the cumulative use, we need to make the semantics of *dou* more flexible as to accommodate examples like (9). In the following two sections, I will show that the cumulative reading poses a challenge to Lin's (1998) overt *dist* analysis and Liu's (2017) *even* analysis.

2.1 Challenge to *Dou* as an overt *dist*

Lin (1998), following Schwarzschild's (1996) analysis of the covert distributive operator *dist* in English, proposes that *dou* is simply an overt version of it. In this proposal, the semantics of *dou* involves three parameters, a predicate, an NP to be distributed over, and a contextually determined cover on the NP. *Dou* asserts that the predicate applies to each element in the cover. For exposition, the definition of *cover* and the semantics of *dou* are given in (11) and (12). The contextually determined cover is returned by applying to a contextually given function *Cov* to the NP. With these parameters available, we can account for a distributive sentence straightforwardly. (13) is an example.

(11) a. C is a plurality cover of A iff C covers A and no proper subset of C covers A

b. C covers A if:
1) C is a set of subsets of A
2) Every member of A belongs to some set in C
3) $\emptyset$ is not in C

(12) $[\![dou]\!] = \lambda Cov \lambda P \lambda x. \forall y (y \in Cov(x) \rightarrow P(y))$

(13) [[The students DOU bought a car]]
=1 iff $\forall y (y \in Cov([\![\text{the students}]\!]) \rightarrow [\![\text{bought a car}]\!](y)=1)$

Can this analysis capture the cumulative sentence in (9)? According to Lin's (1998) proposal, *dou* distributes over a cover on the NP *five apples* in this sentence. Suppose the contextually cover is as in (14). The resulting meaning is as shown in (15)[5], which asserts that there are three students, and for each of the five apples, the

5 We take BA as the thematic role head that introduces the preverbal object. What its syntactic category

three students ate it. This is a felicitous meaning, but not the cumulative reading that we are targeting. In our reading, it is not the case that all the three students are involved in eating each of the five apples.[6]

(14) $Cov([\![\text{the five apples}]\!]) = \{\{a_1\},\{a_2\},\{a_3\},\{a_4\},\{a_5\}\}$

(15) $[\![\text{Three students five apples DOU ate}]\!]$
= 1 iff $\exists X([\![\text{students}]\!](X) \wedge |X| = 3 \wedge$
$\forall y(y \in Cov([\![\text{the five apples}]\!]) \rightarrow [\![\text{ate}]\!](y)(X) = 1))$

2.2 Challenge to *Dou* as *even*

Liu (2017) approaches the semantics of *dou* from a different direction than Lin (1998). To Liu, *dou* is never a distributor by itself. Instead, the semantic core of *dou* is analogous to *even*. The distributive meaning is contributed by a covert *dist* as proposed in Schwarzschild 1996. I summarize the main components of Liu's (2017) theory as follows.

(16) The main components in Liu's (2017) theory

- *Dou* is a focus particle with a presuppositional semantics similar to English *even*
  $[\![\text{Dou}]\!] = \lambda p.\forall q(q \in alt(p) \rightarrow p <_{likely} q) : p$
- A covert *dist* is present in distributive sentences containing *dou*.
- In distributive sentences, *dou* activates atom-based alternatives to its focus associate while in *even* sentences, *dou* activates group-based alternatives. A consequence of the different types of alternatives is that the *even* flavor gets trivialized in distributive sentences.

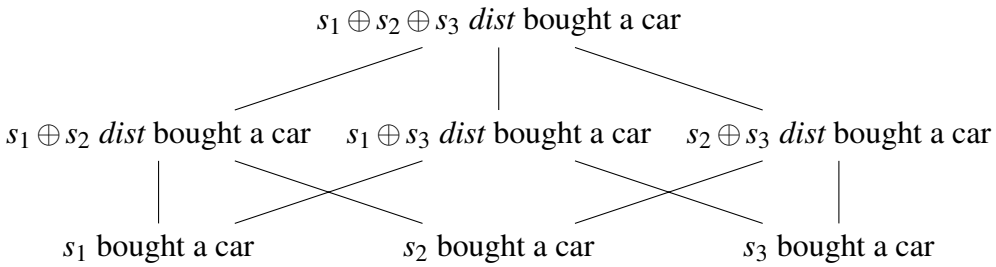
Let's understand how this theory works using (17) and (19) for illustration. In (17), suppose there are three students in the context, s_1, s_2 and s_3. The prejacent of *dou* is logically strongest in the alternative set and entails all the other alternatives. This logical entailment relationship between the alternatives can be represented as a lattice, shown in (18).

is and whether it forms a constituent with the NP following it has been debated. For a review on the literature on BA, see Huang, Li & Li 2009. In this paper, what matters for us is the fact that the BA-phrase preceding *dou* confines association of *dou* to the NP within it. The discussion on this fact can be found in Lee (1986).

6 Note that a singleton cover $\{\{a_1,a_2,a_3,a_4,a_5\}\}$ is compatible with the cumulative reading, yet it's prohibited. This prohibition is exhibited in the impossible interpretation of 'John and Mary DOU got married' as 'John and Mary married each other'. One possible argument for this prohibition is that Gricean maxim Be Brief rules out the singleton cover because the sentence meaning stays the same with or without *dou* when a singleton cover is adopted.

(17) The students DOU bought a car.
The students each bought a car.
LF: [DOU [the students *dist* bought a car]]

(18)

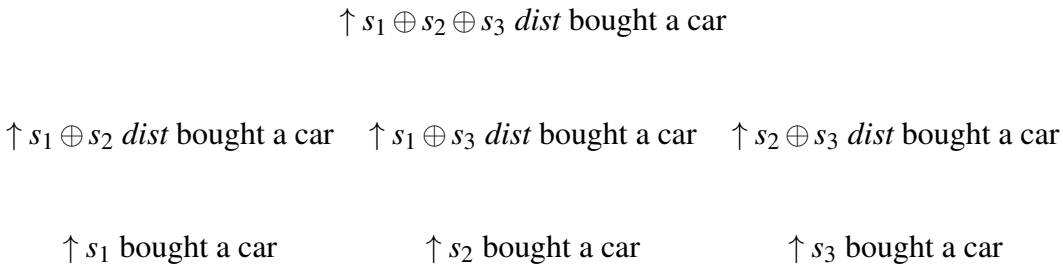


To Liu, logical entailment is stronger than likelihood. If p logically entails q, p is at least as unlikely as q regardless of the context. Given the fact that the prejacent of *dou* in (17) entails the other alternatives, Liu (2017) argues that the presupposition contributed by *dou* is always automatically satisfied in distributive sentences and this is why we cannot sense the *even* flavor.

In *even* sentences like (19), Liu (2017) proposes that *dist* is absent and alternatives are turned into group-based using the $\uparrow$ operator suggested in Landman (2000). A result from these two changes is that the prejacent of *dou* is logically independent from the other alternatives. In order to satisfy the presupposition of *dou*, the context has to be one in which the prejacent is least likely among the alternatives. This is the reason why we can sense the *even* flavor.

(19) The students DOU bought a car.
Even the students bought a car.
LF: [DOU [the students bought a car]]

(20)



Liu's (2017) theory has great merits in unifying the distributive use and *even* use of *dou*. However, it also faces a challenge when we turn to the cumulative use of *dou*. It turns out that neither choice provided in his theory delivers the correct interpretation of the cumulative reading.

Based on Liu 2017, we have two choices when interpreting (9). First, if *dist* is present, we will get the same meaning as given in (15). As discussed before, this is a felicitous reading in a context where there are three students who participate in eating each of the five apples, but it's not the cumulative interpretation that we attempt to capture.

(21) Three students BA five apples DOU ate
Three students ate each of the five apples
LF: [DOU [three students five apples *dist* ate]]

If *dist* is not present, Liu's theory predicts that we get an *even* flavor of this sentence. The interpretation of (22) is roughly 'there are three students who ate even the five apples'. A cumulative reading of the prejacent of *dou* is indeed available. However, due to the fact that group-based alternatives to 'the five apples' generate a set of propositions that do not entail each other, Liu predicts that the *even* flavor is obligatory. This is not true. The cumulative interpretation of sentences like (22) never requires to be accompanied by an *even* flavor.

(22) Three students BA five apples DOU ate
Three students ate even the five apples
LF: [DOU [three students five apples ate]]

In the next section, I will present evidence against two arguments that defend the existing theories by reducing the cumulative reading of *dou* to either non-maximality reading or team-credit reading.

2.3 Cumulative reading of *dou* is not a non-maximality reading

Non-maximality refers to the observation that predications with definite plurals allow exceptions (Link 2002; Dowty 1987; Brisson 1998). For example, sentence (23) is true in a context where few professors countenance a neutral expression.

(23) The professors smiled.

A reviewer points out that both Lin's (1998) and Liu's (2017) theory can account for the cumulative reading of *dou* if we take into consideration the non-maximality reading of definite plurals. For example, the subject *the students* in (24) stands in a cumulative relationship with *the five apples* in the given scenario. Lin's (1998) theory on *dou* as *dist* will derive a meaning that for each of the five apples, the students ate it. Liu's (2017) theory with the assumption that a covert *dist* is present will derive the same meaning.

(24) xueshengmen ba wu ge pingguo dou chi le
the students BA five CL apples DOU eat Asp

The students ate all the five apples.

(25) Scenario: there are three students, s_1, s_2, s_3 and five apples, a_1, a_2, a_3, a_4, a_5. s_1 ate a_1 and a_2, s_2 ate a_3 and s_3 ate a_4 and a_5.

Literally, the derived meaning is not the cumulative reading we want to obtain. However, given the non-maximality reading of definite plurals, it is allowed to say 'the students ate an apple' when only one of them actually ate it. In the given scenario, even though s_1 individually ate a_1 and a_2, under non-maximality, it is still true to assert that the students ate a_1 and a_2. The same reasoning applies to s_2 and s_3. Therefore, the original semantic meaning we obtain for this sentence — for each of the five apples, the students ate it — is regarded as true in the given scenario once the subject is read non-maximally.

However, the resort to non-maximality to accommodate the cumulative reading immediately encounters a problem when we replace the subject with an indefinite numeral-classifier phrase or a definite numeral-classifier phrase. Neither allows a non-maximality reading yet both are grammatical in a cumulative sentence with *dou*. We have seen that (9) is true in a cumulative scenario, but non-maximality does not apply to the subject *three students* in (9). In contrast to the observation in (23) on definite plurals, we cannot truthfully say that *three students ate all the five apples* when only two did the eating. The attempt to simply relegate the cumulative reading to the non-maximality reading of definite plurals, therefore, is not general enough to capture (9).

2.4 Cumulative reading of *dou* is not a team-credit reading

Another defense also questions the status of cumulative reading of *dou* as a real reading and tries to reduce it to the team-credit reading. Team-credit reading refers to a reading where an achievement of some of the team members is considered as an achievement of the whole team. For example, in a scenario where some boys participated in building a raft with one or two boys idling away, sentence (26) is still regarded as true.

(26) The boys built a raft.

One advantage of this defense over the non-maximality defense is that team-credit reading is not confined to definite plurals only. Indefinite numeral phrases also allow it. Example (27) from Kratzer 2002 is true when the three copy editors cumulatively caught all the mistakes. Neither scope relationship between the existential subject and universal object can capture this meaning. However, if any mistake caught by one of the editors is counted as being caught by them three, the cumulative reading is naturally accounted for.

(27) Three copy editors caught every mistake in the manuscript.

Team-credit reading has its own problems, though. First, the cumulative relationship between the subject and the object in (9) and (24) can be maintained in a context where no team whatsoever is formed between the people denoted by the subject NP. For example in (9), if the three students didn't know each other and they grabbed apples on a table and ate them, the sentence is still true as long as the total number of apples eaten by them adds up to five.

Some people may say that whether the three students have formed a team is determined by the speaker's perception, not the actual matter of fact. This is not unreasonable but can be easily dismissed. In a context where three participants in Jeopardy compete to answer questions, sentence (28) is true when they cumulatively complete all the answers. Despite the fact that competitors don't work as a collaborative team, (28) is still true in a cumulative scenario. Therefore, we can conclude that the cumulative reading of *dou* is not simply a team-credit reading.

(28) San ge cansaizhe ba timu dou dawan le
three CL participants BA questions DOU answer-finish Asp
Three participants answered all the questions.

2.5 Interim summary

Given the fact that we can make cumulative examples of *dou* when neither non-maximality or team-credit reading is satisfied, I conclude that the cumulative reading of *dou* is an independent reading that cannot be reduced to either of them. The cumulative use of *dou* being admitted, the challenge posed by it to the distributor analysis in Lin 1998 and the *even* analysis in Liu 2017 calls for a solution. In the next section, I will propose a semantics of *dou* that can account for the cumulative reading. Moreover, the new semantics of *dou* can also capture the distributive use and occasion use of *dou*. The questions that we ask in § 1 all find an answer in this new analysis of *dou*.

3 *Dou* as an event distributor

The idea that *dou* is an event quantifier has been harbored by a few scholars. In order to resolve the problem of double quantification in sentences containing both a universal quantifier and *dou*, Huang (1996) proposes that *dou* is an existential quantifier over the event variable introduced by the predicate.

Li (1995) shares his observation that *dou* can quantify over the event domain and a sentence with singular NPs and collective predicates can get an occasion reading. To him, *dou* is a universal quantifier over events and the distribution that

comes with *dou* is to establish a mapping relationship between the subparts of the plural NP and the subevents that *dou* quantifies over.

The current paper inherits the main idea that *dou* is an event quantifier but intends to give a compositional semantics to it. Adopting Champollion's (2016) analysis of distributive distance items, I will show how this analysis can account for the distributive, occasion, and cumulative use of *dou*. Moreover, I will show how this analysis answers the questions we ask in § 1.

3.1 Compositional semantics of *dou*

The analysis presented in this section draws heavily from Champollion's (2016) analysis of overt distributors cross-linguistically. I summarize the components to be included in the semantics of *dou* as follows. First, *dou* can be associated with a plural element that is either overt or covert in the sentence. This association is contextually determined. The achievement of this association is by indexing *dou* with a thematic function θ. Second, a contextually determined cover on *dou*'s associate will be given to *dou* as input. When θ is contextually resolved to a thematic role function, *dou* distributes over the individuals having that thematic role in the cover. When θ is contextually resolved to a temporal or spatial trace function, *dou* distributes over the temporal intervals or spatial locations in the cover. How fine-grained the distribution is down to is also contextually given. Third and the most important component is that *dou* is a universal quantifier that always distributes through events. What follows *dou* in the sentence is the description of the subevents and what precedes it the description of the mereological sum event.

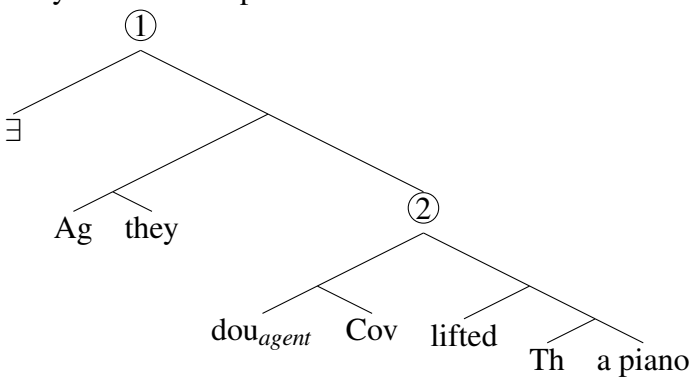
The semantic entry of *dou* is given in (29). We assume thematic cumulativity as in (30). If John is the agent of e_1 and Bill is the agent of e_2, then John$\oplus$Bill is the agent of $e_1 \oplus e_2$. Following neo-Davidsonian event semantics, thematic arguments are not treated as arguments to the 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.

(29) $[\![DOU_\theta]\!] = \lambda Cov \lambda P_{\langle \varepsilon,t\rangle} \lambda e_\varepsilon . \exists E_{\langle \varepsilon,t\rangle} [\forall e' \in E \rightarrow Cov(\theta(e')) \wedge P(e') \wedge e = \bigoplus E]$

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

Let's apply the semantics of *dou* to the distributive use first. In example (3), repeated here as (31), we get a distributive reading when *dou* is indexed with agent thematic function. Suppose in the cover, each person by her/himself is an element. The resulting truth condition asserts that there is an event whose agent is *they*, and this event can be divided into a set of subevents, each of which is an event of lifting a piano with one person from *they* as its agent.

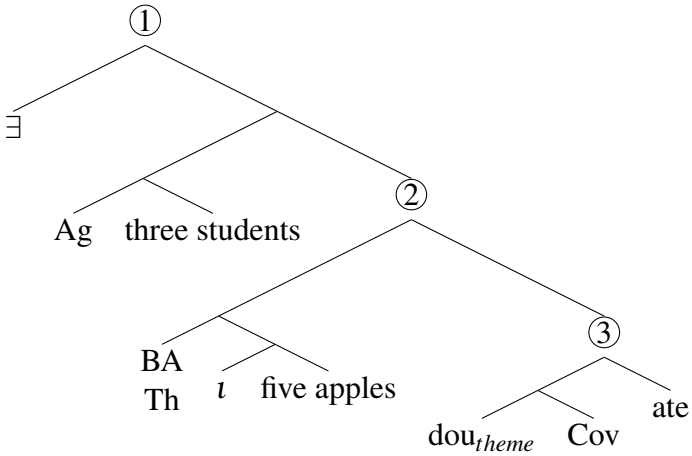
(31) Tamen dou taiqi le yi jia gangqin
they DOU lift Asp one CL piano
They each lifted a piano.



$[\![②]\!] = \lambda e.\exists E[\forall e' \in E \rightarrow Ag(e') \in Cov \wedge lifted(e') \wedge \exists z(piano(z) \wedge Th(e') = z) \wedge e = \bigoplus E]$
$[\![①]\!] = 1$ iff $\exists e.Ag(e) = \bigoplus they \wedge \exists E[\forall e' \in E \rightarrow Ag(e') \in Cov \wedge lifted(e') \wedge \exists z(piano(z) \wedge Th(e') = z) \wedge e = \bigoplus E]$

The cumulative use of *dou* is captured straightforwardly too. In (7), repeated here as (32), the object precedes *dou* and becomes part of the description of the mereological sum event, not the subevents.

(32) San ge xuesheng ba wu ge pingguo dou chi le
three CL students BA five CL apples DOU eat Asp
Three students ate all of the five apples.



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

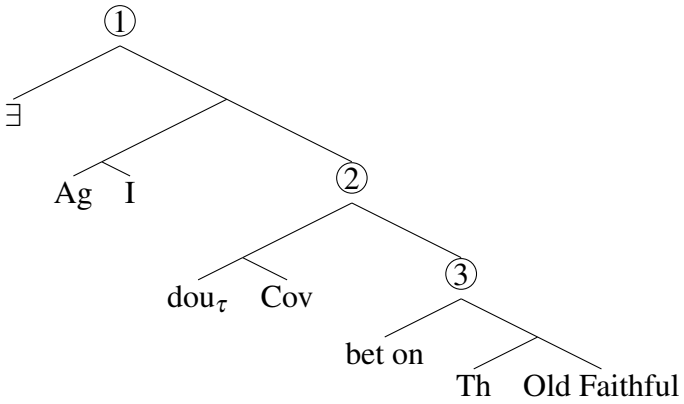
$[\![①]\!] = 1$ iff $\exists e \exists X[students(X) \wedge |X| = 3 \wedge Ag(e) = X \wedge Th(e) = \bigoplus the\text{-}five\text{-}apples \wedge \exists E[\forall e' \in E \rightarrow (Th(e') \in Cov \wedge ate(e')) \wedge e = \bigoplus E]$

The resulting meaning we get is an unspecified meaning. It asserts that there is an event whose agent is three students and whose object is contextually salient five apples. This event can be divided into a set of subevents, each of which is an eating event whose theme is in the cover over the five apples.[7] Since the agent of each subevent is not specified, how the five apples are divided between the students has multiple possibilities. Both the cumulative reading and the distributive reading will be true by this condition. Lumping these two readings, however, is not an undesirable result. As discussed in Kratzer 2007, distributive, collective and cumulative readings are not separate. She adopts the ellipsis test, replicated here in (33). This sentence is true when John and Mary individually lifted four boxes, but Bill and Sue cumulatively did so.[8]

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

Last, the occasion use of *dou* is analyzed as a distributive reading over the temporal or location domain. In (1), repeated here as (34), *dou* is indexed with a temporal thematic function τ which takes the mereological sum event returns the temporal trace of the contextually salient horse races.

(34) wo dou du le Laozhongshi
I DOU bet Asp Old Faithful
I bet on Old Faithful every time.



$[\![③]\!] = \lambda e.Th(e) = OF \wedge bet\text{-}on(e)$
$[\![②]\!] = \lambda e.\exists E[\forall e' \in E \rightarrow (\tau(e') \in Cov \wedge Th(e')=OF \wedge bet\text{-}on(e')) \wedge e = \bigoplus E]$

7 Some readers may ask why *dou* is not indexed with the agent in the sentence. Recall from footnote 5 that an intervening BA-phrase confines the association of *dou* to the NP within it.

8 There is disagreement on the claim that distributive, collective, and cumulative readings are not separate. See discussion on this point in Champollion (forthcoming).

$[\![①]\!] = 1$ iff $\exists e.Ag(e) = I \wedge \exists E[\forall e' \in E \rightarrow (\tau(e') \in Cov \wedge Th(e') = OF \wedge bet\text{-}on(e')) \wedge e = \bigoplus E]$

The reading we get asserts that there is an event whose agent is the speaker and this event can be divided into a set of subevents, each being a betting event with Old Faithful as its theme. Moreover, the run time of each subevent is in the contextually salient cover. Since the cover is on the temporal traces of the multiple horse races, the sum of the cover is the same as the sum of the run time of those horse races.

The composition above shows that analyzing *dou* as an event quantifier that always distributes through the mediation of events can unify the familiar use of distribution over NPs, the cumulative use and the occasion use. Next, we will see how this analysis can answer the questions we in § 1.

3.2 Answers to the questions posed in § 1

The semantics given to *dou* in (29) makes it flexible for *dou* to choose the plural element that it is associated with. Depending on the theta function that *dou* is indexed with, the associate can be a plural NP or a plurality of events. This flexibility answers our questions on sentences (1) to (3). Sentence (1) only has occasion reading because there is no semantically plural NP available to be associated with *dou*. (2) is only felicitous with occasion reading because the predicate *meet* requires a plurality of at least two people as its subject. Therefore, *John and Mary* predicated by *meet* is semantically singular. *Dou* needs to seek a plurality in the event domain and the occasion reading is obligatory.

In (4), *dou* can only associate with the subject plural NP when an individual-level predicate is used. As observed in Kratzer 1995, temporal adverbs or location adverbs cannot modify individual-level predicates because they denote a set of states that do not have subparts varying with time or location, as shown in (35). Therefore, the occasion reading with individual-predicates is prohibited, see (5). This explains why (4) only has a distributive reading on the subject NP.

(35) *Almost all swans are black in Australia.

In (6), the predicate *break that cup* denotes a one-time event. A singular subject NP forces an occasion reading, which, however, is not allowed by the predicate. Hence the ungrammaticality of this sentence. A plural subject is no help because a distributive reading on the subject requires the event denoted by the predicate to happen more than once, which again is not allowed in (6).

As for (7), we have seen in (32) that the semantics of *dou* derives an unspecified meaning for this sentence, which allows both a distributive reading on the object or a cumulative reading. Last, the contrast between (3) and (8) is a direct result of the

dou's semantics. Since everything in the scope of *dou* becomes the description of the subevents, an object in its canonical position as in (8) will be part of the description of the subevents. Therefore, it is impossible to derive a cumulative reading between the subject NP and the object NP. Only the distributive reading over the subject NP is allowed.

3.3 Two predictions

Dou divides a sentence into two parts. Inside the scope of *dou* is the description of the subevents; outside the scope of *dou* is the description of the mereological sum event. In our cumulative example, if we insert an existential quantifier in the scope of *dou*, we expect to see a distributive relationship between the theme and the existential quantifier.[9] This is exactly what we find. In (36), suppose the contextually determined cover on the theme *five apples* divides this plurality into singular apples. *Dou* then asserts that each subevent takes one of the five apples as its theme. Moreover, in each subevent, the theme is consumed one bite. The correlation between the relative order of these constituents and the cumulative/distributive relationship between them follows naturally from *dou*'s semantics.

(36) san ge xuesheng ba wu ge pingguo dou chi le yikou
three CL students BA five CL apples DOU eat Asp one bite
Three students ate the five apples and each apple was consumed one bite.

(37) $[\![(36)]\!] = \exists e \exists X [students(X) \wedge |X| = 3 \wedge Ag(e) = X \wedge Th(e) = \bigoplus the\text{-}five\text{-}apples] \wedge \exists E [\forall e' \in E \rightarrow (Th(e') \in Cov \wedge ate\text{-}one\text{-}bite(e'))) \wedge e = \bigoplus E]$

A second prediction is the possibility of having more than one *dou* in a sentence. Suppose we have a plural NP outside of the scope of *dou* and the predicate is one that allows occasion reading. We should be able to insert two *dou*s, one associated with the plural NP and one with the salient temporal/location traces. (39) show that this is possible.

(38) Tamen dou shi dou du le Laozhongshi
they DOU SHI DOU bet on Asp Old Faithful
They each bet on Old Faithful each time/at each place.

4 Discussion and conclusion

I propose a treatment of *dou* following Champollion's (2016) cross-linguistic analysis of distance distributive items. *Dou* is analyzed as an event quantifier that always distributes through the mediation of events. It is shown that the distributive use,

9 I thank Lucas Champollion for his suggestion on this testing sentence.

occasion use and cumulative use of *dou* are all captured by this proposal.

Taking stock of what we have seen so far, *dou* always seeks a plurality to be associated with, be it a plurality in the nominal domain or event domain. Although the current paper does not address the *even* use of *dou*, the close connection between *dou* and plurality leads to a natural idea that focus is another way of introducing plurality. Actually, there exists an analysis along this line (Portner 2002) that analyzes *dou* as a universal quantifier over the alternative set. However, some linguists criticize this analysis based on the fact that *dou* can be used as *even* without any of the alternatives other than the prejacent being true (Chen 2008; Rullmann 1997: a.o). I will not provide a detailed discussion on the divergences, but would like to point out one problematic prediction of the criticism against Portner (2002). If it is true that none of the alternatives to the prejacent of *dou* is required to be true, sentence (39) should be grammatical, but it is not. Notice that the intended meaning is not infelicitous. It asserts that Zhangsan killed Lisi and presupposes that Zhangsan is the least likely person among the contextually salient people to do so.

(39) Zhangsan dou shasi le Lisi
Zhangsan DOU kill Asp Lisi
Intended meaning: *Even Zhangsan killed Lisi.

Recent research on *dou* (Liao & Jheng 2015) also questions the argument that the additive presupposition of *dou* in its *even* use is an illusion. In order to extend my analysis of *dou* to its *even* use, I will have to dismiss the arguments against the additive presupposition of *dou*, but this will have to be left for future research.

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Zhuo Chen
Linguistics Program
The Graduate Center, CUNY
365 Fifth Avenue
New York, NY 10016
zchen3@gradcenter.cuny.edu