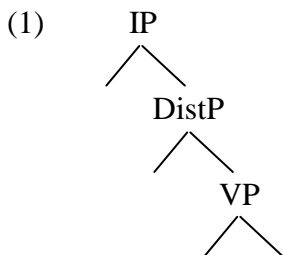# Deriving Distributivity from Discourse

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This paper discusses the structure that incorporates information from discourse to derive distributivity. Following a proposal by López (2009) to account for the interpretation shown in the canonical focus structure using the notion "contrast", I suggest that the feature "contrast" assigned to the edge of CP results in distributivity to the extent that distributivity occurs if and only if predicate and plural meet the structural condition. To get the distributive reading the distributive predicate targets the plural which is either from the sentence or from a combination of sentence and discourse. From the perspective of the plural to be distributed, distributivity is target independent.

1. Licensing distributivity

When a plural occurs in a preverbal position, it is interpreted either collectively or distributively, or both. Sometimes, due to the nature of the element the plural (in the sense of semantics) must be interpreted distributively. In my previous study (Li 1997) a proposal was made to the effect that distributivity as essentially a relation between subject and predicate must be licensed syntactically in a way that a distributive marker functions, either overtly or covertly, as a bridge connecting the subject and the predicate. Syntactically, the relation is realized via spec-head agreement. I proposed that distributivity projection is intrinsically associated with predicate.

(1)   IP
           DistP
               VP

Assume that the distributive predicate has a feature that needs to match a distributive feature on the plural nominal. Assume further that a plural entity is intrinsically capable of being interpreted distributively as well as collectively as default, except for those

universal quantifiers that only require a distributive reading. Under this model, distributivity is obtained within the distributivity projection through spec-head agreement. On the other hand, a collective reading occurs from within VP. As a result, distributivity and collectivity are interpreted compositionally. Given that a plural has the potential to be interpreted both collectively and distributively, the fact that they are is understood to satisfy the Principle of Full Interpretation defined in various versions such as the structure to which the semantic interface rules apply contains no uninterpretable features (Adger 2003), a representation for a given expression must contain all and only those elements which contribute directly to its interpretation at the relevant level (Radford 1997), or no expressions occur idly in grammatical representations (Hornstein et al 2005).

2. Distributivity or focus

The plural subject does not seem to be always overt. In languages like Chinese, subject can be omitted if the context supplies sufficient information for the subject to recover. This is fully expected as long as a pro form is assumed to exist in the sentence in question. Logically speaking, there are three possibilities for the appearance of the plural nominal. Either it appears on the surface, or it does not occur but understood through context. The third possibility is that it partially occurs on the surface in the sentence and partially understood through context. This possibility is considered in this paper. First consider (2):

(2)　　连老王都/也买了房子。
　　　　lian　Lao Wang　dou/ye mai-le　　fangzi
　　　　even　Lao Wang　all/also buy-asp　house
　　　　'Even Lao Wang bought a house.'

With respect to the structure associated with the part "*lian … dou*" in (2), there are two prominent suggestions. It could be argued that the sentence in (2) is interpreted distributively, thus involving a distributive projection, as I assumed in Li (1997), rather implicitly. Another popular analysis takes focus as the structural projection (Shyu 1995 and others).

In (2) the subject *Lao Wang* is singular but associated with it is a possible nominal in parallel with *Lao Wang*. That understood nominal, by virtue of being implicit from context, puts the overt subject in a highlighted position. In the literature the overt subject is often referred to as being focused or emphasized with reference to some other people understood in discourse. Given the fact that (2) involves both distributivity and focus, the question is which one we should take as primitive and which one is derived. If a structure is involved that has a primary function, it does not then seem plausible to posit that the projection is both distributivity and focus. Therefore, a particular syntactic analysis has no other choice but opt for one over the other. I approached cases like (2) as issues relating to distributivity rather than the structure of pure focus or others. This position

certainly regards the problem of distributivity as the core issue and assumes that the issue of focus can be derived. The focus approach on the other hand highlights the difference between the overt nominal and the implied covert and generally neglects the issue of distributivity associated with the structure. Suppose that we take the distributivity approach. To define (2) within the realm of distributivity involves extending the subject-predicate relation to discourse. For distributivity to occur the predicate remains the same and for the predicate each member of the plural nominal is true. The only operation to be manipulated is to make sure that the overt element and the covert form a conjunct. Since the individual members of the plural are interpreted one by one, it is not implausible to superimpose some members with some additional pragmatic functions. Assume the focus approach on the other hand. First, this approach needs to distinguish the focus in question from other types of focus. Focus is a broader notion than shown in (2).

(3) a.　是老王买了房子。
　　　　shi　Lao　Wang　maile　fangzi
　　　　be　　Lao　Wang　bought　house
　　　　'It was Lao Wang who bought a house.'

　　 b.　**老王**买了房子。
　　　　Lao Wang maile　fangzi
　　　　Lao　Wang　bought　house
　　　　'It was Lao Wang who bought a house.'
　　　　(The bold-faced font indicates stress)

In (3) Lao Wang is focused, though in different ways. In (3a) it is focused because of *shi* (be); in (3b) it is focused because of stress. In both cases and many others involving focus the focused element is being highlighted with reference to some implied elements in the context. The predicate is irrelevant; it does not apply to the understood. But in (2) when focus is related to predicate, the restriction is that the predicate has to remain constant, or rather shared. This distinguishes itself from cases like (3) where the so-called focus has nothing to do with distributivity. Naturally focus is classified into two distinct groups depending on the (non)requirement imposed upon predicate. To assume that (2) is essentially a focus structure, we need to define in a way when the highlighted is in contrast with some implied element(s) and the predicate is constant distributivity is bound to occur.

　　It seems that with certain additional assumptions, both approaches could be made to work. So looked at in isolation, whether the sentence in (2) is primarily a case of distributivity or focus is little more than a matter of naming. From either one the other could be derived. The problem lies in the relation with other sentences and with the nature of overt distributive elements shown in the language.

3. Against focus

We may wonder why the issue of distributivity was brought up surrounding (2). To the best of my knowledge, the corresponding sentence in English as in (4) has not been argued elsewhere for or against being related to distributivity.

(4)   even Max bought a house

Given that (4) is related to distributivity, the matter is hidden in English. Even in Chinese it is hidden if we solely take (2) into consideration. Only when we loot at other types of sentence that contain similar elements do we become suspicious that those sentences may be related in a way that could be captured in some principled fashion. One difference between (2) and (4) is that besides corresponding meaningful elements there are two markers for the focus (or distributivity for that matter) in (2), namely *lian* and *dou*, whereas (4) contains only one such element, *even*. This in and of itself is a phenomenon that requires an explanation. But still that does not result in an analysis intrinsically related to distributivity, as we have seen above.

Problems begin to emerge when we shift our attention onto the nature and function of *dou*. The extensive use of *dou* makes Chinese linguists wonder why and try to produce an account general enough to cover the empirical facts as much as possible. Depending on what type of construction receives primary attention, linguists may opt for one analysis over others. In this paper I will not go into details of other analyses on *dou*, but approach the problem directly as it relates to structure. Consider (5):

(5)   每个人都买了房子。
         meige ren dou maile   fangzi.
         everyone all   bought house
         'Everyone bought a house.'

Obviously (5) involves distributivity as the universal quantifier itself is intrinsically distributive. Does (5) also have something to do with focus? It does if universal quantification is arguably intrinsically related to focus. After all, the concept of 'no exception' exhibited by a universal quantifier seems to match well with focus in emphasizing every single member of a set. For the moment let's ignore some cross-linguistic variations and assume that universal quantification entails focus.

Consider another *dou*-containing sentence as in (6):

(6)　　老张和老王都买了房子。
　　　　Lao Zhang he　Lao Wang dou mai-le　　fangzi
　　　　Lao Zhang and Lao Wang all　buy-asp　　house
　　　　'Lao Zhang and Lao Wang both bought a house.'

Is *dou*'s function in (6) to help derive focus or distributivity? Here the choice between distributivity and focus is not simply a matter of label, but rather a matter of significance. It is difficult to argue for an analysis of focus in (6) because *Lao Zhang* and *Lao Wang* are on equal footing in terms of prominence, neither one of whom is more highlighted than the other. If (2) involves focus and (6) involves distributivity, then additional assumption is needed to account for the behavior of *dou*. This is a hard nut to crack, I think. However, if both of them involve distributivity, then the burden is to prove the possibility to derive focus from distributivity. It is doable and preferable.

If *dou* is to focus, problems lie in (6); whereas if *dou* is to distribute, problems lie in (2). Assume that *dou* is to distribute. Consider the plural nominal in (2). Does the overt *Lao Wang* form a conjunct with an implied set? It seems that it does. We know that Lao Wang and some other unspecified person(s) performed the event of purchasing. One analysis, originated in Karttunen and Peters (1979) for *even*, hypothesized that *even* introduces two types of implicature *existential implicature* and *scalar implicature* as shown in (4). The existential implicature ensures that besides Max some other person(s) also bought a house; scalar implicature highlights Max as the least likely to buy a house. In parallel, *lian* in (2) functions like *even*. If the implicature specifies Lao Zhang, then Lao Wang and Lao Zhang form a plural.

Given that a plural must be interpreted collectively or distributively, the question is whether the plural in question needs to be interpreted collectively or distributively. Collective reading precludes isolation of an individual element for an independent interpretation. So when the plural is understood as collectively buying a house, it would not be possible for a member in the set to buy a house separately. Distributive reading, though, is free from this type of restriction. It is natural to see that the overt is highlighted. In fact, it would be pragmatically puzzling if both the overt and the covert are equally highlighted or non-highlighted.

When *lian* is used, the contrast is of the type that it introduces a set of parallel elements to the existing noun in the sentence. Furthermore, the predicate remains intact. The set that contains both the overt element and the implicated one form a plural entity which requires a distributive reading. Note that the collective reading is not possible. This is because the contrast set implicated by *lian* which contains two types of implicature makes it impossible for the sentence to have a collective reading. Once a plural entity is formed, and collective reading is barred, distributive feature must match a distributive head. Therefore, there must be a distributive marker in the head position of the same projection the spec of which holds the contrast.

There are two general questions regarding *dou*. One is what *dou* can do. The other is related to what the structure is relating to *dou*. I think that most analyses focus on the former, but neglect the latter.

4. Focus reanalyzed as contrast

The assumption that (2) involves distributivity does not solve the syntactic problem of distributivity, though. The position of *dou*/*ye* in (2) seems to be higher than *dou* in (6). Consider (7-10):

(7)　　老张和老王都没买房子。
　　　　Lao Zhang he　Lao Wang dou mei mai fangzi
　　　　Lao Zhang and Lao Wang all　not　buy house
　　　　'Neither Lao Zhang nor Lao Wang bought a house.'

(8)　　 老张和老王没都买房子。
　　　　Lao Zhang heLao Wang mei dou mai fangzi
　　　　Lao Zhang and Lao Wang not all　buy house
　　　　'Lao Zhang and Lao Wang didn't both buy a house.'

(9)　　连老王都/也没买房子。
　　　　lian Lao Wang　dou/ye mei mai fangzi
　　　　even Lao Wang　all/also not　buy　house
　　　　'Even Lao Wang didn't buy a house.'

(10)　　*连老王没都/也买房子
　　　　lian　　Lao Wang mei dou/ye mai　　fangzi
　　　　even　　Lao Wang not all/also buy　　house

Further investigating the construction involving (2) and (6), we notice that the negation marker *mei* can precede or follow *dou* as shown in (7-8) relating to (6), but in (2) *mei* can only follow *dou* as in (10-11). This shows that *dou* may occur in two different positions. If the structure relating to distributivity is as in (1), *dou*'s position is set with respect to negation. But as these cases show, it is somewhat flexible. If (2) is also structurally related to distributivity, then there must be two distributivity projections. That begs the question of why this is so.

　　　　Assume that there are two structures relating to distributivity: one is as in (1); the other higher in position. What is the difference between them? The lower one is intrinsically responsible for distributivity. It is a distributive predicate, which may or may not exist. The higher one is not intrinsically related to distributivity. It is a projection for

other appropriate function(s). When context information comes in, it may trigger the structure resulting in distributivity.
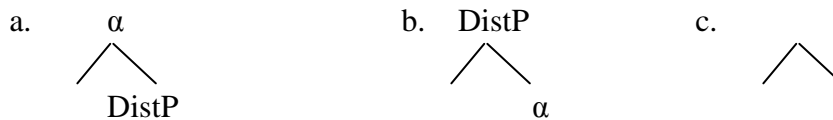
With respect to the free order shown in (7-8), let's consider the following. In the absence of an overt distributive marker, the position of a distributive projection is not rigid in the sense that it does not result in a contrast between collectivity and distributivity, although it makes a difference in the relative scope with respect to other scope-bearing elements. In other words, the force of distributivity is holistic rather than relative with respect to collectivity. Consider (11):

(11)
    a.   α   b.   DistP

            DistP   α

Suppose that DistP is syntactically licensed in (11). Once the distributive projection occurs, it doesn't matter where the projection occurs with respect to α. The collective reading is not available. This follows from two considerations. One is that a specific structure is associated with one particular meaning. The other is that the simultaneous readings of collectivity and distributivity will result in a contradiction. In both (11a) and (11b) distributivity is available but collectivity is not. The distinction between collectivity and distributivity should be reflected in the structure in (12).

(12)
    a.   α   b. DistP   c.

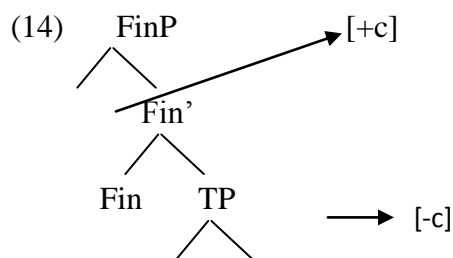   DistP   α

Whether it is licensed or not, the distributive projection is intrinsically associated with predicate. So to begin with, as part of predicate, it has the potential to be instantiated. The assumption is that if DistP does not exist, the predicate is interpreted collectively. When DistP exists there is only distributive reading. A collective reading is only possible in the structure as in (12c) in which no DistP is available. DistP needs to be instantiated by having some content in the head, either overtly or covertly. Here I want to suggest that when a plural nominal needs to be interpreted distributively the predicate needs to be interpreted distributively for the sentence to be grammatical. If the predicate is higher than the normal position for DistP, this predicate should be able to assume that function of distributivity.

In the minimalist program, phases are the locus for semantic interpretation. (Chomsky 2008). It is proposed recently (López 2009) that a feature system based on the notion "contrast" is better adopted to account for the interpretation shown in the
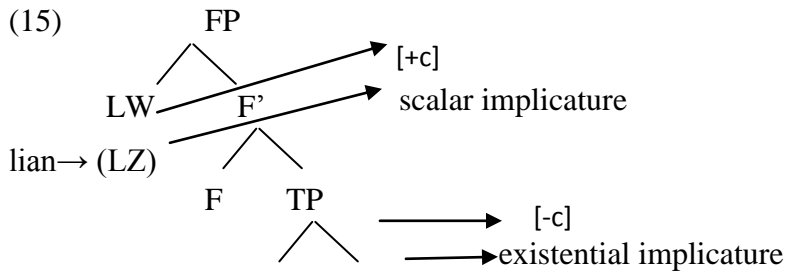
canonical focus structure. The notion "focus" is just a descriptive term for a particular feature, not theoretical primitive. Phase edges are the places where pragmatic rules apply. One crucial information structure notion is (discourse) contrast, giving rise to the binary feature [±c(ontrast)]. The feature [±c] is derivationally assigned. Constituents are not merged in the derivation with features related to their information structure. The feature [±c] is assigned by the modular pragmatics to a constituent in certain structural position: Spec, Fin. Default rules assign the information structure features.

(13) a. Spec, Fin is assigned [+c]
     b. Default rule: complement of Fin is assigned [-c] (complement of Fin is non-contrastive) (López 2009)

(14)   FinP   → [+c]

            Fin'

      Fin   TP   → [-c]

          López views *even* as a contrast inducer associated with a regular focus. In terms of introducing contrast, *even* is stronger than a simple assignment of contrast to the spec. Due to the nature of *even* not only the TP is assigned [-c] but also that the predicate takes force on the contrast that is introduced, which ultimately results in distributivity.

          Following the spirit of this analysis, I suggest that the phase CP, putting aside the argumentation that FinP is one possible realization of CP, is where context information interacts with an existing element to form a distributivity-required constituent if it is the unit that interfaces with interpretive systems. A feature "contrast" assigned to the edge of CP results in distributivity to the extent that distributivity occurs if and only if predicate and plural meet the structural condition. In Chinese, as I assume, *lian* (even) introduces a contrast, which differs from other types of contrast in a way that a conjunct is formed which requires a distributive reading. Essentially distributivity is a relation between spec and complement of a head. When a new set is formed via connecting the identified and the relevant set from discourse, if, as López argues, syntax-information structure integration takes place at the phase level and the feature "contrast" is assigned at CP level, then a structure for distributivity is called for license. As a result a distributive marker is obligatory in Chinese.

(15)

```
                    FP
                   ╱\              ⟶ [+c]
              LW───────F' ────────⟶ scalar implicature
          lian→ (LZ)  ╱\
                    F    TP
                        ╱\  ──────⟶ [-c]
                          ──────⟶ existential implicature
```

In effect, to get the distributive reading the distributive predicate targets the plural which is either from the sentence or from a combination of sentence and discourse. From the perspective of the plural to be distributed, distributivity is target independent.

In light of the discussion above, we may formulate distributivity condition as in (16) and (17).

(16)   *Availability of distributivity*
        Distributivity is available iff
        1. there is a plural nominal
        2. there is a distributive predicate
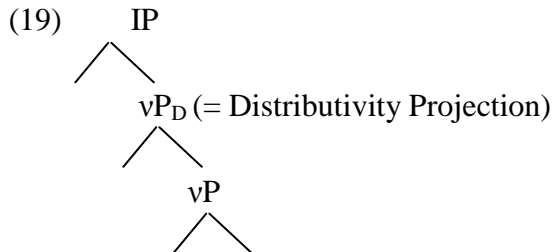   3. (1) and (2) form sped-head relation

(17)   *Distributive predicate*
        A distributive predicate is available iff
        1. there is a licensed distributivity projection, or
        2. a projection headed by an overt distributive marker

(16) guarantees that if the three elements for distributivity, namely plural, predicate, and structural relation, are all available, then distributivity is bound to occur. (17) distinguishes two possible distributive predicates. One is inherent; the other is a function that a predicate assumes to make possible interpretation of a formed plural through context. The structural condition on the inherent distributivity condition, as originally formulated, is in (18).

(18)   *Syntactic Condition on Distributivity Projection*
        Distributivity Projection is licensed iff Dist is instantiated.
        Dist is instantiated if it is lexically filled either overtly or covertly.

(16-18) collectively ensure that distributivity is derived from both overt distributive markers and covert distributive operations. To the extent that the distributivity projection is positionally fixed as it is intrinsically associated with verbs, quite possibly a part of vP

as in (19), (16-17) open up another possibility of deriving distributivity from higher projections than distributivity projection. But that possibility starts to materialize only when the requirement for distributivity is called for.

(19)   IP
         /\
          vP$_D$ (= Distributivity Projection)
           /\
            vP
            /\

One may wonder if the projection vP$_D$ is warranted given that distributivity obtained from higher positions comes from, predicate-wise, projections of some other kinds in nature. Is it possible or ever preferable to eliminate vP$_D$ to achieve a uniform representation for distributivity? In other words, if we give up vP$_D$ we may put an overt distributive marker on a head position of any predicate projection to achieve distributivity. I am reluctant to take this position for two reasons. First, conceptually keeping vP$_D$ and vP separate helps derive meaning compositionally. Since distributivity and collectivity are distinct in interpretation, giving them two distinct structures corresponds to two different interpretations. This is in sharp contrast to distributivity derived from positions higher than vP$_D$ which is exclusively distributive, imposed by joint plural as in (2) accompanied by an overt distributive marker which eliminates the possibility of collectivity. Second, empirically speaking, positing vP$_D$ distinct from vP ensures the existence of language difference. Given the condition in (18), in the absence of an overt distributive marker, the existence of vP$_D$ depends on some syntactic mechanism independently motivated. Such covert operations result in different interpretations in distributivity corresponding to native speakers' intuition.

5. Parametric considerations
Given that a plural nominal is formulated through context which requires a distributive reading, the requirement of a distributive predicate is satisfied by *dou* in (2). This raises a question on the English counterpart as in (4) where no overt distributive marker is used. This can be explained in the following way. In English the distributivity projection already exists due to verb raising indirectly instantiating the distributivity projection. As we have seen above, the effect of a distributive predicate is global in the sense that once the distributive projection occurs the whole predicate is distributive. Assume that for reasons of economy, if a predicate is already distributive it resists the use of an overt distributive marker. Therefore, there is no *dou*'s corresponding element to be used as a distributive marker.

6. Full Interpretation

If a plural nominal has a distributive feature, then to match this feature with the corresponding feature in the distributive predicate via a structural relation will satisfy the principle of full interpretation. Notice that the principle of full interpretation is formulated in different versions in the literature. Let's assume that the principle is formulated in such a way that features must be checked off. Then the question is what if the distributive feature is not checked off. We know that a regular plural noun could be potentially interpreted either collectively or distributively. However, as in (5) minus *dou*, no distributive reading is available. The feature is not checked off, but the sentence is still grammatical. So it seems that the distributive feature may or may not be checked off. What is the catch then? In the absence of a distributive reading as in (5) without *dou* where no relevant feature is checked off, there is always a collective reading available. So failing of checking off distributive feature is simultaneously accompanied by presence of the collective reading. Now let's assume that by default there is a feature for collectivity. Distributivity and collectivity form a feature matrix set {c, d}, with *c* indicating collectivity and *d* distributivity. Assume further that a feature to be checked forms a set, which may contain a single member or multi-members. In case of Case the feature contains a single member {C}. In plurals, it contains two members. To check features one member of the set to be checked is sufficient to satisfy the Principle of Full Interpretation.

So empirically when the subject is a regular plural, distributivity may or may not be available. If the subject is a distributive quantifier, distributivity must be present, resulting in a difference between English and Chinese. In case of focus similar picture presents itself. Chinese needs an overt marker, but English doesn't. In cases where no overt markers are used, the occurrence of distributivity is as follows:

(20)

	Plural Nominal	Predicate	Reading(s)	Full Interpretation
1	$PN_{c, d}$	$P_{c, d}$	C, D	yes
2	$PN_{c, d}$	P_c	C	yes
3	PN_d	$P_{c, d}$	D	yes
4	PN_d	P_c	Ø	no

PN = plural nominal; P = Predicate; c = collectivity; d = distributivity

7. Conclusion

Distributivity is both an inherent property of a plural nominal/distributive predicate and a derived property in the course of derivation. For both types of distributivity to occur there must be a plural nominal and a licensed predicate to be in a required structural position. For inherent distributivity the crucial part is to license the distributive predicate. To derive distributivity from context an external contrast inducer will force distributivity which requires a distributive predicate to be licensed in the same way as sentence internal distributivity.

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