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Articles

Decomposing distribution across dimensions: evidence from Libras

Decompondo dimensões de distribuições: evidências da Libras

Marta Donazzan¹
Luciana Sanchez-Mendes²

ABSTRACT

This paper focuses on the investigation of the meaning of reduplication in Brazilian Sign Language (Libras) analyzing the contribution of each of its forms: repetition (\rep) and alternation (\alt). In order to check their role, we proceeded a data collection with a native signer during elicitation sessions following the methodology for semantic elicitation (Matthewson, 2004). We also collected a spontaneous datum with another signer. We show that \rep is related to aspectual distribution, and \alt is associated to two pieces of information - participant-related distribution and aspectual distribution. We propose a formal analysis for each of the forms as well as of the way they interact compositionally.

Keywords: *pluractionality; Libras; distribution; events.*

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RESUMO

Este artigo enfoca a investigação do significado da reduplicação na Língua Brasileira de Sinais (Libras) analisando sua contribuição para cada uma das seguintes formas: repetição (\rep) e alternância (\alt). Para testar seu papel, procedemos a uma coleta de dados com um sinalizante nativo durante uma sessão de elicitación controlada segundo o protocolo para coleta em semântica (Matthewson, 2004). Nós coletamos, ainda, um dado espontâneo com outro sinalizante. Mostramos que \rep está relacionado a distribuição aspectual enquanto \alt está associado a uma dupla informação – distribuição de participante e aspectual. Propomos uma análise formal para cada uma das formas e para a forma como interação composicionalmente.

Palavras-chave: pluracionalidade; Libras; distribuição; eventos.

1. Introduction

1.1. Goal of this study

In this paper, we present the results of an elicitation study investigating the interpretation of reduplication patterns in Brazilian Sign Language (Libras). From previous work on both spoken and sign languages, it appears that the distributive effect conveyed by reduplication depends on the category and on the scope of the reduplicated morpheme or phrase. Studies on vocal languages have shown that while the reduplication of V-bound morphemes expresses repetition of events in time (Lasersohn 1995), reduplication of adverbial/adnominal phrases may entail distribution on participants (Cable 2013, Donazzan & Müller 2015). In sign languages as well, different semantic effects may depend on the morpho-phonological feature that is repeated (Kuhn & Aristodemo 2017 for French Sign Language (LFS) and Sanchez-Mendes et al. 2017 for Libras). Our study goes further in the analysis of Libras and focuses on patterns of reduplication of VP-internal elements. Our aim is to give a description of the different forms that this type of reduplication can take in Libras, in order to analyse their compositional contribution to the expression of plurality in the event domain.

1.2. About Libras

Brazilian Sign Language (Libras) is the language of the deaf community in Brazil. It is described as an isolated language, probably modeled on LSF through “stimulus diffusion” (Wittman 1991).³

In Brazil, it has already been reported the existence of some native sign languages, such as Ka’apor (Ribeiro 1996); Kaiowá (Vilhalva 2012); Terena (Soares 2018) and Várzea Queimada (Pereira 2013). Recent sociolinguistic studies (Brito et al. 2011, Junior 2011, a.o.) present different registers of SL practiced by micro deaf communities (rural, regional and islands). In this paper we focus on Libras of the Southeast; more specifically, our consultant is from the area of Rio de Janeiro. The consultants of reported papers are from São Paulo.

2. Reduplication and plurality of events

2.1. Plurality of events or pluractionality

Pluralities of events may be construed in natural languages in many ways. An event can be understood as occurring more than once because it has been repeated, as in (1a), or because it is acted or suffered by multiple participants in a shared temporal or spatial frame, as in (1b).

- (1) a. Mary failed the exam again.
b. All the men shot at the deer at once, but the animal dashed through the bushes and eventually disappeared.

In sentence (1a), we understand that there have been at least two events of failing the exam by Mary, whereas sentence (1b) describes a situation where the deer was aimed at by many gunshots, each corresponding to a shooting event. Plurality is conveyed by distinct means in each case: the adverb *again* alone seems to be responsible for plurality in (1a), while it is the interpretation of the DP *all the men* in (1b),

3. Instituto Nacional de Educação de Surdos (INES) (National Institute for Education of Deaf) in Rio de Janeiro was the basis of the diffusion in XIXth century.

together with its relation to the verb, that conveys the interpretation by which multiple gunshots have been fired.

Plurality of events is sometimes referred to as *pluractionality* in the literature (Newman 1990, Cusic 1981, Lasersohn 1995), a convenient term that we also adopt, albeit with a qualification. In this paper, we use the term pluractionality to cover a semantic notion, which defines plurality in the event domain as achieved through different linguistic constructions and processes. In its original definition, however, pluractionality has a narrower interpretation, as it is meant to express more specifically a type of morphosyntactic marking of plurality on the verb.

“[Pluractional] morphemes normally take the form of some sort of affix on the verb, frequently reduplicative, most often derivational rather than inflectional, and expressing a broad range of notions typically including action by more than one individual, temporally iterated action, and spatially scattered action (among others).” (Lasersohn 1995: 238).

According to Lasersohn’s original definition, pluractionality is typically expressed by verb morphology and has scope on the verb. As for its linguistic expression, in spoken languages V-bound pluractional markers can be encoded by affixes, vowel alternation, reduplication of verb roots or of parts of the verb. The examples below illustrate some of this forms. In †Hoan (Khoisan), pluractional affixes express distribution in space (2); in Karitiana (Tupi), reduplication of verb roots is related to iteration (3), in Nahuatl (Uto-Aztecan) reduplication of verb roots expresses intensity (4), and in Kaingang (Macro-Jê) reduplication of verb roots is related to plurality of arguments (5).

- (2) Tsi i **kí-’am-q||o**. †Hoan
3pl past kí-eat-q||o
‘They ate around.’ (Collins 2001)
- (3) a. João i-’ot-Ø. Karitiana
João PART-fall-ABS
‘João fell.’
b. João i-’**ot**-’ot-Ø.
João PART-fall-DUPL-ABS
‘João fell (more than once).’ (Sanchez-Mendes & Müller 2007)

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- (4) a. *tlania* Nahuatl
 ‘to ask’
 b. **tlatlania**
 ‘to ask insistently’ (Gariby 1961 *apud* Cusic 1981)
- (5) a. *hadn* Kaingang
 ‘weave a shirt’
 b. **hadnhadn**
 ‘weave many shirts’ (Henry 1948)

Beyond verb morphology, however, plurality of events can be expressed also by a wider range of constructions, in which the pluractional markers may have scope on the whole verb phrase or on part of it. Examples include adverbial phrases of different categories. A well-known example is the adverb *wieder* ‘again’ in German, which conveys two distinct forms of repetition (iteration of a complex event, as in (6a) or of its resultant state only, as in (6b)). These interpretations appear to be associated with the structural position of the adverb within the extended vP projection (Stechow 1996). Adverbial phrases such as *one by one* (7b) can also be analyzed as pluractional markers in English and across languages (Beck and Stechow 2007), as they convey the unambiguous interpretation by which the events denoted by the V are distributed over the plural argument and in time.

- (6) a. Ali Baba Sesam [*wieder*] öffnete. German
 Ali Baba Sesam again opened
 ‘AB opened Sesam again.’ (repetitive, restitutive)
- b. Ali Baba [*wieder*] Sesam öffnete.
 Ali Baba again Sesam opened
 ‘Again, AB opened Sesam.’ (repetitive, #restitutive)
 (von Stechow, 1996)
- (7) a. The children entered the room (together)
 b. The children entered the room one by one (# together)

Faced with such a diversity of forms, one has to find a more stable linguistic criterion to determine whether a particular form can be classified as a pluractional marker. The semantic definition however also happens to be a broad one. We have seen that they are defined as plu-

rational those morphemes that express distribution on participants or thematic roles (plurality of arguments, as in (5)), distribution in time (iteration, as in (3) and (6)), distribution in space (2) and even intensity, i.e. interaction with a degree scale, as in (4). Sometimes distribution in time and on participants interact, as in (7b), where the adverbial phrase *one by one* distributes a plurality of participants into groups that are then scattered in time. The reason for this broad semantic definition of pluractionality lies probably in the complex definition of individual events and of their sortal properties: for instance, in some complex cases such as (7) it is still not clear if individual events are sorted with respect to spatio-temporal locations or thematic roles.

Another issue concerns the distinction and interaction between pluractionality and other grammatical domains. Plural markers distributing events in time may be seen as interacting with the domain of aspect, intended as *Aktionsart* or as a grammatical category. In Chechen (Caucasian), the aspectual value of telicity, as a feature on the *Aktion-sart* of the verbal predicate, has led to determining the interpretation of vowel alternation as a pluractional marker (Yu 2003). If occurring with telic predicates, the marker expresses iteration (distribution in time) (8b), whereas with atelic predicates it expresses an extension of temporal duration (9b).

- (8) a. as q'iigashna twop-qwessira. Chechen
1sg crow.pl.dat gun-throw.wp
'I shot crows.'
- b. as q'iigashna twop-**qissira**
1sg crow.pl.dat gun-throw.plr.wp
'I shot crows many times.' (Yu 2003)
- (9) a. Cyna~ chow xoizhira. Chechen
3sg.poss wound hurt.wp
'His wound ached (momentarily).'
- b. Cyna~ chow **xiizhira**.
3sg.poss wound hurt.plr.wp
'His wound ached (for a long time).'
- (Yu 2003)

Again, one may wonder if vowel alternation should be considered as related to aspect or plurality proper. In fact, events appear to be multi-sorted entities, and most often than not, according to one's point

of view, pluractionality can be rooted simultaneously in two different notions.

In this work, we use the term pluractionality to refer to any linguistic means of expressing a plurality of events, be it marked on the verb (as in Lasersohn's definition of verbal plurality) or expressed by adverbial or argumental constituents. These dedicated forms will be called pluractional markers. Within this broader frame, our research focuses on the semantics of pluractionality. More specifically, we address the question of the relevance of the different dimensions of space, time and participants (as expressed through thematic relations) as domains of distribution.

2.2. *Pluractionality and reduplication*

Reduplication is probably one of the most widespread pluractional markers across languages (Moravcsik 1978). As we have seen in the previous section, pluractionality can be expressed by reduplication of verbal morphology (cf. examples (2) to (5)). Adverbial phrases can also be reduplicated, with pluractional effects that depend on the relative scope of the adverbial and the constituents realizing the argument structure of the verb. One case study concerns distributive numerical expressions (Gil 2013, Cable 2013, Donazzan & Müller 2015 a.o.). Numeral phrases can be reduplicated to express distribution of groups of a given cardinality and, when they function as adverbials, they convey a pluractional interpretation. In Mandarin (Sinitic), the pluractional marker of reduplication applies to the numeral and classifier of one of the NP arguments of the V. The reduplicated string is then marked as an adverbial modifier, and its interpretation as a pluractional depends on the relative scope that it has with respect to the vP. In (10), the reduplicated adverbial *liang-ge liang-ge de* 'two-NCl two-NCl ADV' can express distribution over either the subject or the object in (10a), but only distributes over the internal argument when it occurs after it (10b).

- (10) a. Haizi [liang-ge liang-ge de] ba huashengdou chi-wan-le. Mandarin
 child two-CL two-CL ADV BA peanut eat-finish-ASP
 (i) ‘The children in groups of two ate up the peanuts.’
 (ii) ‘The children ate up the peanuts taking them two by two.’
 b. Haizi ba huashengdou [liang-ge liang-ge de] chi-wan-le.
 child BA peanut two-CL two-CL ADV eat-finish-ASP
 ‘The children ate up the peanuts taking them two by two.’
 (Donazzan & Müller 2015)

As in the case of morphological marking, reduplication as a pluractional operator scopes on the constituent that it pluralizes and the thematic relation that links it to the verb (Beck and Stechow 2007), but in this case different scope options are possible.

Summing up, previous work on spoken languages has shown that the distributive effect of pluractionality can depend on the lexical properties of the verb (and in particular its *Aktionsart*) and/or on the scope of the pluractional morpheme. Taking the wealth of studies on spoken languages as a background, in this paper we analyse the interpretation of a particular form of reduplication in Libras. In the next section, we present previous studies on reduplication in sign languages, and we follow Sanchez-Mendes et al. (2017) in assuming that the reduplication morpheme is encoded in Libras by the repetition of the verb root. According to standard definitions, then, reduplication in Libras should qualify as a case of verbal plurality, where the pluractional morpheme has narrow scope on the VP.

3. Pluractionality in Sign Languages

Reduplication appears to be a productive formal feature also in sign languages. Early studies in sign languages (Fisher 1973, Klima and Bellugi 1979) investigated the reduplication of signs related to verbal plurality and sought to relate formational features of movements (such as direction, planar orientation, geometric shape) to interpretation. One focus of research has been in particular that of aspectual distinctions, such as duration vs. iteration. Wilbur et al (1983) set a separation between the forms of reduplication related to verbal aspect and those related to argument structure and more recently Wilbur (2009) explored the interaction of different types of reduplication. In this work, we start from Wilbur’s analysis and assume that reduplication in Sign Languages

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may involve two types of morpho-phonological modifications: temporal and spatial. Temporal modification reflects aspectual modification, i.e. iteration of the root predicate, whereas spatial modification expresses information about arguments (distribution on participants).

There are in particular two reduplicative forms that have been associated with pluractionality in sign languages, dubbed one-handed repetition (\rep) and two-handed alternating repetition (\alt) (Klima & Bellugi 1979 for ASL; Kuhn & Aristodemo 2017 for LSF, Sanchez-Mendes et al. 2017 for Libras). According to Kuhn & Aristodemo (2017)'s analysis of these markers in French Sign Language (LSF), they are associated with two distinct pluractional effects. One-handed repetition is used to express plurality obtained by the distribution of one event-type over time (that is, iteration), whereas two-handed alternating repetition entails that plurality is obtained by distributing occurrences on the participants. Thus, given the one-handed sign for FORGET in (11), one-handed repetition conveys the interpretation that the event has been repeated by the same subject and on the same object (see (11a) and (12a)). Conversely, alternating repetition (11b) is used to signify that the event of forgetting is distributed among different participants (12b).

(11) a. FORGET-rep - Distribution over time (LFS)



(Kuhn & Aristodemo, 2017)

b. FORGET-alt - Distribution across participants



(Kuhn & Aristodemo 2017)

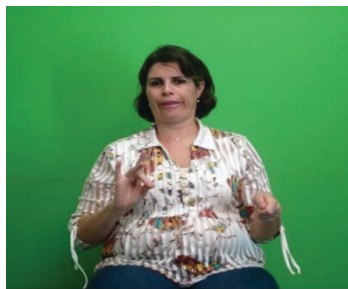
- (12) a. JEAN CAMERA BRING FORGET-rep. (LFS)
 ‘John repeatedly forgot to bring a camera.’
 b. FRIEND POSS-1 IX-arc CAMERA BRING FORGET-alt.
 ‘My friends each forgot to bring a camera.’
 (Kuhn & Aristodemo 2017)

Our first aim in this paper is to define the semantics of these two forms in Libras. The next section presents the properties of pluractionality that have been described for the language by previous studies. Subsequently, we present the elicitation of the new data and its discussion.

3.1. *Pluractionality in Libras*

Pluractionality in Libras has been investigated since Xavier (2014)’s phonological approach to the role of the parameter of number of hands, which showed that a sign typically performed by one hand can have its manual articulator doubled by different semantic factors. Subsequently, Sanchez-Mendes & Xavier (2016) demonstrated that the semantic factors previously described could all be described as forms of event plurality falling under the general notion provided by pluractionality. The attested readings associated to doubling hands were plurality of arguments (13), plurality of events (14) and intensity (15).

- (13) CHEAT – Plural of arguments



- a. One student is cheating on the test. b. Many students are cheating on the test.

(Sanchez-Mendes & Xavier 2016)

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(14) LEARN – Plural of events



a. I learned in one occasion.



b. I learned in many occasions.

(Sanchez-Mendes & Xavier 2016)

(15) LAUGH - Intensity



a. I laughed.



b. I laughed a lot.

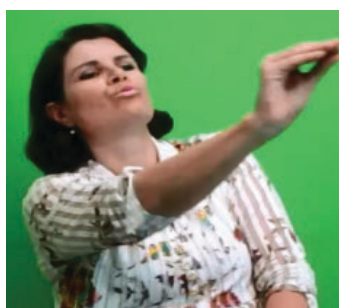
(Sanchez-Mendes & Xavier 2016)

Sanchez-Mendes & Xavier (2016) additionally showed that the three readings are not available for all types of predicates. In the absence of semantic cues on the different classes of predicates in Libras (such as the clear-cut lexical aspectual classes individuated for vocal languages like Chechen), the authors explored the phonological feature of directionality as one way to determine the readings attested for pluractionality.

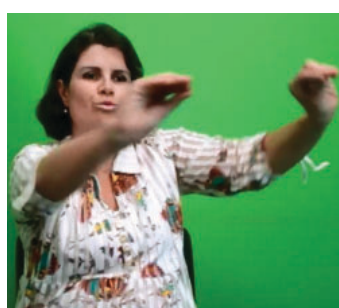
Directional verbs form a sub-type of transitive verbs that shape their movement in order to include the location associated to the participants of the described event. Sanchez-Mendes & Xavier (2016)

showed that with directional verbs the only reading available when two hands are used to perform the verb sign is that of a plurality of arguments. For instance, when the directional predicate *kiss goodbye* is reduplicated, it can only mean kiss goodbye to many people (16). Non-directional verbs, on the contrary, allow for all the readings illustrated by (13) - (15).

(16) KISS-GOODBYE (Directional)– Plurality of Arguments



a. I kissed-goodbye one person.



b. I kissed-goodbye many people.

(Sanchez-Mendes & Xavier 2016)

Considering the tight relation that exists between space in signing and the expression of participants in sign languages, these particular constraints in interpretation make sense. The association of referents to locations in space has been pointed out by Friedman (1975) in one of the first studies on pronominal forms in ASL (American Sign Language). In Libras, Moreira (2007) described formal and pragmatic aspects of pointing of personal pronouns and directional verbs by investigating how signers use the signing space to express the characters of a story. Thus, considering the special relation between space and participants in directional verbs, we can conclude that doubled-hand signs express different participants associated to different locations, and that the interpretation of plurality of arguments is generated in this way.

In a further phase, Sanchez-Mendes et al. (2017) explored the interface between morpho-phonology and semantics, focusing on the parameters of the number of hands and on the two movement of repetition and alternation of verb signs in Libras. The main goal of this phase was to check if different types of reduplication of the verb

sign may indicate different dimensions over which the plurality of events can be distributed, as in French Sign Language (LFS) (Kuhn & Aristodemo 2017).

As described before, in LFS one-handed repetition of the sign expresses distribution in time whereas two-handed alternated repetition is related to distribution across participants (see (12), repeated below as (17)).

- (17) a. JEAN CAMERA BRING FORGET-rep. = (12) (LFS)
 ‘John repeatedly forgot to bring a camera.’
 b. FRIEND POSS-1 IX-arc CAMERA BRING FORGET-alt.
 ‘My friends each forgot to bring a camera.’
 (Kuhn & Aristodemo 2017)

Sanchez-Mendes et al. (2017) showed that the same effect is attested in Libras. The examples under (18) show the difference of the articulation of repetition and alternation of the verb TO CHEAT.

- (18) a. CHEAT-rep - Distribution over time



‘Cheating many times.’

(Sanchez-Mendes et al. 2017)

- b. CHEAT-alt - Distribution across participants



‘Everybody is cheating.’

(Sanchez-Mendes et al. 2017)

Summing up, pluractionality in sign languages can display different semantic effects depending on: (i) the lexical feature of directionality (Sanchez-Mendes & Xavier 2016 for Libras); (ii) the morpho-phonological feature that is repeated (Kuhn & Aristodemo 2017 for French Sign Language (LFS) and Sanchez-Mendes et al. 2017 for Libras).

A question left open by Kuhn & Aristodemo (2017) and Sanchez-Mendes et al. 2017 descriptions is whether the readings associated to repetition and alternation are associated exclusively to these patterns. It is not clear from the reported data if alternating the verb sign could also involve distribution over time besides distribution over participants. This is a reasonable question, given that alternation consists in some kind of repetition.

Starting from the observation that alternation looks like repetition with an added dimensional feature, the goal of this paper is to go further in the analyses aimed at teasing apart the role of repetition and alternation, and to propose a compositional semantic analysis of pluractionality in Libras. Our main aim is to give a definition of each of the forms, and check: (i) if their meaning can be represented by dedicated morphemes and (ii) how these morphemes can interact. Next section shows the design of the elicitation of new data focusing on the answer to this open question.

4. Teasing Apart Repetition and Alternation in Libras

4.1. Goal and design

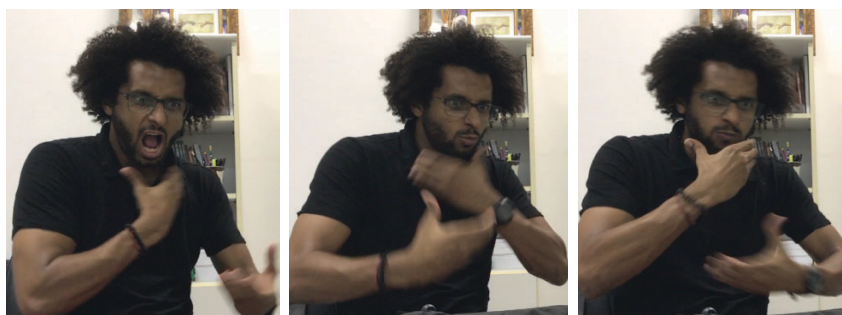
In order to tease apart the role of repetition and alternation in Libras, we started from the hypothesis that reduplication of the sign expresses event plurality in the broad sense defined in section 2.2. We call this reduplication feature RED, and assume that it can take the form of two distinct patterns in signing: (i) a temporal pattern, associated to aspectual information and (ii) a spatial pattern, associated to argument structure (Wilbur et al 1983). We then formulate the hypothesis that aspectual information is related to repetition and argument information is obtained by adding a dimension to the sign,

resulting in the alternation form, which sums both aspect-related and argument-related distributivity.

We followed the method of controlled elicitation by collecting judgments on contexts that were presented by an interpreter (Matthewson 2004). Three sets of conditions were used in the new data collection, corresponding to contexts where: (i) RED implied distribution over participants and time; (ii) RED implied distribution in time without distribution over participants; (iii) RED implied distribution over participants without distribution in time. According to our initial hypothesis, we expected to elicit alternation only in the condition (i).

The results confirmed our hypotheses. The data in (19) shows that in condition (i) the signer expresses the verb phrase alternating the hands.⁴

(19) Eating apples one after the other.



As expected, conditions (ii) and (iii) elicited morphemes dedicated to the expression of distribution in time and over participants respectively. Example (20) illustrates the form of RED implying distribution in time without distribution over participants (repetition).

4. For sake of clarity we present only the data relevant to the discussion, extracting it from the signed sentence.

(20) Shooting one target (repeatedly)



Example (21) on the other hand shows the form of RED with distribution over participants without distribution over time as spatial dispersion.

(21) Children presenting together on the stage in groups of three.



Adding distribution over time to the context above, we get the alternating pattern in the sign, as expected.

(22) Children presenting at the stage three by three.



An additional (spontaneous) piece of data is presented in (23). Here the signer was explaining that she has eight cats in her place. Four of them sleep inside with her and four sleep outside. Since they all sleep at the same time, the distribution is expressed only by spatial dispersion without repetition.

(23) Four cats sleeping inside, four cats sleeping outside



4.2. Discussion and Preliminary Conclusions

Descriptively the data showed that any type of distributive effect involving one-handed repetition ($\backslash\text{rep}$) in Libras always implies distribution in time, whereas participant-related distribution is obtained by adding to $\backslash\text{rep}$ additional marking, which is expressed on the spatial dimension. The combination of the two forms results in two-handed alternation ($\backslash\text{alt}$), which expresses distribution over both times and participants.

We assume that the patterns of repetition ($\backslash\text{rep}$) and alternation ($\backslash\text{alt}$) realise two morphemes whose contribution can be analysed compositionally. Following this hypothesis, $\backslash\text{rep}$ encodes the morpheme REP, which expresses distribution of events on non-overlapping temporal intervals, and $\backslash\text{alt}$ additionally expresses distribution over participants. Specifically, we associate to $\backslash\text{alt}$ the abstract morpheme ALT, the result of compositionally adding to REP a feature expressed on the spatial dimension denoting distribution on participants, that we will call SPA.

The semantics of the pluractional operator expressed by reduplication is encoded in the abstract morpheme RED, defined in (24) (see also Donazzan & Müller 2015).

$$(24) \llbracket \text{RED} \rrbracket = \lambda P_{\langle s, t \rangle} \lambda e_s. P(e) \ \& \ e = \sigma\{e', e''\} : e', e'' < e \ \& \ e' \neq e''$$

In plain words, RED is a general distributive operator applied to a predicate of events: it has the effect of turning the event argument of the verb into a sum of distinct events. Assuming that verbal predicates have a cumulative denotation (Krifka 1998, Kratzer 2003), RED excludes from the denotation atomic events and makes a sum of sub-events accessible to distributive operations.

In Libras, one-handed repetition $\backslash\text{rep}$ expresses REP, which we analyse as a V-bound morpheme (repetition of the verb). We take REP to encode more specifically the aspectual form of RED, which is distribution in time (25). Distribution in time is expressed by anchoring the identity of sub-events to their temporal trace T, i.e. distributing over the set of non-overlapping intervals of their running time.

$$(25) \llbracket \text{REP} \rrbracket = \lambda P_{\langle e, \langle s, t \rangle \rangle} \lambda x \lambda e. P(e) \ \& \ \text{Th}(e) = x \ \& \ e = \sigma\{e', e''\} : e', e'' < e \ \& \ e' \neq e'' \ \& \ \neg T(e') \circ T(e'')$$

Distribution on participants is obtained when RED pluralises the thematic relation that links the verb to its argument(s) (Cable 2013). This argument-related morpheme is dubbed SPA in (26).

$$(26) \llbracket \text{SPA} \rrbracket = \lambda P_{\langle e, \langle s, t \rangle \rangle} \lambda x \lambda e. P(e) \ \& \ \text{Th}(e) = x \ \& \ \text{non-atomic}(x) \ \& \ \langle e, x \rangle = \sigma\langle e', x' \rangle : x' < x \ \& \ e' < e$$

We have seen that in Libras two-handed alternating repetition \backslash alt expresses the simultaneous distribution over the two dimensions of time and arguments. This pattern then encodes a morpheme ALT which results from compositionally adding to REP the feature SPA.

$$(27) \llbracket \text{ALT} \rrbracket = \llbracket \text{REP} + \text{SPA} \rrbracket = \lambda P_{\langle e, \langle s, t \rangle \rangle} \lambda x \lambda e. P(e) \ \& \ \text{Th}(e) = x \ \& \ \text{non-atomic}(x) \ \& \ \langle e, x \rangle = \sigma \langle e', x' \rangle : x', x'' < x \ \& \ e', e'' < e \ \& \ \langle e', x' \rangle \neq \langle e'', x'' \rangle \ \& \ \neg T \langle e', x' \rangle \circ T \langle e'', x'' \rangle]$$

The conclusion is then that REP and ALT express two more particularized interpretations of the general RED morpheme expressing verbal plurality. They allow events to be distributed along two dimensions: REP expressing distribution over time (iteration); and ALT expressing distribution over time and participants (thematic roles).

Given the combination of morphemes proposed one could be tempted to ask if we could find scopal effects between them. Actually, we have seen in section 2 that previous work on spoken languages has shown that the distributive effect conveyed by reduplication depends also on the scope of the reduplicated morpheme or phrase. Nevertheless, a (strict) compositional analysis is challenged in sign languages by the differences in linearization with respect to vocal languages, since in sign languages it proves harder to disentangle parameters and their association with morpho-phonological information. As shown before, the information compositionally contributed by REP and SPA is expressed in Libras by one single sign pattern (\backslash alt), where the respective scope of the two morphemes is difficult to appreciate.

One way to unbind the knot may be to integrate formal approaches that take into account the visuo-gestural modality (body articulators, minding mapping, space and iconicity as in Lepic et al. (2016)). We leave this suggestion to further research.

5. Conclusions

The conclusions reached up to now predict that any type of distributive effect expressed by REP in Libras will always imply distribution in time and will be expressed by \backslash rep; conversely, participant-related

distribution may be obtained by adding to REP additional marking, which is expressed on the spatial dimension, resulting in the form \alt.

From the descriptive point of view, this study contributes to the formal description of the semantics of Libras, which has so far been scarcely investigated. Its more theoretically-oriented goal is to represent the meaning of reduplication in the Logical Form of sentences that express distribution in time or among participants in Libras. More generally, our analysis of pluractionality in Libras aims at giving a contribution to the understanding of natural language, as a system where meaning can be represented through abstract (morphemic) units at the interface with the cognitive system.

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