Dialectologia 21 *(2018), 151-184.*
ISSN: 2013-2247

Received 27 May 2016.

Accepted 18 September 2016.

ON SPATIAL EXPRESSIONS IN AQUILAN

Francesco-Alessio URSINI

Sun Yat-Sen University*

ursini@sysu.edu.cn; randorama@outlook.com

Abstract

The goal of this paper is to analyse *spatial expressions* in Aquilan: spatial prepositions (*a*, '*nfronte*), indexicals (*ecco*, *loco*) and pronouns (*addo'*), thus analysing three problems related to these categories. It is shown that these categories share similar morphological structures and syntactic distribution, which govern their semantic intra- and inter-sentential interpretation. An account of these properties is given and shown to handle data related to the polysemy of prepositions (e.g. *a*) in various contexts. The main claim is that spatial expressions share one morphological category, labelled as "simple ASP" (e.g. *a* 'at/to'), which also determines their syntactic and semantic convergences.

Keywords

Aquilan, spatial prepositions, spatial indexicals, type-logical calculi, polysemy

SOBRE LAS EXPRESIONES ESPACIALES EN EL DIALECTO DE L'AQUILA

Resumen

El objetivo de este trabajo es analizar las *expresiones espaciales* en el dialecto de L'Aquila: las preposiciones espaciales (*a, 'nfronte*), la indicidad *(ecco, loco*) y los pronombres (*addo'*), analizando así tres problemas relacionados con estas categorías. Se muestra que estas categorías comparten estructuras morfológicas y distribución sintáctica similares, las cuales gobiernan su interpretación semántica e intra e inter-oracional. Se da cuenta de estas propiedades y se muestra el manejo de datos relacionados con la polisemia de preposiciones (por ejemplo, *a*) en diversos contextos. La reivindicación principal es que las

* School of Foreign Languages, Sun Yat-sen University , 135, Xingang Xi Road, Guangzhou, 510275, China, 中山大学外国语学院, 广州市海珠区新港西路135号（510275).

expresiones espaciales comparten una categoría morfológica, etiquetada como "simple ASP" (por ejemplo, *a*), la cual también determina sus convergencias sintáctica y semántica.

Palabras clave

dialecto de L'Aquila, preposiciones espaciales, indicidad espacial, cálculos tipo-lógicos, polisemia

1. Introduction: Spatial Expressions in Aquilan

The Aquilan dialect, or *Aquilan*, is a "middle Italian" dialect spoken in L'Aquila, Northwest Abruzzo (Vignuzzi 1997; Avolio 1992, 1993, 2009). Aquilan features a rich set of *spatial prepositions* (henceforth SPs), used to describe the position of one entity, or *figure*, with respect to a landmark object or *ground* (Talmy 2000: Ch. 1). As for many Romance dialects (Luraghi 2011), little is known on *Aquilan SPs* (ASPs) and their relation with two other parts of speech conveying spatial information: indexicals (e.g. *ecco* 'here') and *wh*-pronouns (e.g. *do'* where'). We concentrate on three problems involving these three *Spatial Expressions* (henceforth SEs). Consider (1)-(3):

(1) Q: *A-ddo' sta Mario*? A: '*N-fronte a-lla machina*
Q: A-where is.E Mario? A: N-front A-the car
Q: 'Where is Mario?' A: 'In front of the car'

(2) *Mario è jjito a-rrete a-lla machina. Loco, se sta a rescall-a'*
Mario is.S gone A-back A-the car. PLACE, SELF is.E A warm-INF
'Mario has gone behind the car. There, he is warming himself'

(3) a. *Mario sta/é jjito a-lla casa*
Mario is.E/is.S gone A-the house
b. 'Mario is at/has gone to his house'
c. 'Mario is in/has gone into his house'

The first problem pertains to how ASPs are identified as a category. Consider (1): *where*-questions can identify SP *phrases*, the minimal *congruent* answers to this question

type (Jackendoff 1972: Ch. 4). Congruence is defined as a relation between phrases that carry the same features, and license discourse-based relations, e.g. anaphors (Ward & Kehler 2005). The answer involves an ASP phrase (ASPP), '*n-fronte alla machina*. *'nfronte* 'in front' is its specifier, segmentable into two morphemes, *n-* and *-fronte*. *Alla* is the main head, also taking a ground NP as its complement (i.e. *la machina*). Note that *a* in (1) fuses with the definite article *la* to form a *preposizione articolata* (*alla:* Napoli & Blevins 1987) via "syntactic doubling", and acts as the head of an ASPP. The problem is that questions individuate ASPPs and their heads, but not their constituting morphemes.

The second problem is illustrated in (2). *Loco* lit. 'place' is an indexical. It is anaphorically related to *arrete alla machina* 'behind the car' and can distribute as a noun for locations (e.g. *nu loco strano* 'a strange place'). The anaphoric relation between indexical pronouns and SPPs hinges on their ability to denote spatial sense types, bound across distinct sentences (Creary et al. 1987, 1989; Ursini & Akagi 2013a, b). The second problem pertains to how to account for the fact that ASPPs' can establish anaphoric relations with indexicals such as *loco*, in discourse.

The third problem, illustrated in (3), pertains to how the *polysemy* of ASPs, defined as the property of a lexical item to have multiple, distinct but related senses (Riemer, 2010), can be captured. Aquilan has two copulas, *esse* and *sta* (Ursini 2013a, 2015b). *Sta* denotes a temporary property of the figure and selects the *locative* sense of an ASPP: where the figure lies (Cresswell 1978). Instead, *è* usually acts as an auxiliary verb in compound tenses. Thus, *è jjito* distributes with *alla* and selects its *directional* sense, denoting the "path" of a moving figure. In (3b-c) a first polysemy pattern is displayed as the ability of *a* to either have a directional or a locative sense (cf. Italian, Folli 2002). A second pattern emerges in the contrast between (3b) and (3c). Mario can either stop (or stay) outside his house (viz. (3b)), or he can go (or stay) inside (viz. (3c); other readings are possible. Thus, ASPs can also be polysemous, as these examples show.

Given these three problems emerging from the flexibility of Aquilan SEs, the goal of this paper is to offer a unified solution to these problems. Since Aquilan SEs are understudied, reaching this goal can also shed more light on a neglected group of connected categories across Italian dialects. The paper is organized as follows. Section 2

presents an overview of the data, Sections 3-4 their morpho-syntactic analysis, sections 5-6 their semantic analysis. Section 7 concludes.

2. The Data: Three Problems about SEs in Aquilan

The goal of this section is to present a broader overview of the data. We begin with ASPs, which can be distinguished between morphologically *simple* and *complex* types, as their Italian counterparts (Rizzi 1988: 496-498).[1] Simple (mono-morphemic) ASPs can be part of the structure of complex ASPs. As heads, they cannot undergo *argument demotion*: ellipsis involving the ground NP (Merchant 2001: Ch. 2; Svenonius 2010). Complex ASPs include simple ISPs as "P(preposition)-markers" and "spatial nouns" (Levinson 1994), inserted in a prepositional context to describe axes/directions of a spatial relation (*Axpart Ps* in Svenonius 2006; Pantcheva 2008). A list of simple ASPs, and a non-exhaustive list of complex ASPS are offered in (4)-(5), respectively:

(4) **Simple ASPs**={*a* 'at, to, on, in', *de* 'of, from', *da* 'from, to', *pe'* 'through, across, around'}
(5) **Complex ASPs**={*a-rrete/'n-fronte a* 'behind/in front of', *a-ddestra/a-ssinistra de* 'to the right/left of', *sopre/sottu a* 'above/below', *pettraverso a* 'through', '*n-faccia a* 'against', *'n-centro* 'in the centre of', *'n-torno a* 'around', '*n-nanzi a* 'ahead of', *'n-ammonte a, n-abballe a*}

As (4) shows, Aquilan lacks a cognate of Italian *in* and *su* to respectively denote inclusion ('in') and vertical support ('on'). *A* covers both senses, hence acting as a "general" SP (cf. Levinson & Meira 2003). As (5) shows, complex ASPs always include a "main" head (i.e. *a*, *de*), as in Spanish (cf. Ursini 2013b; Romeu 2014; Ursini & Giannella 2016). Simple ASPs can also be P-markers, with some exponents only having this function. For instance, '*n*- combines with *fronte*, a noun, to form the Axpart *n-fronte*. Note that this marker might be seen as a reduced form of *in*, which however has disappeared in modern

[1]All data were collected by eliciting judgements from 13 NORM speakers over 60 years of age, to ensure that the influence of Italian was minimal (Chambers & Trudgill 1998: 28-30; for discussion on NORMs and their importance).

Aquilan. ASPs *'nammonte* and *'nabballe* are not glossed, as we need to discuss their senses in Section 3.

The tripartite structural contrast among simple, complex ASPs involving argument demotion and axial nouns is shown in (6)-(7), via simple *a*, complex *'nfronte a* and the noun *fronte*:

(6) **Mario sta a(-lla machina)*
Mario is.E A(-the car)
'Mario is at (the car)'

(7) *Mario sta *fronte a-lla machina/'n-fronte (a-lla machina)*
Mario is.E *front A-the car/N-front (A-the car)
'Mario is in front (of the car)'

(6) shows that simple ASP *a* cannot undergo demotion, and (7) that spatial noun *fronte* cannot occur "unmarked" (without '*n*-), in complex ASPs. When Axpart P *'nfronte* is formed, however, demotion can occur. Thus, ASPs seem to include four distinct lexical units: a head (a simple ASP); an Axpart P (Axial Noun and P-marker) and a ground NP, with demotion targeting the latter two.

Let us now focus on the first problem but starting from the structure of *wh*-pronouns. In Aquilan, simple ASPs can attach as prefixes to the pronoun *do'*, featuring the fusion of these morphemes via doubling (e.g. *pe-ddo'*). We thus have the pronouns series *addo'*, *peddo*', *daddo'*, *deddo'*, with *-do'* as the "default" form (cf. den Dikken 2010 on Dutch). If a prefixed pronoun is used, then congruence requires that the answer be headed by the same ASP, viz. (8):

(8) Q: *Da-ddo' vengono le machine?*A: #*'n-fronte a-lla chiesa/da'n-fronte a-lla chiesa*
Q: DA-where come the cars? A: #N-front A-the church/ DA.N-front A-the church
Q: 'From where the cars go?' A: 'In front of the church/From in front of the church'

In (8), *da 'nfronte alla chiesa* is a complex ASP that involves the combination of the simple ASP *da* with the complex ASP '*nfronte a*. Unlike '*nfronte alla Chiesa*, marked as incongruent (i.e. "#"), this ASPP licenses a congruent question-answer pair. The question requires information about "from" which location the cars come, offered via a "from"-type answer. Questions individuate ASPPs and their heads, and simple ASPs can combine with pronouns from the *-do'* series. ASPs can also include structure to make up an ASP phrase, as the demotion patterns show.

We move to the second problem. *Ecco* and *loco* are indexicals that can act as anaphors receiving their interpretation from an SPP antecedent (Creary et al. 1987, 1989; Kayne 2004, 2007). Both indexicals can be affixed to Axpart Ps to form *complex indexicals*: lexical items referring to given locations in discourse. For instance, *loc'ammonte* lit. 'there-on-top' can be used to refer to a distant location on top of an implicit ground (cf. Italian *lassù*, *laggiù*: Rizzi 1988: 520). Simple ASPs can be affixed to indexicals, forming an answer to a *do'*-question. Consider (9)-(11):

(9) *Mario è venuto/jjito ajju centro. Ecco/loco, s'è fatto nu ggiro*
Mario is.E come/gone A-the centre. Here/there, SELF.is.E made a stroll
'Mario has come/gone in the city centre. Here/there, he had a stroll'

(10) *Mario s'è parcheggiato 'n-nanzi a-jju Boss. Ji so parcheggiato loc'a-rrete*
Mario SELF.is.E parked N-ahead A-the Boss. I am.S parked there.A-back
'Mario has parked in front of the Boss. I have parked behind that place'

(11) Q: *Pe-ddo' vanno le machine?* A: *Pe'lloco*
Q: PE-where go the cars? A: PE.there
Q: 'Through where the cars go?' A: 'Through there'

Thus, (9) shows how these two indexicals can take the ASPP *ajju centro*, as its respective antecedent. Note that *loco* can also act as a generic noun for locations, often in attributive constructions (cf. Latin: Luraghi 2011). In (10), the complex indexical *loc'arrete* is formed via vowel truncation. This indexical refers to the posterior region of an implicit, distant ground: the tavern known as *ju boss*, introduced in the previous sentence via the

antecedent ASPP *ajju Boss*. In (11), the answer *pe'lloco* includes the simple ASP *pe'* prefixed to *loco*, forming another type of complex indexical via syntactic doubling, sharing the syntactic distribution of ASPPs. *Loco* may simply refer to a previously mentioned or implicit location through which the cars move (e.g. in front of the church). Thus, as (8)-(11) show, simple ASPs and Axpart Ps can also occur as segments of indexicals (affixes: *pe'lloco*; arguments, *loc'arrete*) and *do'*-pronouns. Simple ASPs seem to act as the morphological "glue" connecting ASPs, indexicals and *do'*-pronouns as SEs, governing their shared syntactic distribution and anaphoric relations.

We move to our third problem: the polysemy of ASPs. We begin from the first pattern, since its status as proof for the polysemy of ASPs is more transparent. Although classical works on English SPs treat each lexical item as either having a directional or a locative sense (Cresswell 1978; Wunderlich 1991), modern works offer a nuanced picture (Tungseth 2006; Gerhke 2008). Typological studies suggest that Romance languages have ambiguous SPs, disambiguated via verbs' senses (e.g. Talmy 2000: ch.4; Folli 2002). ASPs follow this pattern, as (12)-(13) show:

(12) *Ji quatrani stanno/vanno pe'jji campi*
The boys are.E/go PE-the fields
'The boys are (located) around/go across the fields'

(13) *Mario sta/camina 'n-fronte a-jju muro*
Mario is.E/walks N-front A-the wall
'Mario is/walks in front of the wall'

The sense alternation in (12) shows that when *pe'* combines with a locative verb, it denotes a generic position for the figure, roughly captured via the 'across/around' translations (cf. Zwarts 2004). Similarly, (13) shows that '*nfronte a* can also undergo this alternation between a locative and a directional reading, although the underlying "frontal" direction is maintained. Even if verbs determine which sense is accessed, ASPs can contribute either sense to sentence, being polysemous.

Before we discuss the second pattern, then, a *precís* is necessary. Polysemy is contiguous to underspecification (a word sense can be generic in context, e.g. *aunt*) and vagueness (a word sense is context-sensitive, e.g. *expensive*). The key type of evidence that proves the polysemy of a lexical item is the ability of its distinct senses to co-exist in a complex syntactic context (Riemer 2005: Ch. 5). One example is the "coordination test": if a lexical item *α* appears in the conjuncts of a coordinated phrase with distinct senses, then it is polysemous (Kearns 2006). Consider (14):

(14)	*Ji*	*quatrani*	*stanno*	*assettati*	*a-jji*	*tavoli*	*e* *a-lle*	*machine*
	The	boys	are.E	sat	A-the	tables	and A-the	cars

'The boys are sitting at the tables and in the cars'

If in (14) *a* has one sense denoting a relation of proximity in both conjuncts (i.e. it is underspecified), then the boys are understood to sit next to each ground, possibly using chairs as supports. The less awkward interpretation, however, is that the boys sit inside the cars and also next to the tables. The two tokens of *a* involve distinct senses, and the zeugma test proves its polysemy.

We can verify the validity of this test by using it on the other three simple ASPs. *De* can distribute with few Axpart Ps (i.e. *addestra* 'to the right', *ajju fonno* 'at the bottom'), but also with other prepositions that restrict *de*'s sense (e.g. *a ffavo' de* 'in favour of'). Instead, *da* describes the origin of a possibly moving figure. However, when the ground is an animate entity and an opportune verb also distributes with an ASPP, *da* can denote the destination of a moving figure (cf. Italian: Luraghi 2009, 2011). The resulting ASPP can combine with either locative or directional verbs. Instead, *pe'* includes senses involving "route" types of directions (Zwarts 2008). Its combination with locative/directional verbs can denote "distributed" locations/directions for the subjects, akin to English *around* and *through* (Zwarts 2004, 2008). Consider thus (15)-(18):

(15)	*Ji*	*quatrani*	*stanno/vanno*	*a-ddestra*	*e*	*a-jju*	*fonno*	*de-lla*	*valle*
	The	boys	are.E/go	A-right	and	A-the	bottom	DE-the	valley

'The boys are/go at/to the right of the river and at/to the bottom of the valley'

(16) *Mario* *sta/va* *da* *Luigi*
Mario is.E/goes DA Luigi
'Mario is at/goes to Luigi'

(17) *Mario* *è* *jjito* *da* *Roma* *e* *da* *Luigi*
Mario is.S gone DA Rome and DA Luigi
'Mario has gone from Rome to Luigi'

(18) *Ji* *quatrani vanno pe'jji* *campi* *e* *pe-lla* *galleria*
The boys go PE-the fields and PE-the tunnel
'The boys go across the fields and through the tunnel'

Consider (15). By combining with *addestra* 'to the right of' and *ajju fonno* 'to the bottom', *de* also displays the second pattern of polysemy. The distinct Axpart Ps (*addestra*, *ajju fonnu*) explicitly select distinct but related senses: two spatial relations that *de* can denote. In (16), *da* can cover the locative sense of *a* corresponding to English 'at' when it distributes with *sta*, and the directional sense of *to* when it distributes with *va* 'goes' and *Luigi*, the animate NP. Thus, (15)-(16) also attest both polysemy patterns for *da* and *de*. The sense of *da* denoting origin, akin to English 'from', is instead presented in (17), in the first conjunct ASPP *da Roma*. The SPP *da* thus takes two opposing senses, in this conjoined phrase. Furthermore, (18) shows that *pe'* acts as an ASP that covers several senses describing "complex" trajectories and "distributional" patterns of figures within a bounded space. It covers the sets of senses that English *around* and *through*/*across* jointly cover (cf. Evans & Tyler 2004; Zwarts 2004). Thus, simple ASPs display both polysemy patterns; complex ASPs "inherit" this polysemy from the simple ASPs in their structure.

We now turn to the data involving complex ASPs, which usually display more restricted forms of the second pattern. We concentrate on '*nammonte a* and '*nabballe a*, since these two complex ASPs involve a polysemy pattern specific to complex ASPs. First, the senses of '*n-ammonte a* lit. 'N-summit at' denote a figure located at the top, beginning or northern part of a ground. Those of *n-abballe* lit. 'N-valley at' denote a bottom, ending or southern part. Such patterns are rare, although attested in other

languages. For instance, in Tzeltal the term *ajk'ol* lit. 'Uphill' can carry a 'north of', 'on top of' and even an 'above' sense (Levinson 1994; Ross et al. 2015). Thus, the senses of these ASPs can denote relations defined with respect to a *relative*, *intrinsic* or *absolute* reference system. The relative system involves the "computation" of directions with respect to the speaker's point of view; the intrinsic system, the ground's daxes. The absolute system involves polar coordinates, or other fixed referents in the landscape (Levinson 1996).

These two ASPs, then, only display the intrinsic and absolute senses, as shown in (19):

(19) *Mario* *sta* *'n-ammonte* *a-jju colle/a-lla conca*
Mario is.E N-NM A-the hill/A-the basin
'Mario is on top of the hill/north of the valley'

We use the gloss "N-NM" to capture the polysemy of *'nammonte*. Its sense alternations require some subtle conditions to be successfully used in coordinated constructions, so we leave this test aside. Nevertheless, the examples suggest that this complex ASP can have two possible and distinct senses, denoting Mario's position as being on top of the hill, or north of the valley.

Let us take stock. ASPs, *'do*-pronouns and indexicals, *qua* SEs, share morphemes carrying spatial features: simple ASPs. Their syntactic distribution converges at intra- and inter-sentential levels. Discourse patterns (argument demotion, questions-answer pairs and anaphoric relations) suggest that these spatial features play a role beyond the word level. Furthermore, ASPs are polysemous: they can denote directional or local relations, and one of several related types of spatial relations including reference systems (first, second polysemy pattern respectively). Therefore, SEs seem to be tightly connected, and to invite the unified account that we propose in the next sections.

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ISSN: 2013-2247

3. The Solution: Morphological, Syntax and Discourse Structures for SEs

The goal of this section is to present the architecture of grammar and the formal tools for our analysis. For the architecture, we choose *Distributed Morphology* (DM, e.g. Halle & Marantz 1993; Harbour 2007; Harley 2012). This because two of its central assumptions are germane to our goals, and its extension to discourse-level data does not require supplementary assumptions (cf. Hardt 2013). The first assumption is that one operation, known as *merge*, recursively combines morphemes (bundles of features) and generate larger structures (words, phrases, sentences). The second is that the semantic and phonological components of grammar cyclically receive the outputs of this process, in turn generating semantic (meanings) and phonological (utterances) outputs.

In order to capture these assumptions in a formally precise way, we use *Type Logical Syntax* as our formal apparatus (TLS: Moortgat 2010; Morryll 2011). In TLS, the merge of lexical items into larger units is represented by first assigning *types* to items. Lexical items can be either assigned *incomplete* types (e.g. *s\np*) or *complete* types (e.g. *s*, *np*). Incomplete types carry this label because they merge with a (matching) *input* type, to form a complete type. For instance, an intransitive verb such as *sleeps* is assigned the type *s\np*, which reads: if *sleeps* merges with an NP (type *np*, e.g. *Harlock*), then a sentence *s* is derived. If two lexical items have non-matching types, they cannot be merged. Thus, **runs sleeps* is ungrammatical, as both verbs have type *s\np*, and cannot merge.

The notion of *merge* can be made formally precise via the use of the connectives "/" (right division), "•" (product) and "⊢" ("proves"). Division is a *binary*, *associative*, *idempotent* connective; product is a *binary* and *associative* connective. Division allows us to capture the fact that some lexical items (e.g. affixes) must combine with other items to form words/phrases. Instead, product allows us to represent morphemes as the product of more basic morpho-semantic features. We then define *merge* as a *ternary* and *associative* operation that takes two lexical units and forms a third syntactic unit (e.g. a phrase). Note that, via our definition of *merge*, lexical items are merged in a top-down, incremental manner: *Harlock* is merged with *sleeps* on its "right" side. Thus, our derivational system can be seen as idealized model of speech production/comprehension,

consistent with similar models in the literature (cf. Levelt 1989; Phillips 2006; Jarema & Libben 2007).

We now turn our attention to types. Differently from standard TLS approaches (e.g. Moortgat 2010), we do not use "naïve" types such as *s*, *np* and similar others. DM and other frameworks focusing on lexical categories have shown how lexical categories correspond to different combinations of a closed set of features (e.g. Croft 2003; Harbour 2007; Acquaviva 2014). Thus, each syntactic object can be seen as a specific type of *phrase*, even though different phrases correspond to distinct feature clusters. Our recursive rules in (20) aptly capture this fact:

(20) 1. *Given a Lexicon* $\boldsymbol{L}$, $\boldsymbol{p} \in \boldsymbol{L}$ *is a morphological type* (Lexical type)

2. *If* $\boldsymbol{x}$ *is a type and* $\boldsymbol{y}$ *is a type, then* $\boldsymbol{x/y}$ *is a type* (Type formation: division)

3. *If* $\boldsymbol{x}$ *is a type and* $\boldsymbol{y}$ *is a type, then* $\boldsymbol{x \bullet y}$ *is a type* (Type formation: product)

4. *If* $\boldsymbol{x/y}$ *is a type and* $\boldsymbol{y}$ *is a type, then* $\boldsymbol{(x/y) \bullet y \vdash x}$, $\boldsymbol{y \bullet (x/y) \vdash x}$ (Merge: forward application)

5. *If* $\boldsymbol{x/y}$ *is a type and* $\boldsymbol{y}$ *is a type, then* $\boldsymbol{(x/y) \bullet (y/z) \vdash x/z}$, (Merge: cut rule)

6. *Nothing else is a type* (Closure property)

Given a basic set of types represented via $\boldsymbol{p}$ (rule 1), complex types can be defined as the division or product of more basic types (rules 2, 3). When two complex types are merged, the result is a type in which matching information is discarded (rule 4), or compressed (rule 5). No other rules are employed (rule 6). The minimal type set we define to handle our data is $TYPE=\{\boldsymbol{p}, \boldsymbol{p/p}, \boldsymbol{p \bullet p/p/p \bullet p}, \boldsymbol{p \bullet p}\}$. For feature sub-types, we use minimalist and TLS accounts of feature percolation (Adger 2010; Adger & Svenonius 2011; Carpenter 1992; Heylen 1999; respectively), representing sub-types as indexes. Thus, we introduce type $\boldsymbol{p_s}$ and $\boldsymbol{p_n}$ for items/phrases carrying spatial and nominal features, respectively. Finally, we introduce an *Index Set I* for the distinct steps in a derivation, with $I=\{t,t+t,t+2,...,t+n\}$. The symbol "+" represents *addition*, an operation that derives progressive intervals of time in sentence production. In each derivation, the operation *Lexical Selection* (LS) represents the selection of a lexical item as an active unit in the derivation, while *Merge Introduction* (MI) represents the merge of two input constituents, and the resulting output constituent. We are now ready to analyse the morphological and syntactic data.

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ISSN: 2013-2247

4. The Solution: The Analysis of the First and Second Problems

Our analysis of the data requires some preliminary discussion on the structures and types that we assign to SEs. Classic analyses of SPs assume that this category consists of two syntactic positions, usually known as "Path" and "Place" (Jackendoff 1983, 1990; Wunderlich 1991; Kracht 2002). Other analyses suggest that Place is a morphological segment of Path (e.g. van Riemsdijk 1998; Emonds 2000). The "P-within-P" hypothesis (Hale & Keyser 2002: Ch. 1–2), instead, suggests that prepositions can have flexible valence, and be 0-place heads (i.e. phrases), 1-place heads (i.e. affixes) or 2-place heads. Cartographic approaches propose that Ps include several heads, one per constituting morpheme: *in*, *front*, *of* in *in front of* (e.g. Asbury 2008; Svenonius 2010). Regarding analyses of *wh*-pronouns, a standard assumption is that they involve a *wh*-morpheme carrying "interrogative" import, and a second segment acting as a semantic restrictor (*wh-*, *-ere* in *where*: Bianchi 2002a, b; Krifka 2001, 2004; Di Sciullo 2005: Ch. 4). Indexicals, given their morphological and semantic relationship with *wh*-pronouns, have received a similar treatment. *H-* in *here* is treated as an exponent of a "Deixis" head, and *-ere* of a "Place" head (Kayne 2004, 2007).

Although analyses for Aquilan and other Italian dialects have not been offered, there are cartography-oriented works for Italian SPs (Tortora 2006, 2008; Folli 2002, 2008). Since these works only investigate a handful of items (e.g. *dietro a* 'behind at'), they propose a bi-partite, classic analysis. Analyses of indexicals and *wh*-pronouns in Italian also fall within the range of standard analyses of these categories (e.g. Rizzi 1988; Kayne 2007). However, as our discussion suggests, ASPs require a more flexible account. First, simple ASPs have a flexible valence and can be part of indexicals and pronouns. Second, complex ASPs involve up to four morphological units: a head that takes a ground NP possibly undergoing demotion (first, second unit); and a simple ASP or Axpart P as specifiers, with an Axpart P including a P-marker (third, fourth unit).

For these two reasons, the "P-within-P" hypothesis, and a flexible account of the distribution and valence of SEs appear as the best accounts for the analysis of these data. In TLS, type assignment flexibility can be captured via the *residual rule* (Moortgat 2010:

§2.1; Morryll 2011: Ch.1), which comes in two formulations: ***a•b•c⊢a•b/c***, and ***a•b/c⊢a/b/c***.

The first formulation says that a lexical item carrying multiple features can become a 1-place head (e.g. an affix) by having one feature "looking for" a matching phrase. The second formulation says that an affix can then become a 2-place (relational) head. For instance, *a* can start as an affix (viz. *a-ddestra*) and become a head (e.g. '*nfronte a*). *Loco* can start as a generic noun (a phrase, viz. *nnu loco*) and become an affix in complex indexicals (e.g. *loc'abballe*). Our type assignment is in (21):

(21) a. $\boldsymbol{p_n}$:={*Mario, fronte, balle,…*}; $\boldsymbol{p_s}$:={*la machina, a, 'nfronte, loco, abballe, loc'abballe,…*};

b. $\boldsymbol{p_n/p_n}$:={*la*}; p_s/p_n:={*a-, 'n-, pe',da-,de-,...*}; $\boldsymbol{p_s/p}$:={*do'*};

c. $p_s/p_n/p_s$:={*(P), de, da, a, pe',…*}; $p/p_s/p_n$:={*sta, é jjito,…*};

The type assignment in (21a) differentiates between Axpart Ps (e.g. '*nfronte*), other SEs of type $\boldsymbol{p_s}$ (e.g. *a*), and spatial nouns (e.g. *fronte*) of type $\boldsymbol{p_n}$, as phrases that carry spatial and nominal features, respectively. Ground NPs are assigned $\boldsymbol{p_s}$, to represent their status as NPs denoting landmarks (i.e. locations) in a spatial relation (cf. Ursini 2016b). This distinction holds for 1-place heads, too: definite articles and the *wh*-morpheme *do'* carry different features from 1-place SPs (e.g. *a-*), viz. the types $\boldsymbol{p_n/p_n}$ and $\boldsymbol{p_s/p_n}$. Note that simple ASPs as phrases are typed $\boldsymbol{p_s}$ for mere reasons of space, as their actual type is $\boldsymbol{p_s \bullet p_s \bullet p_s}$, a type that corresponds to the type of heads $p_s/p_s/p_s$ via residual rule. The type for verbs only represents their taking SEs and ground NPs as arguments.

We can now derive the structure of ASPPs involving simple ASPs, which we analyse as involving a silent "(P)" head and a simple SP in specifier position (cf. Ursini 2015a). For reasons of readability, the type $\boldsymbol{p_s}$ represents simple ASPs (in subscripts), rather than type $\boldsymbol{p_s \bullet p_s \bullet p_s}$:

(22) *t.* [a_{ps}] (LS)

t+1. [(P)-$la_{ps/ps/ps}$] (LS)

t+2. [a_{ps}]•[(P)-$la_{ps/ps/ps}$]⊢[$_{ps/ps}$[a_{ps}] (P)-$la_{ps/ps/ps}$] (MI)

t+3. [$casa_{ps}$] (LS)

t+4. [$_{ps/ps}$[a_{ps}] (P)-$la_{ps/ps/ps}$]]•[$casa_{ps}$]⊢[$_{ps}$[a_{ps}] (P)-$la_{ps/ps/ps}$ [$casa_{ps}$]] (MI)

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In (22), which repeats *alla casa* from (3), the ASP *a* merges with the silent head P (steps *t* to *t+2*). The ground NP is merged next, and an ASPP of type $\boldsymbol{p_s}$ is thus formed (steps *t+3*, *t+4*). The derivation shows that this ASPP has a distinct type from *a*, since this type $\boldsymbol{p_s}$ does not stand for the product type assigned to simple ASPs. Thus, silent Ps are polysemous (i.e. of type $\boldsymbol{p_s}$); they denote relations that receive their multiple, related senses from the polysemous ASPs in the specifier.

The structure of complex ASPs and ASPPs is our next target. We offer a partial derivation for '*nfronte* in (23), and the final step in the derivation of a complex ASPP in (24):

(23) *t.* ['n-$_{ps/pn}$] (LS; RR)

t+1. [fronte$_{pn}$] (LS)

t+2. ['n-$_{ps/pn}$]•[fronte$_{pn}$]⊢[$_{ps}$['n-$_{ps/pn}$] fronte$_{pn}$]] (MI)

(24) *t+6.* [$_{ps/ps}$[a$_{ps/ps}$]-ddestra$_{p}$]della$_{ps/ps/ps}$]]•[machina$_{ps}$]⊢[$_{ps}$[a$_{ps/ps}$]ddestra$_{pn}$]della$_{ps/ps/ps}$[machina$_{ps}$]]

Thus, (23a) shows that the Axpart P '*nfronte* is formed by having '*n-*, assigned the type of an affix (a P-marker: type $\boldsymbol{p_s/p_n}$), to merge with the noun *fronte* (type $\boldsymbol{p_n}$). The same analysis holds for *addestra*, which merges with *della* and *machina*, as shown in (24). Note that we simplify the type of P-markers, omitting the second input type $\boldsymbol{p_s}$ for space reasons. Silent P, *de* and *a* act as heads of a complex ASP, formed once a P-marker (e.g. '*n-*, *a*) merges with an Axial noun to form an Axpart P. In both cases, phrases of type $\boldsymbol{p_s}$ are derived: these ASPPs carry a polysemous interpretation.

Let us now derive *do'*-pronouns and complex indexicals. We treat *do'*-pronouns as sentential P-markers of type $\boldsymbol{p_s/p}$, viz. (25). We then assume that indexicals *ecco* and *loco* are assigned type $\boldsymbol{p_s \bullet p_s}$: their type is the spatial $\boldsymbol{p_s}$, if an antecedent phrase of the same type occurs in context. Via the residual rule, indexicals can be assigned type $\boldsymbol{p_s/p_s}$. This predicts that they can merge with Axpart Ps, forming complex indexicals, viz. *loc'arrete* from (11), but also merge with ASP affixes, viz. *pe'lloco* as an answer in (11). The derivations underpinning these SEs are offered in (25)-(26):

(25) *t.* [pe'$_{ps/ps}$] (LS; RR)

t+1. [ddo'$_{ps/p}$] (LS)

t+2. [pe'$_{ps/ps}$]•[ddo'$_{ps/p}$]⊢[peddo'$_{ps/p}$] (MI: Cut Rule)

(26) a. *t+2*. [loco$_{ps/ps}$]•[arrete$_{ps}$]⊢[$_{ps}$loc'$_{ps/ps}$ [arrete$_{ps}$]] (MI; RR)

b. *t+2*. [pe'$_{ps/ps}$]•[loco$_{ps}$]⊢[$_{ps}$ pe'$_{ps/ps}$ [lloco$_{ps}$]] (MI; RR)

The derivation in (25) proves that *pe'* merges with *do'* to form a pronoun with a restricted sense. This pronoun can then merge with the rest of sentence to create a question: a syntactic structure requiring complementary information to form a full sentence, as shown in (31). In (26a), *loc'arrete* as a complex indexical is assigned type $\boldsymbol{p_s}$, denoting a distal location, and the 'bottom' of a previously mentioned ground. Note that truncation occurs, as the vowel *o* is truncated before *loco* is fused with *arrete*. The indexical *pe'lloco* can receive a symmetric account in (26b), with *loco* being assigned its basic type, and *pe'* acting as an affix to *loco* via the residual rule, as in (25). Our account can predict the emergence of *do'*-pronouns and complex indexicals as categories combining the three "basic" SE categories, and joined via the spatial features that simple ASPs carry.

The derivation of SEs paves the way for the account of their merging into sentences and clauses. We start from Boolean SPs, simply treating them as complex ASPPs. For this purpose, we assign type $\boldsymbol{p_s/p_s/p_s}$ to conjunction *e* 'and', as a head that takes two ASPPs as conjuncts. This type assignment needs not to be so specific: *e* can take other types of conjuncts as well (e.g. NPs) and return this type as an output, *qua* a syncagorematic head (cf. Emonds 2000). This simplification, however, paves the way for their compressed derivation in (27), based on (3):

(27) *k.* [$_{ps}$ ajji tavoli] (MI)

k+1. [e$_{ps/ps/ps}$] (LS)

k+2. [[$_{ps}$ ajji tavoli]]•[e$_{ps/ps/ps}$]⊢[$_{ps/ps}$[$_{ps}$ ajji tavoli][e$_{ps/ps/ps}$]] (MI)

k+3. [$_{ps}$ alle giostre] (LS)

k+4. [$_{ps/ps}$[$_{ps}$ ajji tavoli][e$_{ps/ps/ps}$]]•[$_{ps}$ alle giostre]⊢[$_{ps}$[$_{ps}$ ajji tavoli] e$_{ps/ps/ps}$[$_{ps}$ alle…]] (MI)

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The derivation in (27) proves that the type of these phrases is $\boldsymbol{p_s}$, like that of their conjuncts: coordinated phrases involving ASPPs are syncagorematic and can also be complements of verbs.

ASPPs and coordinated ASPPs are not the only possible complements of verbs, since complex ASPs but not simple ASPs can undergo demotion. In our account, simple ASPs have a different type (i.e. $\boldsymbol{p_s \bullet p_s \bullet p_s}$) from ASPPs and Axpart Ps, of type $\boldsymbol{p_s}$. Our account of demotion is in (28)-(30):

(28) *t.* [Mario$_{pn}$] (LS)

t+1. [sta$_{p/ps/pn}$] (LS)

t+2. [Mario$_{pn}$]•[sta$_{p/ps/pn}$]⊢[$_{p/ps}$[Mario$_{pn}$] sta$_{p/ps/pn}$] (MI)

t+k. [$_{ps}$['n-$_{ps/pn}$] fronte$_{pn}$] (MI)

k+1. [$_{p/ps}$[Mario$_{pn}$] sta$_{p/ps/pn}$]•[$_{ps}$['n-$_{ps/p}$] fronte$_{p}$]⊢[$_{p}$[Mario$_{p}$] sta$_{p/ps/pn}$[$_{ps}$['n-$_{ps/pn}$] fronte$_{pn}$]]](MI)

(29) *k+1*. [$_{p/ps}$[Mario$_{pn}$] sta$_{p/ps/pn}$]•[a$_{ps \bullet ps \bullet ps}$]⊢* (MI: Derivation crashes)

(30) *k+1*. [$_{p/ps}$[Mario$_{pn}$] sta$_{p/ps/pn}$]•[$_{ps/ps}$[a$_{ps/pn}$] ddestra$_{pn}$] de$_{ps/ps/ps}$]]⊢* (MI: Derivation halts)

In (28), based on (7), *sta* merges with the ASPP *addestra della machina* to form a complete sentence. Note that *Mario* is type $\boldsymbol{p_n}$, the type of NPs, and that the second input type for *sta* is $\boldsymbol{p_s}$, even if *sta* can distribute with adjectives and other verbs (Ursini 2013a). This is a type assignment imprecision that permits us to account why *alla machina* cannot merge with *sta*, as in (29). The type of simple ASPs, here fully represented, does not match the *sta* input type. A similar reasoning applies to (30): *addestra de*, as a partial ASP, is a constituent of type $\boldsymbol{p_s/p_n}$. Rather than crashing, the derivation is halted before a sentence (type $\boldsymbol{p}$) is derived. For the same reasons, complex indexicals (e.g. *loc'addestra*) but not *wh*-pronouns (e.g. *addo'*) can undergo demotion. Thus, we correctly predict that demotion occurs when SEs match the type of verbs and blocked otherwise.

The next datum we discuss pertains to discourse-bound data, starting from question-answer pairs. In our account, a question can be seen as an incomplete sentence,

completed once a congruent answer (i.e. with a matching type) is offered (cf. Bianchi 2002b; Veermat 2005; Ursini 2016a). Consider (31), based on the question in (8), and (32), and based on the mini-text in (9):

(31)

a. *t.* [daddo'$_{ps/p}$] (LS)

t+1. [vengono$_{p/ps/pn}$] (LS)

t+2. [daddo'$_{ps/p}$]•[vengono$_{p/ps/pn}$]⊢[$_{ps/ps/pn}$[daddo'$_{ps/p}$] vengono$_{p/ps/pn}$] (MI: Cut Rule)

t+3. [le machine$_{pn}$] (LS)

t+4.[$_{ps/ps/pn}$[daddo'$_{ps/p}$]vengono$_{p/ps/pn}$]•[lemachine$_{pn}$]⊢[$_{ps/ps}$[daddo'$_{ps/p}$]vengono$_{p/ps/pn}$[le machine$_{pn}$]]

b. *k.* [$_{ps/ps}$[daddo'$_{ps/p}$] vengono$_{p/ps/pn}$[le machine$_{pn}$]]•[$_{ps}$[da'nfronte$_{ps}$] alla$_{ps/ps/ps}$ [chiesa$_{ps}$]]⊢

[$_{ps}$[$_{ps/p}$[daddo'$_{ps/p}$]vengono$_{p/ps/pn}$[le machine$_{pn}$]][$_{ps}$[da'nfronte$_{ps}$] allla$_{ps/ps/ps}$ [chiesa$_{ps}$]]] (Con.)

(32)

a. *k.* [loco$_{ps•ps}$] (LS)

k+1. [F$_{p/p/ps•ps}$] (LS)

k+2. [loco$_{ps•ps}$]•[F $_{p/p/ps•ps}$]⊢[$_{p/p}$[loco$_{ps•ps}$] F$_{p/p/ps•ps}$] (MI)

k+3. [$_{p}$ s'è fatto nu ggiro] (LS)

k+4. [$_{p/p}$[loco$_{ps•ps}$] F$_{p/p/ps•ps}$]•[$_{p}$ s'è fatto nu…]⊢[$_{p}$[loco$_{ps•ps}$] F$_{p/p/ps•ps}$[$_{p}$ s'è fatto nu…]] (MI)

b. *k.* [$_{p}$ Mario è jjito ajju centro]•[$_{p}$loco, F s'è fatto nu ggiro]⊢

[$_{p•ps}$ Mario è jjito ajju centro]•[$_{ps•p}$loco, F s'è fatto nu ggiro]⊢ (PI)

[$_{p•p}$[$_{p•ps}$ Mario è jjito ajju centro][$_{ps•p}$loco, F s'è fatto nu ggiro]] (MI: Cut rule)

In (31a), a question is derived by having *wh*-pronoun and verb to merge via cut rule, forming a head requiring two arguments (steps *t* to *t+2* in (32a)). The subject NP is merged, leaving an open "slot" for the phrase of type $\boldsymbol{p_s}$, the answer to the question at stake (steps *t+3*, *t+4*). Thus, congruence is partially reconstructed as merge when applied to form cohesive texts, viz. (31b) (Kehler 2011; Ward & Birner 2012). Furthermore, since answers to *do'*-questions must be ASPPs, phrases with ASP heads, they prove which lexical items belong to this category.

The derivation in (32) shows how a text involving indexical *loco* and an ASPP antecedent is derived. We assume that sentence-initial *loco* is merged via a silent head "(Deix)", which permits the introduction of optional elements in a sentence (Rizzi 1997;

den Dikken 2010). The first sentence, as we show in (32a), is directly assigned type ***p*** for reasons of space. Once the two sentences are merged, the types $\boldsymbol{p_s}$ of their spatial expressions (ASPP *ajju centro* and indexical *loco*) percolate via product introduction and are used to merge the two sentences via cut rule (cf. Jäger 2001, 2005; Ursini 2015c). Both sentences have NPs referring to the same ground, "the centre", and can form a cohesive text (of type $\boldsymbol{p_s \bullet p_s}$, viz. (32b)) by "sharing" their spatial features. Thus, *merge* applied at discourse level also creates cohesion, when texts are involved.

We can therefore conclude that we have solved the first problem by showing that Aquilan SEs are formed via spatial features, realized via the so-called simple ASPs (e.g. *a*, *pe'*). We have also shown that our theory can indirectly predict the emergence complex categories, one example being complex indexicals. We have solved the second problem by showing that intra- and inter-sentential patterns (e.g. coordinated phrases, verb complementation; anaphoric relations) can also find a unified treatment. This is obtained by using spatial features as structural "glue", governed by one set of derivational processes. We can thus turn to the semantics of SEs, and the third problem.

5. The Solution: A Situation Semantics for SEs

The goal of this section is to introduce *Situation Semantics* as a model-theoretic framework for our semantic account (Kratzer 1989, 2007; von Fintel 1994). We also enrich this framework with a formal account of polysemy, based on frameworks such as "Generative Lexicon" (GL: Pustejovsky 1995, 1998, 2013) and "Type Composition Logic" (Asher 2011). Our assumptions are as follows.

We assume a universal type of senses for lexical items, which corresponds to the domain of *situations*. Pre-theoretically, sentences can denote situations as descriptions of relations involving individuals, locations and other "bits" of information. The domain of situations is a *Boolean algebra*, partially ordered set *S*. The *part-of* relation holds: $s \leq s'$ holds if $s \cap s' = s$ and $s \cup s' = s'$. If a situation is part of another situation, then their intersection will be the sub-set situation, and their union will be the super-set situation. We then assume that situations include sub- and super-types, with situations *s* being the universal

type, *d* and *l* the (basic) sub-types of individuals and locations, respectively. *Qua* distinct types, their intersection forms the empty set (i.e. we have $d \cap l = \varnothing$). The resulting structure is $*S=\langle S=\{d,l,s\},\cap,\cup,\leq\rangle$ (Landman 1991: 65-69; Szabolcsi 1997, 2010: Ch. 1). The recursive definition of types in this domain is offered in (34):

(33) 1. *Given S, s∈S is a type* (Lexical type)

2. *If a is a type and b is a type, then a→b is a type* (Functional type)

3. *If a is a type and b is a type, then a×b is a type* (Compound type)

4. *If a→b is a type and b is a type, then (a→b)×a⊨a* (Function application)

5. *If (a→b) is a type and (b→c) is a type, then (a→b)×(b→c)⊨a→c* (Function composition)

6. *Nothing else is a type* (Closure property)

Given a basic type set of atomic situations (rule 1), a more complex set of types can be defined by combining situations either via functional or compound type formation (rules 2, 3). *Function application* and *composition* can then be defined as rules for type reduction (rules 4, 5), together with a closure principle (rule 6). The smallest type set that we can define via this definition, then, is the "mirror" type $TYPE'=\{s, s\rightarrow s, s\rightarrow(s\rightarrow s), s\times s\}$. Since product types for situations can be used to represent sub-types, we represent the latter type as s_σ: a situation belonging to a sub-type σ.

The definition of a mirror set of rules for the syntax and semantics of ASPs permits us to define a precise mapping between types (cf. also Moortgat, 2010: §4), offered in (34):

(34) MORPHOLOGY⇒SEMANTICS⇒INTERPRETATION

$\boldsymbol{p/p/p} \Rightarrow s\rightarrow(s\rightarrow s) \quad \Rightarrow \lambda x.\lambda y.s{:}(x\leq y)_{s\rightarrow(s\rightarrow s)}$

$\boldsymbol{p_p} \Rightarrow s_s \quad \Rightarrow s_s,\ s_s{:}(a\leq b)$

We employ a standard form of λ-calculus to represent senses (Gamut 1991). Heads denote relations, which are defined as situations in which a part-of relation between other situations holds (i.e. we have $\lambda x.\lambda y.s{:}(x\leq y)_{s\rightarrow(s\rightarrow s)}$). Phrases, instead, denote either situations belonging to a given sub-type (e.g. *l* for location, as in the case of Axparts), or

situations corresponding to saturated relations. An ASPP such as *al tavolo* 'at the table', in this analysis, denotes a location sub-type of situation in which a (spatial) relation between a table and other locations holds. We now offer our polysemy account, which consists of two assumptions, which are defined as follows.

First, we model locations as forming the algebra $*L=<L,\cap,\cup,\leq>$ (Asher & Sablayrolles 1995; Nam 1995; Eschenbach 2005): a set of locations *L* is ordered via the part-of relation "$\leq$". Since our structure includes the union (sum) operation, sum locations can be recursively defined. For instance, the sum location $\cup l=a\cup b$ is the location that includes (sums) locations *a* and *b.* If we assume that our algebra has 12 atomic locations (hence, 2^{10}=1024 sum and atomic locations), we can represent a three-dimensional, Euclidean space, an "internal/external" distinction, and polar coordinates via pairs of axes and their edges. The horizontal dimension, for instance, is defined as the dimension going from a "front" to a "back" locations. This is consistent with other analyses of the semantic space of SPs (cf. Levinson & Meira 2003; Zwarts & Winter 2000; Zwarts 2010).

Second, we model polysemous items as having several senses in virtue of denoting distinct but related entities. Thus, polysemous ASP's senses can individually denote any of the locations in their denotation. To see how this is the case, consider the Axpart P '*nfronte*, which is assigned type $\boldsymbol{p_s}$ in our system. Via the mapping in (35), its interpretation is fr_l: a location defined as the "front" of a ground. While this corresponds to the denotation of this P, its sense is the *identity function* $I(fr_l)=fr_l$ (Landman 1991: 62-64), the function identifying this location.

Third, for simple ASPs, we assume that their senses identify sum locations, instead. For instance, the sense of *a* corresponds to the *identity function* $I(\cup a_l)=\cup a_l$, the function that identifies this specific sum location. Via *distributivity*, we have the identity $I(\cup a_l)=I(fr_l)\cup I(bh_l)\cup I(in_l)\cup I(out_l)\cup\ldots$. (cf. Landman 1991: 65-69; Szabolcsi 1997, 2010: Ch. 1). In other words, the sense of *a* includes and combines the sum of the senses of '*nfronte* 'in front', *arrete* 'behind', *entro* 'inside', *fore* 'out', and so on. Depending on the syntactic context, any of these more specific senses can be selected, compositionally. Thus, a polysemous item is an item that can have distinct but related senses, here modeled as identifying functions (cf. Asher 2011: Ch.3-4). When these senses are composed with the

senses of another lexical item, a more specific interpretation can emerge. Before we anticipate matters further, we move to the analysis.

6. The Semantic Analysis

Our goal in this section is to offer a solution to the third problem, the polysemy of ASPs, but also to offer a semantic treatment of SEs and the data we have discussed so far. We begin our analysis with the type assignment that corresponds to the interpretation of our lexical items, before offering the interpretation of simple and complex ASP(P)s. Consider (35):

(35) a. s_d:={*Mario, fronte, balle,…*}; s_l:={ *la machina, a, 'nfronte, loco, abballe, loc'abballe,…*};

b. $s_s \rightarrow s_s$:={*la*}; $s_l \rightarrow s_d$:={*a-, n-, pe',da-,de-, loco,...*}; $s_l \rightarrow s_s$:={*-do'*};

c. $s_l \rightarrow (s_l \rightarrow s_l)$:={*(P), de, da, a, pe', e,…*} $s \rightarrow (s_s \rightarrow s_d)$:={*sta, é jjito,…*}

The type assignment in (36a) shows that ground NPs are interpreted as landmarks of a spatial relation, of type *l*, like Axpart Ps, ASPPs and other SEs. Figures, *qua* located entities, are assigned the type *d* of individuals. The definite article acts as a function selecting a definite entity in its domain, whereas ASPs as P-markers are interpreted as functions mapping individuals to their locations. ASPs as heads, conjunction *e* and verbs denote distinct types of relations, as (36b) shows.

With this type assignment in mind, we offer the interpretation of ASPs, and of example (23) in (36), followed by a compressed interpretation of (24) and (25)-(26) in (37)-(38):

(36) *t.* [[a]]$\vDash \cup a_l$ (Int)

t+1. [[(P)]]$\vDash \lambda x.\lambda y.s:(x \leq y)_{l \rightarrow (l \rightarrow l)}$ (Int)

t+2. [[a]]×[(P)-la]]$\vDash (\cup a_l)\lambda x.\lambda y.s:(x \leq y)_{l \rightarrow (l \rightarrow l)} = \lambda y.s:(\cup a \leq y)_{l \rightarrow l}$ (FA)

t+3. [casa]]$\vDash c_l$ (Int)

t+4. [[a (P)-la]]×[[casa]]$\vDash \lambda y.s:(\cup a \leq y)_{l \rightarrow l} \times (c_l) = s:(\cup a \leq c)_l = s_l:(in \leq c) \cup s'_l:(out \leq c) \cup \ldots$ (FA, D.)

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(37) *t.* [['n-]]$\vDash \lambda x.\cup(x)_{d\rightarrow l}$ (Int; RR)

t+1. [[fronte]]$\vDash fr_d$ (Int)

t+2. [['n-]]×[[fronte]]$\vDash \lambda x.\cup (x)_{d\rightarrow l}\times(fr_d)= \cup fr_l$ (FA)

(38) *t+6*. [[addestra della]]×[[machina]]$\vDash \lambda y.s:(\cup d\leq y)_{l\rightarrow l}\times(m_l)=s_l:(\cup d\leq m)=s:(d\leq m)\cup s':(d'\leq m)\cup\ldots$

The interpretation in (36) says that *a* introduces a sum of senses identifying distinct locations, $\cup a_l$, which becomes part of a spatial relation (i.e. we have $\lambda y.s:(\cup a\leq y)$, steps *t* to *t+2*). Once the ground argument is added, the possible relations making up the sense of *alla casa* are computed $s:(\cup a\leq c)$), via distributivity (i.e. step *t+4*). In a situation *s*, a figure can be understood as being included in the house (i.e. $in\leq c$), or being outside the house (i.e. $out\leq c$), and so on. Distributivity licenses the emergence of these distinct but related senses, as distinct senses of *alla machina*.

A similar pattern holds for '*nfronte*, in (37). The P-marker '*n*- acts as a function that maps a frontal part of an object onto its corresponding location. Thus, an Axpart P is assigned type *l*, and can become an argument of a silent P, as shown in (38) (e.g. $s:(\cup fr\leq m)$). In the case of *addestra della machina*, the polysemy of *de* as a head is inherited from *addestra*, as the relation $s_l:(\cup d\leq m)$ entails. The interpretation of *addestra* involves the existence of distinct "right" locations defined with respect to a ground, with *a* licensing this polysemous reading (i.e. $\cup d$) when it composes with *destra* as a P-marker. Thus, we reconstruct the distinct senses based on reference systems (e.g. $s_l:(d\leq m)$, $s'_l:(d'\leq m)$ for the intrinsic and relative systems, respectively) as the specific form of the second pattern of polysemy for complex ASPs (cf. Zwarts & Winter 2000; Bohnemeyer 2012).

We can now offer an interpretation of (27)-(28) in (39)-(40), thereby capturing the senses of *do'*-pronouns and indexicals, the other two SEs, via our compositional semantics. The sense of *peddo'* offers a fuller treatment of simple ASP as P-markers denoting functions, via residual rule:

(39) *t.* [[pe']]$\vDash \lambda x.(x \leq \cup tr)_{l \rightarrow l}$ (Int; RR)

t+1. [[ddo']]$\vDash \lambda x.(x)_{l \rightarrow s}$ (FA)

t+2. [[pe]]×[[ddo']]$\vDash \lambda x.(x \leq \cup tr)_{l \rightarrow l} \times \lambda x.(x)_{l \rightarrow s} = \lambda x.(x \leq \cup tr)_{l \rightarrow s}$ (Function Composition)

(40) *t+2*. [[loco]]×[[arrete]]$\vDash \lambda x.\mathbf{dist'}(x)_{l \rightarrow l} \times (bh)_l = \mathbf{dist'}(bh)_l$ (FA)

In (39), we assume that the *wh*-morpheme *do'* acts as the closest proxy of an abstraction function, with *pe'* providing a restriction on the answer sense type (i.e. *l*), and a range of senses this answer can denote (steps *t* to *t+2*: cf. Krifka 2001, 2004). The sense of *pe'* (i.e. $\lambda x.(x \leq \cup tr)$) says that an answer to a *peddo'* question must be a location being part of a set of "transversal" directions. The interpretation of the complex indexical *loc'arrete* shows that *loco* can restrict the sense of *arrete* to a location distal from the speaker, and behind a given ground. The interpretation of the residual rule, then, shows that these interpretations are connected. Indexicals can denote locations when they are phrasal arguments, and functions licensing anaphoric relations when they are affixes.

Since we can now account the second polysemy pattern of ASPs in "single" phrases, we can extend this analysis to Boolean ASPPs. Consider thus (41), the interpretation of (28):

(41) *k.* [[ajji tavoli]]$\vDash s_l:(a \leq tb) = s''_l:(nr \leq tb)$ (Int; Dist.)

k+1. [[e]]$\vDash \lambda x.\lambda y.s:(x \cap y)_{l \rightarrow (l \rightarrow l)}$ Int)

k+2. [[ajji tavoli]]×[[e]]$\vDash (s''_l:(nr \leq tb)) \times \lambda x.\lambda y.s:(x \cap y)_{l \rightarrow (l \rightarrow l)} = \lambda y.s:(s''_l:(nr \leq tb) \cap y)_{l \rightarrow l}$ (FA)

k+3. [[alle giostre]]$\vDash s_l:(a \leq g) = s'_l:(in \leq g)$ (Int; Dist.)

k+4. [[ajji tavoli e]]×[[alle giostre]]$\vDash \lambda y.c:(s''_l:(nr \leq tb) \cap y)_{l \rightarrow l} \times (s'_l:(in \leq g)) =$

$s_l:(s''_l:(nr \leq tb) \cap s'_l:(in \leq g))$ (FA; Distributivity)

This derivation shows that the interpretation of each conjunct ASPP involves the possible disambiguation of *a* and its sense, and the conjunction of two ASPPs. Thus, while the preferred interpretation of *ajji tavoli* involves children sitting near these tables, the interpretation of *alle giostre* involves an inclusion relation between children and

carousels. This analysis can be extended to the other simple ISPs, and it is connected to the polysemy of complex ASPs, as (38) shows. Our formalization of the coordination test clearly shows how these senses are selected and coordinated.

By this point, we have a thorough account of the second polysemy pattern in ASPs. Thanks to the result in (38), we can also offer an account of the distinct senses that '*nammonte*, '*nabballe* and similar Axpart Ps can have, with respect to distinct coordinate systems. For this purpose, we represent the polysemy of '*nammonte*, from (18), as involving the sum of an "intrinsic" and an "absolute" sense via the locations they identify. We have $nnm_I=\cup\{nt,tp\}$ (short for $I(nnm_I=I(\cup\{nt,tp\}_I))$); the denotation of '*nammonte* is the sum of a "north" location *nt* and a "top" location *tp*. The interpretations of the ASPP '*nammonte ajju colle/conca* are presented in (42)-(43):

(42) *k+4*. [['nammonte ajju colle]]$\vDash \lambda y.s{:}(nnm\leq y)\times(h_I)=s_I{:}((\cup(nt,tp)\leq h)=s_I{:}(tp\leq h)$ (FA; Dist.)

(43) *k+4.* [['nammonte alla conca]]$\vDash \lambda y.s{:}(nnm\leq y)\times(b_I)=s_I{:}((\cup(nttp)\leq b)=s_I{:}(nt\leq h)$ (FA; Dist.)

These interpretations emerge as a consequence of hills lacking "North" parts, and basins lacking "top" parts. Since via distributivity only some senses are computed as possible senses of a spatial relation underpinning an ASPP, the intended interpretation emerges compositionally.

We conclude our discussion with our discourse-bound examples. We offer the interpretation of (31) in (44), and of the mini-text involving *loco* and *ajju centro* (i.e. (32)) in (45):

(44) a. *t.* [[daddo']]$\vDash \lambda y.(y\leq\cup fm)_{I\rightarrow d}$ (Int)

t+1. [[vengono]]$\vDash \lambda x.\lambda y.s{:}\mathbf{come'}(x,y)_{d\rightarrow(I\rightarrow s)}$ (Int)

t+2. [[daddo']]×[[vengono]]$\vDash \lambda y.(y\leq\cup fm)_{I\rightarrow d}\times\lambda x.\lambda y.s{:}\mathbf{come'}(x,y)_{d\rightarrow(I\rightarrow s)}=$

$\lambda x.\lambda y.s{:}\mathbf{come'}(x,(y\leq\cup fm))_{d\rightarrow(I\rightarrow s)}$ (FC)

t+3. [[le machine]]$\vDash m_d$ (Int)

t+4. [[daddo' vengono]]×[[le machine]]$\vDash \lambda x.\lambda y.s{:}\mathbf{come'}(x,(y\leq\cup fm))_{d\rightarrow(I\rightarrow s)}\times(m_d)=$

$\lambda y.s{:}\mathbf{come'}(m,(y\leq \cup fm)_{I\rightarrow s}$ (FA)

b. *k.* [[daddo' vengono le machine]]×[[da 'nfronte alla chiesa]]⊨

$\lambda y.s{:}\mathbf{come'}(m,(y\leq\cup fm))_{l\rightarrow s)}\times(s'_{l}{:}(fr\leq(\cup fm\leq ch)))=s_{s}{:}\mathbf{come'}(mc,s'_{l}{:}(fr\leq(\cup fm\leq ch)))$ (FA: Congr.)

(45) a. *k.* [[loco]]⊨$s'_{l\times l}{:}\mathbf{dist'}(d)$ (Int)

k+1. [[F]]⊨$\lambda x.\lambda y.s{:}R(x,y)_{s\times d\rightarrow(s\rightarrow s)}$ (Int)

k+2. [[loco]]×[[F]]⊨$s'_{l\times l}{:}\mathbf{dist'}(d)\times\lambda x.\lambda y.s{:}R(x,y)_{l\times l\rightarrow(s\rightarrow s)}=\lambda y.s{:}R(s'_{l\times l}{:}\mathbf{dist'}(c),y)_{s\rightarrow s}$ (FA)

k+3. [[s'è fatto nu ggiro]]⊨$s''_{s}{:}\mathbf{make'}(m,g)$ (Int)

k+4. [[loco F]]×[[s'è fatto nu…]]⊨$\lambda y.s{:}R(s'_{l\times l}{:}\mathbf{dist'}(d),y)_{s\rightarrow s}\times(s''_{s}{:}\mathbf{make'}(m,g))=$

$s_{s}{:}R(s'_{l\times l}{:}\mathbf{dist'}(c),s''{:}\mathbf{make'}(m,g))$ (FA)

b. *k.* [[Mario è jjito ajju centro]]×[[loco, F s'è fatto nu ggiro]]⊨

$s_{s}{:}\mathbf{go'}(m,s_{l}{:}(a\leq c))\times s_{s}{:}R(s'_{l\times l}{:}\mathbf{dist'}(d),s''{:}\mathbf{make'}(m,g))=$ (FC, coherence)

$s_{s}{:}\mathbf{go'}(m,s_{l}{:}(a\leq c))\times s_{s}{:}R(s'_{l\times l}{:}\mathbf{dist'}(d)=s_{l}{:}(a\leq c),s''{:}\mathbf{make'}(m,g))$ (FC, anaphoric relation)

The derivation in (44a) is based on the "structured meanings" approach to questions (e.g. Krifka 2001, 2004; Veermat 2005). A question is interpreted as an incomplete sentence, since it requires an answer of a matching type to denote a complete situation. Note that in (44a), the *do'*-pronoun *daddo'* denotes a set of possible locations "from" which the figure has moved (i.e. we have $\lambda y.y\leq\cup tm$: steps *t* to *t+2*), thus restricting the sense of the question (steps *t+3*, *t+4*). The answer in (44b) confirms that a frontal location has been the location from which the cars have moved, thereby licensing a congruent question-answer pair. The derivation in (44) is based on Discourse Representation Theory and its treatment of anaphoric relations, although in a simplified format (Kamp, van Genabith & Reyle 2011). Since ASPPs and indexical share the same semantic type, function composition and coherence license the formation of an anaphoric relation (step *k+4*). *Loco* refers to the location that *ajju centro* denotes, as the anaphoric relation $s'_{l\times l}{:}\mathbf{dist'}(d)=s_{l}{:}(a\leq c)$ shows (i.e. a distant location is identical with the "centre" location). The discourse relations that SEs can form are a natural extension of their underlying semantics, which also encompasses their two polysemy patterns. In other words, by giving a principled semantics of ASPs as identity functions over locations, and by building

a semantics of SEs on this assumption, we have solved the third problem and the related discourse patterns. We can thus move to the conclusion.

7. Conclusion

This paper offered an account of three problems pertaining to Spatial Expressions (SEs) in Aquilan: prepositions (ASPs), *wh*-pronouns (e.g. *addo'*, *peddo'*), and spatial indexicals (e.g. *ecco*, *loco*). We have shown that, if we consider the morphological category of simple ASPs as the realization of spatial features across these SEs, it possible to give a unified account of their syntactic distribution (e.g. questions), discourse relations (e.g. anaphors) and semantic patterns (e.g. polysemy). We have done so by offering a Type-Logical account enriched with a treatment of polysemy within a Situation Semantics analysis. We thus have shed light on an understudied category in the Aquilan dialect, and in Romance dialects in general. Nevertheless, this paper certainly does not exhaust the topic of SEs. We believe that this account could be extended to Romance dialects, given their genealogical relations (cf. Luraghi 2011). However, we defer such an extension to future research.

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