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OUT OF our minds and ONTO the paper: On the morphological complexity of configurational spatial relations

Abstract: This study investigates the morphological complexity of spatial relations across a sample of 30 areally and genealogically diverse languages from a functional-typological perspective in both qualitative and quantitative terms. The focus lies on configurational constructions encoding different Directionalities (Place, Goal, Source) and Configurations (inside, on, behind, in front of, under). A comparison is drawn to constructions encoding general location wherever possible. Our findings indicate a hierarchy of complexity from Place via Goal to Source, supporting prior research.

Keywords: spatial relations, configuration, general location, directionality, morphological complexity

1 Introduction

In this study, we address a topic that has been one of the focal points in recent years in the linguistic research of Thomas Stolz and his research team in Bremen, viz. spatial relations (cf., e.g. Stolz et al. 2014, 2017a, 2017b; Stolz 2018; Stolz and Nintemann 2024; Robbers and Hober 2018; Nintemann and Robbers 2019; Nintemann et al. 2020; Nintemann and Hober 2023)[1]. The focus of our present study lies on constructions in which Directionality, i.e. location at, movement to, or movement from, and Configuration, i.e. the relative position of an entity to a reference-object, are combined (see Section 2). This is exemplified with the superior Configuration ON in Kolyma Yukaghir in (1).

1 However, Stolz's interest in this topic began even before his time in Bremen, as his 1992 monograph on local case systems (*Lokalkasussysteme*) shows.

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(1) Kolyma Yukaghir [Yukaghir] (Maslova 2003: 270)[2]

a. AT + ON

. . . irk-in	*pajpā-die*	*pie*	***budie***	*modo-t*
. . . one-ATTR	woman-DIM	mountain	**SUPER**	sit-SS:IPFV

pon'-ō-l'el
leave-RES-INFR(3SG)
'. . . one woman remained sitting **on top of** the mountain.'

b. TO + ON

pulun-die-gele	*tude*	***budie-n***	*im-delle*	*tāt*	*køu-de-j-m*
old.man-DIM-ACC	he	**SUPER-DIR**[3]	put-SS:PFV	CA	go-CAUS-PFV-TR:3SG

'She put the old man **on** her back and brought him away that way.'

c. FROM + ON

tāt	*unu-d+ørd'e-gen*	*qon-de-ge*	*pie*	***budie-t***
CA	river-ATTR+middle-PROL	go-3SG-DS	mountain	**SUPER-ABL**
jaqte-lek	*medū-nu-l*			
sing-PRED	be.heard-IPFV-SF			

'When he was going along the middle of the river, he could hear a song coming **from the top of** the mountain.'

Configuration in Kolyma Yukaghir is expressed with a postposition, in this case *budie* 'on (the top/surface of)'. Directionality on the other hand is usually expressed with case suffixes. As shown in (1a), however, Place is not overtly coded in combination with a configurational postposition. Goal in (1b) and Source in (1c), however, are expressed with directional and ablative case suffixes, respectively. The example of Kolyma Yukaghir spatial constructions shows that different types of morphemes (i. e. free vs. bound) may be involved in expressing Directionality and Configuration. Furthermore, the examples demonstrate that there is asymmetry between the constructions in that Place is not overtly coded, while Goal and Source are both overtly expressed.

This study aims at investigating how Directionality and Configuration are expressed in a sample of 30 areally and genealogically diverse languages, while also taking account of asymmetries in the morphological complexity of the constructions. In Section 2, we provide our theoretical framework, explain the relevant

2 The original glossing was retained as close as possible for the provided examples. To avoid doublets, we unified grammatical labels according to the Leipzig Glossing Rules (cf. Comrie et al. 2015). If the original source does not provide glosses and/or an (English) translation, this will be indicated in a footnote. Relevant spatial expressions are marked in bold.

3 In the original example in Maslova (2003: 270), *-n* is falsely glossed as ABL. We corrected this according to an analogous example (Maslova 2003: 320).

concepts and terminology, and outline our hypotheses. Section 3 serves to outline our methodology, while Section 4 presents a qualitative analysis of different types of spatial constructions. A quantitative analysis is offered in Section 5. Section 6 concludes this paper.

2 Theoretical background, terminology, and hypotheses

According to Talmy (1985: 60–61), "[t]he basic motion event consists of one object (the 'Figure') moving or located with respect to another object (the reference-object or 'Ground')". The Ground can assume different roles in a spatial situation. The three basic spatial relations (SR) which encode Directionality considered in this study are

– Place, i.e. the location of the Figure (= AT),
– Goal, i.e. the endpoint of the movement of the Figure (= TO), and
– Source, i.e. the starting point of the movement of the Figure (= FROM).

Creissels (2006: 19) assumes that "[a]ll languages must encode in some way or another the distinction between localisation, the source of motion, and the destination of motion, but they differ in the way spatial adpositions or case affixes participate in the encoding of this distinction." Similarly, we expect that all languages have the means to express different types of spatial Configuration, i.e. the relative position of the Figure to the Ground, e.g. INSIDE, ON, UNDER, etc.

Based on these assumptions, we examine how languages express Directionality and Configuration in combination from a functional-typological perspective and use canonical typology as outlined in Corbett (2005) as a yardstick to compare the occurring forms:

> In a canonical approach, we take definitions to their logical end point and build theoretical spaces of possibilities. Only then do we ask how this space is populated. [. . .] It follows that canonical instances (the best examples, those most closely matching the canon) may well not be the most frequent. They may indeed be extremely rare, or even non-existent. However, they fix a point from which occurring phenomena can be calibrated, and it is then significant and interesting to investigate frequency distributions. (Corbett 2005: 26)

The starting point for a comparison within the canonical framework is an idealised paradigm, which contains all logical combinations of the relevant features. This is beneficial to this study, as it enables a data-driven approach to document all possi-

ble forms used in different languages. Table 1 presents the canonical constructions for the expression of Directionality and Configuration including all relevant components.

Table 1: Canonical constructions for the expression of spatial relations (Stolz [to appear], following Lestrade 2010: 73).

SR	Figure	Verb	Directionality	Configuration	Ground
Place	Figure	±dynamic	X	Configuration	Ground
Goal	Figure	+dynamic	Y	Configuration	Ground
Source	Figure	+dynamic	Z	Configuration	Ground

Table 1 presents the structure of the sentences that are the object of this study as well as the terminology used. In this study, we focus on the cells highlighted with grey shading. We neglect the shape of the Figure entirely and mention the verb briefly when necessary, but exclude this category from the analysis. In the following, we apply the canonical framework only to the cells denoting Directionality and Configuration in combination with a very limited scope of possible Grounds (namely common nouns, see Section 3.1). The centre of attention therefore lies on the nominal domain and we also include examples of phrases without a verb. Additionally, it is important to keep in mind that the order in which the individual elements occur in Table 1 is an arbitrary example and varies from one language to another. Word order does thus not have an effect on the canonicity of a construction. Table 2 illustrates a canonical example in English.

Table 2: Source and BEHIND in English.

SR	Figure	Verb	Directionality	Configuration	Ground
Source	*She*	*came*	*from*	*behind*	*the house*

Both the Directionality and the Configuration cell are filled with one and only one form, i.e. every relevant element is expressed overtly. This is not always the case in English, as visible in Table 3:

Table 3: Place/Goal and BEHIND in English.

SR	Figure	Verb	Directionality	Configuration	Ground
Place	*She*	*was*		*behind*	*the house*
Goal	*She*	*went*		*behind*	*the house*

The examples for Place and Goal in combination with *behind* are less canonical in that the cell for Directionality is empty. In analogy to Source, one could expect prepositions such as *at* and *to*. However, stating them overtly (**she was at behind the house*, **she went to behind the house*) is not considered standard language. In these cases, Directionality seems to be implied without requiring a preposition.

The canon makes no statement about what kind of morpheme is canonical, i.e. different types of markers for Directionality and Configuration are possible, such as case markers, adpositions, or relational nouns. Hagège (2010: 291) notes that

> in languages with both case affixes and [adpositions], spatial *directions*, such as "into", "out of", "across", etc. will often be expressed by bound morphemes, while spatial *dimensions*, such as "inside", "above", "in front of", "beside", will tend to be expressed by independent morphemes like [adpositions]. [original italics]

For our qualitative analysis in Section 4, we consider what kind of morphemes are employed to express Directionality and Configuration, however, for the quantitative part (Section 5), their form does not play a role. Morphemes are counted no matter whether they are bound or free.

In many languages, it is possible to mark the Ground in a spatial construction without specifying the exact position in which the Figure is located relative to the Ground. In these cases, *general location* (GL) is expressed, see (2a). In contrast, a more exact localisation of the Figure in relation to the Ground can be expressed by including a Configuration, see (2b).

(2) Japanese [Japonic]

a. GL / Place (Hasegawa 2015: 95)
*Midori ga uchi **ni** iru.*
Midori NOM home **at** exist
'Midori is **at** home.'

b. ON / Place[4] (Tanimori 1994: 289)
*Jisho wa tsukue **no** **ue** **ni** aru.*
dictionary TOP desk **GEN** **on** **at** exist
'The dictionary is **on** the desk.'

The Japanese example in (2a) shows that GL is expressed with the particle *ni*, which, depending on the context, can mean 'at, in, on, to, towards' as well as 'for, from, per, in order to' in non-spatial constructions (Tanimori 1994: 137). As Ursini (2020: 496)

4 The glosses are our own.

puts it for a similar example[5]: "This relation does not individuate a single location that the figure occupies [. . .]. Rather, it implies that the figure may be in any of a heterogeneous set of possible locations." In contrast, the position of the Figure in relation to the Ground is specified in (2b) as ON. Although we do not expect all languages to have the possibility to express GL, we include it in our analysis for those languages for which GL is attested in our respective sources as a basis for comparison. Concerning the canonical constructions for GL, we assume similar spatial constructions as depicted in Table 1 above, however, without a morpheme that expresses a Configuration, i.e. a combination of Figure, Verb, Directionality, and Ground.

According to the canon, the number of morphemes should be the same for Place, Goal, and Source, both for GL and configurational constructions, respectively. However, past studies have already shown that there are asymmetries in the coding of spatial relations, especially between the two dynamic relations Goal and Source. Kopecka and Vuillermet (2021: 9–10), for example, explain that

> [i]t has been observed that linguistic markers, such as adpositions and/or case markers, used by languages for expressing the Goal are morphologically less complex than those used for expressing the Source, and, furthermore, that the expression of the Goal tends to be less constrained and, in general, more 'straightforward' than the expression of the Source (cf. Ikegami 1987, Bourdin 1997).

Other studies have shown that there is a general tendency of increasing complexity from Place via Goal to Source (cf. Stolz et al. 2017b; Nintemann et al. 2020).

Different languages have different means to overtly or covertly code these spatial relations. One of the most prominent topics in the linguistic research of spatial relations is that of syncretism, i.e. "the formal identity of the expressions employed for two or more categories" (Stolz et al. 2017b: 11). If we consider all possible combinations of syncretism in the expression of Place, Goal, and Source, the patterns in Table 4 arise, where X, Y, and Z represent formally distinct constructions.

Table 4: Logically possible patterns of formal distinctions (adopted from Stolz et al. 2017b: 11).

Option	Place	Goal	Source	Pattern	Word-Forms
I	X	Y	Z	Place ≠ Goal ≠ Source	3
II	X	X	Z	(Place = Goal) ≠ Source	2

5 The example given by Ursini (2020: 466) is *Mario is waiting at the pub* in contrast to the "more narrowly defined" location expressed in *Mario is waiting in front of the pub*.

Table 4 (continued)

Option	Place	Goal	Source	Pattern	Word-Forms
III	X	Y	Y	Place ≠ (Goal = Source)	2
IV	X	Y	X	Goal ≠ (Source = Place)	2
V	X	X	X	(Place = Goal = Source)	1

The patterns presented in Table 4 occur to various degrees in the languages of the world. Although different studies come to different conclusions as to the exact distribution of these patterns, the general picture is that Options I, II, and V are the most prevalent patterns, while Options III and IV occur less frequently (see, e.g. Creissels 2006; Pantcheva 2010; Lestrade 2010; Stolz et al. 2017b; Nintemann et al. 2020). Only with Option I is it possible to match the canon as depicted in Table 1 – if we exclude the verbal domain and focus solely on the nominal domain – as syncretism is one of the mismatches as postulated by Corbett (2005). Optional elements or different syntactic rules may result in one language attesting to more than one syncretism pattern. Theoretically, it is possible that languages attest to different options for different types of spatial constructions, e.g. there may be one pattern for UNDER in Place, Goal, and Source Constructions, but a different one for BEHIND. We assume, however, that languages tend to stick to the same option(s) independent of the type of Configuration (or GL) expressed.[6]

Based on the results of previous studies as discussed above, we formulate the hypotheses for our study as follows:

(3) Hypothesis 1
On average, morphological complexity increases from Place via Goal to Source both for GL and configurational constructions.

(4) Hypothesis 2
On average, configurational constructions are morphologically more complex than GL.

6 However, other factors, e.g. the Ground's word class, may have a larger impact on the syncretism pattern. English, for example, attests to Option I (P≠G≠S) when the Ground is a common noun, but to Option II (P=G≠S) with spatial adverbs, see (i).

(i) English [Indo-European, Germanic]
a. Place: *He is **at** the market.* / *He is **Ø** there.*
b. Goal: *He goes **to** the market.* / *He goes **Ø** there.*
c. Source: *He comes **from** the market.* / *He comes **from** there.*

(5) Hypothesis 3
Languages employ the same syncretism patterns throughout the paradigms of GL and configurational constructions.

In the following sections, we analyse the constructions under scrutiny in both qualitative and quantitative terms. The qualitative discussion of selected examples in Section 4 offers a look at actual manifestations of both GL and configurational constructions. It will be shown that languages have different means for the expression of spatial relations and that there is great variation between the languages considered in our study. With the quantitative analysis of our data in Section 5, we test our hypotheses as formulated in (3)–(5).

3 Methodology and data

3.1 Methods

The constructions under scrutiny express a combination of Directionality and Configuration. These configurational constructions can be read as 'onto a Ground', 'from inside a Ground', 'behind a Ground', etc. Given the limited extent of this paper, we restrict our focus to a subset of these. We investigate three spatial directions: location AT (= Place), movement TO (= Goal), and movement FROM (= Source) a given Ground. As for the Configuration, we centre our attention on five basic relations, viz. interior (INSIDE), superior (ON), posterior (BEHIND), anterior (IN FRONT OF), and inferior (UNDER). Some languages distinguish between [+contact] (ON) and [-contact] (ABOVE) in the superior configuration. In these cases, we consider only the option denoting [+contact]. We decided to restrict ourselves to spatial relations involving an inanimate common noun acting as the Ground mainly for two reasons. First of all, toponyms often follow their own rules in spatial constructions in that they are often zero-marked or need shorter markers in Ground position (cf., e.g. Stolz et al. 2014; Stolz and Nintemann 2024).[7] Anthroponyms and animate common nouns on the other hand often need special, usually longer marking (see Haspelmath 2019:

7 Additionally, it is not uncommon that a language has a set of nouns that is closer to toponyms in their grammatical properties than to other common nouns. Haspelmath (2019: 322) establishes the term topo-noun based on the observation that "languages sometimes give special treatment to a diverse set of nouns that denote concepts which are commonly used as spatial landmarks, such as '(one's) house', 'village', 'school', 'church', 'beach'". However, for this study, we included all kinds of inanimate common nouns and thus did not exclude topo-nouns as Grounds from our analysis. A special case is the notion of 'home, (one's) house', which is often expressed by non-nominal means

322; Nintemann 2024). Pronouns are also non-prototypical candidates for a Ground as they often behave like anthroponyms and animate common nouns in that they need special marking, and often appear in the form of indexed adpositions (see Nintemann 2024). The second reason is that we assume that Configurations like ON, INSIDE, or IN FRONT OF are most commonly used with inanimate common nouns, while they occur less frequently with toponyms, anthroponyms, animate common nouns, or pronouns due to their referents' semantic properties.

We proceeded exploratively in that we started out solely from the function of the investigated spatial relations and gathered the means of their expression in the examined languages. Our focus rests, however, on the marking at the nominal level. If a language marks Directionality only on the verbal level, it is considered zero-marked. The same goes for Configuration, which can be expressed by motion verbs. This can be seen in Yuwaalaraay in example (6).

(6) Yuwaalaraay [Pama-Nyungan] (Giacon 2014: 58)
INSIDE / Goal
*giirr ganunga / dhaymaa-**yi** **wuu-waa**-nha, ngandabaa*
true 3PL / ground-**ABL** **go_in-MOV**-PRS snake
'They are all **going into** the ground, the snakes.'[8]

These verb-framed languages contrast with satellite-framed languages, where Configuration is expressed by an overt element that includes the nominal Ground (Talmy 1991: 486) like an adposition in Welsh, see example (7).

(7) Welsh [Indo-European] (King 2003: 166)[9]
GL / Place
*Mae dyn **yn** y stafell aros*
be.3SG.PRS man **in** DEF room wait.VN
'There is a man **in** the waiting room.'

Our investigation is based on grammars or grammatical descriptions of spatial relations, complemented by input from language experts and our own language competence. Since obtaining diachronic information for lesser-documented languages is difficult, we keep a solely synchronic perspective on all languages. This still poses a problem as not every grammatical description provides information

(Nintemann (in preparation)). For this study, we only include examples in which 'home, (one's) house' is expressed by nominal means.

8 Some verbs counterintuitively use the ablative for a Goal expression (Giacon 2014: 60–61).

9 All of the glosses for Welsh are our own.

on the analysability of a given segment. This raises questions such as whether the English preposition *into* consists of one or two morphemes. The same goes for the case system in Hungarian (see Section 4.1), which has fossilised case suffixes that are no longer productive on their own. Synchronically, forms containing these fossilised case suffixes are thus no longer analysable as consisting of two morphemes. In case a source does not provide evidence for the synchronic separability of a form, we count it as monomorphemic.

3.2 Data

For our investigation, we compiled a sample of 30 languages (see Appendix 1: Map 1). As a basis for the sampling, we made use of the Genus-Macroarea (GM) method as introduced by Miestamo et al. (2016). The aim was to cover as much of the diversity of the world's languages as possible. The method takes into account two varietal factors: genetic and areal diversity. The areal distribution is categorised into macroareas based on Dryer (1992): Africa, Eurasia, Southeast Asia and Oceania, Australia and New Guinea, North America, and South America. Several factors such as state of documentation, distribution and number of genera per macroarea are taken into account to calculate a selection among the 521 genera mentioned in Dryer (1992) that accounts for the best diversity per macroarea. Miestamo et al. (2016) generate several compilations of language lists that if one would use the top-down method and predetermine the sample size, they would find which combination of genera would be best to choose from.

As our undertaking is a crosslinguistic comparison, there is no necessity to determine which language represents each genus best. In a large-scale sampling such an effect becomes less important. However, the decision which language was chosen per genus cannot be considered without bias. Languages differ greatly in how well they are documented, so our choice always fell on those that have available sources for our research topic.[10] Following Miestamo et al.'s (2016: 250) approach, we selected the languages for each genus as randomly as possible. However, only languages for which our sources provide sufficient data for our research questions could be included. While spatial relations are covered in most grammatical descriptions, a thorough analysis of configurational spatial relations is hard to come by.

10 At this point, we deem it necessary to acknowledge that the majority of our data is based on doculects, i.e. "a linguistic variety as it is documented in a given resource" (Cysouw and Good 2013: 342).

Of the 100 languages we investigated, we were only able to gather data for 30 languages, shown in its macroarea distribution in Table 5.

Table 5: Number of languages per Macroarea.

Macroareal	Africa	Eurasia	Southeast Asia and Oceania	Australia and New Guinea	North America	South America	Total
No. of languages	5	7	2	7	5	4	30

Additionally, some genera in a macroarea are (over)represented even though they were not included according to Miestamo et al.'s (2016) calculations, namely one language from each of the Japonic, Yukaghir, Eskimo-Aleut genus, one isolate and two Afro-Asiatic languages instead of one. We also added one sign language to further diversify our sample. Our genealogical classification is based on Glottolog 5.1 (Hammarström et al. 2024).[11]

4 The qualitative side of spatial Directionality and Configuration

In this section, we offer a qualitative analysis of our data on the basis of selected examples. We show how case, adpositions, relational nouns, or a combination of these strategies are used to express Directionality and Configuration (4.1–4.6). It is also shown that static and dynamic verbs play a major role in some languages, particularly when it comes to encoding Directionality (4.6–4.8). Furthermore, it will become clear that the presence or absence of overt markers can be influenced by language-specific factors, such as syntactic rules (4.8). Last but not least, we offer an analysis of how sign languages fit into the picture (4.9).

In the following subsections, we discuss the different types of constructions occurring in different languages. For each language, we offer the paradigm in the form of a table.[12] A few points have to be explained to ensure a proper understanding of these tables. X acts as a place-holder for the Ground noun. The position of X corresponds to the position of the Ground noun in a construction. If there is more

11 An exception was made for German Sign Language as sign languages often lack enough research to be classified sufficiently into language families.

12 The paradigms of the languages not discussed in this section are offered in Appendix 2: Tables 17–37.

than one possible construction, each construction is represented in a separate line. Optional elements are presented in brackets. Some languages do not employ GL, which is marked with ∄ (= non-existent). We use NA for columns where at least one Directionality could not be extracted from our sources. The last row presents the syncretism patterns (Options I–V as depicted in Table 4 above) attested for GL and each configurational construction in the respective language.

4.1 Case: Hungarian

In the Uralic language Hungarian, Place, Goal, and Source can be expressed with case affixes as in (8) for the Configurations INSIDE and ON, respectively, while for BEHIND, IN FRONT OF, and UNDER, postpositions are used as in (9). The postpositions expressing BEHIND, IN FRONT OF, and UNDER have a fossilised case suffix that is no longer productive in the nominal system of the language. A final long vowel indicated the lative, *-Vtt* was the ending for the locative, and *-Vl* was used for the ablative in Old Hungarian (cf. Stolz 1990: 345). Thus, as our study is purely synchronic, we do not count e.g. *alatt* 'under' as consisting of two morphemes (i.e. *al-att* [under-LOC]) but as only one.

(8) Hungarian [Uralic] (Kenesei et al. 1998: 76)
   a. INSIDE / Place
      *Anna a ház-**ban** lakik.*
      Anna the house-**INE** lives
      'Anna lives **in** the house.'
   b. INSIDE / Goal
      *Anna a ház-**ba** lépett.*
      Anna the house-**ILL** entered
      'Anna entered **into** the house.'
   c. INSIDE / Source
      *Anna a ház-**ból** érkezett.*
      Anna the house-**ELA** arrived
      'Anna came **from** the house.

(9) Hungarian [Uralic]
   a. UNDER / Place (Dékány and Hegedűs 2021: 49)
      *a híd **alatt***
      the bridge **under**
      '**under** the bridge'

b. UNDER / Goal (Hegedűs and Dékány 2021: 238)
egyenesen az ágy ***alá***
straightly the bed **under_to**
'straight **under** the bed'

c. UNDER / Source (Hegedűs and Dékány 2021: 212)
a felszín ***alól*** *érkező hangok*
the surface **under_from** coming sound.PL
'the sounds coming **from under** the surface'

The ∄ in the GL column in Table 6 indicates that this column has to remain empty for Hungarian as "the basic meanings of the three sets of local cases are interior, exterior, and surface, so there is no way of describing general location in Hungarian" (Kenesei et al. 1998: 237). The columns for INSIDE and ON are filled with several allomorphic forms due to vowel harmony.

Table 6: Paradigm of Hungarian [Uralic] (Kenesei et al. 1998; Dékány and Hegedűs 2021).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	∄	X-*ban* X-*ben*	X-*n* X-*on* X-*en* X-*ön*	X *mögött*	X *előtt*	X *alatt*
Goal	∄	X-*ba* X-*be*	X-*ról* X-*ről*	X *mögé*	X *elé*	X *alá*
Source	∄	X-*bol* X-*ből*	X-*ra* X-*re*	X *mögül*	X *elől*	X *alól*
Option		I	I	I	I	I

As each cell in Table 6 is filled by a different configurational form, Hungarian follows Option I for all Configurations. However, it deviates from the canon in that the forms are synchronically unanalysable and thus encode both Directionality and Configuration (i.e. fused exponence).

4.2 Adpositions: Welsh

Welsh, like many Indo-European languages, marks spatial relations using adpositions. Place, Goal, and Source are expressed by three different prepositions, viz. *yn* 'at', *i* 'to', and *o* 'from', see example (10).

(10) Welsh [Indo-European, Celtic] (King 2003: 32, 288, 291)

a. GL / Place
yn *yr* *ysgol*
in DEF school
'**at** school'

b. GL / Goal
Dych *chi* *'n* *mynd* ***i*** *'r* *dre* *heddiw?*
be.2PL 2PL PRED go.VN **to** DEF [L]town today
'Are you going **to** town today'

c. GL / Source
Diolch ***o*** *galon* *i* *ti*
thanks **from** [L]heart to 2SG
'Thank you **from** [the bottom of] my heart'

For configurational constructions, Welsh employs a mix of prepositions and spatial nouns, which are also used as adjectives. These constructions are presented in Table 7.

Table 7: Paradigm of Welsh [Indo-European, Celtic] (King 2003; Iwan Rees, p.c.).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	*yn* X	*tu fewn i* X	*ar* X	*tu ôl i* X	*o flaen* X	*(o) dan* X
Goal	*i* X	*i mewn i* X *i fewn i* X	*ar* X	*tu ôl i* X	*i flaen* X *i ffryn*t X	*(o) dan* X
Source	*o* X	*allan o* X	*oddiar* X	*o'r tu ôl i* X	*o flaen* X *o ffrynt* X	*oddidan* X
Option	I	I	II	II	I / IV	II

Although in Welsh it is possible to differentiate Place and Goal, this is not done for all configurational constructions, e.g. ON, see example (11). This syncretism causes them to be less canonical than GL, where all three cells are occupied by a different form.

(11) Welsh [Indo-European, Celtic] (King 2003: 279, 292)

a. ON / Place
Mae *'r* *llyfr* ***ar*** *y* *bwrdd*
be.3SG.PRS DEF book **on** DEF table
'The book is **on** the table'

b. ON / Goal
Rho *'r* *llyfr* ***ar*** *y* *bwrdd*
put.2SG.IMP DEF book **on(to)** DEF table
'Put the book **on(to)** the table'

c. ON / Source
Cymer *dy* *bethau* ***oddiar*** *y* *bwrdd,*
take.2SG.IMP 2SG.POSS [L]thing.PL **from.on** DEF table
nei *di?*
[L]do.2SG.FUT 2SG
'Take your things **off** the table, will you?'

The Source relation usually differs from both Place[13] and Goal in that it employs some form of the preposition *o* 'from', see example (11c). The spatial nouns used for the Configurations in question are *tu* 'side', *ôl* 'back', and *blaen* 'front'. *Tu* 'side' may be combined with the preposition *mewn* 'in' or *ôl* 'back' to mean 'inside' or 'backside', respectively.

Overall, Welsh exhibits a mixed pattern in terms of syncretism, as the forms for Place and Goal are identical in some cases and different in others.

4.3 Adpositions + case: Udihe

In the Tungusic language Udihe, Place, Goal, and Source are pervasively coded by locative (*-lA ~ -dulA/-dilA*)[14], lative (*-tigi*), and ablative (*-digi*) suffixes, respectively. Udihe thus attests to Option I. These case markers can be attached directly to the Ground noun to express GL or a postposition that encodes Configuration. In the latter case, "[t]he changeable postpositions must be inflected with possessive affixes that refer to the argument of the postposition" (Nikolaeva and Tolskaya 2001: 403), i.e. the Ground noun. In line with Nikolaeva and Tolskaya (2001: 402), the forms presented in Table 8 are given in the 3rd person singular form and thus carry the possessive suffix *-ni.*

13 One exception is the Configuration IN FRONT OF, where one option for Source (*o flaen* X) coincides with Place.

14 The capital letter <A> is used to indicate that it is subject to vowel harmony. Which of the two forms is used depends on the noun class, i.e. *-lA* is used for class I nouns, while *-dulA/-dilA* ist used for class II nouns (cf. Nikolaeva and Tolskaya 2001: 124).

Table 8: Paradigm of Udihe [Tungusic] (Nikolaeva and Tolskaya 2001).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*lA* X-*dulA/dilA*	X *do-lo-ni*	X *xo:-lo-ni* X *xo:n-dule-ni* X *xo:n-dile-ni* X *ge:-le-ni*	X *ca:-la-ni* X *aka-la-ni* X *tau-ze-le-ni*	X *ñondu-le-ni*	X *xegie-le-ni*
Goal	X-*tigi*	X *do-tigi-ni*	X *xo:n-tigi-ni* X *ge:-tigi-ni*	X *ca:-tigi-ni* X *aka-tigi-ni* X *tau-ze-tigi-ni*	X *ñondu-tigi-ni*	X *xegie-tigi-ni*
Source	X-*digi*	X *do-digi-ni*	X *xo:n-digi-ni* X *ge:-digi-ni*	X *ca:-digi-ni* X *aka-digi-ni* X *tau-ze-digi-ni*	X *ñondu-digi-ni*	X *xegie-digi-ni*
Option	I	I	I	I	I	I

GL in Udihe is completely in line with the canon in that there is exactly one morpheme, in this case a suffix, that expresses Place, Goal, or Source, respectively, and no other morpheme is involved.[15] The use of these suffixes is exemplified in (12).

(12) Udihe [Tungusic] (Nikolaeva and Tolskaya 2001: 336, 121, 715)
a. GL / Place
Min-zuŋe *omo* *škola-**la*** *ñansule-fi.*
me-both one school-**LOC** study-1PL.INCL
'We study with you **in** the same school.'

15 There are some instances of a possessive suffix attached to the locative, lative, or ablative suffix, respectively. We assume, however, that these cases are either instances of actual possessive constructions or that the possessive is used to express definiteness, as in Udihe, "[a]rticles are missing, and definiteness may be expressed by means of 3rd person possessive affixes" (Nikolaeva and Tolskaya 2001: 479). This is illustrated in (ii).

(ii) Udihe [Tungusic] (Nikolaeva and Tolskaya 2001: 521)
Wakca-i *ni* *mo:-digi-**ni*** *eu-gi-e-ni.*
hunt-PRP man tree-ABL-**3SG** climb.down-REP-PST-3SG
'The hunter climbed down [from] **the** tree.'

b. GL / Goal
*We:-**tigi*** *ŋene-ze-fi* *seutigi* *diga-na-za-fi.*
forest-**LAT** go-SBJV-1PL.INCL nut eat-DEST-SBJV-1PL.INCL
'Let us go **to** the forest and eat some nuts.'

c. GL / Source
Nua-ni *ŋele-ini* *teŋku-**digi*** *tiŋme-le-zeŋe-zi:.*
he-3SG be.afraid-3SG chair-**ABL** fall-SING-FP-INST.SS
'He is afraid to fall **from** the chair.'

The configurational forms, however, follow different rules. They follow the canon in that there is exactly one morpheme that expresses Configuration and exactly one morpheme that specifies Directionality. In contrast to the canonical construction as depicted in Table 1 in Section 2 above, however, an additional element is needed, viz. the possessive suffix that refers back to the Ground noun, see (13).

(13) Udihe [Tungusic] (Nikolaeva and Tolskaya 2001: 885, 517, 521)

a. ON / Place
J'eu *bi:-ni* *uti* *montom-ziga-i* *uti* *t'a* ***xo:n-dile-ni****?*
what be-3SG that circle-PL-FOC that tree **top-LOC-3SG**
'Why are circles there **on** the fallen tree?'

b. ON / Goal
Čeradaka ***xo:n-tigi-ni*** *tukti:-ni.*
attic **top-LAT-3SG** climb-SG
'He is climbing **up to** the attic.'

c. ON / Source
Čeradaka ***xo:n-digi-ni*** *eu-gi:-ni.*
attic **top-ABL-3SG** go.down-REP-3SG
'He is going **down from** the attic.'

The use of postpositions in Place (13a), Goal (13b), and Source (13c) constructions is exemplified with *xo:n-* 'over, above, on'. As Nikolaeva and Tolskaya (2001: 402) state, "[t]he declension of other postpositions is completely analogous". Overall, configurational constructions in Udihe are more complex than GL. The three spatial relations, however, show the same complexity – at least when it comes to the number of morphemes.

4.4 Adpositions + relational nouns: Rapanui

In Rapanui, Directionality is marked by the prepositions *i*/*ʻi*[16] 'in, at, on' for Place, *ki* 'to' for Goal, and *mai* 'from' for Source throughout the whole paradigm provided in Table 9. Example (14) illustrates the use of these prepositions to convey GL. The configurational forms on the other hand are more complex and consist of an initial preposition followed by a relational noun (referred to as locational by Kievit 2017: 121) and a second preposition. This second preposition "does not have any semantic contribution; it serves just to provide a syntactic link between the locational and its complement [. . .] the second preposition may be either *i* [. . .], *o* [. . .], or a copy of the first preposition [. . .]" (Kievit 2017: 124). In Table 9, only one form is listed, in this case a copy of the first preposition.

Table 9: Paradigm of Rapanui [Austronesian, Oceanic] (Kievit 2017; Du Feu 1996[17]).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	*ʻi* X	*ʻi roto i* X	*ʻi/ʻa ruŋa i* X	*ʻi tuʻa o* X	*ʻi muʻa i* X	*ʻi raro i* X
Goal	*ki* X	*ki roto ki* X	*ki ruŋa ki* X	*ki tuʻa ki* X	*ki muʻa ki* X	*ki raro ki* X
Source	*mai* X	*mai roto mai* X	*mai ruŋa mai* X	*mai tuʻa mai* X	*mai muʻa mai* X	*mai raro mai* X
Option	I	I	I	I	I	I

(14) Rapanui [Austronesian, Oceanic] (Kievit 2017: 210, 213, 95)

a. GL / Place
He noho ***ʻi*** *te hare o re huŋavai.*
NTR stay **at** ART house of ART parent_in_law
'She stayed **in** the house of her in-laws.'

b. GL / Goal
E tahi mahana he turu a Tiare ***ki*** *te*
NUM one day NTR go_down PROP Tiare **to** ART
hare hāpī.
house learn
'One day Tiare went down **to** school.'

16 "In the accepted Rapa Nui orthography [. . .], this preposition is written either *ʻi* or *i*, depending on its function [. . .] the preposition in a locative sense is written *ʻi*, while the preposition occurring after locationals is *i*" (Kievit 2017: 210).

17 In contrast to Kievit (2017), Du Feu (1996) writes the first preposition and the locational as one word, e.g. ***kiroto ki*** *te hare* '**into** the house'. We adhere to the conventions used in Kievit (2017) here and used data provided in Du Feu (1996) only to complete the paradigm in Table 9.

c. GL / Source
Mai *tai nei,* ***mai*** *te hopu iŋa mātou ko*
from sea PROX **from** ART bathe NMLZ 1PL.EXCL PROM
kuā Tonere.
COLL Tonere
'We are coming **from** the shore, **from** swimming with Tonere.'

The examples in (15) illustrate this pattern for INSIDE. In (15a) and (15c), a copy of the first preposition, *i* or *mai*, respectively, is used, while in (15b), *i* is used as the second preposition.

(15) Rapanui [Austronesian, Oceanic] (Kievit 2017: 121, 124)
a. INSIDE / Place
A mua ***'i roto i*** *te hare.*
PROP Mum **at inside at** ART house
'Mother is **in** the house.'
b. INSIDE / Goal
He uru te kurī ***ki roto i*** *te hare.*
NTR enter ART cat **to inside at** ART house
'The cat entered **into** (lit. **to inside**) the house.'
c. INSIDE / Source
He e'a ***mai roto mai*** *te koro.*
NTR go_out **from inside from** ART feast_house
'They went **out of** the feast house.'

Like Hungarian and Udihe, Rapanui follows Option I for all Configurations. However, Directionality is expressed by two morphemes, e.g. *ki* . . . *ki* 'to . . . to' and thus does not entirely follow the canon.

4.5 Case + relational nouns: Kalaallisut

West Greenlandic, or Kalaallisut, attests to the second-highest average number of morphemes in our sample, shortly after German Sign Language (see Section 4.9). This is clearly because of its general language type. Like all Eskimo-Aleut languages, Kalaallisut is highly polysynthetic and agglutinative so that nouns can carry numerous affixes[18] (Holst 2005: 55). In combination with the use of relational nouns for spatial relations, this leads to the employment of several morphemes. The basic

18 In fact, Kalaallisut has almost exclusively suffixes, there is only one real prefix.

pattern is to put the Ground in the ergative case, employ the relational noun, refer back to the Ground by a possessive suffix for the third person, and then mark Directionality by case (Lybach 2022: 251). These cases by themselves also mark GL in Place, Source, and Goal constructions.

(16) Kalaallisut[19] [Eskimo-Aleut] (Nielsen 2019: 247–249)

a. GL / Place
*Illu-**mi*** *ino-qa-nngila-q.*
house-**LOC** human-there_is-NEG-3SG.IND
'There is no one **in** the house.'

b. GL / Goal
*Pisiniarfim-**mut*** *iser-poq.*
shop-**ALL** go_in-3SG.IND
'He went **into** the shop.'

c. GL / Source
*Illu-**miit*** *ani-voq.*
house-**ABL** come_out-3SG.IND
'He came **out** of the house.'

Kalaallisut possesses several relational nouns that denote not only various configurational but also coordinate relations, along with expressions of distant or close surroundings. For all investigated relations, we found corresponding relational nouns, as presented in Table 10 below.

Table 10: Paradigm of Kalaallisut [Eskimo-Aleut] (Lybach 2022).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-{*mi*}	X-{*p*} {*ilu*} {*a*}{*ni*}	X-{*p*} {*qaa*} {*a*}{*ni*}	X-{*p*} {*tunu*} {*a*}{*ni*}	X-{*p*} {*saaq*}{*a*} {*ni*}	X-{*p*} {*atə*}{*a*}{*ni*}
Goal	X-{*mut*}	X-{*p*} {*ilu*} {*a*}{*nut*}	X-{*p*} {*qaa*} {*a*}{*nut*}	X-{*p*} {*tunu*} {*a*}{*nut*}	X-{*p*} {*saaq*}{*a*} {*nut*}	X-{*p*} {*atə*}{*a*}{*nut*}
Source	X-{*mət*}	X-{*p*} {*ilu*} {*a*}{*nət*}	X-{*p*} {*qaa*} {*a*}{*nət*}	X-{*p*} {*tunu*} {*a*}{*nət*}	X-{*p*} {*saaq*}{*a*} {*nət*}	X-{*p*} {*atə*}{*a*}{*nət*}
Option	I	I	I	I	I	I

19 The morphemic dissemination is kept rudimentary to easily illustrate the GL marking here.

The examples in (17) and (18), are a comparison of the different uses for BEHIND and IN FRONT OF.

(17) Kalaallisut[20] [Eskimo-Aleut] (Stian Lybach, p.c.)

a. BEHIND / Place

Qitsuk	*illup*	*tunuaniippoq*.
{qitsuk}	{illu}**{p}**	**{tunu}{-a}{ni}**{ət}{vu}{q}
cat.NOM	house.**ERG**	**backside-POSS.3SG/SG-LOC**-be_located-IND-3SG

'The cat was **behind** the house.'

b. BEHIND / Goal

Qitsuk	*illup*	*tunuanukarpoq*.
{qitsuk}	{illu}**{p}**	**{tunu}{-a}{nut}**{-kaq}{vu}{q}
cat.NOM	house.**ERG**	**backside-POSS.3SG/SG-ALL**-move-IND-3SG

'The cat went **behind** the house.'

c. BEHIND / Source

Qitsuk	*illup*	*tunuani(i)t*	*takkuppoq*.
{qitsuk}	{illu}**{p}**	**{tunu}{-a}{nət}**	{takkut(ə)}{vu}{q}
cat.NOM	house.**ERG**	**backside-POSS.3SG/SG-ABL**	appear-IND-3SG

'The cat appeared **from behind** the house.'

As illustrated in (17), the Ground is marked with the ergative case suffix {-p}, the relational noun {tunu} is then introduced, and can even be accompanied by another verbal suffix as in (17a) and (17b). In example (18), the same structure is seen with the relational noun {saaq} for IN FRONT OF.

(18) Kalaallisut [Eskimo-Aleut] (Stian Lybach, p.c.)

a. IN FRONT OF / Place

Qitsuk	*illup*	*saavaniippoq*.
{qitsuk}	{illu}**{p}**	**{saaq}{-a}{ni}**{ət}{vu}{q}
cat.NOM	house.**ERG**	**front-POSS.3SG/SG**-be_located-IND-3SG

'The cat is **in front of** the house.'

20 Since Greenlandic possesses numerous sound laws that truncate, add, assimilate, or change sounds and the orthography only shows the end result of these processes, we added the underlying form of each morpheme in curved brackets to better illustrate the structure of each word, a hyphen in front of a morpheme marks a morpheme that truncates the preceding consonant. For more information on sound rules in Greenlandic see Lybach (2022: Chapter 2).

b. IN FRONT OF / Goal
Qitsuk *illup* *saavanukarpoq.*
{qitsuk} {illu}**{p}** **{saaq}{-a}{nut}**{-kaq}{vu}{q}
cat.NOM house.**ERG** **front-POSS.3SG/SG-ALL**-move-IND-3SG
'The cat went **in front of** the house.'

c. IN FRONT OF / Source
Qitsuk *illup* *saavani(i)t* *illup*
{qitsuk} {illu}**{p}** **{saaq}{-a}{nət}** {illu}**{p}**
cat.NOM house.**ERG** **front-POSS.3SG/SG-ABL** house.**ERG**
tunuanut *ingerlavoq.*
{tunu}{-a}{nut} {ingerla}{vu}{q}
backside-POSS.3SG-ALL go-IND-3SG
'The cat went **from in front of** the house **to behind** the house.'

Of all the languages in our sample that employ relational nouns, Kalaallisut seems to have the most complex embedding, i.e. the highest number of morphemes within the expression, with four on average. As can be seen from Table 10, Kalaallisut shows Option I for all spatial relations, general or configurational. GL is solely marked by case, while all configurational expressions combine relational nouns with the respective directional case suffix. There is no syncretism in the expression of spatial relations in Kalaallisut.

4.6 Adpositions + verbs: Maltese

Maltese uses adpositions, more specifically prepositions, to express configurational constructions. For Place and Goal constructions expressing GL, zero-marking is used for "a place which is fairly predictable from the context" (Borg and Azzopardi-Alexander 1997: 155).[21] However, Source is always expressed overtly with the preposition *minn* 'from' as in (19c).

21 The zero-marked expressions in (19a–b), 'church' and 'school', are prototypical candidates for topo-nouns, which are generally more prone to zero-marking. For a more thorough discussion of zero-marking of spatial relations in Maltese we refer the reader to Borg (1988), Stolz et al. (2014: Ch. 4.2) and Stolz and Vorholt (in preparation, Ch. 4.3.3.2 and 5).

(19) Maltese [Afro-Asiatic, Semitic] (Borg and Azzopardi-Alexander 1997: 49, 156)[22]

a. GL / Place
Ommi *(qiegħda)* **∅** *l-knisja*
mother:3SG located:3SG.F **at** DEF-church
'His mother is **at** church.'

b. GL / Goal
Ġrew **∅** *l-iskola*
run.3PL.PFV **to** DEF-school
'They ran **to** school.'

c. GL / Source
Tlaqna ***mill***[23]*-ajruport* *fil-ħin*
leave:1PL.PFV **from**:DEF-airport in:DEF-time
'We left [**from**] the airport on time.'

Goal constructions are either only marked by the verb, or by use of a second preposition as indicated by the parenthesis in Table 11 below. The two options are shown in (20b) and (20c).

(20) Maltese [Afro-Asiatic, Semitic]

a. UNDER / Place (Borg and Azzopardi-Alexander 1997: 161)
It-tfal *iħobbu* *jistaħbew* ***taħt*** *il-mejda*
DEF-children 3.IPFV:love:PL 3.IPFV:hide:PL **under** DEF-table
'Children love to hide **under** the table.'

b. UNDER / Goal (Borg and Azzopardi-Alexander 1997: 162)
Il-qarnita *niżlet* ***għal*** ***taħt*** *il-blata* *biex*
DEF-octopus go_down:3SG.F.PFV **for** **under** DEF-rock to
tistaħba
3SG.F.IPFV:hide
'The octopus went **under** the rock in order to hide.'

c. UNDER / Goal [Korpus Malti 3.0, news79496][24]
Mort ***taħt*** *it-tieqa* *tiegħu*
go:1SG.PFV **under** DEF-window of:3SG.M
'I went **under** his window [. . .].'

22 We added the ∅ here for better comprehensibility of the a. and b. example.
23 The preposition *minn* 'from' fuses with the definite article *(i)l-* to *mill-* 'from the'.
24 The glosses and translation are our own.

d. UNDER / Source [Korpus Malti 3.0, literature13][25]
Ħriġthom ***minn taħt*** *l-iskipp*
take_out:1SG.PFV:3PL.DO **from under** DEF-skip
'I took them out **from under** the skip.'

Table 11: Paradigm of Maltese [Afro-Asiatic, Semitic] (Borg & Azzopardi-Alexander 1997).[26]

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	∅ X	*fi* X *ġo* X *ġewwa* X	*fuq* X	*wara* X	*quddiem* X	*taħt* X
Goal	∅ X	*fi* X *ġo* X *ġewwa* X	*(għal) fuq* X	*(għal) wara* X	*quddiem* X[27]	*(għal) taħt* X
Source	*minn* X	*minn ġo* X *minn ġewwa* X	*minn fuq* X	*minn wara* X	*minn quddiem* X	*minn taħt* X
Option	II	II	I / II	I / II	II	I / II

Source constructions, and in some cases Goal constructions as well, use a periphrastic form while Place is always indicated by a monolectic form in Maltese. Consequently, the Maltese paradigm is not in line with the canon.

4.7 Directionality via verbs: Wari'

Wari' expresses Directionality exclusively with verbs. This strategy is an option in many languages (e.g. in English: *I entered the house* (Goal), *I left the house* (Source)), however, in Wari' it is the only possibility to express Directionality. This leads to

25 The glosses and translation are our own.

26 It could be argued that *fi* 'in' could also be added to the GL column of the paradigm in Table 11. However, we chose to only include the forms provided in Borg and Azzopardi-Alexander (1997: 155–162) in this study. There is still ongoing research with regard to zero vs overt marking of Place and Goal, and the competition between zero, *fi, ġo,* and *ġewwa*, especially with regard to toponyms (cf. Stolz et al. 2014, 2017c, 2023), which we chose to exclude form this study (cf. Section 3). An in-depth analysis of configurational spatial relations in Maltese that is currently undertaken by Stolz and Vorholt (in preparation) reveals a more intricate paradigm.

27 The possibility of *għal* 'for' and *quddiem* 'in front of' is not mentioned by Borg and Azzopardi-Alexander (1997). Stolz and Vorholt (in preparation, Ch. 5.1.2.2.10.1.2) discuss this case specifically and find only three genuine instances in the consulted text corpus.

the zero-marking of Directionality in nominal phrases, ultimately resulting in the syncretism of Place, Goal, and Source (= Option V), as displayed in Table 12.

Table 12: Paradigm of Wari' [Chapacuran] (Everett and Kern 1997).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	∅ X	*tequipa-in* X	NA	*wara-in* X	*quima-in* X	*xone-in* X
Goal	∅ X	*tequipa-in* X		*wara-in* X	*quima-in* X	*xone-in* X
Source	∅ X	*tequipa-in* X		*wara-in* X	*quima-in* X	*xone-in* X
Option	V	V		V	V	V

Wari' differentiates four types of movement or states: 'at rest', 'motion to', 'motion from', and 'motion past' (Everett and Kern 1997: 246). The verb *pe/to* 'to be at' is employed for 'at rest' location (see (21a) and (22a)), while *mao/mama'* 'to go' expresses 'motion to' (see (21b) and (22b)). The Source relation requires a post-verbal modifier, e.g. *qui'* 'coming this way' (see (21c)) or *ca'* 'this neuter' (see (22c)).

(21) Wari' [Chapacuran] (Everett and Kern 1997: 247–248)

a. GL / Place
Pe *na-in* ∅ *xirim.*
be:at:SG 3SG:R.PST/PRS-3N ∅ house
'He is **at**, or **in**, the house.'

b. GL / Goal
Mao *na-in* ∅ *xirim*
go:SG 3SG:R.PST/PRS-3N ∅ house
'He went **to** the house'

c. GL / Source
Tan' *qui'* *nana-in* ∅ *xiri-nain* *pic*
arrive:PL coming:this:way 3PL:R.PST/PRS-3N ∅ house-3N rubber
They arrived **from** the rubber camp (lit. '. . . rubber's house')

As displayed in Table 12, Configuration is expressed through spatial nouns combined with a possessive pronoun referring to the Ground (see (22)). The nouns signify body parts, e.g. *tequipa* 'thorax', *wara* 'back', *quima* 'chest', and *xone* 'curve of back'. This is exemplified in (22) with INSIDE.

(22) Wari' [Chapacuran] (Everett and Kern 1997: 253–254)

a. INSIDE / Place
(Corom) to nana-in ***tequipa-in*** *xirim.*
enter be:at:SG 3PL:R.PST/PRS-3N **thorax-3N** house
They are **inside** the house.' (lit. '. . .**in** the house's **thorax.**')

b. INSIDE / Goal
Corom mama' nana-in ***tequipa-in*** *xirim 'oro wari'.*
enter go:PL 3PL:R.PST/PRS-3N **thorax-3N** house COLL person
'The people entered going **into** the house.' (lit. '. . .**into** the house's **thorax.**')

c. INSIDE / Source
Hwet ca' na-in ***tequipa-in*** *xirim.*
appear:SG this:N 3SG:R.PST/PRS-3N **thorax-3N** house
'He came **out of** the house.' (lit. '. . .out of the house's **thorax.**')

Examples (22a) and (22b) illustrate how the verbs *to* 'be at (SG)' and *mama'* 'go (PL)' may be combined with an additional verb (*corom* 'enter') to convey Directionality. The verbs described above are just a small sample of the many verbs and combinations that Wari' employs to express Location and Direction.

4.8 Syntactic influence: Mandarin Chinese

Several language-specific factors may influence a spatial construction. In Mandarin Chinese, for example, both Place and Goal constructions may be either zero-marked or take a preposition. This is true for both GL and the configurational constructions as Table 13 demonstrates.

Table 13: Paradigm of Mandarin Chinese [Sino-Tibetan, Sinitic][28] (Ross and Ma 2006; Jingting Ye, p.c.).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	*(zài)* X *(nàr)*	*(zài)* X *(de) lǐtou* *(zài)* X *lǐ*	*(zài)* X *(de) shàngtou* *(zài)* X *shàng*	*(zài)* X *(de) xiàtou*	*(zài)* X *(de) qiántou*	*(zài)* X *(de) xiàtou* *(zài)* X *xià*

28 Ross and Ma (2006: 291) explain that "Mandarin location words consist of a base form and a location suffix". They list the location words with three different location suffixes, viz. *-tou*, *-miàn*, and *biān*. For reasons of clarity, we decided to present only one of the forms in Table 13. Furthermore, not all of the location words can follow the Ground noun in their base form without a location suffix. According to Ross and Ma (2006: 293), this is only possible with *lǐ* 'inside', *sháng* 'above', and *xià* 'below' – as well as *wài* 'outside' which we do not consider in this study. In these cases, *de* 'of' does not occur, while it is optional in combination with the forms carrying a location suffix (Ross and Ma 2006: 292).

Table 13 (continued)

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Goal	*(dào)* X *(nàr)*	*(dào)* X *(de)* *lǐtou* *(dào)* X *(de)* *lǐ*	*(dào)* X *(de)* *shàngtou* *(dào)* X *shàng*	*(dào)* X *(de)* *xiàtou*	*(dào)* X *(de)* *qiántou*	*(dào)* X *(de)* *xiàtou* *(dào)* X *xià*
Source	*cóng* X *(nàr)*	*cóng* X *(de)* *lǐtou* *cóng* X *lǐ*	*cóng* X *(de)* *shàngtou* *cóng* X *shàng*	*cóng* X *(de)* *xiàtou*	*cóng* X *(de)* *qiántou*	*cóng* X *(de)* *xiàtou* *cóng* X *xià*
Option	I / II	I / II	I / II	I / II	I / II	I / II

As the brackets in Table 13 indicate, the prepositions *zài* 'at, in, on' and *dào* 'to' are not obligatory in every case. However, different factors determine the absence or presence of the preposition in these two relations. *Zài* can act as a preposition 'at' or a verb with the meaning 'exist, be located at' (cf. Ross and Ma 2006: 87–88).[29] If followed by an object noun phrase and a verb phrase, it is analysed as a preposition (23a). Without another verb phrase, however, it functions as a verb (23b).

(23) Mandarin Chinese [Sino-Tibetan, Sinitic] (Ross and Ma 2006: 88)[30]

a. GL / Place with *zài* as a verb
Tā ***zài*** *jiā* *chī* *fàn.*
he **at** home eat meal
'He is eating **at** home.'

b. GL / Place with *zài* as a preposition
Tā ***zài*** *jiā.*
he **exist** home
'He **is at** home.'

If we follow the consulted grammar by Ross and Ma (2006) and consider *zài* a verb in (23b), the Place construction is zero-marked. In (23a), however, *zài* is used as a preposition that marks the Ground *jiā* for the relation of Place. It is important to note that not all Grounds can be marked with only *zài*. *Jiā* 'home' is one of the few common nouns that may directly be marked with *zài* (and other locational prepositions). In Mandarin Chinese, there is a group of place nouns that differ from other nouns in that they may follow these prepositions without any additional

29 The form *zài* is commonly analysed as a preposition that also functions as a verb (e.g. Ross and Ma 2006: 87–88). Alternatively, some authors suggest that this element should be analysed as a coverb (e.g. Li and Thompson 1989: 366; Po-Ching and Rimmington 2006: 152).
30 The glosses are our own.

element (cf. Chao 2011: 532–544). This group consists of toponyms, position words like the configurational forms listed in Table 13 above – which may also function as a Ground by themselves – but also words like *zhèr* 'here' or *nàr* 'there', and a few common nouns like *jiā* 'home', *xuéxiào* 'school', or *fēijī chǎng* 'airport'[31]. Other nouns have to be used with position words, e.g. *fángzi lǐ* 'house in' or *fángzi nàr* 'house there'. Chao (2011: 543) defines these constructions as compounds which then form place nouns.

For Goal constructions, the preposition *dào* 'to'[32] is used under certain conditions, i.e. if a verb phrase follows the Ground (24a). However, the verb may also precede the Ground, in which case the preposition is not used (24b).

(24) Mandarin Chinese [Sino-Tibetan, Sinitic] (Ross and Ma 2006: 303)[33]
   a. GL / Goal with preposition *dào*
      *Wǒ xiǎng **dào** túshūguǎn **qù**.*
      I want **to** library **go**
      'I want to **go to** the library.'
   b. GL / Goal without preposition *dào*
      *Wǒ xiǎng **qù** túshūguǎn.*
      I want **go** library
      'I want to **go to** the library.'

Depending on the syntactic properties, viz. the motion verb preceding or following the Ground, the Goal construction is either zero-marked or overtly marked with the preposition *dào* 'to'. Similar rules apply when configurational forms are used, so that a variety of constructions is possible in Mandarin Chinese.

4.9 Spatial relations in sign languages: German Sign Language

Our sample also contains one sign language, viz. German Sign Language (DGS, 'Deutsche Gebärdensprache'). The features it shows regarding our research question are comparable to many other sign languages. The principle of universalism dictates that all human languages, whether they use the oral-auditive or visual-manual modality, are typologically comparable. As Behrens (2024) has exemplarily shown, sign languages can for instance partake in the same language

31 These place nouns thus correspond to Haspelmath's (2019) notion of topo-noun (see fn. 7).
32 Similar to *zài* 'at' or 'exist, be located at', *dào* 'to' can also be used as a verb with the meaning 'to arrive'.
33 The glosses are our own.

contact dynamics (e.g. *sprachbunds*) as spoken languages. The most prominent and very central feature of sign languages for this research question is the grammaticalisation of the sign space, i.e. the imaginary space in front of the signer's body that is reachable by the hands and arms. Virtually all points within this space can be served in an utterance, while economy results in certain areas on a level plane being more grammaticalised than others. The expressions under scrutiny contain several morphemes that can be referred to as Indices. Their free and bound forms place a Figure, Ground, or other parts of speech at a certain place in the signing space. Their indexical values have to agree anaphorically (Sandler and Lillo-Martin 2006: 25–26).

Another pivotal (but not exclusive) feature of sign languages are classifiers. The two main forms are substitutors, where a classifier hand form substitutes an entity in an expression, and manipulators, where the hand form represents how an entity is semantically handled (Eichmann et al. 2012: 94–96). Not only do they play an important role in verbal contexts but also in spatial expressions. The use of classifiers for spatial expressions instead of adpositions seems to be common among sign languages as a typological study by Eberle (2013) for five sign languages[34] suggests. While all sign languages show a great variety in the expression of spatial relations, classifiers are the most dominant method. The use of adpositions, however, is rare and often associated with influence from an oral language with late-deafened informants (Eberle 2013: 54–55).

In what follows, a general, possible template for the expression of a configurational spatial relation is given. The Figure is normally signed first. After this, the Ground is introduced, optionally by an indexical morpheme, i.e. signed on the side to embed it in the signing space. Hereafter follows the substitute classifier, marked with the same Index as the Ground. Lastly, a sign is expressed that consists of one morpheme for each the anaphorical Index, Directionality, and Configuration.[35]

Since sign languages have the facility to express morphemes simultaneously, indicated by square brackets, not all of them are in a sequential order.

34 She investigates Catalan Sign Language, Estonian Sign Language, Nigerian Sign Language, Thai Sign Language, and Austrian Sign Language.

35 To not exceed the scope of this paper, we have chosen a context-free pattern for this language. Since sign languages can make very productive use of iconicity, the exact morphological structure can differ vastly between different semantic contexts. It is not possible to take account of them all and calculate an average morpheme length for it.

(25) German Sign Language (DGS)[36] [German Sign Language family][37]
INSIDE / Place
BEAR POSS.3b CAVE-left [**SUBS:opening-left.a**; **INDEX-left.b**] LIVE INDEX-left.b
'The bear lives **inside** his cave.'

The glossing is partly simplified in order to represent the pattern as clearly as possible. What evokes the meaning of INSIDE in example (25) is the simultaneous expression of the substitutor classifier and the Index sign and their relation to each other. The orientation of the classifier sign (here described as positional -left.a, closer to the body) and the placement of the ending position of the Index (here as -left.b, further away from the body) gives the meaning of INSIDE as the indexical morpheme of the Index is within the iconic opening demonstrated by the substitutor. The optional doubling at the end of the sentence of indexical signs is used as reinforcement. It may be used here to underline the meaning of INSIDE but it is not generally obligatory (Quer et al. 2019: 400–402).

(26) German Sign Language (DGS) [German Sign Language family] (own competence)
a. INSIDE / Goal
WATER [**SUBS:surface-left**; **left.high-DIR.ALL-left.low**]
'into the water'
b. INSIDE / Source
WATER [**SUBS:surface-left**; **left.low-DIR.ABL-left.high**]
'from out of the water'

As to Directionality, DGS uses two locational morphemes on the Index sign when it encodes a direction, the starting and ending place of the sign path. When it has a stationary meaning, as in example (25), there is only one morpheme, the ending position of the Index sign. When two locational markers are present, the Index sign produces a path, this is why the Index is glossed here as DIR.ALL for Goal and DIR.ABL for Source.[38] The opposite meaning of (26a) is glossed in (26b) and would be conveyed by reversing the ending and starting locational morphemes on the Index and turning the pointing direction of the Index around, switching from DIR.ALL to DIR.ABL, to align with the resulting path.

36 All glosses for DGS are our own.
37 https://media.spreadthesign.com/video/mp4/9/164048.mp4 (accessed 06.11.2024)
38 See Sandler and Lillo-Martin (2009: Chapter 9) for more information on sign language phonology.

(27) German Sign Language (DGS) [German Sign Language family] (own competence)
BEHIND / Source
CORNER [**SUBS:edge-left**; **left.front-INDEX-left.back**]
'**from behind** the corner'

In (27), another example is shown with the use of a classifier to express FROM + BEHIND. While it illustrates well the theoretical marking of this configurational spatial relation, it also shows how much the glossing leaves to imagination with sign languages. The Index sign has two locational morphemes and shows a path between these too. However, there can be virtually indefinite realisations of this. The path can show how a Figure is walking very closely to the corner, or the distance between the two locations can be very big, showing that the Figure is going a long way.

However, often enough, Directionality and Configuration are marked on the verb itself. There is a subclass of special spatial verbs in sign languages that have the locational Index marker on the verb, like STAY, GO, COME etc. With the placement of this Index in relation to the Ground sign or classifier sign, Configuration can be marked on the verb, too. (28a) illustrates how a verb, containing a manipulator classifier, encodes both Configuration and Directionality within the verb by having the starting and ending locations within the verb PUT. In example (28b), the directional verb LOOK, which can carry indexical markers for who is looking and what is looked at, encodes TO + BEHIND by a right sided lean of the body to enable an iconically free viewing path to what is behind the tree.

(28) German Sign Language (DGS) [German Sign Language family] (own competence)
a. UNDER / Goal
1SG TABLE [**SUBS:surface-left**;
BEER **left.middle**-MANIP:container-PUT-**left.bottom**]
'I put a glass of beer **under the table**.'
b. BEHIND / Goal
_____ leaning.right
TREE [**SUBS:upright.object-left**; 1SG-LOOK-**left.front**]
'I look **behind** the tree.'

As illustrated, the grammaticalisation of the signing space, combined with classifiers, multi-purpose indexical morphemes, and iconicity can lead to a plethora of different expressions of our investigated configurational spatial relations. In the absence of a spatial or directional verb, the spatial relations can be overtly marked on the Ground. Often enough, however, the Ground is zero-marked whenever the locational markers can be outsourced to the verbal domain.

Of all the investigated languages, DGS is the one with the highest number of morphemes on average. This can have many reasons. Prominently, the signing space might require more exact marking as it contains far more possible parameters than oral languages. Given that sign languages can articulate morphemes simultaneously, this might not lead to a longer duration of the expression. At least, effects of language economy do not seem to have shortened the constructions so far. As mentioned above, we have chosen the pattern with a classifier as the basic context-free one for our investigation, acknowledging that DGS has many more options for the expression of configurational spatial relations, arguably even structures without classifiers like [HOUSE-left left.middle-DIR.ALL-left.side] 'into the house', which would still contain four morphemes, however. Eberle (2013: 54–56) also reports that using lexical items only and placing them in relation to each other in the sign space (e.g. by using the dominant and non-dominant hand simultaneously) is a common alternative to the use of classifiers. However, neither construction in DGS can be considered canonical as defined above, since they all show a higher number of morphemes than there are functions (Directionality and Configuration).

Table 14: Paradigm of configurational spatial relations in DGS (own competence).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X(-IX) (INDEX-IX)	X(-IX) [CLASS:___-IX; (INDEX-IX)]	X(-IX) [CLASS:___-IX; (INDEX-IX)]	X(-IX) [CLASS:___-IX; (INDEX-IX)]	X(-IX) [CLASS:___-IX; (INDEX-IX)]	X(-IX) [CLASS:___-IX; (INDEX-IX)]
Goal	X(-IX) (DIR.ALL-IX)	X(-IX) [CLASS:___-IX; (IX-DIR.ALL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ALL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ALL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ALL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ALL-IX)]
Source	X(-IX) (IX-DIR.ABL)	X(-IX) [CLASS:___-IX; (IX-DIR.ABL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ABL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ABL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ABL-IX)]	X(-IX) [CLASS:___-IX; (IX-DIR.ABL-IX)]
Option	I / V	I / V	I / V	I / V	I / V	I / V

Table 14 shows the syncretism pattern for the mentioned classifier construction in DGS. GL as well as all configurational expressions show no syncretism for Directionality. The opposite is true for when the Configuration and/or Directionality is marked on the verb as mentioned above. Then, Option V emerges as all expressions are marked the same, viz. zero.

5 The quantitative side of spatial Directionality and Configuration

In this section, we analyse and discuss quantitative aspects of our study. In Section 5.1, we measure the morphological complexity of the constructions under scrutiny to test our Hypotheses 1 and 2. Hypothesis 3 will be addressed in Section 5.2 which offers an analysis of the occurring syncretism patterns.

5.1 Morphological complexity

For our quantitative analysis, we focus on the number of morphemes to assess the morphological complexity of the constructions under scrutiny. As Stolz et al. (2017b: 16) note, "[t]he complexity of constructions can be measured against several yardsticks". The yardsticks chosen in their volume on spatial interrogatives are the number of words (mono-word vs. multi-word constructions), the number of morphs and morphemes, zero-marking, the number of syllables, and the number of segments. Based on these yardsticks, they calculate the complexity scores for Place, Goal, and Source constructions and establish a markedness hierarchy which is replicated in Figure 1.

<WHERE; WHITHER; WHENCE>

Figure 1: Markedness hierarchy of spatial interrogatives (Stolz et al. 2017b: 585).

According to this hierarchy, the calculated complexity scores increase from WHERE (= Place) via WHITHER (= Goal) to WHENCE (= Source). This hierarchy was confirmed by Nintemann et al. (2020) for spatial interrogatives on the one hand and spatial adverbs on the other hand. As stated in Hypothesis 1 formulated in (3) above, we expect a similar hierarchy, provided in Figure 2, for GL and configurational constructions in combination with a nominal Ground as well. Since measurements on different linguistic levels as conducted by Stolz et al. (2017b) would exceed the scope of this study, measuring the morphological complexity on the basis of the number of morphemes will suffice at this point.

Place < Goal < Source

Figure 2: Markedness hierarchy of spatial relations.

To test Hypothesis 1, we first include all languages with no empty columns for our calculations (13 languages[39]). We calculate the mean number of morphemes for each Directionality across all constructions. In case cells are filled with more than one form, we calculate the mean so that for some cells we get a decimal number. Across the 13 languages this results in an average of 2.15 morphemes for Place, 2.24 for Goal, and 2.45 for Source. Even though the average complexity increases only by 0.09 from Place to Goal, it builds up by 0.21 for Source. Thus, Hypothesis 1 can be confirmed.

Subsequently, we check the hierarchy for GL and all configurational constructions individually. For this we only include languages that have no empty cells in the respective spatial relation. The number of languages that are included in the calculations for each spatial relation are indicated in Table 15. Due to the different languages that are included for the different spatial relations, we exclusively compare Place, Goal and Source in individual Configurations. The results are not suitable for making comparisons between the individual Configurations. As can be seen from Table 15, the hierarchy in Figure 2 can be confirmed for GL and all configurational constructions.

Table 15: Average number of morphemes (mean).

Directionality	All spatial constructions	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Number of languages	13	27	30	25	21	16	22
Place	2.15	0.96	2.45	2.29	2.42	2.42	2.33
Goal	2.24	0.96	2.56	2.45	2.54	2.50	2.48
Source	2.45	1.19	2.68	2.68	2.85	2.69	2.68

Furthermore, we expect that in those languages that employ GL constructions, configurational constructions are morphologically more complex than GL constructions. For example, Japanese makes use of the particle *ni* 'at', i.e. one morpheme, for GL as presented in (2a) in Section 2, while the ON construction in (2b) consists of three morphemes, viz. *no ue ni* (GEN on at) 'on'.

39 Hungarian is not included here as it has no means of expressing GL, cf. Section 4.1.

The sample for the comparison between general and configurational spatial relations includes those 13 languages of our sample that employ GL and have no empty cells for the other configurational constructions. The boxplot in Figure 3 clearly shows that Hypothesis 2 can be confirmed for our small sample. With an average complexity of 1.04, general spatial relations have the lowest score while also showing less variation compared to the other configurational spatial constructions. The complexity for general spatial relations ranges from 0 to 2.5 morphemes while configurational spatial constructions show a range from 0.5 to 6 morphemes. The boxes for the five configurational spatial constructions look almost identical with only minor differences between the means that range from 2.47 morphemes for ON to 2.60 for BEHIND.[40]

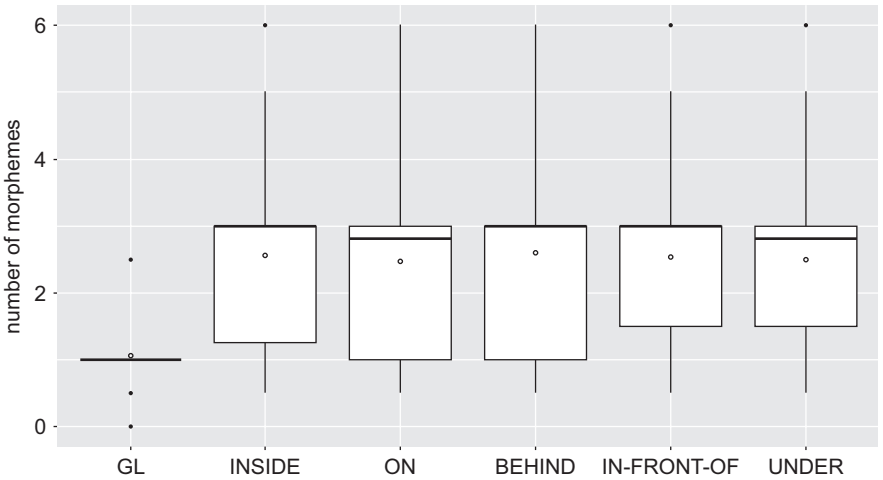

Figure 3: Boxplot of complexity across spatial relations.

This also shows that our sample languages correspond to what is postulated by the canon in so far as on average, GL is expressed with fewer morphemes than configurational constructions. Although languages are not always in line with the canon by employing one and only one morpheme for each function, the average scores displayed in Figure 3 show quite clearly that constructions encoding both Directionality and Configuration use a larger number of morphemes than constructions encoding only Directionality.

40 However, due to our small sample size, we do not attempt to make any generalising statements about the differences in complexity of the individual Configurations at this point.

5.2 Syncretism

As mentioned in Section 2 above, syncretism is one of the most discussed topics in studies on spatial relations. Previous studies mostly focussed on the distribution of patterns across languages (cf., e.g. Creissels 2006; Pantcheva 2010; Lestrade 2010; Stolz et al. 2017b; Nintemann et al. 2020). In our study, the focus lies on whether languages attest to the same pattern throughout the paradigms of GL and configurational constructions.

We group the 30 languages of our sample into five categories according to the number of filled columns in the paradigms. Table 16 shows the number of languages in each category and the number of languages that can display that same syncretism pattern across all filled columns. In case individual cells were filled with more than one option, we counted whether one of the options was possible across other columns. This is the case in ten languages of our sample. Overall, Hypothesis 3 is confirmed by our data. 11 (= 84.62%) of the 13 languages that have no empty columns are in line with Hypothesis 3. The group of languages with only one empty column is made up of four languages, where three languages show the same syncretism pattern throughout while one does not. All languages in the other three categories with four to two filled columns employ the same pattern throughout. However, it cannot be ruled out that this might be due to the low number of columns that are compared.

Table 16: Distribution of syncretism patterns in individual languages.

Number of filled columns	Number of languages	Number of languages that show same patterns	%
6	13	11	84.62
5	4	3	75.00
4	6	6	100.00
3	4	4	100.00
2	3	3	100.00
Total	30	27	

All in all, only three languages (=10%) do not behave in line with Hypothesis 3, while 27 languages (=90%) do. In Shoshoni [Uto-Aztecan], GL employs option I while INSIDE, ON, and UNDER follow option III, and BEHIND and IN FRONT OF show option V. Welsh [Indo-European, Celtic] also attests to three different patterns. GL, INSIDE, and IN FRONT OF follow Option I, with the latter also showing option IV, while ON, BEHIND, and UNDER attest to option II. The third language is Modern Eastern Armenian [Indo-European, Armenic], which follows option I for GL while other configurational constructions show option II.

6 Conclusions

Our description of only a selected number of languages in Section 4 shows the varying means of languages to express general and configurational spatial relations. Even though the difficult data collection process limited our sample size to 30 languages, for half of which only incomplete paradigms could be obtained, our hypotheses are confirmed by our data.

Based on the 13 languages that present complete paradigms, our study confirms the markedness hierarchy (viz. Figure 2) observed in former research (cf. Stolz et al. 2017b; Nintemann et al. 2020). Despite only small differences in the average number of morphemes, GL and all configurational constructions confirm our Hypothesis 1 by exhibiting an increase from Place via Goal to Source.

To test Hypothesis 2 that addresses a difference in the morphological complexity of GL vs. configurational constructions, we are again only able to include those 13 languages for which a complete paradigm could be obtained. However, the data clearly reveals that the average GL construction exhibits a distinctly lower morphological complexity than the average configurational construction. In comparison, the five configurational constructions show almost identical complexity in the languages considered. Mizuno's (2024a) findings in his study on coding asymmetries in locational expressions corroborate these results, providing additional support for the hypothesis. He notices that "[m]arkers used for axial [= configurational] locations tend to be more complex than those used for plain [= general] locations."

27 of our 30 languages, i.e. 90%, show the same syncretism pattern for all configurational spatial relations that are included in our sample for the respective language. Even if only considering those 13 languages with a complete paradigm, the share remains almost the same with 84.62%. We thus conclude that there is a notable tendency to employ one and the same syncretism pattern across GL and configurational constructions and consider our Hypothesis 3 confirmed. Nevertheless, exceptions do occur. Providing explanations for occurring inconsistencies lies beyond the scope of our study and remains a task for the future.

Our study has demonstrated that configurational spatial relations are still an understudied area of research. A substantial number of the grammars that we consulted do not discuss them and only a few cover the whole range of spatial relations. Because of this limitation, we do not have sufficient data for possible generalisations regarding, for example, the complexity of different Configurations or the grammatical categories involved in the expression of spatial relations from a typological perspective. At this point, we want to draw the attention once more to Mizuno's work which seeks to tackle the question of "[w]hat cross-linguistic generalisations can be made regarding the coding of configuration and direction" (Mizuno 2024b). Apart from the shortcomings imposed by our limited data set, we have also

taken a restricted perspective by largely excluding the verbal domain from our analysis. Extending the scope in this regard will certainly offer new insights into the coding of (configurational) spatial relations. While the results of our study need to be tested against a larger and more diverse sample, we hope to have provided some insights into the exploration of configurational spatial relations and their morphological complexity.

Acknowledgements

We are grateful to Thomas Stolz for helping us develop a topic for a joint project – unaware that it would be published in a collective volume in his honour. Since we all are his students, our gratitude is not limited to his help with this study, but extends to the fact that it is thanks to his support that we were able to pursue this path in linguistics. For this reason, it was important to us to contribute to this collective volume together to show our appreciation for Thomas Stolz's many years of support.

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Abbreviations

1, 2, 3	1st, 2nd, 3rd person
ABL	ablative
ACC	accusative
ALL	allative
ART	article
ATTR	attributive
CA	connective adverbial
CAUS	causative
COLL	collective
DEF	definite
DEST	destinative

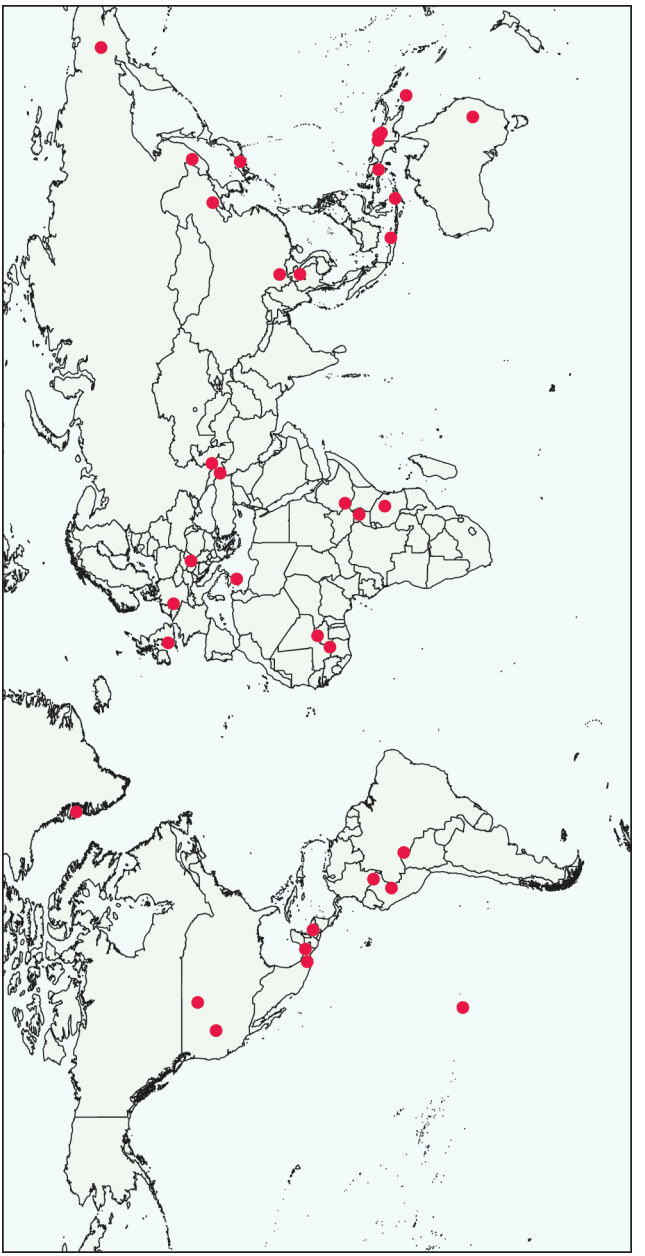
DGS	German Sign Language (Deutsche Gebärdensprache)
DIM	diminutive
DIR	directional
DO	direct object
DS	different-subject
ELA	elative
ERG	ergative
EXCL	exclusive
F	feminine
FOC	focus
FUT	future
FP	future participle
GEN	genitive
GL	general location
GM	Genus-Macroarea
ILL	illative
IMP	imperative
INCL	inclusive
IND	indicative
INE	inessive
INFR	inferential
INST	instrumental
IPFV	imperfective
LAT	lative
LOC	locative
L	lenition
M	masculine
MOV	continuous moving
N	neuter
NEG	negation
NMLZ	nominaliser
NOM	nominative
NTR	neutral aspect (he)
NUM	numeral marker
PL	plural
PFV	perfective
POSS	possessive
PRED	predicative
PROL	prolative
PROM	prominence marker
PROP	proper article
PROX	proximal
PRP	present participle
PRS	present tense
PST	past tense
R	realis
REP	repetitive

RES	resultative
SBJV	subjunctive
SF	S-focus
SG	singular
SING	singulative
SR	spatial relation
SS	same-subject
SUPER	superior
TOP	topic
TR	transitive
V	vowel
VN	verbal noun

Additional glossing for Sign Languages

[SIGN; SIGN]	Signs in square brackets, divided by a semicolon are signed simultaneously
Xa, Xb	Used when two different loci are established in a similar signing space area
INDEX	Sign that is signed by the pointing finger for referring within the signing space
left	Sign is placed to the left of the signer
left.high	Sign is placed to the left of the signer and slightly higher
left.low	Sign is placed to the left of the signer and slightly lower
left.middle	Sign is placed to the left, but further to the middle of the signer
MANIP:__	Manipulator classifier sign, indicating how an object is handled
SUBS:__	Substitutor classifier sign where the handform replaces the referent

Appendix 1: Map



Map 1: Geographical distribution of sample languages.

Appendix 2: Paradigms

Table 17: Ayutla Mixe [Mixe-Zoque] (Romero-Mendez 2008).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X=*ë'n*	X-*ojt-py*	X-*këx-p*	NA	NA	NA
Goal	X=*ë'n*	X-*ojt-py*	X-*këx-p*			
Source	X=*ë'n*	X-*ojt-py*	X-*këx-p*			
Option	V	V	V			

Table 18: Bora [Boran] (Thiesen and Weber 2012).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	NA	X *pañe*	X *hallú*	X *déju*	NA	X *lliiñé*
Goal		X *pañe-vu*	X *hallú-vu*	X *déju-vu*		X *lliiñé-vu*
Source		X *pañe-tu*	X *hallú-tu*	X *déju-tu*		X *lliiñé-tu*
Option		I	I	I		I

Table 19: Chol [Mayan] (Vázquez Álvarez 2011; Coon 2010).[41]

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	*tyi* X	*tyi i-mali* X	*tyi i-jol* X	*tyi i-paty* X	NA	*tyi y-e'bal* X
Goal	*tyi* X	*tyi i-mali* X	**tyi i-jol* X	**tyi i-paty* X		**tyi y-e'bal* X
Source	*tyi* X	*tyi i-mali* X	**tyi i-jol* X	**tyi i-paty* X		**tyi y-e'bal* X
Option	V	V	V	V		V

Table 20: Crow [Siouan] (Graczyk 2007).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*n*	X *(ashk)awúua(-n)* X *awúualee*	NA	X *alítchia-n*	NA	NA
Goal	X-*ss(aa)*	X *awúu(a)-s(s)* X *awúua-ko*		X *alítchia-s(s)*		
Source	X-*kaa* X-*ss(aa)* X-*n*	X *awúua(-n)*		X *alítchia-n*		
Option	I / III / IV	I / IV		IV		

41 The forms marked by an asterisk are reconstructed based on Coon (2010: 235–236).

Table 21: Garifuna [Arawakan] (Haurholm-Larsen 2016).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*rugu*	*t-ídan* X	NA	NA	NA	NA
Goal	X-*rugu* X-*rugu-n*	*t-íd-on* X				
Source	X-*rugu-giyen*	*t-ídan-giyen* X				
Option	I / II	I				

Table 22: Iatmul [Sepik] (Jendraschek 2012).[42]

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X(-*ba*)	X(-*ba*)	X(-*ba*)	X(-*ba*)	X(-*ba*)	X(-*ba*)
Goal	X(-*ba*)	X(-*ba*)	X(-*ba*)	X(-*ba*)	X(-*ba*)	X(-*ba*)
Source	X(-*ba*) X(-*ak*)	X(-*ba*) X(-*ak*)	X(-*ba*) X(-*ak*)	X(-*ba*) X(-*ak*)	X(-*ba*) X(-*ak*)	X(-*ba*) X(-*ak*)
Option	II / V	II / V	II / V	II / V	II / V	II / V

Table 23: Imonda [Border] (Seiler 1985).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*ia*	X *me-ia*	X *huls-ia*	X *mãs-ia*	NA	NA
Goal	X-*ia-m*	X *me-ia-m*	X *huls-ia-m*	X *mãs-ia-m*		
Source	X-*ia-nèi*	X *me-ia-nèi*	X *huls-ia-nèi*	X *mãs-ia-nèi*		
Option	I	I	I	I		

Table 24: Jalkunan [Mande] (Heath 2017).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X *tɔ*	X *dù*	X *mà*	NA	NA	NA
Goal	X *tɔ*	X *dù*	X *mà*			
Source	X *tɔ*	X *dù*	X *mà*			
Option	V	V	V			

42 Iatmul marks Configuration only on the verb. Directionality can be optionally marked on the noun with a suffix, where there is syncretism either between all three spatial relations (= Option V) or between Place and Goal, while Source can employ a distinct morpheme (= Option II).

Table 25: Japanese [Japonic] (Hasegawa 2015; Tanimori 1994).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X *ni* X *de*	X *no naka ni* X *no naka de*	X *no ue ni* X *no ue de*	X *no ushiro ni* X *no ushiro de*	X *no mae ni* X *no mae de*	X *no shita ni* X *no shita de*
Goal	X *ni* X *e*	X *no naka ni* X *no naka e*	X *no ue ni* X *no ue e*	X *no ushiro ni* X *no ushiro e*	X *no mae ni* X *no mae e*	X *no shita ni* X *no shita e*
Source	X *kara*	X *no naka kara*	X *no ue kara*	X *no ushiro kara*	X *no mae kara*	X *no shita kara*
Option	I / II	I / II	I / II	I / II	I / II	I / II

Table 26: Kalamang [West Bomerai] (Visser 2022).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X=*ko*	X*(-)ne=ko* X *nerun=ko*	NA	NA	NA	NA
Goal	X=*ka* X=*ko*	X*(-)ne=ko* X *nerun=ko*				
Source	X=*ka*	X*-ne=ka* X *nerun=ka*				
Option	II / III	II				

Table 27: Kolyma Yukaghir [Yukaghir] (Maslova 2003).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X*-ge*	X *molho*	X *budie*	NA	NA	X *āl*
Goal	X*-ge* X*-ŋin* X *laŋi(n)*	X *molho-n*	X *budie-n*			X *ā-n*
Source	X*-get*	X *molho-t*	X *budie-t*			X *ā-t*
Option	I / II	I	I			I

Table 28: Kombio [Torricelli] (Henry 1992).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X Ø	X (*pmin*)	X (*keipm*)	NA	NA	X (*tapm*)
Goal	X Ø	X (*pmin*)	X (*keipm*)			X (*tapm*)
Source	X Ø	X (*pmin*)	X (*keipm*)			X (*tapm*)
Option	V	V	V			V

Table 29: Koromfé [Atlantic-Congo] (Rennison 1997).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X *nɛ*	X *joro*	X *dɔba*	X *bɛllɛ*	X *jɪka nɛ*	X *hogo*
Goal	X *nɛ*	X *joro*	X *dɔba*	X *bɛllɛ*	X *jɪka nɛ*	X *hogo*
Source	X *nɛ*	X *joro*	X *dɔba*	X *bɛllɛ*	X *jɪka nɛ*	X *hogo*
Option	V	V	V	V	V	V

Table 30: Mehek [Sepik] (Hatfield 2016).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X=*k*	X *siki=k*	X *ili=k*			X *nuw=k*
Goal	X *yoko*	X *siki yoko*	X *ili yoko*	NA	NA	X *nuw yoko*
Source	X *fenda*	X *siki fenda*	X *ili fenda*			X *nuw fenda*
Option	I	I	I			I

Table 31: Modern Eastern Armenian [Indo-European, Armenian] (Dum-Tragut 2009; Ani Karapetyan, p.c.).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*i* X-*um*	X-*i meĵ*	X-*i vra*		X-*i dimac'*	X-*i tak*
Goal	X Ø	X-*i meĵ*	X-*i vra*	NA	X-*i dimac'*	X-*i tak*
Source	X-*ic'* X-*yic'*	X-*i meĵ-ic'*	X-*i vraj-ic'*		X-*i dimac'-ic'*	X-*i tak-ic'*
Option	I	II	II		II	II

Table 32: Reta [Alor-Pantar] (Willemsen 2001).[43]

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	∅	∅	∅			
Goal	∅	∅	∅	NA	NA	NA
Source	∅	∅	∅			
Option	V	V	V			

43 "In Reta such modifiers are all verbal in the sense that they comprise sequences of fully lexical verbal predicates – e.g. oblique participants such as comitatives and allatives are introduced by bivalent verbs, specifications of manner, quality and speed are expressed by means of stative and dynamic verbs in lieu of manner adverbs, etc" (Willemsen 2001: 331).

Table 33: Sandawe [Isolate] (Eaton 2010).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*ts'ì*	X-*tà*	NA	NA	NA	NA
Goal	X-*nà*	X-*tà-nà*				
Source	X-*tʃè*	X-*tà-tʃè*				
Option	I	I				

Table 34: Shipibo-Konibo [Panoan] (Valenzuela 2003).[44]

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*n(ko)* X-*ain* X-*ainko*	X *meran* X *chichó*	X *manaon*	X *pekáo*	X *bebon*	X *naman*
Goal	X-*n(ko)* X-*ain* X-*ainko*	X *meran* X *chichó*	X *manaon*	*X *pekáo*	*X *bebon*	*X *naman*
Source	X-*nkonia* X-*ainoa* X-*ainkoania* X-*mea* X-*kea*	X *mera-mea* X *meran-oa* X *chicho-kea*	X *manaon-kea*	*X *pekao-kea*	*X *bebo-mea*	*X *nama-mea*
Option	II	II	II	II	II	II

Table 35: Shoshoni [Uto-Aztecan] (Shaul 2012).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X *ma*	X *gupaN* X *gupandeN*	X *ba'aN* X *ba'andeN*	X *gewayaH*	X *mamanai*	X *dukaN* X *dukandeN*
Goal	X *garu*	X *gupai* X *gupandi*	X *ba'ai* X *ba'andi*	X *gewayaH*	X *mamanai*	X *dukai* X *dukandeN*
Source	X *nai*	X *gupai* X *gupandi*	X *ba'ai* X *ba'andi*	X *gewayaH*	X *mamanai*	X *dukai* X *dukandeN*
Option	I	III	III	V	V	III

44 The forms marked by an asterisk are reconstructed based on Valenzuela (2003: 228, 231).

Table 36: Tabasaran [Nakh-Daghestanian] (Babaliyeva 2023).

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place		X-*f*	X-*ʿil*	X-*ḵ*		X-*k*
Goal	NA	X-*f-na*	X-*ʿil-na*	X-*ḵ-na*	NA	X-*k-na*
Source		X-*f-an*	X-*ʿil-an*	X-*ḵ-an*		X-*k-an*
Option		I	I	I		I

Table 37: Yuwaalaraay [Pama-Nyungan] (Giacon 2014).[45]

SR	GL	INSIDE	ON	BEHIND	IN FRONT OF	UNDER
Place	X-*da*	X-*da mudhuu-ga*	X-*da gaburran-da*	X-*da bawa-ga*	X-*da bani-dja*	X-*da ganhaga-dha*
Goal	X-*gu*	X-*gu mudhuu-gu*	X-*gu gaburran-gu*	X-*gu bawa-guu*	X-*gu bani-guu*	X-*gu ganhaga-y*
Source	X-*dji*	X-*dji mudhuu-dhi*	X-*dji gaburran-di*	X-*dji bawa-di*	X-*dji bani-dji*	X-*dji ganhada-dhi*
Option	I	I	I	I	I	I

45 Yuwaalaraay shows a big variety in non-core uses of the locative cases that are mostly driven lexically, as can be seen in example (6). We cannot account for all individual verbs where, for example, the ablative case construction is used for a Goal function or else. Also, verbs that carry configurational meaning do not need to use relational nouns, they then only mark Directionality (Giacon 2014: 45). As we did not focus on verbs, this is left out of our analysis.

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