Semantic Maps or Coding Maps?
Towards a unified account of the coding degree, coding complexity and coding distance of coordination relations*

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Abstract
The aim of this paper is to explore the degree to which semantic maps and conceptual spaces may comprehensively describe the cross-linguistic variation, by discussing the types of phenomena that may be consistently represented in a unified account. By analyzing the cross-linguistic coding of coordination relations, it will be argued that the degree to which every conceptual situation is explicitly coded by means of dedicated markers and the cross-linguistic possibility that two conceptual situations are coded by means of the same construction (*coding degree*) are not the only dimensions of cross-linguistic variation that may be described on a semantic map. On the contrary, it is possible to build a unified *coding map* accounting also for the presence and morphophonological complexity of overt markers coding the conceptual situations at issue (*coding complexity*). The integration of this representation with the Multi-Dimensional Scaling (MDS) technique will provide a representation for a further dimension of variation, namely the frequency with which two conceptual situations are coded by means of the same marker across languages (*coding distance*). The coding map and the MDS map will be argued to be compatible and complementary, thus highlighting the possibility to build a unified representation of the coding degree, coding distance, and coding complexity of coordination relations.

1. Introduction

1.2. *Aim and sample*

The aim of this paper is to explore the degree to which semantic maps may comprehensively describe the cross-linguistic variation and to examine what types of phenomena may be consistently represented in a semantic map. This theoretical and methodological issue will be discussed with reference to the specific case of coordination relations, so that the cross-linguistic coding of combination (1), contrast (2) and alternative (3) between states of affairs[1] (henceforth SoAs) will exemplify the general arguments.

(1) *The summer ends **and** everybody goes back to work.*
(2) *The summer ends **but** many people are still on holiday.*
(3) *Are you coming to the cinema tonight **or** do you relax at home?*

Traditional semantic maps are used to describe the multifunctionality patterns of grammatical constructions, by linking the different values that a single form may have in a structured network of functions (see Haspelmath 2003; Malchukov 2004). The basic idea of a semantic map is to highlight the fact that a multifunctional form does not express random meanings, but these meanings are organized in an orderly way. Namely, multifunctional forms are used for functions that are contiguous on the semantic map. Based on the iconic principle that recurrent similarity in form reflects similarity in meaning (Haiman 1985: 26), this contiguity is taken to be an indicator of the functional proximity between the given functions.

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[1] By state of affairs will be meant here the concept of something that can be the case in some world, and can be evaluated in terms of its existence (Siewierska 1991). The term 'state of affairs' will be understood as a hyperonym for the words 'situation', 'event', 'process' and 'action' (see Van Valin 2006: 82-89 for detailed definitions).

Croft (2003: 144-52) makes a distinction between *semantic map,* which represents the multifunctionality of a given construction in a given language, and *conceptual space*, the overall representation of which conceptual situations may be expressed by the same construction across languages. In this work, the labels 'semantic map' and 'conceptual space' will be used according to Croft's assessment. The organization of the functions on a conceptual space represents universal relations among constructions coding these functions, thus allowing for the identification of restrictions on the cross-linguistic variation.

In this paper the following question will be addressed: are semantic maps and conceptual spaces restricted to the representation of recurrent multifunctionality or could they be structured in such a way that further cross-linguistic predictions can be made? In other words, the problem at issue is whether the motivations underlying regular multifunctionality patterns are the same principles at work in the regular cross-linguistic variation of other morphosyntactic phenomena, like the presence vs. absence of overt markers and their morphophonological complexity. If the functional motivations underlying semantic maps and certain implicational hierarchies are proved to be homogeneous, it should be possible to organize functions on a conceptual space in such a way that their respective location constrains not only the possible multifunctionality patterns, but also the possible cross-linguistic variation of other morphosyntactic phenomena.

In this work, such a unified representation will be proposed for the cross-linguistic coding of coordination relations and the label '*coding map*' will be introduced to indicate this more complex descriptive model. The typological research on coordination is based on a convenience sample of 74 languages,[2] 37 European languages (EUROPEAN sample) and 37 from the rest of the world (COMPARISON sample), examined by means of descriptive grammars and questionnaires filled out by native speakers (see Mauri, 2008b).[3]

The discussion will be organized as follows. First, the relevant definitions and the parameters of analysis will be explained (section 1.2). In section 2, the implicational patterns of variation attested in the coding of the interclausal relations of combination, contrast and alternative will be examined, together with the functional motivations underlying them. In section 3, the elaboration of the unified coding map of coordination relations will be described (section 3.1) and the Multi-Dimensional Scaling technique (MDS, cf. Cysouw 2007; Wälchli 2007) will be used to integrate the map with a further dimension, i.e. the frequency with which each couple of relations is coded by means of the same overt marker (section 3.2). In section 4 some conclusive remarks on the theoretical and methodological implications of this integrated model will be discussed.

1.2. *Definitions and parameters of analysis: coordination relations under exam*

A coordination relation between two SoAs is defined as a relation established between functionally equivalent SoAs, that is, SoAs which have the (*i*) same semantic function (cf. Haspelmath 2004a: 34), (*ii*) autonomous cognitive profiles (neither is presented in the perspective of the other, cf. Langacker 1987: 484), and (*iii*) are both coded by utterances characterized by the presence of some

[2] EUROPEAN SAMPLE: Albanian, Basque, Belorussian, Bulgarian, Catalan, Chechen, Czech, Danish, Dargi, Dutch, English, Estonian, Finnish, French, Georgian, German, Greek, Hungarian, Icelandic, Irish, Italian, Latvian, Lezgian, Lithuanian, Luxembourguish, Maltese, Norwegian, Polish, Portuguese, Romanian, Russian, Sardinian, Serbo-Croatian, Spanish, Swedish, Turkish, Ukrainian. COMPARISON SAMPLE: Arabic, Dumi, Hakha Lai, Harar Oromo, Hausa, Hdi, Hebrew, Hocak, Iraqw, Jamul Tiipay, Japanese, Kisi, Kolyma Yukaghir, Korean, Koromfe, Lango, Limbu, Malayalam, Mangarayi, Maori, Marathi, Maricopa, Meithei, Mosetén, Nànáfwê, Ndyuka, Persian, Rapanui, Somali, Supyire, Tauya, Tukang Besi, Tuvaluan, Upper Kuskokwim Athabaskan, Vietnamese, Warì, West Greenlandic.

[3] The strong bias on Europe is motivated by the fact that this study was conducted within a project on Europe and the Mediterranean from a linguistic point of view, within which European languages have been compared with non-European ones in order to highlight possible areal phenomena (see Mauri 2007). Furthermore, much attention in this research is devoted to the degree to which the various coordination relations are overtly coded by means of dedicated markers. As Kortmann (1997: 46) points out, overt means of linking states of affairs are typical of the written language. Hence, written languages show a wider, or at least a stable range of markers specifying different conceptual relations among states of affairs. European languages constitute a high proportion of the languages that have a developed written register and a long literary tradition and thus constitute a favored sample for a research on overt inter-clausal markers.

illocutionary force (cf. Verstraete 2005: 613; Cristofaro 2003: 30). A given construction is thus defined as coordinating when it is used to establish a coordination relation, independently of its morphosyntactic properties (see Mauri, 2008b for a detailed discussion).

The three coordination relations under exam are *combination*, *contrast* and *alternative*. Each of these relations may in turn be further classified into more specific subtypes. Based on the location of the SoAs on the temporal axis (see example (4)), combination may be SEQUENTIAL, if the SoAs are located at successive points along the time axis, SIMULTANEOUS, if the SoAs are located at the same point on the time axis, or ATEMPORAL, if the location of the SoAs is outside the temporal axis or is simply irrelevant (the SoAs may be either sequential or simultaneous without affecting the relation itself, cf. discussion in Lakoff 1971: 115-129; Longacre 1985: 241-244).

(4)	SEQUENTIAL COMBINATION:	'*I opened the door and went away.*'
	SIMULTANEOUS COMBINATION:	'*He is dancing and clapping his hands.*'
	ATEMPORAL COMBINATION:	'*Doctors are rich and lawyers marry pretty girls.*'

Any contrast relation implies a conflict, and depending on the origin of the conflict, the relation may be classified as oppositive, corrective or counterexpectative (see example (5)). An OPPOSITIVE contrast is generated by the comparison of two somewhat opposite and symmetric SoAs (cf. Haspelmath 2007). A CORRECTIVE contrast is determined by the denial of the first SoA and its substitution with the second one. Finally, a COUNTEREXPECTATIVE contrast is characterized by the denial of some expectation, either generated by the first SoA or by the context (cf. Scorretti 1988; Lang 2000: 245-246).

(5)	OPPOSITIVE CONTRAST:	'*I bought a pair of shoes whereas Sue found a skirt.*'
	CORRECTIVE CONTRAST:	'*He did not run upon the hill, but simply walked slowly and lazily following the rest of the group.*'
	COUNTEREXPECTATIVE CONTRAST:	'*John is tall but he is not good at basketball.*'

Finally, any alternative relation implies a choice at a certain point, but this choice needs not be immediate. The aim with which an alternative relation is established distinguishes between choice-aimed and simple alternative (see example (6)). If the relation is established in order to define a set of options *without* the explicit request for a choice, it is called SIMPLE alternative. On the other hand, if it is established *in order to* ask for an immediate choice, it is called CHOICE-AIMED alternative (cf. Haspelmath 2007; Mauri 2008a).

(6)	CHOICE-AIMED ALTERNATIVE:	'*Usually, I watch TV or a I read until late at night.*'
	SIMPLE ALTERNATIVE:	'*Do you come with us or do you stay here?*'

The cross-linguistic coding of the aforementioned relations may be studied with respect to a number of different aspects, such as the syntactic parallelism of the construction (cf. Johannessen 1998, Mauri 2008b) or the presence of ellipsis phenomena (see van Oirsow 1987). For the aim of this paper, however, the only parameters under exam are those concerning *whether* and *how* the specific relation is coded. In other words, we will compare the means by which the various coordination relations are overtly indicated, i.e. coded, across languages.

First of all, the *coding complexity* is examined. Two questions are at issue here: (*i*) the presence of an overt coordinating marker (distinguishing between asyndetic (7a) vs. syndetic (7b) constructions) and, in case a marker is present, (*ii*) its morphophonological complexity.

(7) Chechen, Nakho -Daghestanian, Caucasic (Jeschull 2004: 252-253)

(a)	*Mox*	*c'iiza*	*byylira*	*darc*	*hwovziira*
	wind	howl.INF	start.WP	blizzard	turn.around.WP

'The wind started to howl and the blizzard turned around'

→ ASYNDETIC CONSTRUCTION

(b) [. . .] *peetar-ie* *juxa-vaxaniehw* *chai* *'a* *mer* *dara,* *byysa*
inn-ALL back-go.PAST.COND tea COORD drink.FUT be.IMPF night
'a *joaqq-ur* *jara [. . .]*
COORD spend-FUT be.IMPF
'[. . .] if we had returned to the inn, we could have drunk tea and spent the night [. . .]' [4]
→ SYNDETIC CONSTRUCTION

The morphophonological complexity of the attested markers is measured on the basis of the following parameters: syntactic bondedness, number of syllables and number of morphemes, distinguishing respectively between free vs. bound marker, mono- vs. poly-syllabic marker; mono- vs. poly-morphemic marker. As exemplified in Table 1, the complexity of every marker consists of the sum of these parameters.

		Free	**Polysyllabic**	**Polymorphemic**
Hebrew	*–ve*	--	--	--
Italian	*o*	+	--	--
German	*sondern*	+	+	--
French	*tandis que*	+	+	+

Table 1. *Morphophonological complexity of the attested coordinating markers*. + = presence of the given feature; – = absence of the given feature.

Secondly, the *coding degree* of each relation is taken into account. The coding degree is determined by (*i*) the degree to which every coordination relation is explicitly coded by means of dedicated markers (as opposed to a non-dedicated ones), and (*ii*) the degree to which different coordination relations are likely to be coded by means of the same construction across languages. Along a form-to-function direction of analysis, the counterpart of the coding degree is the *semantic domain*, that is, the set of coordination relations that may be expressed by each construction. The semantic domain is what is traditionally considered in the construction of a conceptual space, because it identifies multifunctional (general) and monofunctional (dedicated) markers and allows to describe the attested polysemy patterns.

Example (8) from Somali exemplifies the use of two dedicated markers, one for the simple alternative (8a) and the other for the choice-aimed alternative (8b). The English translations in (8), on the other hand, show the use of the same general marker *or*, whose semantic domain includes both simple and choice-aimed alternative relations.

(8) Somali, Cushitic, Afro-Asiatic
(a) *Amá* *wuu* *kéeni doonaa* ***amá*** *wuu* *sóo.díri* *doonaa*
COORD 3sg bring that COORD 3sg send that
'Either he will bring it **or** he will send it.' (Saeed 1993: 275)
(b) *ma* *tégaysaa* ***misé*** *waad jóogaysaa?*
INT go:2sg COORD here stay:2sg
'Are you going **or** are you staying?' (Saeed 1993: 275)

Data show a significant cross-linguistic variation both in the coding degree and in the coding complexity of coordination relations. However, this variation is not random, but is constrained by a number of implicational patterns. In the next section, the attested patterns will be described together with the functional motivations underlying them. It will be argued that the coding degree (i.e. the attested multifunctionality patterns) and the coding complexity of coordination relations (i.e. the

[4] Abbreviations that will be used in this paper: 1, 2, 3=1st, 2nd, 3rd person; ADESS=adessive; ALL=allative; COND=conditional; COORD=coordinating marker; DAT=dative; DUB=dubitative; EMPH=emphatic; FUT=future; GEN=genitive; IMPF=imperfective; IND=indicative; INF=infinitive; INT=interrogative; LOC=locative; M=masculine; NEG=negation; NOM=nominative; PAST=past; PL=plural; PERMIS=permissive; PRS=present; Q=question marker; SG=singular; TOP=topic; WP=witnessed past.

presence and morphophonological complexity of coordinating markers) may be explained with reference to the same functional principles.

2. Cross-linguistic patterns of variation: implicational hierarchies and semantic maps

2.1. *Coding complexity of coordination relations*

On the basis of the presence of an overt marker, the attested cross-linguistic variation may be described by the implicational patterns in (a) and (b) (see Mauri, 2008b for more examples and a detailed discussion of the individual languages).

(a) **The combination-contrast coding implication**:
Syndesis for sequential, simultaneous, atemporal combination, oppositive contrast, corrective contrast → *Syndesis for counterexpectative contrast.*

According to (a), in a given language the presence of an (optional) overt marker to express one of the three combination relations, oppositive and corrective contrast implies the presence of an overt marker for the expression of counterexpectative contrast, too. Table 2 exemplifies the attested language types.

	Temporal		Atemp	Opp	Correc	Count
	Seq	Sim				
Italian	+	+	+	+	+	+
Georgian	+	+	+	–/+	–/+	+
Chechen	–/+	–/+	–/+	+	+	+
Tuvaluan	–	–/+	–/+	+	+	+
Maori	–/+	–/+	–/+	–	–/+	+
Hdi	–/+	–	–	–	–	+
Limbu	–/+	–/+	–/+	–	–	–/+
Lango	–/+	–	–	–	–	–/+
Warì	–	–	–	–	–	–

Table 2. *Overt markers for combination and contrast relations: cut-off points in the combination-contrast coding implication.* + = presence of an overt marker; – = absence of an overt marker.

In (9) the Georgian asyndetic construction normally employed for correction (9a) is contrasted with the syndetic construction used to express the counterexpectative contrast (9b), where the denial of an expectation is overtly signalled by the coordinating marker *magram*.

(9) Georgian, Kartvelian, Caucasic

(a) *Petre tavis otaxši k'i ar mecadineobs, bayši tamašobs.*
Peter his room.LOC EMPH NEG study:3sg garden:LOC play:3sg
'Peter is not studying in his room, **but** he is playing in the garden.' (M.T., questionnaire)

(b) *dzalian mc'q'uria,* ***magram*** *portoxlis c'veni ar momc'ons*
very be.thirsty.1sg COORD orange:GEN juice:NOM NEG please.me:3sg
'I'm very thirsty **but** I don't like orange juice.' (M.T., questionnaire)

(b) **The combination-alternative coding implication**:
Asyndesis for simple alternative → *asyndesis for temporal and atemporal combination, asyndesis for choice-aimed alternative.*

According to (b), in a given language, if a simple alternative relation is normally expressed with an asyndetic construction, such a strategy will be available also for the expression of temporal and atemporal combination relations and for the choice-aimed alternative. In Table 3 the attested language types are shown.

	Temporal c.		Atemporal c.	Choice-aimed a.	Simple a.
	Seq	Sim			
Mangarayi	–	–	–	–	–
Warì	–/+	–/+	–	–	–
Hausa	–/+	–/+	–/+	+	+
Malayalam	–/+	–/+	–/+	–	+
Korean	+	+	+	–	+
Latvian	+	+	+	+	+

Table 3. *Overt markers for combination and alternative relations: cut-off point in the combination-alternative coding implication*. + = presence of an overt marker; – = absence of an overt marker.

In example (10), Malayalam exemplifies the coexistence in the same language of a syndetic construction for the simple alternative relation (10a), in which the overt marker *alleŋkil* is used, and an asyndetic construction for the expression of choice-aimed alternative (10b). In (10b) the choice-aimed alternative relation is inferred from the juxtaposition of two interrogative clauses.

(10) Malayalam, Tamil-Kannada, Dravidian (Asher and Kumari 1997: 140)

(a) *niŋŋaíkkə kiṯakkayil kiṯakkaam* ***alleŋkil*** *paayayil kiṯakkaam*
2sg:DAT bed:LOC lie:PERMIS COORD mat:LOC lie:PERMIS
'You can lie here **or** you can lie on the mat.'

(b) *innale raaman vann-oo vannill-ee?*
yesterday Raman come:PST-INT come:PST:NEG-INT
'Did Raman come yesterday **or** he did not come?'

Implications (a) and (b) may be explained with reference to the principle of *syntagmatic economy*, according to which what is already inferable from the context needs no further specification (cf. Haiman 1985: 159). The coding of the various types of combination, contrast and alternative is connected to the degree to which every relation can be inferred from the context. Specifically, the more a relation is easy to infer, the less it needs to be overtly marked.

Let us now start by implication (a): combination relations, opposition and correction are more easily inferable than counterexpectative contrast and are thus more likely to be expressed without any overt marker. On the one hand, in order to infer a combination relation, the hearer is simply required to identify the two SoAs as cooccurring within a common frame, without any further specification regarding the nature of the cooccurrence. On the other hand, in order to infer a contrast relation, the hearer is required to identify a conflict between the SoAs. However, certain types of conflict are more easily inferable than others.

Opposition and correction are both characterized by a conflict inherent in the semantics of the linked SoAs, which can be easily inferred even without an explicit marker. In the case of opposition, the conflict depends on the somehow antonymic relation existing between the two SoAs, which are presented as opposite facets of the same scene (11). In the case of correction, the conflict is determined by the opposite polarity of the two clauses: the first SoA is overtly negated, while the second SoA is positively asserted as a substitute of the first one (12).[5]

(11) *(Tomorrow we have a conference...) I am working, you are relaxing in front of the TV!*
(12) *He did not come here to visit London; he came for a conference.*

Counterexpectative contrast, on the other hand, is less easy to infer from the simple juxtaposition of two SoAs. In this case the conflict is not inherent in the semantics of two antithetic SoAs, but

[5] It must be remarked that the use of a juxtapositive strategy for the expression of correction is widespread across languages at the spoken level. However, juxtaposition is often limited to the colloquial level and both in written and in spoken language the use of overt markers is preferred (cf. Italian, French, English, German among others).

originates from a contradiction between the semantics of one SoA and some expectation activated by the other SoA or by the context of communication, identified through an inferential process.

If the SoAs are simply juxtaposed as in (13), even if the speaker's intention is to establish a counterexpectative contrast between the SoAs, the hearer may happen to establish a relation between the SoAs as such and this relation may involve no conflict at all (cf. the sequential interpretation in (13a)).

(13) *The UN forces have arrived to Lebanon, ten civilians died this morning.*
(a) [*The UN forces have arrived to Lebanon* (AND) *ten civilians died this morning*].
(b) [*The UN forces have arrived to Lebanon* (BUT) *ten civilians died this morning*].

The interaction between the degree of inferrability and syntagmatic economy also explains implication (b). The reason why combination relations are easy to infer has been already stated and depends on the very basic nature of the relation. On the other hand, the reason why a choice-aimed alternative is easier to infer than a simple alternative is that the former always occurs in interrogative sentences while the latter is commonly established in declarative sentences, and an alternative is more easily inferred from the juxtaposition of two interrogative clauses, than from the juxtaposition of two declarative clauses. When two SoAs that stand in a semantic contrast are juxtaposed in a declarative sentence this may easily be for reasons other than the existence of an alternative relation between the two (e.g. a relation of sequentiality or simultaneity, assuming the co-occurrence of the SoAs, cf. (11), (12) and (13)). On the other hand, if the SoAs are encoded by two juxtaposed interrogative clauses, this means that they are questioned and the speaker does not know if they actually occur. Since they are not presented as actually occurring, the reason for presenting the two SoAs together will hardly be that they are linked in a relation of temporal/causal sequentiality. Consequently, they will be most easily interpreted as alternatives (see Mauri 2008a for a detailed discussion).

On the basis of the morphophonological complexity of the attested coordinating markers, the cross-linguistic variation may be described by the implicational patterns in (c) and (d).

(c) **The combination-contrast coding complexity hierarchy**:
Dedicated and general marker for combination relations > general marker expressing contrast relations > dedicated marker for a contrast relation.

The hierarchy in (c) states that dedicated markers encoding a specific contrast relation (counterexpectative, oppositive or corrective contrast) are at least as complex as the general markers used for contrast relations (but no combination relation), i.e. markers employed for corrective and counterexpectative contrast, such as English *but* or French *mais*. These general contrast markers are in turn at least as complex as dedicated and general markers used to express at least one combination relation. Some examples are shown in Table 4.

	DEDICATED SEQUENTIAL	GENERAL ALSO FOR COMBIN.		GENERAL ONLY FOR CONTRAST		DEDICATED COUNTER.	DEDICATED CORR.	DEDICATED OPPOS.
Finnish	–	ja	>	–	>	mutta	vaan	–
Georgian	–	da	>	–	>	magram	–	k'i
Italian	–	e	>	ma	>	però	bensì	mentre
Albanian	–	e/dhe	>	por	>	–	–	kurse
French	–	et	>	mais	>	–	–	tandis que
S-Croatian	pa	i, a	>	–	>	ali	nego/ve´c	–
Chechen	–	'a, tq'a	>	–	>	amma	–	–
Maori	aa	hoki	>	engari	>	–	–	–
Supyire	kà	sì	>	–	>	\`ïkàà	–	–

Table 4: *The combination-contrast coding complexity hierarchy: attested complexity patterns.* – = absence of the given marker.

(d) **The combination-alternative coding complexity implication**:
Marker used for at least one alternative relation → marker used for at least one combination relation.

The implication in (d) states that overt markers used to express alternative relations, either general or dedicated, are at least as morphophonologically complex as the markers used to express at least one combination relation. Table 5 presents some examples of the attested complexity patterns.

	DEDICATED SEQUENTIAL	GENERAL ALSO FOR COMBIN.		GENERAL ONLY FOR ALTERNATIVE	DEDICATED CHOICE-AIMED ALT	DEDICATED SIMPLE ALT
German	–	und	>	oder	–	–
Basque	–	eta	>	edu	ala	–
Hausa	–	kuma	>	kokuma	–	–
W.Greenlandic	–	=lu	>	imaluunniit,	–	–
S-Croatian	pa	i, a	>	ili	–	–
Polish	–	i, a	>	–	czy	lub/albo
Supyire	kà	sì	>	–	làa	yô

Table 5: *The combination-alternative coding complexity hierarchy: attested complexity patterns*. – = absence of the given marker.

Implications (c) and (d) may be explained on the basis of the economic principle of *form-function asymmetry*, according to which the more general a connective is (i.e. the more relations it may express), the lower is its degree of morphophonological complexity (cf. Kortmann 1997: 123-36). The principle at work is Zipf's Law of Abbreviation of Words, which is in turn a manifestation of the more general principle of syntagmatic economy. As Zipf (1949: 66-133) argues, the frequency of use of a linguistic expression correlates *inversely* with its formal complexity, *directly* with its semantic versatility, *directly* with the number of contexts in which it may occur and *directly* with its age (cf. Kortmann 1997: 127-128).

On the one hand, frequency of use is a consequence of multifunctionality. The higher is the number of relations a marker may express (i.e. the more general it is), the higher is the number of contexts where it may occur and, consequently, the more frequent it will be in discourse. Its phonological substance will thus be eroded, leading to morpho-phonologically simple forms. Therefore general markers, expressing more than one coordination relation, tend to be structurally simpler than dedicated ones (cf. implication (c)).

On the other hand, frequency in discourse may also be the consequence of a basic semantics. The more basic and semantically unspecified a conceptual relation is, the more it tends to correlate with high frequency of use. Since combination is the simplest coordination relation, it is the most frequently attested in discourse (Ohori 2004: 61), and this is why markers used to express at least one combination relation, either general or dedicated, tend to be simpler than markers used to express contrast and alternative (cf. implications (c) and (d)).

The cross-linguistic variation described in (a)-(d) highlights three main phenomena: (*i*) counterexpectative contrast and simple alternative relations are less easy to infer from simple juxtaposition and therefore are more likely to be coded by means of overt markers (cf. implications (a) and (b)); (*ii*) combination markers, which express the most basic and unspecified relations, are structurally simpler than both contrast and alternative markers (cf. implications (c) and (d)); (*iii*) general markers, expressing more than one coordination relation, are structurally simpler than dedicated ones (cf. implication (c)).

To conclude, the coding complexity of coordination relations is directly influenced by the interaction of syntagmatic economy with the degree of semantic specificity and inferrability of the relation.

2.2. *Coding degree of coordination relations*: *semantic maps (the traditional way)*

Let us now examine the coding degree of coordination relations. On the basis of the attested semantic domains, it is possible to separately compare combination with contrast and alternative.

Combination and contrast markers show recurrent overlapping polysemy patterns across languages, pointing to the linear combination-contrast conceptual space exemplified in Fig.1. On the top of Fig.1, the order in which the different relations follow each other on the conceptual space is represented. Below, some of the attested semantic domains are shown. Every marker occurs inside a box, whose extension covers all the relations on the conceptual space that may be expressed by the given marker. For instance, the box of the marker *kae* in Fig.1 spans over simultaneous and atemporal combination, oppositive, corrective and counterexpectative contrast. The whole of these relations constitutes the semantic domain of the general Tuvaluan marker *kae*.

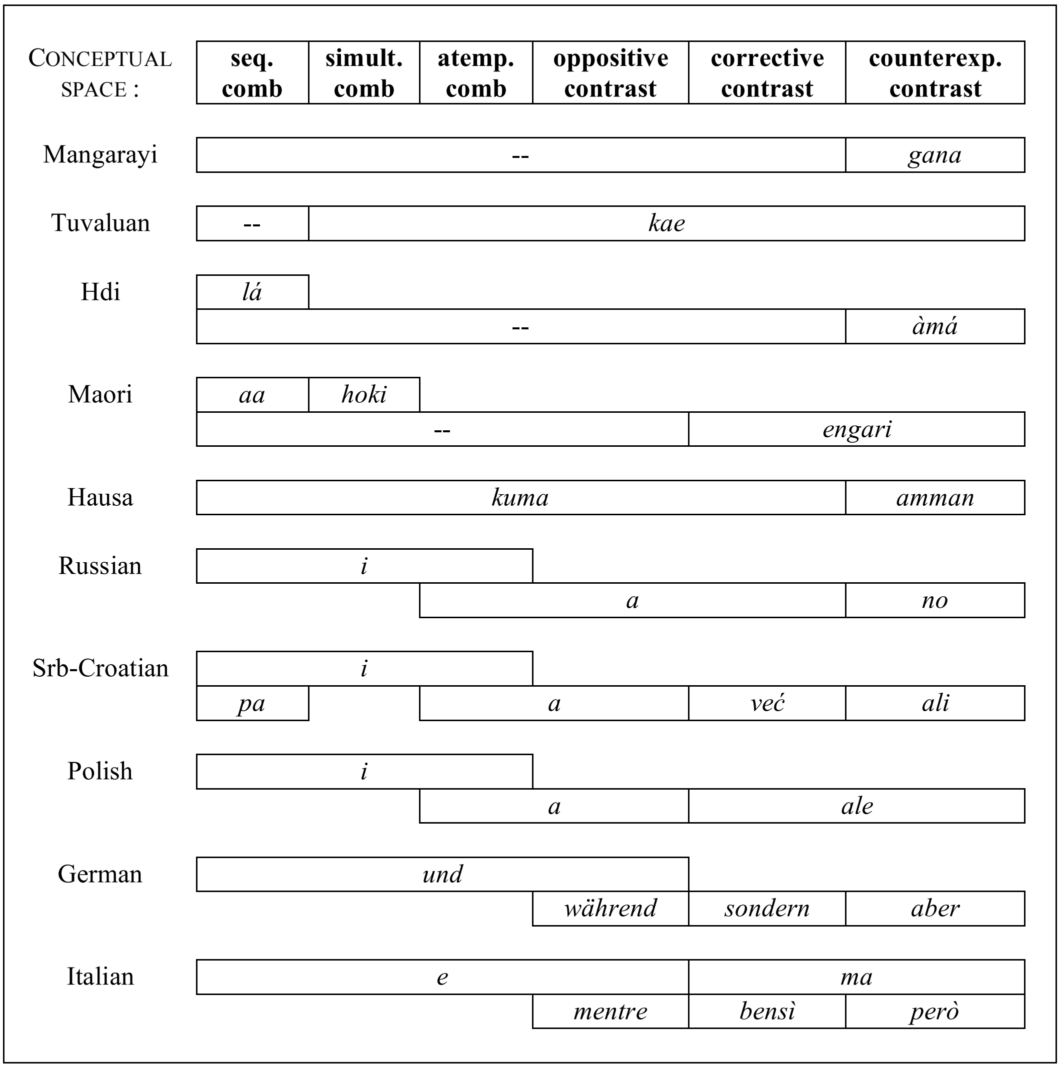

Fig.1: *Combination-contrast conceptual space and individual semantic maps.* – = no overt marker.

What a conceptual space is able to show is the degree to which certain conceptual situations are likely to be coded by means of the same strategy across languages, and this is mirrored by the respective location of the conceptual situations on the space. The underlying semantic maps, on the other hand, show the degree to which every conceptual situation is explicitly coded by means of a dedicated marker (as opposed to a multifunctional one) in a given language. Fig.1 thus provides a unified picture of the coding degree of combination and contrast relations. If a coordinating marker is used to express more than one combination or contrast relation, it will convey relations that are contiguous on the conceptual space. Therefore, if a general marker is used to express relations that do not stand next to each other on the space, it will also be able to express the relations located in between.

A slightly different semantic map is proposed by Malchukov (2004: 178), within a general cross-linguistic analysis of the recurrent polysemy patterns shown by coordinating connectives. The set of relations examined by Malchukov is wider than the one considered in this study, and encompasses mirative, concessive and comitative relations, which have not been taken into account in this research. Restricting the comparison between Malchukov's map and the map proposed in Fig.1 to the relations they have in common, a major difference must be remarked, namely the position of corrective contrast with respect to oppositive and counterexpectative contrast. On the one hand, in both maps the oppositive relation is located between combination and counterexpectative contrast. On the other hand, however, in the combination-contrast conceptual space proposed in the present study, corrective contrast is placed between the oppositive and the counterexpectative relation, while in Malchukov's map it is only linked to opposition, thus leaving oppositive and counterexpectative contrast next to each other (Malchukov 2004: 178).

The difference between Malchukov's assessment and the combination-contrast conceptual space proposed in Fig.1 is a direct consequence of Malchukov's different treatment of sentences like (14a). In this work, following Lang (2000), such sentences are regarded as examples of counterexpectative contrast relations, in which the denied expectation lies in the context (i.e. a shared expectation that Paul and Mike are both rich). Opposition has instead been defined as a symmetric contraposition of two somehow antonymic situations, without the negation of any expectation (usually conveyed by markers such as *while/whereas*, as in (14b)).

(14) (a) *Paul is rich but Mike is poor.* (CONTEXT: As for Paul and Mike, are they both rich?)
(b) *Paul is rich whereas Mike is poor.* (CONTEXT: As for Paul and Mike, what is their income?)

Malchukov (2004: 179-84), on the other hand, regards sentences like (14a) as instances of oppositive contrast, following Lakoff's (Lakoff 1971) definition of 'semantic opposition'. Therefore, in his account of contrast markers, the English connective *but* is examined as expressing denial of an expectation, correction and also opposition. In particular, he states that this marker is able to express counterexpectative and corrective contrast, which are distant on the map he proposes, insofar as it may be also used to express opposition, which is located between the corrective and the counterexpectative contrast (Malchukov 2004: 184, 193; for a detailed comparison of the two assessments see Mauri 2008b: 203-206).

A detailed discussion of the reasons underlying the respective order in which the relations are located on the conceptual space in Fig. 1 is provided in Mauri (2008b: chapters 4 and 6). It suffices here to point out that the closeness of two relations on the space is due to their functional proximity. The functional proximity of two relations depends (*i*) on whether they share some conceptual features, (*ii*) on the frequency with which they are associated in discourse and (*iii*) on the degree to which they can be easily inferred from each other.

For instance, simultaneous and atemporal combination are functionally close because they both denote a non-conflicting cooccurrence of two SoAs that do not have a reciprocal order. As a consequence, simultaneous and atemporal combination are often associated in discourse and contraposed to sequential combination. The functional proximity of atemporal combination and opposition is due to the symmetric structure that the two relations share and, most importantly, to the fact that opposition is often inferred from an atemporal combination (see Mauri 2008b and below). Opposition and correction share the presence of a conflict generated by the antonymic semantics of the linked SoAs (cf. discussion in section 2.1). Finally, the corrective and the counterexpectative contrast are functionally close because they share the presence of an expectation to deny. A corrective relation is established between two SoAs when the first one has been previously asserted in the context of communication or if there is a shared expectation for it to be true. The corrective relation thus consists of the explicit denial of that expectation, with the substitution of the wrong SoA with the correct one. On the other hand, in the counterexpectative contrast the expectation is implicit in the sentence itself or in the context.

Relations that are contiguous on the conceptual space may be further specifications one of the other. For instance, the two relations of atemporal combination and opposition only differ with respect to the degree of attention paid to the differences existing between the linked SoAs. This in turn depends on whether emphasis is placed on the cooccurrence of the SoAs as such (leading to a combination reading) or on the specification of this cooccurrence as a conflicting one. In general, any contrast relation implies that the SoAs are first of all combined and that this combination is further specified as somehow conflicting.

Let us now compare the coding degree of combination and alternative relations. Combination and alternative tend to be coded by means of completely different markers, thus showing a reduced semantic overlap. This is basically due to the fact that the two relations differ under a fundamental respect. Combination and contrast relations imply the cooccurrence of two SoAs,[6] while an alternative relation implies the *non*-cooccurrence of the linked SoAs, which are instead presented as replaceable possibilities. Therefore combination and alternative relations are functionally very distant from each other.

Yet, in languages with no overt equivalent to *or*, combination and alternative are expressed by means of the same construction, namely alternative is systematically conveyed through the combination of possibilities. In such cases, the potential (rather than actual) status of each combined SoA is obligatorily marked by means of some irrealis markers (like the conditional marker *mo* in (15a) or the dubitative adverb *am'* 'perhaps' in (15b)).

(15) Wari', Chapacura-Wanam (Everett and Kern 1997: 162)

(a) *mo ta pa' ta' hwam ca, mo ta pa'*
COND realis.future kill 1sg:realis.future fish 3sg.M COND realis.future kill
ta' carawa ca
1sg:realis.future animal 3sg. M
'Either he will fish or he will hunt.' (lit. 'if he (says) "I will kill fish", if he (says) "I will kill animals".')

(b) *'am 'e' ca 'am mi' pin ca*
perhaps live 3sg. M perhaps give complete 3sg. M
'Either he will live or he will die.' (lit.'perhaps he will live, perhaps he will die')

In other words, in order for an alternative relation to be conveyed, either a connective coding the alternative relation or some overt irrealis marker is necessary (see Mauri 2008a for further discussion). If no overt connective of alternative is used, each SoA must display an irrealis marker and is therefore presented as possible, rather than occurring or realized, and the relation of alternative is inferred from the combination of two irrealis SoAs.

To sum up, the motivations underlying the degree to which the different coordination relations are likely to be coded by means of the same construction are to be looked for in the functional proximity of the various relations. The more conceptual features two relations share, the more frequently they will be associated in discourse and the more easily they will be inferred from each other. This has been argued to have diachronic implications. As pointed out by Croft et al. (1987), if a given construction acquires a new function, it will not randomly jump to a distant meaning but will extend gradually, including the closest functions on the conceptual space first.[7]

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[6] See Mauri (fc.: chapter 3) for a detailed discussion on the contraposition of the two dimensions of cooccurrence and non-cooccurrence, as associated respectively to combination and alternative relations.

[7] Diachronic change is in turn (uni)directional (see Lehmann 1995[1982]; Haspelmath 2004b), and this means that certain conceptual situations are likely to develop from others but the reverse is not true. This directionality may be represented in the conceptual space by linking the various conceptual elements through arrows, which show the direction of semantic change (for further discussion on the diachronic reading of conceptual spaces, see Van der Auwera and Plungian 1998; Haspelmath 2003).

To conclude, the degree of semantic specificity and reciprocal inferrability of two coordination relations is closely connected to their functional proximity. Let us now examine how the interconnections between these factors may be represented in a unified account.

3. An integrated account: from semantic to coding maps

In section 2 it has been argued that the cross-linguistic variation in the coding of coordination relations is constrained by implicational patterns, both with regard to their coding degree and to their coding complexity. Furthermore, the motivations underlying these regular patterns of variation have been proved to be homogeneous, since they basically depend on the interaction between the general principle of syntagmatic economy and the semantic properties of the various relations. In particular, the coding degree of two coordination relations depends on their functional proximity, and the coding complexity of two overt markers depends on the degree of semantic specificity and inferrability of the relations they express. These three dimensions, in turn, are closely intertwined, since the degree to which two relations are functionally close is strictly connected to how semantic specified they are, and to the degree to which they may be easily inferred from each other.

Therefore, it is possible to organize coordination relations on a conceptual space in such a way that not only their functional proximity is represented, but also the different degrees of inferrability and semantic specificity become visible. As a consequence, the phenomena that may be consistently predicted from such a conceptual space include, besides the possible multifunctionality patterns, also the presence of overt markers coding each function and their degree of morphophonological complexity.

This unified representation is not simply a *semantic* map accounting for the respective semantic organization of the relations, but it may be reasonably called a *coding map*, because it also accounts for those properties of cross-linguistic coding that specifically concern whether and how the relations are explicitly coded across languages. Let us now see how the coding map of coordination relations is realized.

3.1. *The twofold hierarchical* coding map *of coordination relations*

The semantic domains of the attested coordinating markers point to a neat *bipartition* within the coordination conceptual space, which separately relates combination to contrast and to alternative. On the one hand, the functional proximity between combination and contrast relations is higher than between combination and alternative. On the other hand, it is possible to identify in both cases polysemous constructions, even though in the expression of alternative the only polysemous constructions attested are characterized by the absence of an overt connective (but have obligatory irrealis markers, cf. (15)).

A hierarchical coding map is proposed in Fig.2, based on (*i*) the functional proximity between the various coordination relations, as manifested in the attested multifunctionality patterns, and (*ii*) on their different degrees of semantic specificity and inferrability, as manifested in the attested implicational patterns of coding complexity. The coding map is structured along two perpendicular axes of increasing semantic specificity having their origin in the combination relation.

Fig. 2 describes a number of phenomena. Fist of all, combination, contrast and alternative do not stand on the same level, but combination is semantically less specified and more basic than the other two relations, and this is why it is located near the origin of the axes. Contrast and alternative are represented as further semantic specifications of the basic relation of combination. A combination of SoAs may be specified in terms of some discontinuity (Givón 1990: 849) producing a contrast, or it may be specified in terms of the irreality of the SoAs it links, producing a set of alternative possibilities.

The *horizontal axis* is meant to show that (*i*) contrast implies some discontinuity between the linked SoAs and this in turn implies that they are first of all combined; (*ii*) the notion of alternative as such implies the combination of two irrealis SoAs, i.e. the SoAs are jointly presented as a set of possibilities (cf. example (15)), which may then be further specified as replaceable alternatives. The *vertical axis*, on the other hand, is meant to show the specifications internal to each coordination relation (i.e. the sub-types of combination, contrast and alternative at issue). The further away from both the vertical and the horizontal axis a relation is located in the figure, the more semantically specified it is, along two hypothetical diagonals going from the origin of the axes towards the bottom right and the top right corners of the figure. The more semantically specified is a relation, the less it is easy to infer from simple juxtaposition.

The coding map in Fig.2 predicts a number of phenomena. First, the order in which coordination relations occur from left to right mirrors the attested multifunctionality patterns described in section 2.2. Therefore, like traditional conceptual spaces, it predicts that if a construction is used for more than one coordination relation, it will be used for relations that are contiguous along the horizontal axis of the space (cf. section 2.2).

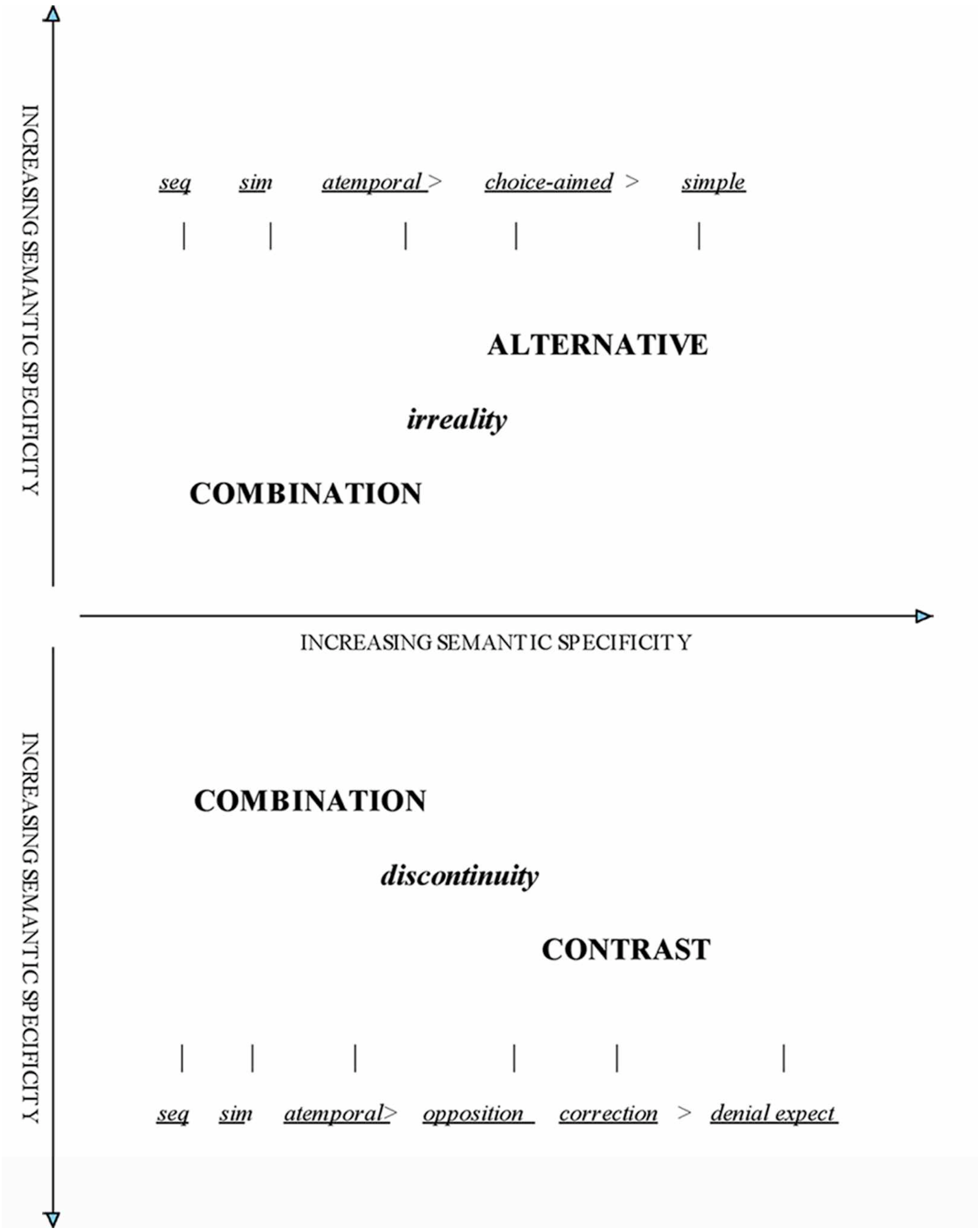

Fig.2: *The twofold hierarchical coding map of coordination relations*.

Second, based on the increasing degree of semantic specificity, Fig. 2 predicts that, other things being equal, the closer a relation is to the bottom right corner or to the top right corner of the space, the more difficult it will be to infer and, consequently, the more likely it will be expressed by means of overt markers. Conversely, the closer a relation is to the origin of the axes, the easier it will be to infer and the more likely it will be expressed by means of asyndetic constructions (cf. implications (a) and (b)).

Third, the more basic and semantically unspecified a relation is, the more it correlates with a high frequency of use, and the markers coding it tend to undergo phonological erosion. Therefore, the closer a relation is to the origin of the axes in Fig.2, the simpler will be the morphophonology of the markers coding it; the further it is from both the vertical and the horizontal axis, the more dedicated markers coding it will be complex (cf. implications (c) and (d)).

The implicational patterns of cross-linguistic variation described in 2.1 are thus predictable along the diagonals of Fig.2, and the implicational patterns of mutifunctionality described in 2.2 are predictable along the horizontal axis of coding map.[8] Conceptual spaces and semantic maps as traditionally conceived are representations of the attested polysemy patterns, and as such they represent the cross-linguistic possibility that two conceptual elements are coded by means of the same construction, i.e. their coding degree. The coding map proposed in this section integrates the representation of the functional proximity of the conceptual elements with their respective degree of semantic specificity, thus predicting the possible cross-linguistic patterns of both coding degree and coding complexity. Let us now see how this coding map may be further enriched with the representation of the *coding distance* between the various coordination relations at issue.

3.2. *Highlighting the coding distance: the experiment of a MDS visualization*

The coding map in Fig. 2 does not represent frequency, i.e. whether a given polysemy pattern occurs once, rarely or frequently in the sample. For instance, in languages with an overt marker for atemporal combination, atemporal combination and opposition may *always* be expressed by means of the same marker (i.e. every language in the sample shows at least one strategy that may be used for both relations), by virtue of their being easily inferable from each other and frequently associated in discourse. Correction and counterexpectative contrast are *frequently* expressed by means of the same overt marker, but there are a significant number of languages that convey the two relations by means of distinct markers. On the contrary, atemporal combination and choice-aimed alternative are *never* expressed by means of the same overt marker: the only strategy they may share is juxtaposition.

Yet, these differences are not visible on the coding map in Fig.2, nor are they visible on traditional conceptual spaces. A possible way to represent the frequency with which each couple of relations is coded by means of the same overt marker in the sample, is to give frequency a mathematical value and visualize it through the Multi-Dimensional Scaling technique (MDS, see Cysouw 2007; Wälchli 2007).

Before analyzing the results in Fig.3, let us briefly examine the methodology adopted in the assignment of the mathematical values. For any pair of coordination relations under exam, the constructions attested to express them in each language of the sample are compared. Given two relations *x* and *y*, the following cases are possible:

(*i*) the language uses the *same marker* **A** for *x* and *y*. In this case, the distance value is zero.

GERMAN	Choice aimed alt	Simple alternative
	oder	*oder*

[8] For some relations data did not show any particular functional asymmetry (like temporal and atemporal combination, or oppositive and corrective contrast). These relations are located one after the other on the basis of the combination-contrast conceptual space (cf. 2.2). In order to highlight the points along the horizontal axis where a coding cut-off point occurs, the symbol ">" has been used.

(*ii*) the language uses two *different markers* **A** and **B** for *x* and *y*. In this case, the distance value is 1.

FINNISH	Choice aimed alt	Simple alternative
	vai	*tai*

(*iii*) the language uses the *same marker* **A** for *x* and *y* but also shows dedicated markers for each relation (**C** for *x*, and **D** for *y*). In this case, the distance value is 0.5.

ITALIAN	Corrective cont	Counterexpect cont
	ma	*ma*
	bensì	*però*

(*iv*) the language uses the *same marker* **A** for *x* and *y* but also shows one dedicated marker for one of the two relations (e.g. **C** for *x*). In this case the distance value is 0.25.

BASQUE	Choice aimed alt	Simple alternative
	edo	*edo*
	ala	

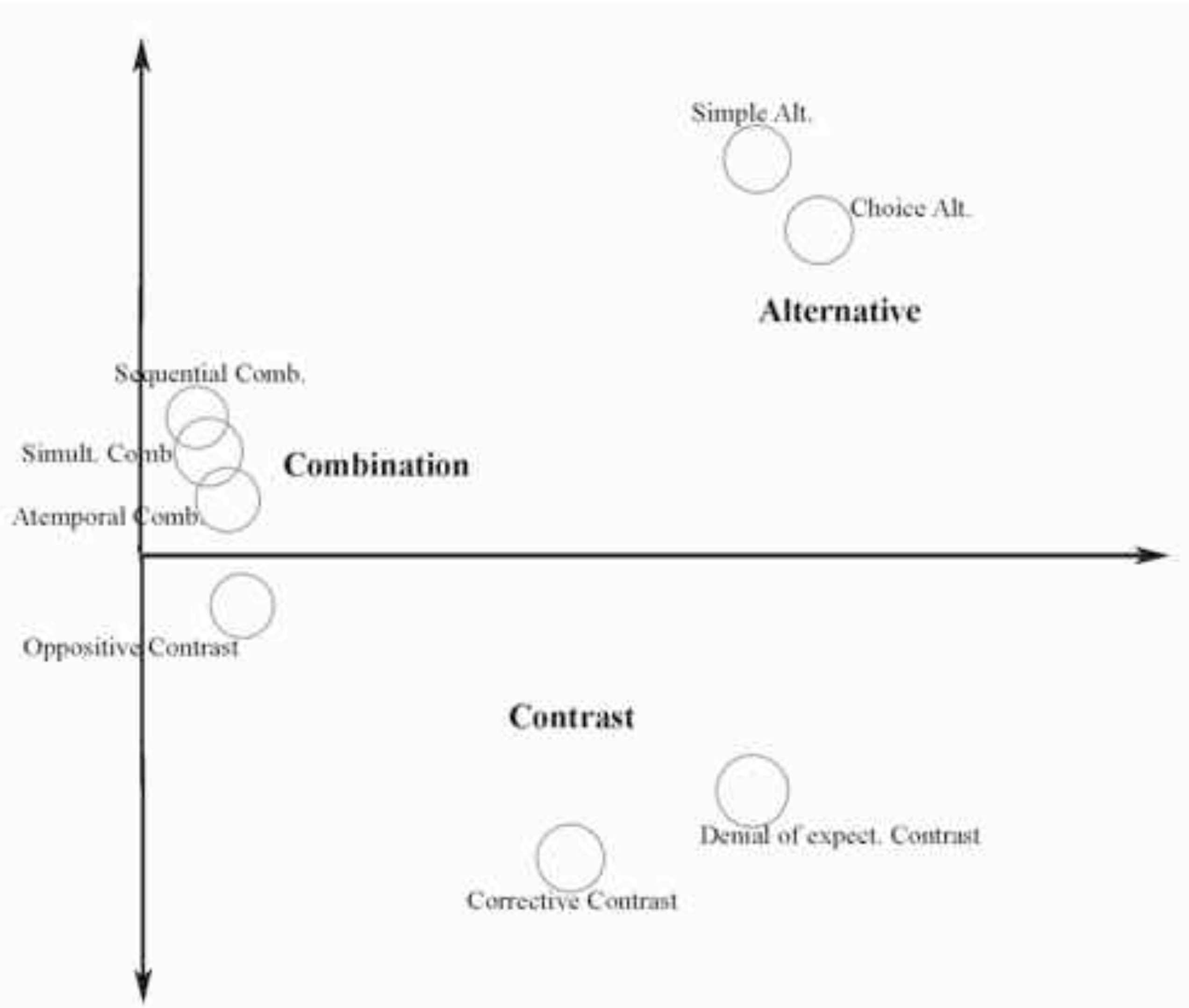

Fig. 3: *A Multi Dimensional Scaling Visualization of the coordination conceptual space*

For every pair of coordination relations, the average of the distance values is calculated (*average* = sum of the distance values divided by the total number of languages in which both relations receive an overt coding, i.e. the cases of juxtaposition are not included in the calculation). The result is a dissimilarity matrix of 8 x 8 cells, which constitutes the input of PerMap, a specific application for Multi Dimensional Scaling. The output is the bidimensional figure shown in Fig.3, in which the eight coordination relations examined are represented by circles and their respective distance corresponds to the frequency with which they are coded by means of the same marker across languages (i.e. *coding distance*).

The MDS visualization in Fig.3 nicely repeats the twofold structure identified in the coding map (Fig.2) and makes the different *coding distances* between the individual coordination relations visible. The degree to which two relations are close on the map is directly proportional to the probability with which they are coded by means of the same marker across languages. Fig.3 shows a horseshoe pattern, which is a common arrangement in MDS representations and basically corresponds to a linear representation (Croft and Poole, 2008: 17).

Yet, the methodology described in this section has some limits. First of all, only constructions showing overt markers have been considered and it is not clear what mathematical value should be attributed to those cases in which two relations are both expressed by means of juxtaposition. Furthermore, of the parameters described in section 1.2, only one is taken into account in the MDS representation, namely the coding degree of coordination relations, based on the semantic domain of the attested constructions. Nevertheless, the MDS map provides a bidimensional visualization of frequency, converted into *coding distance* between relations, thus describing a further dimension of cross-linguistic variation, which was not visible in Fig.2.

4. Conclusion

The aim of this paper was to explore the degree to which conceptual spaces may comprehensively describe the cross-linguistic variation and to examine what types of phenomena may be consistently represented in a unified account. The key question was whether recurrent multifunctionality is the only dimension of cross-linguistic variation that may be described on a conceptual space or whether there are other dimensions of variation that may be included.

By examining the case of coordination relations, it has been argued that it is possible to build a unified *coding map* accounting also for the presence and morphophonological complexity of overt markers coding the conceptual situations at issue. In other words, the regular cross-linguistic variation concerning *whether* and *how* a specific conceptual situation is coded is motivated by homogeneous functional motivations, which may be jointly mirrored by the respective location of the elements on the map.

Besides their functional proximity, the conceptual elements may be hierarchically organized according to their respective degree of inferrability and semantic specificity. Then, the interaction of these semantic properties with the general principle of syntagmatic economy makes the cross-linguistic variation in the coding of the elements on the map predictable, at least as far as the parameters of coding degree and coding complexity are concerned.

The coding map proposed in this paper may still be considered a conceptual space, insofar as it provides a geometrical representation of functions on the basis of the attested variation in their cross-linguistic coding. Only, the phenomena of cross-linguistic coding that are taken into account are not limited to the attested patterns of multifunctionality, but include also the presence of overt marking and its morphophonological complexity. Hence, the term ‘coding’ map, instead of ‘semantic’ map, is introduced, because it better mirrors the wider scope of this descriptive model.

The integration of the coding map with the Multi-Dimensional Scaling (MDS) technique provides a measure for a further dimension of variation, namely the frequency with which two conceptual situations are coded by means of the same marker (see also Cysouw 2007 and Van der Auwera 2008 for similar conclusions). Cysouw (2007: 234) suggests integrating the frequency of multifunctionality patterns in a traditional semantic map by means of different degrees of thickness of the lines connecting the various conceptual situations. Nonetheless, he acknowledges that the final result is rather messy. Since the coding map (Fig.2) and the MDS map (Fig.3) have proved to be compatible and complementary (i.e. they show the same internal basic structure and focus on different phenomena), a possible integration of the two methodologies could be provided by a coding map in which the respective distances between the elements mirror the coding distances highlighted through a MDS map. Yet, this final step of the integrative process is left for further research. For now, this paper has shown the compatibility and complementarity of the two maps, highlighting promising possibilities of integration of the two approaches, towards a comprehensive account of the cross-linguistic variation.

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