MEASURE PHRASES AND SPATIAL CATEGORIES: MEASURING DISTANCE IN CANTONESE

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Abstract. The goal of this paper is to offer a compositional treatment of the interplay between measure phrases and spatial categories in Cantonese. We show that *jiècí* 'predicators' and *fāngwèicí* 'localisers' (e.g. respectively *hai*^{2} 'at'; *soeng*^{6} 'top', *hau*^{2}*-min*^{1} 'behind') contribute to the well-formedness of sentences including measure phrases (e.g. *ng*^{5}*sap*^{6} *gong*^{1}*-fan*^{1} 'fifty centimetres'*).* We also address the possible presence of the spatial pronoun *go*^{2}*-dou*^{6} 'that place' in these sentences. We offer evidence based on an elicitation task in which native speakers of Cantonese (*N=40*, mean age=*27*) evaluated the acceptability of sentences including these categories. We then propose a Lexical Syntax plus feature projection analysis in which acceptability arises when lexical items belonging to spatial categories have *+d(egree)* feature values matching those on MPs. We discuss how these results and their analysis advance our understanding of spatial categories in Sinitic languages, and the interplay of these categories with measure phrases.

Keywords: Cantonese, adpositions, measure phrases, spatial pronouns, Sinitic languages.

1. INTRODUCTION

The interaction of *Measure Phrases* (henceforth: MPs), such as English *ten metres* with spatial categories such as prepositions *on*, *behind*, presents still unaddressed problems cross-linguistically. Works such as Zwarts (1997), Zwarts and Winter (2000) suggested that only *projective* spatial prepositions in English and Dutch form prepositional phrases (henceforth: PPs) that can combine with MPs. Projective prepositions are defined as prepositions that denote distances and axial projections defined with respect to a reference entity (or *ground*, Talmy 2000: Ch. 1). *Geometrical* prepositions, i.e. prepositions only defining geometric relations, cannot conversely denote projections (e.g. Vandeloise 2017; Stosic 2023). For instance, *on* can describe a geometrical relation in which a located entity (or *figure*, Talmy ibid.) is on the top surface of a

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ground (cf. (1)). Instead, *behind* describes a relation in which a figure is located along the back axis/projection of a ground, and usually at a non-null distance (cf. (2)):

(1) *#The book is one metre on the table.*
(2) *The chair is one metre behind the table.*

The geometrical preposition *on* heads the PP *on the table*; this phrase cannot combine with the MP *one metre*. This is the case because *on* describes a relation between a figure (i.e. the book) in contact with a ground (i.e. the table), at a null (i.e. non-projective) distance. Thus, (1) is uninterpretable, viz. the symbol "#". The projective preposition *behind* heads the PP *behind the table* in (2); this PP can combine with the MP *one metre*, and the sentence becomes interpretable. These distributional patterns have been investigated in various languages. Examples include English (Svenonius 2010), Italian (Ursini and Wu 2024), French (Ursini and Tse 2021), and Urdu (Franco *et al.* 2017), among others. Certainly, European families feature prominently in the analysis of these patterns (cf. Gehrke 2008; Real-Puigdollers 2013; respectively on Germanic, Romance languages). Nevertheless, a conclusion is that the lexical/semantic content of spatial adpositions projects at a phrasal level and determines the distribution of PPs with MPs (e.g. *on, behind* in (1)–(2)).

However, the interaction of PPs with MPs is understudied across several languages, particularly within the Sinitic family. A partial exception is Cheng and Sybesma (2022), which focuses on Mandarin and Cantonese, and in which two categories approximate spatial pre- and post-positions: *jiècí* and *fāngwèicí*. The first category can act as a copula-like verb in "Basic Locative Constructions" (BLCs, e.g. Levinson and Wilkins 2006: Ch. 1; Levinson *et al.* 2018). These are defined as sentences introducing locative (i.e. spatial) relations. The second category can select a specific spatial relation, possibly via the mediating occurrence of the relational head *de* (Djamouri *et al.* 2013; Zhang 2017). The work suggests that only the content of *fāngwèicí* in phrases headed by *jiècí* determines the acceptability of MPs. in Cantonese, the morphological type of *fāngwèicí* can determine this distribution. While simple *fāngwèicí soeng*^{6} 'above' can never license the presence of MPs, compound *fāngwèicí soeng*^{6}*-min*^{6} lit. 'above-face' can do so, as in (3):[4]

(3)

哩	副	畫	掛	喺	張	檯	上-面
li^{1}	fuk^{1}	waa^{2}	gwaa^{3}	hai^{2}	zoeng^{1}	toi^{2}	soeng^{6}-min^{6}
DEM	CL	painting	hang	P	CL	table	above-face
50	公分		*（嗰-度）。				
ng^{5}sap^{6}	gong^{1}fan^{1}		*(go^{2}-dou^{6})				
50	cm		DIS CL$_{PLACE}$				

'This painting was hanging 50cm above the table.' (Cheng and Sybesma 2022 (29), 92)

[4] Examples follow Leipzig glosses (Croft 2003: vi-xxv) and include Chinese characters in the first line, pinyin transliterations for Mandarin and jyutping transliterations for Cantonese in the second line (https://jyutping.org/en/jyutping/). The third line provides interlinear glosses; the fourth line, provides idiomatic translations. We also provide detailed scores in the fifth line for Cantonese test sentences, as we will explain in Section 4. For Mandarin examples, we follow instead pinyin transliteration (https://www.archchinese.com).

The work suggests these patterns can be accounted for, via the presence of silent syntactic structure mediating the combination of MPs (here, *ng^{5}sap^{6}gong^{1}-fan^{1}* '50 centimetres') with spatial PPs. Furthermore, the work observes that the presence of spatial (distal) pronoun *go^{2}-dou^{6}* 'that place' is obligatory for some but not all speakers, whereas other speakers always reject it. Though the work suggests that these data involve elaborate grammatical structures and intra-speaker variation, it does not analyse which *fāngwèicí* and *jiècí* items qualify as projective prepositions/adpositions in either language. It thus leaves its claims partially unconnected to previous literature. A remedy to this situation is in Ursini *et al.* (2020), which tests the projective/geometrical classification but only for Mandarin data. Hence, the interplay of spatial PPs with MPs in Cantonese seems to be a still understudied pattern.

The goal of this work is to ameliorate this situation by offering empirical evidence on the distribution of Cantonese *jiècí*, *fāngwèicí* and spatial pronouns with MPs. We show that the first two categories contribute to the well-formedness of "Spatial Phrases" (henceforth SPs) and that their features compositionally determine their combination with MPs. We therefore aim to address two theoretical questions. The first is *what* lexical/semantic features and items can license this presence; the second is *how* Cantonese SPs can affect the presence of MPs in sentences. We achieve this goal by reviewing previous literature on Cantonese SPs and motivating our study (Section 2). We present our experimental methodology (Section 3), and results (Section 4). We propose an analysis based on a variant of Lexical Syntax (Section 5), and conclude the paper with a discussion on spatial categories in Sinitic languages (Section 6).

2. LITERATURE REVIEW

In this section we offer an overview of Cantonese spatial categories, and justify the need for novel data. We frame this discussion within the research paradigm on Sinitic languages, and explain how technical terms from this tradition compare with terms from other paradigms.

Reference grammars of Mandarin define *jiècí* as parts of speech equivalent to prepositions or co-verbs (e.g. Chao 1968; Li and Thompson 1981; Sun 2006; Cheung 2016). The term "co-verb" refers to the fact that *jiècí* can act as predicative elements in sentences (e.g. *Zhangsan zai Beijing* lit. 'Zhangsan is-at Beijing'). Typologically oriented works suggest that *jiècí* are transitive verbs when distributed as co-verbs, and intransitive verbs when distributed as prepositions (e.g. Chappell and Peyraube 2008). Generative approaches suggest that Mandarin has several pairs of homophonous co-verbs and prepositions (e.g. Djamouri *et al.* 2013; Paul 2015). The syntactic status of *jiècí* thus appears controversial. However, most works agree that *jiècí* can express relations involving directed movement (e.g. Mandarin *dáo* 'to') or static position (e.g. *zài* 'at') of the figure with respect to the ground.

Compound *fāngwèicí* correspond to simple items plus one of five suffixes (e.g. *miàn*) or two prefixes (e.g. *zhi-*). They can combine with relator *de* to follow a ground DP (e.g. *zhuōzi de qián-miàn*). Simple *fāngwèicí* cannot combine with *de* (e.g. **zhuōzi qián*). Some proposals analyse *fāngwèicí* as postpositions (e.g. Djamouri *et al.* 2013; Paul 2015; Niu and Liu 2021); others, as phrasal clitics (e.g. Liu 1998; Lin 2013; Zhang 2017). Recent proposals

treat simple *fāngwèicí* as clitics, compound *fāngwèicí* as distinct words, and both as nominal categories rather than postpositions (Ursini and Huang 2020; Liang and Her 2023). Though the syntactic status of *fāngwèicí* seems controversial, their semantic contribution seems clear. As 'localisers', they restrict a spatial relation to a specific region or axis defined with respect to the ground.

Research on Cantonese spatial categories offers a similar picture and terminological choices. Reference grammars suggest that *jiècí* correspond to co-verbs. However, prepositional uses are also frequent (e.g. Killingley 1993; Matthews and Yip 2011; Tang 2015; Zhou *et al.* 2015; Wong 2023: Ch. 1–2). *Fāngwèicí* are treated as elements usually appearing in compound form (Zhou *et al.* 2015; Bai 2016); nine suffixes can potentially attach to simple items (e.g. *jau*^{6}*-bin*^{1} 'right-side', Pacioni 2018). A relational element *ge*^{3} can take ground DPs and *fāngwèicí* as arguments, when present (Stonham 1998; Sio 2003, 2006). These categories thus have similar, though not identical, properties to their counterparts in Mandarin. We propose non-exhaustive lists in (4)–(7):

(4) ***Jiècí***:={*hai*^{2} 喺 'at', *hoeng*^{3} 向/wong^{5} 往 'in the direction of', *ging*^{1} 经 'pass', *cung*^{4} 從 /jau^{4} 由 'from', gaak^{3} 隔 'away'}

(5) ***Fāngwèicí***:={*soeng*^{6} 上 'on, above', *haa*^{6} 下 'down, below', *zo*^{2} 左 'left', *ja*u^{6} 右 'right', *dung*^{1} 東 'East', *sai*^{1} 西 'West', *naam*^{4} 南 'South', *bak*^{1} 北 'North', *zung*^{1}*-gaan*^{1} 中間 'middle, between', *cin*^{4} 前 'front', *hau*^{6} 後 'back, behind', *leoi*^{5} 裡 'in', *ngoi*^{6} 外 'out', *jap*^{6} 入 'in', *ceot*^{1} 出 'out', *pong*^{4} 旁 'aside', *deoi*^{3} 对 'in the opposite direction'…}

(6) **Suffixes**:={*bin*^{6}*/bin*^{1}便/邊 'side', *min*^{6} 面 'face', *gou*^{1} 高 'high', *tau*^{4} 頭 'head', *fong*^{1} 方 'square', *dai*^{1}低 'low', *jik*^{6} 翼 'wing', *zak*^{1}側 'side', *dou*^{6} 度 'at this place'}

(7) **Compound *fāngwèicí***:={*ne*^{1}*-bin*^{1} 呢邊 'this side', *soeng*^{6}*-gou*^{1} 上高 'above', *leoi*^{5}*-tau*^{4} 裡頭 'inside', *cin*^{4}*-min*^{6} 前面 'front face', *haa*^{6}*-dai*^{1} 下低 'below', *bak*^{1}*-jik*^{6} 北翼 'north wing', *zak*^{1}*-bin*^{1} 側邊 'aside', *go*^{3}*-dou*^{6} 嗰度 'that place',…}

In (4), we have the core Cantonese *jiècí*; in (5), the core *fāngwèicí*. Note that *zung*^{1}*-gaan*^{1} includes two morphemes (*zung*^{1} 'middle' and *gaan*^{1} 'part'), but it is generally treated as a simple item. In (6), we have the nine suffixes; in (7), some examples of compound *fāngwèicí*. Suffixes can also appear as independent words for objects and their parts (e.g. *min*^{6} 'face') or for locations (e.g. *dou*^{6} 'place'). As independent words, *fāngwèicí* follow nouns or adjectives; thus, they act as nominal classifiers (e.g. *ne*^{1} *cin*^{4}*-bin*^{1} 'this front side'; Szeto 1998; Wong 2000; Li and Leung 2007). Furthermore, the productive combination of suffixes and *fāngwèicí* is restricted via semantic and pragmatic factors: items such as *jap*^{6}*-jik*^{6} lit. 'in-wing' seem to denote undefined locations. A full list of well-formed and ill-formed spatial *fāngwèicí* is however missing (cf. Pacioni 1998, 2017, 2018; Li and Leung 2007). Overall, Cantonese includes several *jiècí*, plus simple and compound *fāngwèicí*. Simple items are nominal-like categories; compound items are derived via nominal classifiers acting as suffixes.

Theoretical analyses of Cantonese spatial categories are similar to the analyses offered for Mandarin data. Typological works analyse Cantonese *jiècí* and *fāngwèicí* as co-verbs and nominal-like elements, respectively (e.g. Chappell and Peyraube 2008; Qiu 2008; Cheng and Sybesma 2009; Chu 2010). The clitic analysis for *fāngwèicí* is also suggested for Cantonese

and other Sinitic languages (Liu 1998; Lin 2013). The recent Lam (2013) proposes an analysis based on the Cartography (generative) framework (cf. Cinque and Rizzi 2010). According to Cartography, functional categories project hierarchical sequences of distinct heads. Crucially, this work suggests that spatial pronouns *ni²dou⁶* 'this place' and *go² dou⁶* 'that place' are also part of Cantonese spatial categories and SPs. Thus, Lam (2013) extends this analysis to Cantonese SPs in the manner shown in (8a–b):

(8) a.

喺	嗰	條	橋	上-面	嗰	度。
hai²	go³	tiu⁴	kiu²	soeng⁶-min⁶	go²	dou⁶
p	DIST	CL	bridge	top-face	DIST	CL_{PLACE}

'At there, on top of that bridge.' (Lam 2013 (238), p. 118)

b. $[_{PrP}Pr_{Loc}[_{DP}[_{YP}[_{ReflP}DP_{Grd}[_{DP}PLACE]]]_i Y^0[_{XP}AxPartP\ t_i\ ]^j\ D^0\ [_{DeicP}Deic[_{ClP}CL\ t_j\ ]$ (237)

Via several movement operations (cf. the trace element t_j), the ground D(eterminer)P raises from the lowermost position (i.e. the complement of CL_{PLACE}) to a position between Pr_{LOC} and AxPartP. The two morphemes forming the pronoun *go²dou⁶* project the categories Deic(tic) and CL_{PLACE}: they denote the "place" on top of a bridge, distant from the speaker. The locative preposition *hai²* projects the head known as "Loc(ation)" (i.e. "Pr_{Loc}" in (8)). The "Ax(ial)PartP" category projects from *soeng⁶-min⁶*; for which this work proposes a different English translation from Cheng and Sybesma (2022) (i.e. 'on top of', lit. 'top-face'). In cartographic accounts, this category can determine whether a *fāngwèicí* carries a projective or geometric sense (cf. Svenonius 2010; Wu 2015; for Mandarin). Overall, Lam (2013) offers a thorough analysis of Cantonese SPs; however, this analysis does not address their interplay with MPs, even though it partially addresses *fāngwèicí*'s structure.

A work that addresses this pattern for Mandarin data is Ursini *et al.* (2020). This work shows via an elicitation task that the distribution of MPs with spatial PPs depends on the lexical content of both *jiècí and fāngwèicí*, as shown in (9)–(12):

(9)

Zhangsan	*dao*	*le*	*che*	*hou-mian*	*shi*	*mi.*
Zhangsan	go-to	pf	car	back-face	ten	metre

'Zhangsan has gone ten metres behind the car.'
(Average value: 4.19; =(40), ___)

(10)

Zhangsan	*zai*	*che*	*de*	*qian-mian*	*shi*	*mi.*
Zhangsan	be-at	car	de	front-face	ten	metre

'Zhangsan is ten metres in front of the car.'
(Average value: 3.91; =(29), ___)

(11)

#*Zhangsan*	*dao le*	*zhuozi d e*	*xia-tou*	*yi*	*mi.*
Zhangsan	go-to pf	desk de	*down*-head	one	metre

'Zhangsan has gone one metre below the desk.'
(Average value: 2.16; =(39), ___)

(12)

#*Zhangsan*	*zai*	*shandong*	*li*	*yi*	*mi.*
Zhangsan	be-at	cave	in	one	metre

'Zhangsan is one metre in the cave.'
(Average value: 1.94; =(26), ___)

When PPs included projective *fāngwèicí* and motion *jiècí*, participants judged the presence of MP near-optimal (cf. (9), and respectively *hòu-miàn* and *dào*). When PPs included projective *fāngwèicí* and static *jiècí*, participants judged the presence of MPs acceptable but non-optimal (cf. (10); *qián-miàn* and *zài*). PPs including non-projective *fāngwèicí* and motion *jiècí* licensed highly marginal sentences (cf. (11); *xià-tou* and *dào*). Non-projective *fāngwèicí* and static *jiècí* triggered uninterpretable sentences (cf. (12); *lǐ* and *zài*). Furthermore, the presence or absence of the relational head *de* mediating between *fāngwèicí* and ground DP did not affect judgements (cf. (9), (12) vs. (10)–(11)). Thus, Ursini *et al.* (2020) concluded that *jiècí and fāngwèicí* affect the presence of MPs in sentences in a piece-meal manner. However, the work focused was on Mandarin data and excluded spatial pronouns; other Sinitic languages were left aside.

The recent Cheng and Sybesma (2022), instead, addresses Cantonese data involving spatial PPs. The first work focuses on BLCs that also include MPs such as *wǔshí gōngfēn* '50 centimetres' in Cantonese and Mandarin. The work suggests that a further projection, the Deg(ree) head, can mediate between MPs and phrases including spatial PPs by occurring via multiple realizations. According to this analysis, Cantonese sentence such as (1) includes a PP and an MP that project the structure in (13). Note that, given the apparent optionality of the pronoun *go²dou⁶*, the analysis does not include this pronoun's contribution to the phrasal structure of SPs including MPs:

(13) [P [$_{\text{DegP}}$ Deg [$_{\text{AxPartP}}$ [DP] [$_{\text{AxPart'}}$ AxPart [$_{\text{DegP}}$ Deg μ DP]]]]]

The analysis introduces two silent Deg heads. One mediates between ground DP *zoeng¹ toi²* 'CL the table' and AxPart head *soeng⁶-min⁶* in (1) (i.e. the head μ in (13)). The other Deg head mediates between the resulting AxPartP (i.e. *zoeng¹toi² soeng⁶-min⁶* 'above the table') and the MP *50 gong¹-fan¹* '50 centimetres' (i.e. the head "Deg"). Once an AxPartP is formed, the second Deg head introduces MPs in their specifier position. As foreshadowed in the introduction, this work does not discuss which items carry projective features and whether *jiècí* may also carry licensing features. It also does not explain how these Deg features may block or license the presence of MPs. It thus offers an underspecified though mostly accurate overview of the relevant Cantonese data.

Another work, Xie *et al.* (2024), offers an account of Cantonese Spatial categories hinging on the Lexical Syntax (generative) framework (Hale and Keyser 2002; Acedo-Matellán 2016). The work analyses these categories' distribution in several structures (e.g. declarative sentences including relational morpheme *ge³*, coordinated constructions). Building on these data, it suggests that *jiècí* are potential predicative heads of sentences that take figure DPs and other PPs as their specifiers and complements, respectively. The complement PP is formed when *ge³*, a relational clitic, takes a ground argument phrase and a compound *fāngwèicí* as their complement and specifier phrases, respectively. Crucially, a ground phrase is formed when an DP combines with a classifier to form a Cl(assifier)P. Compound *fāngwèicí* involve instead the suffixation of simple items via nominal classifiers, thus also forming ClPs. We show this analysis in (14b), with (14a) providing a reference example for the analysis:

(14) a. 個 女仔 喺 張 檯 嘅 後-面/*後。
go^{3} neoi^{5}zai^{2} hai^{2} zoeng^{1} toi^{2} ge^{3} hau^{6}-min^{6}
CL girl P CL desk GE back-side
'The girl is behind the table.' (=(1), ___)

b. [$_{PP(s,p)}$[$_{ClP(s)}$ fig$_{HP}$][$_{P'}$ *jièc*í$_{P(s)}$[$_{ClP(s,sp)}$[$_{Cl'}$[$_{ClP(s,sp)}$[$_{DP}$ ground] cl$_{Cl(s,sp)}$] *ge*^{3}$_{Cl}$][$_{ClP(s)}$ [$_{DP}$ fang]-cl$_{(s)}$]]]

As (14b) shows, classifier heads carry features that license the well-formedness of their respective phrases (i.e. the features *s(patial)* and *sp(ecific)*). For instance, the relational clitic *ge*^{3} selects a DP affixed with a classifier, establishing its role as a ground DP. Compound *fāngwèicí* can include suffixes establishing that these compounds refer to specific locations (i.e. that they carry the *(s,sp)* features). These features project at a PP and sentential level, and thus determine that BLCs are well-formed. As the analysis also shows, the possible presence of MPs in these sentences remains unaddressed, along with the status of Deg heads and their features. Furthermore, this work does not address the potential contribution of spatial pronouns (here, *go*^{2}*dou*^{6}) to BLCs, irrespective of the presence of MPs. Our *impasse* can therefore be defined as follows: previous works offer potentially adequate theoretical tools, but do not address the relevant Cantonese data. Hence, they cannot directly answer our research questions.

3. METHOD & MATERIALS

We proceeded via a three-step procedure. In the first step, we verified which compound *fāngwèicí* are well-formed, and which are not: in this manner, we devised the testing materials for the second and third steps. In the second step, we aimed to find sentences including MPs in corpora. In the third step, we created an elicitation task to obtain the relevant data. We explain why we devised a sequential procedure by explaining each procedure and respective finding.

The first step worked as follows. The combination of *fāngwèicí* and suffixes potentially generates17x9=153 possible compound *fāngwèicí*. However, a question emerging from the literature pertains to which combinations are actually well-formed (again, Pacioni 1998, 2017; Li and Leung 2007). For this reason, we prepared a list including all possible compound *fāngwèicí*. We then asked three linguist colleagues and native speakers of Cantonese to evaluate whether each of these items can denote actual specific locations (e.g. the 'front side' of a car). We then verified the possible compound *fāngwèicí* in the corpus. We will clarify the details of this test in the next paragraph, once we fully define our corpus findings.

The second step worked as follows. We consulted three corpora: the Early Cantonese Tagged Database (https://database.shss.hkust.edu.hk/Cantag/; Yao Project No. 644608); the HongKong Cantonese Corpus (HKCanCor, http://compling.hss.ntu.edu.sg/hkcancor/; Leung and Law 2001); the PolyU Corpus of Spoken Chinese (Cantonese) (https://chaaklau.github.io/polyu_corpus/; Luke and Wong 2015). The first corpus included 160k characters. The second corpus was partially accessible; the third corpus contained only 180k characters. For the quantity of corpus, we queried the three corpora to

find examples of sentences including MPs plus each of the *fāngwèicí* items. Crucially, we found two novel forms of evidence regarding our categories that informed our third step: these forms are as follows.

First, we found evidence that a tenth suffix, *-bou*^{6} 'part', can attach to simple *fāngwèicí*. We verified this finding with the three native speakers, and inserted the well-formed compound items in the data files. We thus tested 17x10=170 possible compound *fāngwèicí* in the update of the first step; we verified whether these forms were attested in corpus-based data, in the second step. Second, we found evidence that *hoeng*^{3} mostly distributes as a preposition, rather than a co-verb: most sentences including this *jiècí* also included a lexical verb describing the type of motion. The *jiècí*, instead, introduced the ground DP and the specific direction of motion. Even though this item-specific distribution is adumbrated in previous work (e.g. Lam 2013), our finding permits us to outline a more defined analysis of our target categories.

The third step worked as follows. The informants accepted only 44 compound *fāngwèicí*.as well-formed, 18 as slightly marked. The corpus findings confirmed the presence of these 62 items in sentences (BLCs). We also found sentences including three compound items that informants considered highly marked. Crucially, we did not find any sentences including MPs and SPs, whether they included *fāngwèicí* or either of the two *jiècí*. We therefore prepared sentences including simple and attested compound *fāngwèicí*. In sentences including *hai*^{2}, this item was always a co-verb: no lexical verbs were inserted. In sentences including *hoeng*^{3}, we inserted lexical verbs and therefore controlled the presence of spatial pronouns *go*^{2}*dou*^{6}. We then perfected these sentences with the native informants before testing them. Informants observed that *hai*^{2} used as a co-verb would not affect the presence of this spatial pronoun (e.g. *go*^{3} *dou*^{6} 'that place'). *Hoeng*^{2} used as *jiècí* plus the one-character verb (e.g. *zau*^{2} 'walk') would instead obligatorily require it.

Overall, we had 17 sentences lacking verbs with classifiers plus pronouns, and simple *fāngwèicí* plus MPs; 17 sentences including verbs with classifiers plus pronouns and simple *fāngwèicí* plus MPs. The role of verbal morphology and how it influences sentence/information structure in Cantonese is fairly complex (cf. Kwan 2005, 2010). For our purposes, it suffices to know that we can test the presence of the spatial pronoun *go*^{2}*dou*^{6} via the selection of the opportune lexical verbs. In some cases, informants suggested the insertion of *ge*^{3} between ground DP and *fāngwèicí*, but its presence in sentences was otherwise optional. Since we tested sentences including either *hai*^{2} or *hoeng*^{3}, we had a total of 76x2=152 test sentences.

The test worked as follows. Participants were native speakers (N=40, 18–57 years, median age 27 years), from the Greater Bay Area (GBA, e.g. Macau, Guangzhou, Shenzhen, Zhuhai), who completed the test over December 2023. Participation was voluntary, and participants electronically signed a consent form before starting the test. Participants read a simple word file, and chose values along a 1–5 Likert scale (1="terrible Cantonese", 2="near terrible Cantonese", 3="average Cantonese", 4="good Cantonese", 5="Precise Cantonese"). Participants could also add comments below sentences. Participants observed that they used "3" and "4" values for sentences that were certainly acceptable, but not stylistically "perfect". We considered as "unacceptable" sentences with average scores below 2,0: these are marked as "*" in the next section. We considered sentences between 2,0 and 3,0 as "marginal", and marked them as "?". We considered sentences between 3,0 and 4,0 as acceptable; those over 4,0 as near-ideal. We collected a total of 152*40=6080 tokens.

In the results section we use the scoring format introduced in de Clerq and Haegeman (2018). Examples include a fourth line with the average score, and the participants' answers in this format: "1^{x} 2^{y} 3^{z} 4^{r} 5^{s}". This reads: *x* participants offered "1" as an answer, *y* participants offered "2" as an answer, and so on. For instance, a sentence with an average value of 4.7 but with scores 1^{3} 2^{0} 3^{0} 4^{0} 5^{37} is a near-ideal sentence involving a bi-modal score distribution. While 37 participants evaluated the sentence as precise Cantonese (i.e. they selected "5"), 3 participants found the sentence uninterpretable (i.e. they selected "1"). We can thus explicitly show intra-speakers' variation on judgement and discuss it when necessary. We can also show whether an example is acceptable overall (cf. also Schütze and Sprouse 2013). Supplementary files A, B and C respectively include all the results from each step in the study. The next section offers a qualitative overview of the data as a stepping stone for our analysis.

4. RESULTS

In the first step, informants accepted only 44+18=62 possible compound *fāngwèicí*. Informants commented that compound forms including the suffixes *-bin*^{6}/*-bin*^{1} 'side', *-min*^{6} 'face' and *-zak*^{1} 'side' were well-formed or slightly marked. However, only few combinations including *-gou*^{1} 'high', *-tau*^{4} 'head', *-fong*^{1} 'square', *-dai*^{2} 'low', and *-jik*^{6}'wing' were acceptable. The suffix *-dou*^{6} 'at this place' blocked all forms, even though it can appear as a free form in spatial pronoun *go*^{2}*dou*^{6}. Crucially, the first three suffixes allow speakers to refer to "necessary" parts of ground objects and the locations defined via these parts. For instance, *hau*^{6}*-min*^{6} denotes the location associated to the 'back-side' of a ground; its use in sentences seems unproblematic. Instead, informants confirmed that *jap*^{6}*-jik*^{6} lit. 'in-wing' seems to denote an "impossible" location, as interior parts of ground do not have 'wings' (corridor-like parts). Similarly, *zung*^{1}*-gaan*^{1} 'middle' resists suffixation, unlike the other simple *fāngwèicí*: informants found that no more specific locations could be defined. Informants also accepted several compound items including *-bou*^{6} 'part', thus confirming the main novel finding of the second step.

In the second step, we verified that all the simple *fāngwèicí* and all the 62 compound *fāngwèicí* appeared in the corpora. We did not find any examples of impossible *fāngwèicí*, thus confirming the results from the first step. Crucially, we did also not find any sentences including *fāngwèicí* and MPs, irrespective of the type of item. This absence of evidence thus suggested that further testing was needed; in general, "negative evidence" in corpora requires validation via other sources (Stefanowitsch 2006, 2008). Furthermore, this corpus evidence lacks cues to the *degree* of acceptability that speakers can assign to these sentences (Schütze and Sprouse 2013). Finally, we did not find any evidence of sentences including spatial pronouns and MPs, as a logical consequence of this structure missing from the corpora.

In the third step, we tested the sentences (BLCs) construed via the information gathered in the first and second steps. The central results can be presented by analysing the sentences including simple *fāngwèicí* and then those including compound *fāngwèicí*. For the first group, the *fāngwèicí zung*^{1} 'middle', *leoi*^{5} 'in', *jap*^{6} 'in' and *deoi*^{3} 'in the opposite direction' attracted marked scores (i.e. scores between 2;0 and 3;0) when co-occurring with *hai*^{2} (cf. (15)–(18)). Similarly, *ngoi*^{6} 'out' and *ceot1* 'out' attracted near-marked scores (i.e. average 3.1) when co-occurring with *hai*^{2} (cf. (19)–(20)). Crucially, the distribution of scores

covered all five values, even if low scores dominate the results. For instance, 12 participants rejected (15) with a "1", 11 rejected it with a "2", but one participant accepted it with a "5". Similar considerations can be extended to (16)–(20):[5]

(15) ?張 檯 喺 間 房 中 一 米。
zoeng[1] toi[4] hai[2] gaan[1] fong[2] zung[1] jat[1] mai[5]
CL desk P CL room middle one metre
'?The table is one metre in the middle of the room.'
(Average value: 2.275; scores: 1^{12} 2^{11} 3^{12} 4^{4} 5^{1})

(16) ?禮物 喺 禮盒 裡 十 釐米。
lai[5]mat[1] hai[2] lai[5]hap[2] leoi[5] sap[6] lei[4]mai[5]
gift P gift box inside ten centimetre
'?The gift is 10 centimetres in the box.'
(Average value: 2.5; scores: 1^{11} 2^{12} 3^{6} 4^{8} 5^{3})

(17) #個 男人 喺 山洞 入 十 米。
go[3] naam[4]jan[2] hai[2] saan[1]dung[6] jap[6] sap[6] mai[5]
CL man P cave inside ten metre
'?The man is 10 metres in the cave.'
(Average value: 2.9; scores: 1^{7} 2^{9} 3^{9} 4^{11} 5^{4})

(18) ?部 車 喺 貨車 對 十 米。
bou[6] ce[1] hai[2] fo[3]ce[1] deoi[3] sap[6] mai[5]
CL car P truck opposite ten metre
'?The car is ten metres in the opposite direction of the truck.'
(Average value: 2.475; scores: 1^{12} 2^{11} 3^{8} 4^{4} 5^{5})

(19) 啲 花 喺 花樽 外 十 釐米。
di[1] faa[1] hai[2] faa[1]zeon[1] ngoi[6] sap[6] lai[4]mai[5]
CL.PL flower P vase outside ten centimetre
'The flowers are 10 centimetres out of the vase.'
(Average value: 3.1; scores: 1^{6} 2^{6} 3^{13} 4^{8} 5^{7})

(20) 個 女人 喺 隧道 出 十 米。
go[3] neoi[5]jan[2] hai[2] seoi[6]dou[6] coet[1] sap[6] mai[5]
CL woman P tunnel outside ten metre
'The woman is 10 metres out of the tunnel.'
(Average value: 3.1; scores: 1^{5} 2^{10} 3^{8} 4^{10} 5^{7})

Crucially, the other simple *fāngwèicí* attracted higher scores in the acceptable range (i.e. between 3.125 and 3.45 values). Scores were similar though higher when the selected *jiècí* was *hoeng[3]*. Sentences including motion verbs required the presence of pronoun *go[2]dou[6]*: the verb preceded the SP including the MP, and the pronoun was in sentence-final position. Hence, *go[2]dou[6]* can occur when a verb and a projective *fāngwèicí* co-occur in a sentence. In general, these sentences are good but not near-ideal. We illustrate these patterns via (21)–(22):

[5] For some sentences, the presence of *ge[3]* relating ground DP and *fāngwèicí* was deemed optimal: see supplementary file C for details.

(21) 貨車 駛 向 大門 前 一 米 嗰 度。
fo^{3}ce^{1} sai^{2} hoeng^{3} daai^{6}mun^{4} cin^{4} jat^{1} mai^{5} go^{2} dou^{6}
truck go P gate front one metre DIS CL$_{PLACE}$
'The truck has gone one metre in front of the gate.'
(Average value: 3.925; scores: 1^{1} 2^{5} 3^{10} 4^{12} 5^{11}.)

(22) 個 男仔 走 向 張 檯 旁 一 米 嗰 度。
go^{3} naam^{4}zai^{2} zau^{2} hoeng^{3} zoeng^{1} toi^{4} pong^{4} jat^{1} mai^{5} go^{2} dou^{6}
CL boy move P CL table aside one metre DIS CL$_{PLACE}$
'The boy has moved one metre aside the table'
(Average value: 3.45; scores: 1^{1} 2^{10} 3^{9} 4^{10} 5^{10}.)

We can now turn to compound *fāngwèicí*. All suffixes seem to improve the acceptance of sentences, though to differing degrees. Suffixes *jik^{6}* 'wing', *bou^{6}* 'part' triggered scores in the lower range of acceptability (i.e. between 3.0 and 3.5, cf. (23)–(26)), again with *hoeng^{3}* correlating with higher scores (cf. (24), (26)):

(23) 公司 喺 上海 西翼 一千 公里。
gung^{1}si^{1} hai^{2} soeng^{6}hoi^{2} sai^{1}-jik^{6} jat^{1}cin^{1} gung^{1}lei^{5}
company P Shanghai west-wing one.thousand kilometre
'The company has relocated 1000 kilometres West of Shanghai.'
(Average value: 3.2; scores: 1^{2} 2^{9} 3^{15} 4^{7} 5^{7}.)

(24) 飛機 飛 向 上海 西翼 一千 公里
fei^{1}gei^{1} fei^{1} hoeng^{3} soeng^{6}hoi^{2} sai^{1}-jik^{6} jat^{1}cin^{1} gung^{1}lei^{5}
plane fly P Shanghai west-wing one.thousand kilometre
嗰 度。
go^{2} dou^{6}
DIS CL$_{PLACE}$
'The plane flies 1000 kilometres West of Shanghai.'
(Average value: 3.425; scores: 1^{3} 2^{4} 3^{15} 4^{9} 5^{9})

(25) 大學 校園 喺 市 中心 東部 一公里。
daai^{6}hok^{6} haau^{6}jyun^{4} hai^{2} si^{5} zung^{1}sam^{1} dung^{1}-bou^{6} jat^{1}gung^{1}lei^{5}
university campus P city centre east-part one kilometre
'The university campus is 1 kilometre East of the city centre.'
(Average value: 3. 25; scores: 1^{4} 2^{8} 3^{10} 4^{10} 5^{8}.)

(26) 火車 駛 向 車站 東部 一 公里 嗰 度。
fo^{2}ce^{1} sai^{2} hoeng^{3} ce^{1}zaam^{6} dung^{1}-bou^{6} jat^{1} gung^{1}lei^{5} go^{2} dou^{6}
train move P train.station east-part one killometre DIS CL$_{PLACE}$
'The train moved towards one kilometre East of the train station.'
(Average value: 3. 5; scores: 1^{3} 2^{4} 3^{11} 4^{13} 5^{9})

Instead, *zak^{1}* 'side', *bin^{6}* 'side', *min^{6}* 'face', *fong^{1}* 'square' as suffixes triggered scores in the higher acceptability range (i.e. between 3;5 and 4;0, cf. (27)–(29)). When the compound *fāngwèicí* co-occurred with *hoeng^{3}*, scores rose to near-ideal values (i.e. between 4;0 and 5;0, cf. (30)–(33)). Hardly any speakers rejected sentences (e.g. one "1" answer for (27), four "2" answers for (30)): this fact further suggests that *hoeng^{3}* carry features that MPs also carry:

(27) 餐廳 喺 街角 左側 五 米。
caan[1]teng[1] hai[2] gaai[1]gok[3] zo[2]-zak[1] ng[5] mai[5]
restaurant P street.corner left-side five metre
'The restaurant is five metres to the left of the street corner.'
(Average value: 3.975; scores: 1^{1} 2^{0} 3^{13} 4^{11} 5^{15})

(28) 部 車 喺 大門 前邊/便 一 米。
bou[6] ce[1] hai[2] daai[6]mun[4] cin[4]-bin[6] jat[1] mai[5]
CL car P gate front-side one metre
'The car is one metre in front of the gate.'
(Average value: 3.975; scores: 1^{0} 2^{2} 3^{11} 4^{13} 5^{14})

(29) 個 男人 喺 火車站 前方 十 米。
go[3] naam[4]jan[2] hai[2] fo[2]ce[1]zaam[6] cin[4]-fong[1] sap[6] mai[5]
CL man P train.station front-square ten metre
'The men are waiting ten metres in front of the railway station.'
(Average value: 3.975; scores: 1^{0} 2^{6} 3^{6} 4^{11} 5^{17})

(30) 部 車 駛 向 貨車 左側 一 米 嗰 度。
bou[6] ce[1] sai[2] hoeng[3] fo[3]ce[1] zo[2]-zak[1] jat[1] mai[5] go[2] dou[6]
CL car move P truck left-side one metre DIS CL_{PLACE}
'The car moves one metre to the left of the truck.'
(Average value: 4.1; scores: 1^{0} 2^{4} 3^{7} 4^{10} 5^{19})

(31) 單車 駛 向 汽車 後邊/便 一 米 嗰 度。
daan[1]ce[1] sai[2] hoeng[3] hei[3]ce[1] hau[6]-bin[6] jat[1] mai[5] go[2] dou[6]
bike go P car back-side one metre DIS CL_{PLACE}
'The bike has gone one metre behind the car.'
(Average value: 4.125; scores: 1^{0} 2^{3} 3^{8} 4^{10} 5^{19})

(32) 市政廳 喺 圖書館 對面 一百 米。
si[5]zing[3]teng[1] hai[2] tou[4]syu[1]gun[2] deoi[3]-min[6] jat[1]baak[3] mai[5]
city hall P library opposite-face one.hundred metre
'Town hall is one hundred metres in the opposite direction of the library.'
(Average value: 4.225; scores: 1^{1} 2^{1} 3^{6} 4^{12} 5^{20})

(33) 貨車 駛 向 大門 前面 一 米 嗰 度。
fo[3]ce[1] sai[2] hoeng[3] daai[6]mun[4] cin[4]-min[6] jat[1] mai[5] go[2] dou[6]
truck go P gate front-side one metre DIS CL_{PLACE}
'The truck has gone one metre in front of the gate.'
(Average value: 4.075; scores: 1^{1} 2^{3} 3^{4} 4^{16} 5^{16})

Interestingly, this was the case even with compound *fāngwèicí* that informants found slightly marked when evaluating them in the second step (cf. (34)–(35), in which we have the marked form *haa[6]-fong[1]*). This latter result suggests that their partially marked status could be resolved once these *fāngwèicí* are used in sentential contexts:

(34) 潛艇 駛 向 敵軍 戰艦 下方
cim[4]teng[5] sai[2] hoeng[3] dik[6]gwan[1] zin[3]laam[6] haa[6]-fong[1]
submarine navigate P enemy ship below-square

一 公里 嗰 度。
jat[1] gung[1]lei[5] go[2] dou[6]
one kilometre DIS CL_{PLACE}
'The submarine navigates one kilometre below the enemy ship.'
(Average value: 4.1; scores: 1^{0} 2^{4} 3^{8} 4^{8} 5^{20})

(35) 蛙人 游 向 海面 下底 十 米 嗰 度。
waa[1]jan[4] jau[4] hoeng[3] hoi[2]min[6] haa[6]-dai[1] sap[6] mai[5] go[2] dou[6]
scuba divers swim P sea.surface below-bottom ten metre DIS CL_{PLACE}
'The scuba divers swim ten metres below the sea surface.'
(Average value: 3.9; scores: 1^{2} 2^{1} 3^{8} 4^{17} 5^{12})

These results invite the following generalisations. First, some simple *fāngwèicí* can be classified as non-projective/region-denoting items (cf. (15)–(18)), but most items belong to the projective type. Thus, not only compound *fāngwèicí* can combine with MPs, as argued in previous works; most simple *fāngwèicí* can also do so. Second, compound *fāngwèicí* always belong to the projective type via suffixation, unlike Mandarin (cf. Ursini *et al.* 2020). For instance, simple *leoi*[5] 'in', *zhung*[3] 'middle' are non-projective, whereas compound *leoi*[5]*-bin*[6] 'in-side', *ngoi*[6]*-bin*[6] 'out-side' are projective. Third, *hai*[2] does not affect distribution with MPs when they distribute as co-verbs, whereas *hoeng*[2] can improve acceptability when it distributes as a preposition. These patterns may also extend to other *jiècí*, though we have not tested them. Hence, Cheng and Sybesma (2022)'s account involving multiple Degree heads may be accurate: *fāngwèicí* and *jiècí* can affect MPs' presence. Fourth, spatial pronouns do not seem to determine MPs' licensing: sentences are acceptable irrespective of their presence. An analysis of these patterns must therefore capture the piece-meal, compositional contribution of each category to the acceptability of sentences.

5. ANALYSIS

In this section we use the Lexical Syntax framework to offer an account of our data (Hale and Keyser 2002: Ch. 4; Mateu 2002; Acedo-Matellan 2016; Ursini and Huang 2020; Ursini and Tse 2021; Ursini and Wu 2024). We use Lexical Syntax because we build our analysis as an extension of Ursini (2020) to these data that also integrates the Cheng and Sybesma (2022) insights. We compare our analysis with other generative analyses in Section 6, in order to clarify its central results. The tenets of this framework that we employ can be summarised as follows.

First, Lexical Syntax posits that the central syntactic unit is the "head", and that there are four language-general head types. Heads can instantiate 0-place, 1-place and 2-place head types. Morpho-syntactic categories thus vary in the number of arguments that a head can take in a morpho-syntactic context to form a phrase, i.e. their valence. 2-place heads can take (or "merge" with, in generative parlance) a specifier and a complement to form a phrase. Instead, 1-place heads only take either argument type; 0-place heads are "bare" arguments. Originally, the framework assumed a distinction between two types of 2-place heads. However, we can use only one type, without loss of analytical insight (cf. Acedo-Matellan 2016; Ursini 2020).

Second, language-specific categories may have flexible valence. This property is captured by mapping categories to more than one head type (Hale and Keyser 2002: Ch. 3–4; Mateu 2002; Acedo-Matellan 2016: Ch. 2). This fact entails that certain macro-categories (e.g. adpositions) can be partitioned into sub-categories involving different head types (e.g. pre- and post-positions). For instance, Hale and Keyser (2002: Ch. 4), Mateu (2002), Acedo-Matellan (2016) propose specific analyses of prepositions involving this possibility (i.e. the "P-within-P" analysis and its declinations). In a similar manner, Ursini and Huang (2020), Xie *et al.* (2024) offer language-specific versions of this analysis for Mandarin and Cantonese, respectively. We have briefly discussed the analysis that these works propose for *fāngwèicí*, *jiècí* and the BLCs they form in (14b). We repeat the structure in (37), before we present our current extensions:

(36) a. $[_{PP(s,p)}[_{ClP(s)}[fig_{HP}]cl_s][_{P'}jiècí_{P(s)}[_{ClP(s,sp)}[_{Cl'}[_{ClP(s,sp)}[_{DP}ground]cl_{Cl(s,sp)}]ge^3_{Cl}][_{ClP(s)}[_{DP}$ fang]-$cl_{(s)}]]]$

b. $[_{PP(s,p)}[_{ClP(s)}[$ $go^3_{HP}]]$ $neoi^5zai^2_{Cls}][_{P'}$ $hai^2_{P(s)}$
$[_{ClP(s,sp)}[_{Cl'}[_{ClP(s,sp)}[_{DP}$ $zoeng^1]$ $toi^2_{Cl(s,sp)}]ge^3_{Cl}][_{ClP(s)}[$ hau^6_{DP}]-$min^6_{Cl(s)}]]]$

(37) a. $[_{PP(s,p)}[_{ClP(s)}[fig_{HP}]$ $cl_s][_{P'}$ verb
$[_{PP}jiècí_{P(s)}[_{ClP(s,sp)}[_{Cl'}[_{ClP(s,sp)}[_{DP}gr]cl_{Cl(s,sp)}]ge^3_{Cl}][_{ClP(s)}[_{DP}$ fang]-$cl_{(s)}]]]]$

b. $[_{PP(s,p)}[_{ClP(s)}[fig_{HP}]bcl_s][_{P'}$ verb
$[_{PP}jiècí_{P(s)}[_{ClP(s,sp)}[_{Cl'}[_{ClP(s,sp)}[_{DP}gr]cl_{Cl(s,sp)}]ge^3_{Cl}][_{ClP(s)}[_{DP}$ fang]-$cl_{(s)}]]]]$

As (36a) shows, predicative *jiècí* such as hai^2 are 2-place heads taking two Cl(assifier)Ps as arguments. One of these arguments is a ClP including the figure DP; the other is the phrase headed by ge^3, analysed as a relational/2-place Cl(assifier) head (cf. Pacioni 1997, 1998, 2017). A "relational" ClP is formed when the ground ClP (i.e. a ground DP plus classifier) and a *fāngwèicí* combine or *merge*, in generative parlance, as arguments of a silent or realised ge^3 head. As (36b) shows, this structure minimally captures the constituency of BLCs in which *jiècí* are co-verbs heading P(redicative)Ps, i.e. minimal phrases/clauses predicating a relation between figure and ground. As (37a) shows, an extension for prepositional *jiècí* such as $hoeng^3$ requires that lexical verbs become Predicator heads. *Jiècí* become prepositional 1-place heads of PPs that only introduce ground ClPs in BLCs. In both cases the features assigned to each category, represented as sub-scripts in (37b), project at phrasal and sentential levels, and thus determine BLC's well-formedness. To properly illustrate this projection mechanism, we must however first define its rules.

In Ursini and Wu (2024) (cf. also Ursini and Tse 2021) feature representation and projection work as follows. When two categories merge, their features merge accordingly and form complex feature structures. Phrases thus inherit features from their constituting categories, provided that their feature structures are well-formed. Using (36) as an example, a classifier Cl with feature *s(patial)* merges with a complement DP with feature *sp(ecific),* and forms a ClP with the *s* and *sp* features. In formal notation, from <*Cl,s*> and <*DP,sp*> (i.e. <*Cl,s*>⊔<*DP,sp*>, "⊔" representing the merge operation), we obtain <*ClP,s,sp*> (e.g. Shieber 1986; Adger 2010; Benavides 2022). As this projection mechanism is recursive, features initially associated with single lexical items can project at a phrasal and sentential level. Thus, the feature structure(s) *(s,sp)* become associated to ClPs and then PPs, as the sub-scripts in the structure show. In prose, ground figure arguments (i.e. ClPs) can denote specific

spatial locations. The PPs including them can then denote relations between these specific spatial locations.

Let us now turn to our empirical problem. As our data suggest, *fāngwèicí* and *jiècí* (specifically, *hoeng*^{2}) can contribute piece-meal to the acceptability of MPs in BLCs. If we interpret the data from a feature-based perspective, then each category contributes features that can license/block the presence of MPs once these features project at phrasal, sentential level. As proposed in Ursini *et al.* (2020), Cheng and Sybesma (2022), such features denote the measurability of the types of location under discussion: they thus are *d(egree)* features. What we must capture, however, are the precise mechanisms regulating these patterns and the nuanced acceptability values observed in the data. For this purpose, we must extend the category and feature assignment for the structure in (36) with *d* features and heads introducing MPs. We can then conclude this extension with an analysis of the sentential contribution of spatial pronoun *go*^{2}*dou*^{6} and its interplay with lexical verbs.

The extended assignment works as follows. We assume that simple *fāngwèicí* are "bare" DPs, i.e. 0-place heads that can occur without a classifier (cf. Ursini and Huang 2020). Compound *fāngwèicí* involve nominal classifiers acting as suffixes, i.e. 1-place Cl heads merging with simple *fāngwèicí* to form a Classifier Phrase/0-place head. Items belonging to either category carry either a *+d(egree)* or *-d(egree)* feature. The combination of the *+d* and *s* features denotes projective type items; that of *-d* and *s* features, region/non-projective type items. Suffixes can act as derivational morphemes possibly changing features' values. For instance, *leoi*^{5} 'in' blocks the presence of MPs, but *leoi*^{5}*-bin*^{1} 'in-side' licenses their presence. Thus, *-bin*^{1} changes the value of the *fāngwèicí* from *-d(egree)* to *+d(egree)*. Not all of the test sentences included *ge*^{3}, as informants indicated that this element is often optional.

Let us turn to the analysis of the data. MPs involve a numeral introducing an *sp* feature, e.g. *ng*^{5}*sap*^{6} 'fifty' and a ClP introducing a *(s,+d)* compound feature, e.g. *gong*^{1}*fan*^{1} 'centimetres', with the former being affixed to the latter. MPs thus denote specific distances along directions/projections (i.e. 'spatial degrees'). MPs and SPs can merge via the intervention of a silent Deg head, provided that their *d* features match. The postulation of such a silent head is justified on the ground that MPs and SPs are full-fledged phrases (i.e. 0-place heads). Thus, they can form a more complex phrase only via an otherwise unrealised head (cf. Svenonius 2010; Ursini and Wu 2024). The resulting DegP becomes the complement that a *jiècí* takes as one of its arguments, the other being the figure DP. As in Ursini *et al.* (2020), we assume that *hoeng*^{2} and other motion *jiècí* can also carry *+d* features, unlike *hai*^{2} and other locative *jiècí*. Consider thus the structures in (38)–(43):[6]

(38) $[_{PP(s,sp,+d)}[_{ClP(s)}[\ fig_{DP}]\ Cl_{s}][_{P}$*jiècí*$_{P}\ [_{DegP(s,sp,+d)}[_{Deg'(s,sp,+d)}$
$[_{ClP(s,sp)}[_{Cl'(s,sp-d)}[_{ClP(s,sp)}[_{DP}$ ground] $cl_{Cl(s,sp)}]$ *ge*$^{3}{}_{Cl}][_{DP(s,+d)}$ fang]]$\emptyset_{Deg}][_{MP(+d)}$ measure]]]]

(39) $[_{PP(\#)}[_{ClP(s)}[\ fig_{DP}]\ Cl_{s}]][_{P}$*jiècí*$_{P}\ [_{DegP(\#)}[_{Deg'(\#)}$
$[_{ClP(\#)}[_{Cl'(s,sp,-d)}[_{ClP(s,sp)}[\ _{DP}$ ground] $cl_{Cl(s,sp)}]$ *ge*$^{3}{}_{Cl}][_{DP(s,-d)}$ fang]]$\emptyset_{Deg}][_{MP(+d)}$ measure]]]]]

(40) $[_{PP(s,sp,+d)}[_{ClP(s)}[\ fig_{DP}]\ Cl_{s}][_{P}$*jiècí*$_{P(+d)}\ [_{DegP(s,sp,+d)}[_{Deg'(s,sp,+d)}$
$[_{ClP(s,sp)}[_{Cl'(s,sp-d)}[_{ClP(s,sp)}[_{DP}$ ground] $cl_{Cl(s,sp)}]$ *ge*$^{3}{}_{Cl}][_{DP(s,+d)}$ fang]]$\emptyset_{Deg}][_{MP(+d)}$ measure]]]]

(41) $[_{PP(\#)}[_{ClP(s)}[\ fig_{DP}]\ Cl_{s}][_{P}$*jiècí*$_{P(+d)}\ [_{DegP(\#)}[_{Deg'(\#)}$
$[_{ClP(\#)}[_{Cl'(s,sp,-d)}[_{ClP(s,sp)}[\ _{DP}$ ground] $cl_{Cl(s,sp)}]$ *ge*$^{3}{}_{Cl}][_{DP(s,-d)}$ fang]]$\emptyset_{Deg}][_{MP(+d)}$ measure]]]]

[6] We use round brackets (i.e. "*(,)*") rather than sequence markers (i.e. '<,>") in structures for formatting reasons.

(42) $[_{PP(s,sp,+d)}[_{ClP(s)}[\ fig_{DP}]\ Cl_s][_{P}$*jièc*$í_{P(+d)}\ [_{DegP(s,sp,+d)}[_{Deg'(s,sp,+d)}[_{ClP(s,sp)}[_{Cl'(s,sp-d)}$
$[_{ClP(s,sp)}[_{DP}$ ground] $cl_{Cl(s,sp)}]$ *ge*$^3{}_{Cl}][_{ClP(s,+d)}[_{DP(s,-d)}$ fang]-$suff_{Cl(s,-d\rightarrow+d)}]]\emptyset_{Deg}][_{MP(+d)}$ measure]]]]

(43) $[_{VP(dx,s,sp,+d)}[_{PP(s,sp,+d)}[_{ClP(s)}[\ fig_{DP}]\ Cl_s][_{P}$*jièc*$í_{P(+d)}\ [_{DegP(s,sp,+d)}[_{Deg'(s,sp,+d)}[_{ClP(s,sp)}[_{Cl'(s,sp-d)}$
$[_{ClP(s,sp)}[_{DP}$ ground] $cl_{Cl(s,sp)}]$ *ge*$^3{}_{Cl}][_{ClP(s,+d)}[_{DP(s,-d)}$ fang]-$suff_{Cl(s,-d\rightarrow+d)}]]\emptyset_{Deg}][_{MP(+d)}$ measure]]]]
Verb $[_{DeixP(dx,s,sp)}$ *go*^{2} $[_{ClP(s,sp)}$ *dou*^{6}]]]

The structure in (38) represents a BLC in which a simple *fāngwèicí* carries a *+d* feature. *Hai*^{2}, as a predicative *jiècí*, lacks this feature and thus does not affect the presence of MPs. The *fāngwèicí*'s feature projects as a phrasal level (i.e. we have *ge*$^3P_{(s,+d)}$). This feature merges with the *+d* feature that an MP contributes, once a DegP is formed (i.e. we have $DegP_{(s,sp,+d)}$). This and the other features (*s*, *sp*) establish that a full BLC denotes a complex spatial relation. A specific projection, the 'front axis' of a ground, is selected; a specific distance along this axis, 'ten metres', is also selected. The figure occupies a position along this axis and at this distance. The notation $PP_{(s,sp,+d)}$ represents all this information in a compact manner. The features that each constituent introduce project at a sentential level and define the sense assigned to the whole sentence, in a compositional manner.

The structure in (39), instead, represents a BLC in which a simple *fāngwèicí* introduces a *-d* feature, again with *hai*^{2} as a predicative head. When this feature merges with its opposite feature *+d*, we have an uninterpretable feature structure (i.e. we have $DegP_{(s,sp,-d,+d)=(\#)}$). The DegP would denote a distance from the ground ('ten metres') but defined via a region of the ground ('the back') that should be at a minimal (i.e. non-projective) distance. The notation $PP_{(\#)}$ thus represents the fact that BLCs involving this type of mismatch become uninterpretable, as a result of their constituents being uninterpretable.

The structure in (40) represents a BLC including *hoeng*^{2} as the prepositional *jiècí* that introduces a further *+d* feature, and a lexical verb acting as the predicative head. In this case, feature-matching occurs at two different steps. The first is in the DegP, between MP ('ten metres') and SP ('in front of the car'). The second is in the PP, between DegP ('ten meters in front of the car') and P head ('to'). We suggest that this second step licenses the near-ideal evaluations attested in all test sentences involving this *jiècí*. Conversely, the absence of this step in sentences including *hai*^{2} (e.g. (38)–(39)) leads to acceptable but not near-ideal sentences.

The structure in (41) shows that prepositional *hoeng*^{2} can merge with an ill-formed DegP marginally improving its unacceptability, because it explicitly establishes the existence of a measurable distance *+d* (i.e. we have $P_{(+d)}$). However, the mismatch generated at the DegP level between MP and SP creates an uninterpretable sentence (i.e. $DegP_{(\#)}$), which ultimately renders a BLC uninterpretable.

The structure in (42) represents the contribution of compound *fāngwèicí* in BLCs. The compound *leoi*^{5}*-bin*^{1} 'in-side' introduces a *+d* feature once its suffix changes the feature value of the simple *fāngwèicí* (i.e. *-d* for *leoi*^{5} 'in'). This feature then projects at the DegP and PP level, licensing a well-formed sentence. We model the derivational nature of the suffix by assuming that these suffixes carry complex (functional) features (here, $\pm d \rightarrow +d$: Shieber 1986; Adger 2010; Benavides 2022). When a suffix merges with a *fāngwèicí* carrying a *d* feature (i.e. $<DP,-d> \sqcup <Cl, \pm d \rightarrow +d> = <ClP,+d>$), it maps it onto a *+d* feature via a form of *modus ponens* (i.e. $-d \sqcup (-d \rightarrow +d) = +d$ holds). A simple *fāngwèicí* such as *leoi*^{5} may belong to the (region) type *-d*, but a compound *fāngwèicí* obtained via *-bin*^{1} always maps to the projective type *+d*.

The structure in (43) offers an analysis of the patterns involving lexical verbs and spatial pronouns. We assume that *go²dou⁶* projects a Deix(is) category and a Cl(assifier) category respectively introducing <*dx*> and and <*s*,*sp*> features (cf. Svenonius 2010; Lam 2013; Wu 2016). Thus, from the merge of <*Deix,dx*> and <*ClP,s,sp*> we have <*DeixP,dx,s,sp*>. Crucially, verbs with classifiers merge with their oblique arguments in sentence-initial, discourse-focused position (Kwan 2005, 2010). The spatial pronoun thus acts as a presumptive pronoun. It establishes that a verb has a complement to form a full VP, but also that this pronoun refers to the same location introduced by the topicalised PP. From this analysis, we can infer that the pattern observed in Cheng and Sybesma (2022) does not hinge on the presence of MPs, but on the discourse-sensitivity of verbs and spatial categories. As we now have an empirically adequate account of our data, we can turn to the discussion.

6. DISCUSSION & CONCLUSIONS

We believe that our results warrant three discussion points. First, we can offer our answers to the two initial research questions: how Cantonese SPs can merge in BLCs also including MPs, and what features license well-formedness. First, *fāngwèicí* mostly determine whether MPs can also occur or not; *jiècí* improve acceptability when they carry dynamic/directional content. The SPs (Spatial Phrases) that these constituents form inherit their morpho-semantic features in a compositional manner. If these features match those of MPs, then SPs and thus BLCs are well-formed and interpretable; if they do not match, ill-formedness and uninterpretability occur. Second, we have dubbed the chief feature licensing these patterns *d(egree)*, but we also have shown that the *s(patial)* and *sp(ecific)* feature play a key role in BLCs' interpretability. Therefore, we extend the proposal for Cantonese SPs in Xie *et al.* (2024) with the mechanisms and features proposed in Ursini *et al.* (2020), Cheng and Sybesma (2022). In so doing, we answer our research questions while also aptly modelling our empirical findings.

Second, our analysis is also consistent with other previous proposals. Our analysis of *fāngwèicí* is symmetrical to flexible treatments of this category in Mandarin (e.g. Ursini and Huang 2020; Liang and Her 2023). Similarly, we follow Pacioni (1998, 2017, 2018)'s analysis *ge³* as a relational classifier (cf. also Sio 2006; Zhang 2017; on Mandarin *de*). We then offer evidence on the possible combinations of compound *fāngwèicí* one can find in this language, showing that some but not all spatial classifiers acting as suffixes can license productive forms (i.e. *-bin⁶*/*-bin¹* 'side', *-min⁶* 'face' and *-zak¹* 'side'). Notably, we do not follow cartographic analyses in their category assignment for our target categories (e.g. Lam 2013; Wu 2015). This is the case, however, because our data support an analysis of *jiècí* as co-verbs, and of *fāngwèicí* as nominal elements with flexible valence. Crucially, our analysis also shows that spatial pronouns can occur in these sentences, but under conditions orthogonal to the licensing of MPs. This is consistent with Lam (2013), Cheng and Sybesma (2022)'s observations on this category.

Third, the analysis is also consistent with cross-linguistic findings regarding MPs and their distribution with SPs. This result confirms that these categories can interact in various manners across languages. For instance, English, French and Italian data suggest that AxPart items mostly determine the licensing/blocking of MPs (e.g. respectively Svenonius 2010; Ursini and Tse 2021; Ursini and Wu 204). Other categories forming the "adpositional field"

seem not to play a role, in this pattern. In German, Urdu and Mandarin, however, spatial case morphemes and *jiècí* also contribute to this pattern, but as distinct categories (e.g. respectively Gehrke 2008; Franco *et al.* 2017; Ursini *et al.* 2020). Hence, it seems that the set of categories that can carry *±d(egree)* features can be language-specific, and possibly not limited to spatial categories. Nevertheless, our account can potentially capture this form of variation by offering a recursive mechanism of feature projection that can correctly predict (un)interpretability.

In conclusion, our paper has offered an account of novel data involving the distribution of Measure Phrases (MPs) and Spatial Phrases (SPs) in Cantonese. The paper has shown that *jiècí* ('co-verbs') and *fāngwèicí* ('localisers') are the two core categories that can distribute with MPs, and determine the well-formedness and interpretability of their sentences. Crucially, simple and compound *fāngwèicí* alike mostly determine this distribution when locative *jiècí* act as co-verbs/predicative heads (cf. the *hai*^{2} data). Directional/prepositions *jiècí* (e.g. *hoeng*^{2}) can improve but not determine the acceptability of sentences including projective *fāngwèicí*, instead. We propose an extension of Lexical Syntax with a feature projection mechanism to account for these data, showing that phrasal interpretability recursively generates sentential acceptability. We then suggest that this analysis and data shed further light on "measurability" in SPs, and can be potentially applied to other Sinitic languages and beyond. We however leave such extensions for future research.

ABBREVIATIONS

CL	=	classifier
CL.PL	=	plural classifier
CL_{PLACE}	=	place classifier
DEM	=	determiner
DIS	=	distal
GE	=	cluster of senses associated with *ge3*
P	=	preposition
MP	=	measure phrase

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