Inner and outer aspect in Cantonese

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Abstract

Aspect is a core part of Chinese verbal expressions. This analysis covers the main types of aspect for Cantonese (inner/situation and outer/viewpoint), modeling their semantics and constraining their combinations. Outer aspectual particles are treated as verbal markers that combine with their head using the head marker rule and constrain its aspect. They must combine with a verb that is a lexeme, not a phrase. Inner aspectual particles also combine with lexemes, but differ from outer aspectual particles in that they introduce a one-place predicate. This behavior is similar to resultative verbs. We therefore treat inner aspectual particles as defective resultative verbs with three special properties: (i) one subclass (event) takes the predicate of the first verb as an argument, the other subclass (individual) takes the ARG1 or ARG2 of the head verb. (ii) Both types constrain the (viewpoint) aspect of the head verb to be perfective or experiential. This also ensures that once the inner aspect is added, it is only compatible with a subset of outer aspectual particles (e.g., not progressive, continuous or delimitative). (iii) The inner aspectual particles cannot be main verbs. The analysis is implemented in an open-source Cantonese HPSG, available at ⟨https://github.com/neosome/yue⟩.

1 Introduction

Chinese languages have a rich aspectual system, including post-verbal aspectual particles and a variety of other indicators. There is a large literature on Mandarin Chinese, but less on other varieties such as Cantonese (see Matthews & Yip 2013 and Yip 2025 for a recent discussion). In this paper, we first give a selective summary of the literature, then we sketch an analysis for Cantonese. Our goal is to have an analysis suitable for implementation in a broad computational grammar. We are using the DELPH-IN framework (Uszkoreit 2002) for the grammars, with Minimal Recursion Semantics for the meaning representation (Copestake et al. 2005).

The notion of aspect can be divided into two kinds: viewpoint aspect and situation aspect. Viewpoint aspect is concerned with the temporal perspective of the event. It encodes how much of a situation is made visible grammatically (Smith 1991): perfective and imperfective viewpoints. Situation aspect (lexical aspect or aktionsart) is concerned with the internal structure of the situation. There are five situation types: state, accomplishment, achievement, activity, and semelfactive, which can be expressed in terms of binary feature composition (+/-telic, +/-durative, +/-static) (Smith 1991), as shown in Table 1.

It has been claimed that there are no mono-morphemic verbs in Mandarin that express accomplishments or achievements: mono-morphemic verbs in Mandarin express either states or activities, accomplishments and achievements are derived syn-

[†]We would like to thank Dan Flickinger for his help in developing this analysis and debugging the implementation; the HPSG reviewers for their useful comments; the participants of DELPH-IN 2025 and HPSG 2025 for their illuminating discussion and finally Stefan Müller for his help with the final proof.

Table 1: Situation types

state	'know'	−telic,	+durative,	+static
activity	'run'	−telic	+durative,	−static
accomplishment	'build a house'	+telic,	+durative,	−static
achievement	'die'	+telic,	−durative,	−static
semelfactive	'cough'	−telic,	−durative,	−static

tactically (Sybesma 1997, Lin 2004).[1] For example, 看 *kàn* 'look' in Mandarin Chinese is an activity verb (-telic, +durative,−static), while 看到 *kàndào* 'see' (lit. 'look.arrive') is an achievement verb (+telic, −durative, −static). The post-verbal particle 到 *dào* adds an end point to the activity of looking (changing the event from -telic to +telic) and also makes the internal structure of the event inaccessible (changing the event from +durative to -durative). 看到 *kàndào* 'see' is incompatible with the pre-verbal progressive marker 在 *zài*. In Cantonese 擦乾 *caat3 gon1* 'wipe dry' is an accomplishment verb (+telic, +durative, −static). 擦 *caat3* 'wipe' is an activity (−telic +durative, −static) and the resultative adjective 乾 *gon1* 'dry' turns the event into an accomplishment (+telic, +durative, −static). 擦乾 *caat3 gon1* 'wipe dry' in Cantonese, unlike 看到 *kàndào* 'see' in Mandarin, is compatible with the progressive aspect (encoded by the post-verbal aspectual particle 緊 *gan2* in Cantonese) (Lu et al. 2019). The main verb, together with the element that is added (e.g., a verbal particle or a resultative verb/adjective), jointly determine the aspectual class of the verbal complex.[2]

In Chinese, there are different kinds of post-verbal particles that are related to aspectual properties. Some particles can shift the situation aspect (as shown in the previous paragraph). Structurally they are often referred to as inner aspectual particles (Sybesma 2017), as they occupy the inner most aspectual layer (closer to the root verb). There are, at least, two kinds of inner aspectual particles (relating to situation aspect): resultative particles and phase complements (Sybesma 2017). Resultative particles have lexical meaning, can be used as predicates on their own, and also provide an endpoint to the action encoded by the verb (e.g., the Mandarin 飽 *bǎo* 'satiated' as in 吃飽 *chībǎo* 'eat.satiated'). Such endpoints (e.g., 'satiated') also encode a thematic relation either to the subject or the object (e.g., the subject is satiated in an event of 'eat-satiated'). Phase complements (Chao 1965) are particles that are semantically bleached (e.g., 到 *dào* 'arrive' in 看到 *kàndào* 'see', lit. 'look.arrive'), they provide an endpoint to the event (making the event + telic). For both types of inner aspectual particles, in addition to adding an end-point, they also make the internal structure of the event inaccessible (creating an achievement predicate). Resultative

[1]This is not without exceptions: there are also verbs like 死 *sǐ* 'die', which arguably are +telic, −durative, −static.

[2]Mandarin data are transcribed using *Pinyin* (where tonal information is expressed with diacritics); Cantonese data are transcribed using *Jyutping* (where tonal information is expressed with numbers) following standard practice for the two languages.

particles and phase complements do not co-occur. Viewpoint aspectual particles signal whether the event has reached its endpoint or not (e.g., the perfective particle 了 le in Mandarin). Viewpoint aspectual particles appear to the right-hand side of inner aspectual particles. We refer to them as outer aspectual particles, so the order is always: verb - inner aspectual particle - outer aspectual particle.

Matthews & Yip (2013) identify eight viewpoint aspectual particles (outer aspectual particles). They are: 咗 *zo2* 'perfective', 過 *gwo3* 'experiential', 緊 *gan2* 'progressive', 住 *zyu6* 'continuous', 吓 *haa5* 'delimitative', 起上嚟 *hei2soeng5lei4* 'inchoative', 落去 *lok6heio3* 'continuative' and 開 *hoi1* (or 慣 *gwaan3*) 'habitual'.[3] In addition, Matthews & Yip (2013) identify 10 directional particles, 15 resultative particles, 3 quantifying particles and 1 adversative/habitual particle which we do not analyze in this paper. Matthews & Yip (2013) didn't have a separate particle class that encodes situation aspect (inner aspectual particles). Yip (2025), on the other hand, identifies 14 inner aspectual particles in Cantonese based on the following criteria: (i) A morpheme following the verbal root; (ii) Contributes to aspectual meaning (situation aspect) ; (iii) Can be followed by the perfective suffix 咗 *-zo2* (which marks perfective viewpoint aspect); (iv) Cannot undergo verb doubling alone. Criterion (i) states that inner aspectual particles are post-verbal. Criterion (ii) states that such particles contribute to the formation of different situation types. Criterion (iii) is based on the observation that inner aspectual particles occupy a slot closer to the verb than outer aspectual particles. 咗 *-zo2* is compatible with verbs with an inner aspectual particle added. Criterion (iv) requires some explanation. Verbs in Cantonese may be doubled for contrastive topicality (Lee 2024). Consider (1) where the word 做 *zou6* 'do' is doubled:

(1) Cantonese (yue)

做	，	佢	係	識	做	嘅
zou6		*keoi5*	*hai6*	*sik1*	*zou6*	*ge2*
do		3SG	be	know	do	SFP

'As for doing, s/he knows how to do [it].'

Yip (2025) observes that postverbal elements behave differently as to whether they can double alone without the verbal roots. Outer aspectual particles (e.g., 咗 *zo2*) cannot be doubled without the verbal root. For post-verbal elements that encode an endpoint, they diverge. For example, 飽 *baau2* 'satiated' in 食飽 *sik6baau2* 'eat.satiated' can be doubled alone while 完 *jyun4* 'finish' in 食完 *sik6jyun4* 'eat.finish' cannot.

In view of this contrast, Yip (2025) treats 飽 *baau2* 'satiated' in Cantonese as a resultative verbal complement (RVC), while 完 *jyun4* 'finish' in 食完 *sik6jyun4* 'eat.finish' as an inner aspectual particle.

[3]There is no Mandarin counterpart of the Cantonese progressive post-verbal particle 緊 *gan2*. In Mandarin, the pre-verbal element 在 *zài* (literally means 'be at') expresses progressive. In Cantonese, there is also a pre-verbal progressive marker 喺度 *hai2dou6* (literally means 'be here') The progressive aspectual particle 緊 *gan2* and marker 喺度 *hai2dou6* can be used concurrently.

(2) Cantonese (yue)

a. 飽 ， 佢 係 已經 食飽 咗 嘅
baau2 *keoi5* *hai6* *ji5ging1* *sik6baau2* *zo2* *ge2*
satiated 3SG be already eat.satiated PERF SFP

'As for becoming full, s/he has already eaten and become full.'

b. * 完 ， 佢 係 已經 食完 嗰 碗 飯 嘅
jyun4 *keoi5* *hai6* *ji5ging1* *sik6jyun4* *go2* *wun2* *faan6* *ge2*
finished 3SG be already eat.finish that CL rice SFP

Intended: 'As for eating, s/he has finished eating that bowl of rice.'

We concur that there is a distinction in judgment between (2a) and (2b), but in both cases, such elements (飽 *baau2* 'satiated' and 完 *jyun4* 'finish') provide an endpoint to the event and the whole event becomes an achievement. They alter the situation aspect in the same way. In both cases, the progressive aspectual particle cannot be added, as opposed to other resultative state, such as 乾 *gon1* 'dry' in (3c):

(3) Cantonese (yue)

a. * 佢 食飽 緊
keoi5 *sik6baau2* *gan2*
3SG eat.satiated PROG

Intended: 'S/he is in the process of eating to become satiated.'

b. * 佢 食完 緊 嗰 碗 飯
keoi5 *sik6jyun4* *gan2* *go2* *wun2* *faan6*
3SG eat.finish PROG CL bowl rice

Intended: 'S/he is in the process of eating that bowl of rice to completion.'

c. 佢 抹 乾 緊 啲 蘋果
keoi5 *maat3* *gon1* *gan2* *di1* *ping4gwo2*
3SG wipe dry PROG CL apple

'S/he is wiping the apple(s) dry.'

In view of the above, we treat 飽 *baau2* 'satiated' and 完 *jyun4* 'finish' both as inner aspectual particles. We adopt the following slightly revised definition for inner aspectual particles: (i) A monosyllabic morpheme following the verbal root; (ii) Contributes to situation aspectual meaning; (iii) Can be followed by the aspectual particle 咗 *zo2*; (iv) Changes the event into an achievement. Note that this means, with our definition, we exclude cases like 乾 *gon1* 'dry' in 抹乾 *maat3 gon1* 'wipe dry' in Cantonese as an inner aspectual particle, because the resulted event is an accomplishment (compatible with the progressive aspect). They are resultative predicates but not inner aspectual particles, and will have different syntactic properties. This however

suggests that a line has to be drawn between what is considered an inner aspectual particle and what is considered simply a resultative predicate. We consider an element as an inner aspectual particle if it fulfills our 4 criteria.

In the Mandarin Grammar Zhong (Fan 2019), inner aspectual particles are treated as part of the verb, following the Penn Treebank segmentation, but it is not an ideal treatment due to their productivity. Most HPSG discussions of aspect and implemented grammars deal only with outer aspect (Müller & Lipenkova 2013, Fan 2019, Morgado Da Costa 2021). In this paper, we propose an HPSG implementation of both inner and outer aspectual particles for Cantonese. The analysis is implemented in an open-source Cantonese HPSG (Sio & Song 2015).[4]

2 Data

Cantonese has a rich inventory of aspectual particles. Outer aspectual particles include: 咗 *zo2* (perfective), 緊 *gan2* (progressive), 過 *gwo3* (experiential), 住 *zyu6* (continuous activity or state without change), 吓 *haa5* (delimitative) (Matthews & Yip 2013). Inner aspectual particles, as mentioned earlier on, are of two kinds: resultative particles and phase complements (Sybesma 2017). The general understanding is that resultative particles carry lexical meanings, predicative of the subject or the object and denote the end-point of events. In contrast, phase complements are particles that are generally semantically bleached and do not contain any predicative meaning. However, a closer look at a range of Cantonese inner aspectual post-verbal particles show that the clear dichotomy is not without problems. For instance, the post-verbal particle 親 *can1*, when added to an activity verbs like 撞 *zong6* 'bump into', denotes an unspecified degree of bodily harm to either the subject or the object (depending on factors such as animacy of the arguments) (Sio 2020). However, it cannot be used as an independent predicate. It can only be used in the post-verbal position as a particle. In contrast, the post-verbal particle 完 *jyun4* 'finish' has a clear lexical meaning, and yet it is not predicative of either the subject or the object when added to an activity verb like 油 *jau4* 'paint', it simply adds an end-point to the event of painting. This suggests that the dichotomy, as defined above, might not represent the correct division. It should also be noted that many inner aspectual particles of the resultative type are derived from main verbs, but they are not main verbs in the aspectual usage we are discussing here. They have the same forms as main verbs (and sometimes are very close in meaning), but they are a different class of syntactic entities.

In this paper, we look at three kinds of Cantonese post-verbal aspectual particles: outer aspectual particles (OAP) and inner aspectual particles (IAP) that provide an end-point to the event while rendering the internal structure of the event inaccessible. There are two kinds of IAPs: those that are predicative of an individual (IAPi) and those that are only linked to an event (IAPe). We give a full list in Table 2.

[4]The implementation, using the DELPH-IN tools, is available at ⟨https://github.com/neosome/yue⟩.

We have incorporated the most common post-verbal aspectual particles into the Cantonese HPSG grammar for this paper, which would be sufficient to be illustrative of OAP, IAPi and IAPe:

- OAP: 咗 *zo2* (perfective), 緊 *gan2* (progressive), 過 *gwo3* (experiential), 住 *zyu6* (continuous activity or state without change), 吓 *haa5* (delimitative: 'do … for a while')
- IAPi: 飽 *baau2* 'satiated', 死 *sei2* 'die', 親 *can1* 'hurt to a non-specific degree'
- IAPe: 完 *jyun4* 'finish', 好 *hou2* 'good', 到 *dou2* 'complete' (lit. 'arrive'), 掂 *dim6* 'fixed'

The ordering of post-verbal particles in the verbal cluster is always V-IAP-OAP and IAPi and IAPe do not co-occur.

(4) Cantonese (yue)

a. 我 食 咗/緊 麵
ngo5 sik6 zo2/gan2 min6
1SG eat PERF/PROG noodles

'I have eaten noodles'/ 'I am eating noodles.' V-OAP

b. 我 食飽 *(*咗*)* 麵
ngo5 sik6baau2 zo2 min6
1SG eat.satiated PERF noodles

'I have eaten noodles to the point that I am full.' V-IAPi-OAP

c. 我 食完 *(*咗*)* 麵
ngo5 sik6jyun4 zo2 min6
1SG eat.finish PERF noodles

'I have finished eating noodles.' V-IAPe-OAP

There are selectional criteria between the event (situation type) and the OAP. Regarding our selected set of inner aspectual particles, when they are added to the root verb, the event becomes an achievement, and is consequently incompatible with any imperfective viewpoint aspect (e.g., progressive, experiential, etc.). The OAP 吓 *haa5* (delimitative) is only compatible with activities, and thus is not compatible with events that contain any IAP (which always provide an end-point, making the event +telic). Such idiosyncrasies among the different requirements of individual particles will also be taken into account.

3 Analysis

Here we give the main points of our analysis. The descriptions given are only partial, we omit information not relevant to the discussion at hand. We are trying, as far as

Table 2: Co-occurrence of inner and outer aspectual particles

Particle		Meaning	type	zo2	gwo3	gan2	zyu6	haa5
飽	*baau2*	full	x	+	+	-	-	-
死	*sei2*	die	x	+	+	-	-	-
親	*can1*	hurt	x	+	+	-	-	-
完	*jyun4*	finish	e	+	+	-	-	-
好	*hou2*	good	e	+	+	-	-	-
到	*dou2*	complete	e	+	+	-	-	-
掂	*dim6*	fixed	e	+	+	-	-	-

possible, to keep our analyses similar to those implemented for Mandarin in Zhong (Fan 2019) so we can compare them easily.

3.1 Outer Aspect

In this paper, we will model 5 outer aspectual particles (OAPs). We list the them in Table 3 and their compatibility with inner aspectual particles (IAPs) in Table 2. Because the outer aspectual particles only change the aspect of the verb they attach to, we chose to model them as markers. The head is the verb and the marker is the aspectual particle.

Table 3: Outer Aspect

Particle		Aspect	Comment
zo2	咗	perfective	
gwo3	過	experiential	
gan2	緊	progressive	- stative (dynamic)
zyu6	住	continuous	activity or state without change
haa5	吓	delimitative	

The SPEC feature allows markers (and determiners) to select their heads (Pollard & Sag 1994: 45). The SPEC feature on the mother will be determined by the marker. We enable aspect-markers to constrain their complement to be SPEC non-empty (notionally compatible with combining with a marker), but stamp SPEC empty on the mother to block iteration of marker attachments. Then aspectual particles propagate the SPEC value of their complement.

We show the aspect marker lexical type in (6).[5] This is broadly similar to the treatment for Mandarin Chinese implemented in the grammar Zhong (Fan et al. 2015), although the use of SPEC is new, they instead used a special feature *marked* to block iteration. We only instantiate a version of the rule where the marker comes on the left (after the verb).

[5]We also treat sentence final particles as markers: sentence and aspect markers share a common supertype (*verbal-marker*).

(5) Head marker construction

$$\begin{bmatrix} \textit{head-marker} \\ \text{CAT.VAL} \begin{bmatrix} \text{SUBJ} & \boxed{0} \\ \text{SPR} & \boxed{1} \\ \text{COMPS} & \boxed{2} \\ \text{SPEC} & \boxed{3} \end{bmatrix} \\ \text{HD-DTR} \ \boxed{4} \begin{bmatrix} \text{CAT.VAL} \begin{bmatrix} \text{SUBJ} & \boxed{0} \\ \text{SPR} & \boxed{1} \\ \text{COMPS} & \boxed{2} \end{bmatrix} \end{bmatrix} \\ \text{NH-DTR} \begin{bmatrix} \text{CAT.VAL} \begin{bmatrix} \text{SUBJ} & \langle\rangle \\ \text{SPR} & \langle\rangle \\ \text{COMPS} & \langle \boxed{4} \rangle \\ \text{SPEC} & \boxed{3} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The outer aspectual particles (aspect markers) are markers and require their complement's head to be a verb or adjective (+*vj*). The value of SPEC of the mother is set to the SPEC value of their complement. Further, the complement is of type *lex-synsem* and thus must be non-phrasal and can not be modified.

(6) Marker lexical type

$$\begin{bmatrix} \textit{aspect-marker-lex} \\ \text{CAT} \ \begin{bmatrix} \text{HEAD} & \textit{marker} \end{bmatrix} \\ \text{VAL} \begin{bmatrix} \text{COMPS} & \left\langle \begin{bmatrix} \textit{lex-synsem} \\ \text{CAT.HEAD} & +\textit{vj} \\ \text{MODIFIED} & \textit{notmod} \\ \text{VAL.SPEC} & \boxed{0} \end{bmatrix} \right\rangle \\ \text{SPEC} & \boxed{0} \end{bmatrix} \end{bmatrix}$$

Individual markers inherit from *aspect-marker-lex* and set the value of the aspect. We show the perfective marker in (7).

(7) Marker lexical type

$$\begin{bmatrix} \textit{pfv-marker-lex} \\ \text{VAL.COMPS} & \left\langle \begin{bmatrix} \text{HOOK.INDEX.E.ASPECT} & \textit{perfective} \end{bmatrix} \right\rangle \end{bmatrix}$$

The possible values we distinguish for aspect are shown in Figure 1. We do not decompose aspect here.

3.2 Inner Aspect

Inner aspectual particles differ from outer aspectual particles in two ways: they always introduce a one-place predicate and this predicate must link to an argument. We therefore treat inner aspectual particles as defective resultative verbs with three special properties:

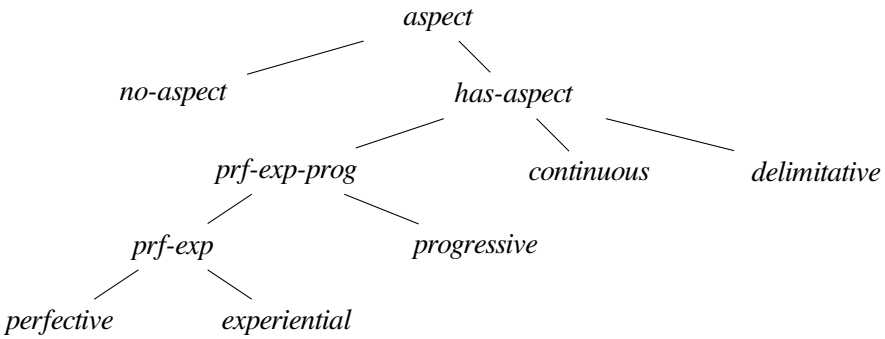

Figure 1: Aspect Type Hierarchy

1. We create a new kind of resultative verb whose predicate takes the predicate of the first verb as an argument (not the ARG1 or 2 of the head verb): this is for IAPe.

2. Both IAPe and IAPi change the aspect of the head verb to *prf-exp*. We do not model the lexical aspect directly, so cannot just change telic − to +, but this ensures that the outer aspect will be compatible (e.g. not progressive, continuous or delimitative).

3. We constrain these lexical entries so that they can not appear as main verbs.

Our initial analysis of resultative constructions is based on that for Mandarin in Zhong (Song et al. 2015) which in turn was based on Li (1990) and Lee (2013). This is a headed lexical rule, with the main verb (the head) on the left, and the result (verb or adjective) on the right. We show the type hierarchy in Figure 2 but omit some of the rarer types (inverse-oriented and no-share) for readability. We have extended it by adding event-oriented inner aspectual particles (such as 掂 *dim6*). Newly added items are shown in red, inheritance from the subject, object and event oriented types is shown with dotted lines.

We also constrain the aspect of the head daughter to be *prf-exp-prog*. We were unable to construct any grammatical examples of resultative constructions with durative or continuous aspect, and this constraint reflect this. An example is given in (8). The sentence is ungrammatical because the action of 'wipe-dry' (or any action that can lead to a result) is dynamic in nature, and thus is incompatible with the continuous aspect 住 *zyu6:*

(8) Cantonese (yue)
* 佢 抹 乾 住 啲 蘋果
keoi5 maat3 gon1 zyu6 di1 ping4gwo2
3SG wipe dry CONT CL apple

Intended: 'S/he is wiping the apples dry.

Another popular approach to resultatives is to use a lexical rule that changes the subcategorization of the head verb (Müller 2002, Lu et al. 2023). We think the core ideas of the analysis are compatible with this approach, but did not find any phenomena that would distinguish the two analyses, we therefore will not further investigate it.

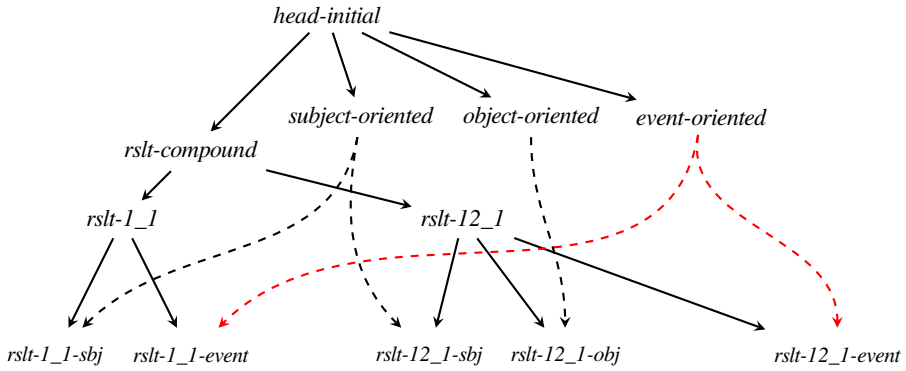

Figure 2: Extended Resultative Construction Types

The basic rslt-compound type is given in (9). It is a binary lexical rule, it takes two lexemes (marked as *lex-synsem*) and outputs something that is also *lex-synsem*. The rslt element is constructionally introduced as an individual constraint (ICON: Song 2017) to show the relatedness of the two events. We use the value of SPEC to block aspect on the daughters, but allow it on the mother.

(9)
$$\begin{bmatrix} \textit{rslt-compound} & \\ \text{SYNSEM} & \begin{bmatrix} \textit{lex-synsem} \\ \text{VAL.SPEC} & \langle\rangle \end{bmatrix} \\ \text{HD.SYNSEM} & \begin{bmatrix} \textit{lex-synsem} & \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{VAL.SPEC} & \langle [] \rangle \end{bmatrix} \\ \text{LIGHT} & + \\ \text{HOOK.INDEX} & \boxed{1}\ \begin{bmatrix} \text{E.ASPECT} & \textit{prf-exp-prog} \end{bmatrix} \end{bmatrix} \\ \text{NHD.SYNSEM} & \begin{bmatrix} \textit{lex-synsem} & \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & +\textit{vj} \\ \text{VAL.SPEC} & \langle \begin{bmatrix} \text{HOOK.INDEX.E.ASPECT} & \boxed{0} \end{bmatrix} \rangle \end{bmatrix} \\ \text{LIGHT} & + \\ \text{HOOK.INDEX} & \boxed{3} \end{bmatrix} \\ \text{C-CONT} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix} \text{INDEX.E.ASPECT} & \boxed{0} \end{bmatrix} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{rslt} & \\ \text{ARG1} & \boxed{1} \\ \text{ARG2} & \boxed{2} \end{bmatrix} \right\rangle \\ \text{HCONS} & \left\langle \begin{bmatrix} \text{HARG} & \boxed{2} \\ \text{LARG} & \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

This type is then inherited by the individual result types. We have extended it with one new type *event-oriented* (10) in which the first argument of marker is the index of the verb. This models the semantics of the IAPe particles, which predicate over the main verb. That is, they introduce a predicate, which takes as its argument the predicate of the main verb.

(10) $\begin{bmatrix} \textit{event-oriented} \\ \textsc{hd.hook.index}\ \boxed{0} \\ \textsc{nhd.hook.xarg}\ \boxed{0} \end{bmatrix}$

For example, in (11), the predicate introduced by 完 *jyun4* 'complete' takes the predicate of 食 *sik6* 'eat' as it's argument: the result is that the eating is complete. We show an example of parsing this in (14), below.

(11) 我 食完 蘋果
ngo5 sik6jyun4 ping4gwo2
1SG eat.finish apple

'I ate apples until eating is finished./I ate apples until I was done.'

We also exploit SPEC to allow the resultative daughter to stamp aspect on the result relation (which is the semantic head). Crucially, inner aspectual particles will set the ASPECT of their SPEC to *prf-exp*. We are doing this because once an inner aspectual particle is added, an end-point is added and the internal structure of the event is no longer accessible. The resulting verbal complex is no longer compatible with continuous, delimitative or progressive aspect.

We show the lexical type for *inner-aspect-lex* below. It inherits from *lex-synsem*, so even though it is a verb with a saturated subject, it cannot head a sentence, which must be *phrase-synsem*.

(12) $\begin{bmatrix} \textit{inner-aspect-lex} \\ \textsc{cat} \begin{bmatrix} \textsc{head}\ \textit{verb} \\ \textsc{val} \begin{bmatrix} \textsc{subj}\ \langle\rangle \\ \textsc{spec}\ \langle [\textsc{hook.index.e.aspect}\ \textit{prf-exp}] \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$

This is further specified to two lexical types which differ as to whether the external argument is an event or a referential index.

We give an example of the sentence (13) being parsed by our grammar and the resulting semantics in Figure 3. We have shortened the lexical type names for readability. The aspect of the event of the main verb 食 *sik6* 'eat' (with label $\boxed{2}$) is *perfective*, and its subject (ARG1 = $\boxed{3}$) is coindexed with subject of the relation for the inner aspect particle 飽 *baau2* 'be satiated' ($\boxed{3}$ is the label of the first person pronoun 我 *ngo5*).

(13) 我 食飽 咗 蘋果
ngo5 *sik6baau2* *zo2* *ping4gwo2*
1SG eat.full PERF apple

'I ate apples until I was satiated.'

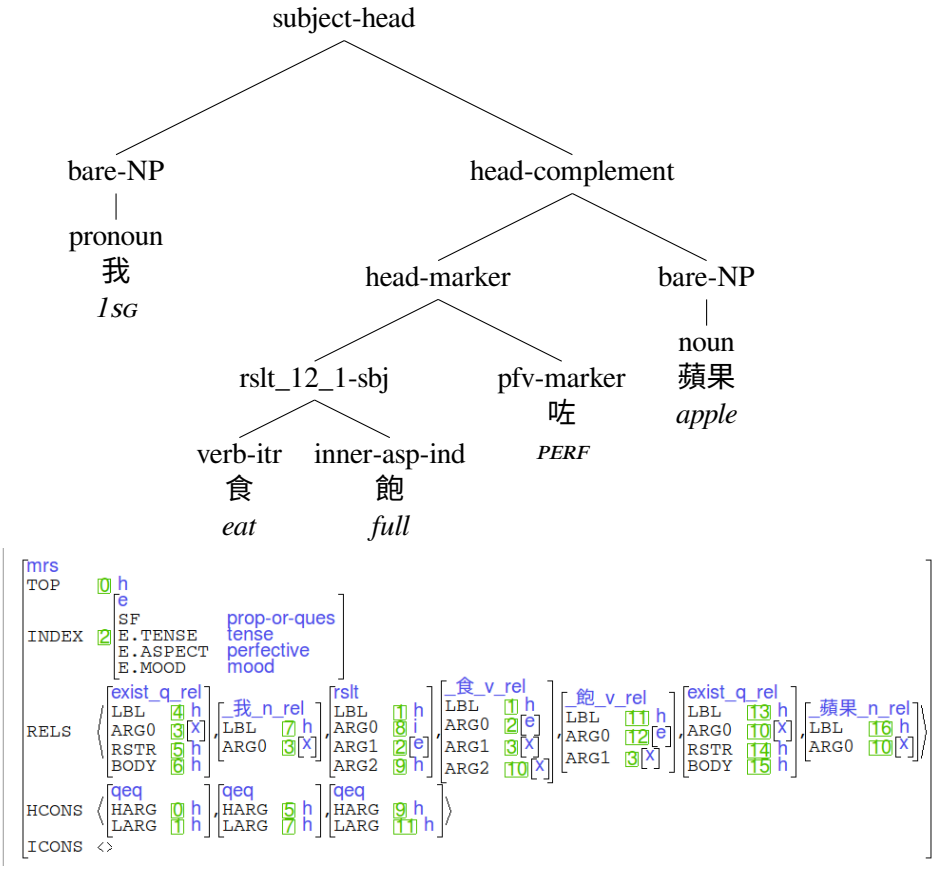

Figure 3: Derivation Tree and MRS for (13) showing both inner and outer particles

We also get a less likely reading where the apple is full, rather than the speaker being full (not shown).

Finally we show an example of parsing a sentence with an inner event particle (14) in Figure 4. The ARG1 of the aspect particle's predicate (_ 完 _v_asp_rel) is the label of the predicate of 食 *sik6* 'eat': [2], as desired.

(14) 我 食完 蘋果
ngo5 *sik6jyun4* *ping4gwo2*
1SG eat.finish apple

'I ate apples until eating is finished.'

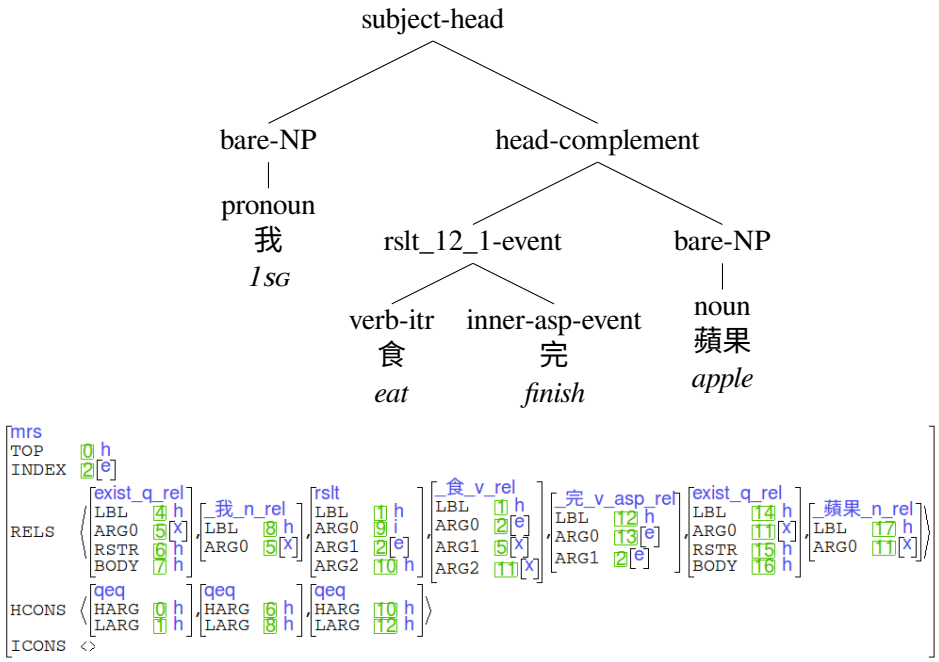

Figure 4: Derivation Tree and MRS for (14) showing an inner aspect event particle.

4 Conclusion and Future Work

This analysis covers some of the most common aspectual particles, modeling their semantics and constraining their combinations. The analysis is fully implemented in the computational grammar **yue**.

As for future work, we have only implemented a small set of common particles, while ignoring their interaction with different verbs. For instance, a verb like 知道 *zi1dou3* 'know', being a state, is not compatible with the progressive aspectual marker 緊 *gan2* or the delimitative aspectual marker 吓 *haa5*:

(15) Cantonese (yue)

*	我	知道	緊/吓	段	新聞
	ngo5	*zi1dou3*	*gan2/haa5*	*dyun6*	*san1man2*
	1SG	know	PROG/DELIMIT	CL	news

Intended: 'I am knowing/do a little knowing of the news'

We will deal with this by adding aspect to verbs' lexical entries. We would also like to investigate other phenomena that interact with aspect, such as negation, verb doubling and modification.

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