

Kalaallisut Participles in Relative Clauses

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1 Introduction

This paper aims to develop an HPSG analysis of relative clauses (RCs) in Kalaallisut (West Greenlandic). The most common RC form uses participles with inflections, as illustrated by the S-argument-extracting intransitive participle *-đuq* in (1). The inflection after *-đuq* agrees with the case and number of the modified head noun (*meeqqat*). In contrast, the inflection of the O-argument-extracting passive participle *-ḍaq* in (2), which is identical in form to a nominal possessive inflection, agrees with both the person and number of the RC subject (*Juunap*) as well as the case and number of the modified head noun (*meeqqat*).

- (1) *Meeqqat silami*
miiraq-t sila-mi
child-PL.ABS outside-SG.LOC
pinnguurtut illarput.
pinjuaq-đuq-t iglaq-(v)vut
play-NMLZ-PL.ABS laugh-IND.3PL
‘The children who are playing outdoors are laughing.’ (Bittner 1994: 55)

- (2) *Meeqqat Juunap*
miiraq-t Juuna-p
child-PL.ABS Juuna-SG.ERG
paarisai
paarə-ḍaq-i
look.after-PASSPART-3SG>PL.ABS
sinipput.
sinək-(v)vut
sleep-IND.3PL
‘The children that Juuna is looking after are sleeping.’ (Bittner 1994: 55)

- (3) a. * *angut aallaat*
aḷutə aullaitə
man.SG.ABS gun.SG.ABS
tigusimasaa
tigu-sima-ḍaq-a
take-PFV-PASSPART-3SG>SG.ABS
b. *angut aallaammik*
aḷutə aullaitə-mik
man.SG.ABS gun-SG.INS

tigusisimasooq
tigu-ḍi-sima-đuq
take-HTR-NMLZ.SG.ABS

‘the man who took the gun’ (Bittner 1994: 58)

Importantly, in Kalaallisut RCs, an A argument of a verb cannot be relativized unless a half-transitive morpheme (HTR) transforms it into an S argument, as shown by example (3) (Fortescue 1984, Manning 1995, Bittner 1994)¹. Bittner (1994) provides a Case Filter (CF) account in Transformational Grammar, but the corresponding trees do not respect lexicalist assumptions in HPSG; for example, with CF, in (2) *Juuna-p* and *paarə-* first jointly form an NP which then combines with D *-ḍaq-i* to form a DP. CF also relies on heavy uses of traces.

Section 2 proposes an HPSG-compatible analysis with MRS semantics (Copestake et al. 2005) to address the stated issue. Section 3 shows that this analysis can be extended to explain the affix *-(f)fik* as a PP-extracting relativizing affix and hence a “PP-participle”. Section 4 shows that with a modified analysis, we can similarly explain some noun-incorporating (NI-ing) affixes that are semantically equivalent to NI-ing verbal affix counterparts followed by participles. All the analyses in this paper have been implemented in a grammar fragment of Kalaallisut² originating from the Grammar Matrix (Emily M. Bender, Flickinger, and Oepen 2002).

2 An HPSG Analysis of Participles

2.1 Participles: Lexical Rules

Participles *-đuq* and *-ḍaq* occupy the same position class (PC)³ as normal verb endings (normally representing mood and persons of arguments, e.g. *-(v)vut* in (1)), and additionally they must be followed by a PC representing the case and number of the participle subject (e.g. the

¹Excluding the less productive active participle *-ḍa*. The HTR mainly changes the object case and optionality of transitive verbs; in other words, a transitive verb with S and O arguments can be transformed, by attaching an HTR to it, into an “intransitive verb” with an A argument and an optional O argument in oblique case.

²<https://github.com/alexhsu-nlp/kal-hpsg>

³Readers may refer to Appendix C for more information.

-*t* in *pin̄nuaq-ḍuq-t* in (1)). As the relative clause containing participles can modify nouns attributively, we consider the clause to have a nonempty MOD feature⁴ that originates from the participles, such that it can take part in *head-adj-phrase* and the like. This is shown in (4), which denotes the participle supertype. The negative PRD value prevents predicative use in finite clauses⁵, as in those cases we need a normal case ending for the finite verb.

For participles, MOD contains the missing or gappy element of the relative clause. (5)⁶ shows the lexical rule (LR) for -*ḍuq*. It borrows key feature values of MOD from the original gappy subject, and the verb’s SUBJ list is then empty, preventing further application of *subj-head-phrase*. Note that KYCMP (key complement) serves as a pointer to the verb’s O argument with absolutive case on the COMPS list, if any; a verb followed by -*ḍuq* should not have an O argument, hence KYCMP is assigned the type *non-synsem*, a subtype of *avm* but not *synsem-min*, which ensures that it cannot unify with any legal complement. In contrast, *pass-participle-lex-rule* (6)⁷ for passive participles “identifies” (in a rather loose sense) the verb’s MOD with the gappy O argument’s in KYCMP, and the COMPS of the LR output has the KYCMP element removed.

$$(4) \left[\begin{array}{c} \text{participle-lex-rule} \\ \text{SYNSEM} \left[\begin{array}{c} \text{LOCAL..HEAD} \left[\begin{array}{c} \text{verb} \\ \text{PRD} \quad - \\ \text{MOD} \quad \text{cons} \end{array} \right] \end{array} \right] \\ \text{C-CONT..INDEX} \left[\begin{array}{c} \text{SF} \quad \text{prop} \\ \text{E} \mid \text{MOOD} \quad \text{no-mood} \end{array} \right] \end{array} \right]$$

⁴The original analysis claimed a non-empty SLASH value instead, similar to classical HPSG analyses of RCs (Arnold and Godard 2024, Borsley and Crysmann 2024). However, a SLASH analysis is only meaningful when long-distance or unbounded dependencies involving relative clauses are present, but such constructions have not actually been attested. Therefore, we move to a tentative MOD analysis which is sufficient for all the examples with local dependencies. We thank the anonymous reviewer who pointed this out in the comments.

⁵This is done by constraining PRD values of finite clauses and the NON-HEAD-DTRS of modifying phrasal constructions such as *head-adj-int-phrase*. For reference, attributive adjectives take the same negative PRD value.

⁶We are and will be abusing the feature structure representation to avoid taking up too much space. Also note that some less important details may be omitted for clarity.

⁷Note: the actual implementation is somewhat different due to the DELPH-IN formalism which does not make the list difference operation available; it is therefore substituted with a more restrictive version. In particular, it assumes that the key complement is always in the first position of the COMPS list, which in the majority of cases is true. An alternative solution is to totally rewrite *head-comp-phrase* by introducing a binary feature to indicate whether a COMPS element is a key complement, and the first *head-comp-phrase* to be applied always looks for the key complement regardless of its distance from the verb. This is in some sense similar to the treatment in Emily M Bender 2008 for Wambaya complements.

$$(5) \left[\begin{array}{c} \text{intrans-participle-lex-rule} \\ \text{SYNSEM..CAT} \left[\begin{array}{c} \text{HEAD} \mid \text{MOD} \left\langle \left[\text{LOCAL} \left[\begin{array}{c} \text{CONT..INDEX} \quad \boxed{1} \\ \text{CAT} \mid \text{HEAD} \quad \boxed{2} \end{array} \right] \right\rangle \right. \\ \text{VAL} \mid \text{SUBJ} \quad \langle \rangle \end{array} \right] \\ \text{DTR..VAL} \left[\begin{array}{c} \text{SUBJ} \quad \left\langle \left[\text{LOCAL} \left[\begin{array}{c} \text{CONT..INDEX} \quad \boxed{1} \\ \text{CAT} \mid \text{HEAD} \quad \boxed{2} \end{array} \right] \right\rangle \right. \\ \text{KYCMP} \quad \text{non-synsem} \end{array} \right] \end{array} \right]$$

$$(6) \left[\begin{array}{c} \text{pass-participle-lex-rule} \\ \text{SYNSEM..CAT} \left[\begin{array}{c} \text{HEAD} \mid \text{MOD} \left\langle \left[\text{LOCAL} \left[\begin{array}{c} \text{CONT..INDEX} \quad \boxed{1} \\ \text{CAT} \mid \text{HEAD} \quad \boxed{2} \end{array} \right] \right\rangle \right. \\ \text{VAL} \mid \text{COMPS} \quad \boxed{A} \ominus \langle \boxed{2} \rangle \end{array} \right] \\ \text{DTR..VAL} \left[\begin{array}{c} \text{COMPS} \quad \boxed{A} \\ \text{KYCMP} \quad \boxed{2} \left[\text{LOCAL} \left[\begin{array}{c} \text{CONT..INDEX} \quad \boxed{1} \\ \text{CAT} \mid \text{HEAD} \quad \boxed{2} \end{array} \right] \right] \end{array} \right] \end{array} \right]$$

We can explain the unrelativizability of A arguments mentioned in the introduction with KYCMP. A verb with an A argument has an O argument and therefore a meaningful KYCMP value (i.e., of the *synsem-min* type), which will fail in unification with the *non-synsem* KYCMP value of the DTR of (5). This means its subject (the A argument) cannot be relativized.

KYCMP is first defined on verbal lexical entries (LEs), and may be modified in the HTR PC, which can make the A argument of a transitive verb (with a sole complement) relativizable, as it can undergo the LRs (7) or (8) from the HTR PC. *antipass-lex-rule* (7) corresponds to the HTR morpheme -*ḍi* or -*nnik*, and its output frees the KYCMP pointer to the sole complement. The verb then gains the potential to undergo (5) and the original subject, the A argument, can then be relativized. In contrast, the *active-lex-rule* (8)⁸ represents the default valency structure for transitive verb LEs, which links KYCMP with its sole argument and prevents it from becoming an intransitive participle, forcing the verb to avoid taking (5) but only (6).

$$(7) \left[\begin{array}{c} \text{antipass-lex-rule} \\ \text{SUBJ} \quad \text{cons} \\ \text{COMPS} \quad \left\langle \left[\text{LOCAL..CASE} \quad \text{ins} \right] \right\rangle \\ \text{KYCMP} \quad \text{non-synsem} \end{array} \right]$$

$$(8) \left[\begin{array}{c} \text{active-lex-rule} \\ \text{SUBJ} \quad \left\langle \left[\text{LOCAL..CASE} \quad \text{erg} \right] \right\rangle \\ \text{COMPS} \quad \langle \boxed{1} \rangle \\ \text{KYCMP} \quad \boxed{1} \end{array} \right]$$

The inflections (right) after participles are modeled by a separate PC, which assigns the number and case of the

⁸This is more for ease of implementation under the DELPH-IN formalism due to the current lack of default constraint implementation. One can safely remove this LR by asserting the information directly on the lexicon and *antipass-lex-rule* (and other rules in this PC) will not be constraining but modifying the default COMPS and KYCMP values, for example.

head noun, and for -ḍaq, also the person and number of the RC subject. For example, the LR in (9) corresponds to the morpheme *-i* in (2)), which asserts that the modified head noun (*meeqqat*) is plural in absolutive case, and that the RC subject *Juunap* is third person singular, as expected. The constraint of SUBJ length to be one avoids intransitive participles from taking this inflection.

$$(9) \left[\begin{array}{c} \text{part-3sg-subj-pl-abs-lex-rule} \\ \text{SYNSEM..CAT} \left[\begin{array}{c} \text{MOD} \left\langle \left[\text{LOCAL} \left[\begin{array}{c} \text{CAT..CASE} \text{ abs} \\ \text{CONT..NUM} \text{ pl} \end{array} \right] \right\rangle \right. \\ \text{SUBJ} \left\langle \left[\text{LOCAL..INDEX|PNG} \left[\begin{array}{c} \text{PER} \text{ 3rd} \\ \text{NUM} \text{ sg} \end{array} \right] \right\rangle \right. \end{array} \right] \end{array} \right]$$

2.2 Unary Phrase Rules: Relative Clauses

We describe how a verb with participle takes part in a RCs by unary phrase rules. The rule for a normal attributive RC is shown in (12)⁹. The current assumption is that the noun modifiee still needs to take a specifier similar to the case of adjectives, so that *bare-np-phrase* takes part after all modifications.

$$(12) \left[\begin{array}{c} \text{rel-mod-phrase} \\ \text{SYNSEM} \left[\begin{array}{c} \text{LCL|CAT} \left[\begin{array}{c} \text{s-cat} \\ \text{HD} \left[\begin{array}{c} \text{PRD} \text{ -} \\ \text{MOD} \left\langle \left[\text{CAT} \left[\begin{array}{c} \text{noun-cat} \\ \text{SPR} \left\langle \left[\text{LCL..HD} \text{ det} \right] \right\rangle \right] \right\rangle \right. \end{array} \right] \end{array} \right] \\ \text{C-CONT|HOOK} \left[\begin{array}{c} \text{LTOP} \text{ ①} \\ \text{INDEX} \text{ ②} \\ \text{XARG} \text{ ③} \end{array} \right] \\ \text{ARGS} \left\langle \left[\begin{array}{c} \text{SYNSEM|LCL} \left[\begin{array}{c} \text{CAT} \left[\begin{array}{c} \text{s-cat} \\ \text{HD} \left[\begin{array}{c} \text{PRD} \text{ -} \\ \text{MOD} \left\langle \left[\text{CAT} \left[\begin{array}{c} \text{noun-cat} \\ \text{SPR} \left\langle \left[\text{LCL..HD} \text{ det} \right] \right\rangle \right] \right\rangle \right. \end{array} \right] \end{array} \right] \\ \text{CONT|HOOK} \left[\begin{array}{c} \text{LTOP} \text{ ①} \\ \text{INDEX} \text{ ②} \\ \text{XARG} \text{ ③} \end{array} \right] \end{array} \right] \end{array} \right] \end{array} \right]$$

The main reason for this unary phrase rule is because of the information structure representation, where we follow the approach of Song 2014 in the Grammar Matrix. The HOOK of the daughter cannot be fully identified with the HOOK of the mother (in C-CONT), as in DELPH-IN formalism, HOOK also contains features *CLAUSE-KEY* and *ICONS-KEY* for argument pro-drop information. A direct attempt of HOOK identification therefore lets the modifiee noun receive *CLAUSE-KEY* and *ICONS-KEY* from verbs in

⁹See below for the meaning of shorthand notations *noun-cat* and *s-cat*. Besides, HD means HEAD and LCL means LOCAL.

$$(10) \left[\begin{array}{c} \text{noun-cat} \\ \text{HEAD} \text{ noun} \\ \text{VAL} \left[\begin{array}{c} \text{SUBJ} \langle \rangle \\ \text{COMPS} \langle \rangle \end{array} \right] \end{array} \right] \quad (11) \left[\begin{array}{c} \text{s-cat} \\ \text{HEAD} \text{ verb} \\ \text{VAL} \left[\begin{array}{c} \text{SUBJ} \langle \rangle \\ \text{COMPS} \langle \rangle \end{array} \right] \end{array} \right]$$

both the main clause and RC, leading to unification failure¹⁰.

Apart from normal attributive RCs, Kalaallisut participles interestingly can stand alone representing the would-be-modified head noun without an explicit modifiee, as can be seen from the following example:

- (13) *Nakorsiartut*
 nakursiaq-ḍuq-t
 go.to.the.doctor-NMLZ-SG.LOC
aggertarput.
 aggiq-ḍaq-(v)vut
 come-HAB-IND.3PL
 ‘The patients (i.e. those who go to see the doctor) come (habitually).’ (simplified from Berthelsen 1996: 46)

We consider them to be headless relative clauses due to the fact that the verbs of concern can still have temporal and locative adjuncts. For an HPSG analysis, to avoid the use of head traces, standalone participles are modeled by the unary phrase rule supertype *part-to-noun-phrase* in (14), which extracts the nominal MOD element of a participle and uses it to construct its LOCAL value. Note that the formed NP would be in third person. The *nonpossessive* constraint for the POSSESSUM feature prevents future combination with a possessor specifier via *spec-head-phrase*. A leaf subtype of it, *part-to-noun-with-rels-phrase* (15), additionally contributes a generic noun relation, making the phrase a real noun in meaning.

$$(14) \left[\begin{array}{c} \text{part-to-noun-phrase} \\ \text{SYNSEM} \left[\begin{array}{c} \text{LOCAL|CAT} \left[\begin{array}{c} \text{noun-cat} \\ \text{HEAD} \text{ ①} \left[\text{MOD} \langle \rangle \right] \\ \text{POSSESSUM} \text{ nonpossessive} \end{array} \right] \end{array} \right] \\ \text{C-CONT|HOOK} \left[\begin{array}{c} \text{LTOP} \text{ ②} \\ \text{INDEX} \text{ ③} \left[\text{PNG|PER} \text{ 3rd} \right] \\ \text{XARG} \text{ ④} \end{array} \right] \\ \text{ARGS} \left\langle \left[\begin{array}{c} \text{SYNSEM..CAT} \left[\begin{array}{c} \text{s-cat} \\ \text{HD} \left[\begin{array}{c} \text{PRD} \text{ -} \\ \text{MOD} \left\langle \left[\text{HEAD} \text{ ①} \left[\text{MOD} \langle \rangle \right] \right] \right\rangle \right. \end{array} \right] \end{array} \right] \end{array} \right] \end{array} \right]$$

$$(15) \left[\begin{array}{c} \text{part-to-noun-with-rels-phrase} \\ \text{SYNSEM|LOCAL} \left[\begin{array}{c} \text{CAT..SPR} \left\langle \left[\text{LOCAL..HEAD} \text{ det} \right] \right\rangle \\ \text{CONT..INDEX} \text{ ①} \end{array} \right] \\ \text{C-CONT} \left[\begin{array}{c} \text{HOOK|LTOP} \text{ ②} \\ \text{RELS} \left\langle \left[\begin{array}{c} \text{noun-relation} \\ \text{PRED} \text{ entity_n_rel} \\ \text{LTOP} \text{ ②} \\ \text{ARG0} \text{ ①} \end{array} \right] \right\rangle \end{array} \right] \end{array} \right]$$

¹⁰An alternative solution is to introduce separate phrase rules to specially deal with the case of relative clauses, but due to its complexity, this approach is not pursued here.

3 The PP Participle: *-(f)fik*

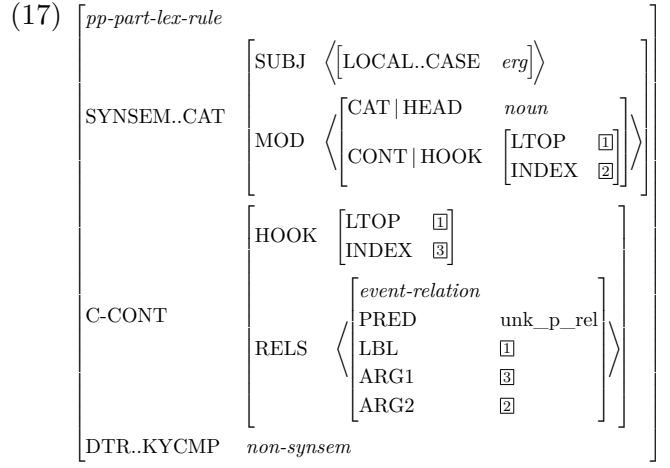
-(f)fik denotes the place where (or time when) one does the event indicated by the preceding verb. Although not usually discussed with other participles in the literature, it can similarly modify an NP with a possessive ending where the possessor also refers to the RC subject, similar to the case of *-ḍaq*, as shown in (16):

- (16) *Ilłu inunngorfia tassa*
iglu inuṅṅuq-(f)fik-a tassa
 house.SG.ABS be.born-place-3SG>SG.ABS COP
palasiṗ
palasi-p
 priest-SG.ERG
illugisimasaa.
iglu-gə-sima-ḍaq-a
 house-have.as-PFV-PASSPART-3SG>SG.ABS
 ‘The house where he was born was once the pastor’s
 (lit. what the pastor had as their house).’ (simplified
 from Berthelsen 1996: 121)

The fact that the nominal modifier in noun-noun compounding usually cannot be possessed suggests that *-(f)fik* may be closer to RCs than normal modifiers. The place/time meaning suggests that the gappy constituent of an RC with *-(f)fik* is the NP in some adjunct PP of the clause. This account can also partially explain its semantic ambiguity, as apparently the lack of an explicit case marker to denote the exact PP type can contribute to various possible readings. The RC explanation makes it legit to call *-(f)fik* a new type of participle, the “PP participle”.

The LR for *-(f)fik* is shown in (17). It introduces a generic adposition relation with the event of the RC verb as its ARG1 and its semantic complement (location/recipient/goal/etc.) as its ARG2, which is the gappy constituent and hence gets introduced to the verb’s MOD after the LR. Therefore, in *part-to-noun-phrase*, it is exactly this semantic complement of the adposition relation that receives the generic noun relation, thereby obtaining the usual meaning of place or time. Moreover, since *-(f)fik* takes a subject, it will be able to take a possessive nominal ending, and this is verified by (16).

The subject’s ergative case constraint is necessary here, as for a syntactically intransitive verb (either semantically intransitive or become “intransitive” via LR (7)), its subject would be in absolutive case by default.



4 Noun-Incorporating Affixes

Kalaallisut typically achieves noun incorporation by appending a verbal suffix after the base noun, which can then be followed by participles. Meanwhile, there are a group of suffixes syntactically and semantically similar to the combination of verbal suffixes and participles. For example, the morpheme *-lək* is (almost) semantically equivalent to the combination of the NI-ing verbal affix *-qaq* (“have”) and *-ḍuq*, and in reality people typically prefer to use *-lək* wherever *-qaq-ḍuq* is intended¹¹; see (18). It also has a headless use shown in Appendix A, i.e. example (23).

- (18) *Qeqertaq orpilik*
qiqqtaq uqpik-lək
 island.SG.ABS tree-have.NMLZ.SG.ABS
takuua.
taku-vaa
 see-IND.3SG>3SG
 ‘S/he saw a tree-filled island.’ (Kahn and
 Valijärvi 2021: 123)

(19) models the noun-incorporating ability of both NI-ing verbal affixes and these NI-ing verb-participle “complexes” without extra external objects (which is true for *-qaq* and *-lək*), as indicated by the void KYCMP pointer. The first RELS element represents the verbal relation, whose ARG2 is the INDEX of the incorporated noun (also the DTR). (20) represents the NI-ing verbal affix subtype, which requires a subject. In contrast, similar to (5), the verb-participle complex *-lək* does not introduce any subjects in (21), but instead gains a MOD element (the external subject’s INDEX). In fact, (21) can be viewed as the composite result of (20) and (5).

The formed complexes can also go through (12) and (15). Note that a different group of affixes (such as *-siaq*; see (22)) resemble passive participles instead of *-ḍuq*, but the semantic meaning of such an affix is the incorporated

¹¹Personal communication with Stian Lybech.

noun itself, and they cannot go through (15). These are not discussed here due to space, but will be included in the full paper.

$$(19) \left[\begin{array}{l} \text{common-incorp-lex-rule} \\ \text{SYNSEM..CAT} \left[\begin{array}{l} \text{HEAD} \quad \text{verb} \\ \text{VAL} | \text{KYCMP} \quad \text{non-synsem} \end{array} \right] \\ \text{C-CONT} \left[\begin{array}{l} \text{HOOK} \left[\begin{array}{l} \text{XARG} \quad \boxed{1} \\ \text{INDEX} \quad \boxed{3} \end{array} \right] \\ \text{RELS} \left\langle \begin{array}{l} \text{ARG0} \quad \boxed{3} \\ \text{ARG1} \quad \boxed{1} \\ \text{ARG2} \quad \boxed{2} \end{array} \right\rangle, \left[\begin{array}{l} \text{quant-relation} \\ \text{PRED} \quad \text{_exist_q_rel} \end{array} \right] \end{array} \right] \\ \text{DTR..LOCAL..INDEX} \quad \boxed{2} \end{array} \right]$$

$$(20) \left[\begin{array}{l} \text{incorp-verb-lex-rule} \\ \text{SYNSEM..SUBJ} \left\langle \begin{array}{l} \text{LOCAL} | \text{CAT} \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \text{noun} \\ \text{CASE} \quad \text{abs} \\ \text{MOD} \quad \langle \rangle \end{array} \right] \\ \text{VAL} | \text{SPR} \quad \langle \rangle \end{array} \right] \\ \text{CONT..INDEX} \quad \boxed{1} \end{array} \right\rangle \\ \text{C-CONT..XARG} \quad \boxed{1} \end{array} \right]$$

$$(21) \left[\begin{array}{l} \text{lik-part-lex-rule} \\ \text{SYNSEM..CAT} \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \text{PRD} \quad - \\ \text{MOD} \quad \langle \text{CONT..INDEX} \quad \boxed{1} \rangle \end{array} \right] \\ \text{VAL} | \text{SUBJ} \quad \langle \rangle \end{array} \right] \\ \text{C-CONT} \left[\begin{array}{l} \text{HOOK} | \text{XARG} \quad \boxed{1} \\ \text{RELS} \quad \langle \text{PRED} \quad \text{_have_v_rel}, \dots \rangle \end{array} \right] \end{array} \right]$$

(22) *Ilinnit savissiaara*
 ilinnit savək-siaq-ga
 2SG.ABL knife-bought.thing-1SG>SG.ABS
takuara.
 taku-vara
 see-IND.1SG>3SG
 ‘I see the knife I bought/got from you.’
 (modified from Fortescue 1984: 50)

5 Computational Modeling

The grammar fragment is implemented and tested via LKB¹², and originated from a starter grammar from the Grammar Matrix (Emily M. Bender, Flickinger, and Oepen 2002). The grammar fragment has been tested with the following three datasets:

- A test suite with various phenomena related to the customization system as well as some others, including noun incorporation and related adjective modification. Negative examples (and also some positive ones) were created based on Fortescue (1984), Kahn and Valijärvi (2021), Lybech (2022), and p.c. with Stian Lybech.

- A test suite specifically for relative clauses. This includes all the example sentences in this paper and also some other sentences extracted from or constructed according to Fortescue (1984) and Lybech (2022).
- An IGT corpus¹³ built from the texts of Berthelsen (1996), a Greenlandic reader textbook. The morpheme segmentation forms have passed an initial check with a self-built permissive morphological analyzer¹⁴ mostly avoiding checking morphosyntax.

	#p	#p-r	#n	#n-r	Cvg	Overgen
TS (common)	223	222	203	18	99.6%	8.9%
TS (rel)	26	26	29	5	100%	17.2%
Corpus	1532	646	0	0	42.2%	N/A

Table 1: Grammar Fragment Performance.

Cvg: coverage; **Overgen**: overgeneration;

TS: test suites (rel: for RCs; common: for other phenomena);

#p: positive items (should be grammatical); **#p-r**: positive results (having parses);

#n: negative items (should be ungrammatical); **#n-r**: negative results (unexpectedly having parses).

The parsing results are shown in Table 1. In particular, the grammar fragment has a coverage of 100% on all grammatical examples of participles and relative clauses, including those in the paper. All of the overgenerations either come from overgeneration of other rules involved, including *noun-mod-phrase* for forming compound nouns and *title-phrase* for constructing title phrases, or the large flexibility of word order in Kalaallisut for the purpose of information structures that are generally not assumed in creating ungrammatical sentences for the time being, as they would acquire additional dislocating phrase rules.

6 Summary

This paper provides an HPSG analysis of participles and relative clauses (normal and headless) in Kalaallisut and their interaction with other grammatical components such as HTRs. It also extends the analysis to include *-(f)ik* as a kind of participle and other noun-incorporating affixes with participle-like behavior. The implemented grammar fragment helps improve the feasibility and rigor of the analysis. We hope that the HPSG analyses presented in this paper can both provide scholars a better understanding of the Kalaallisut language, and also benefit future grammar engineers in implementing the relative clause library for the Grammar Matrix by providing a good feasible example.

¹³https://github.com/alexhsu-nlp/kal_igt_corpus_kalaallisut-sungiusaatit

¹⁴<https://github.com/alexhsu-nlp/karma>

¹²<https://github.com/delph-in/docs/wiki/LkbTop>

References

- Arnold, Doug and Danièle Godard (2024). “Relative clauses in HPSG”. In: *Head-Driven Phrase Structure Grammar: The handbook, 2nd revised edn. (Empirically Oriented Theoretical Morphology and Syntax 9)*, pp. 635–711.
- Bender, Emily M (2008). *Radical non-configurationality without shuffle operators: An analysis of Wambaya*. Universitätsbibliothek Johann Christian Senckenberg.
- Bender, Emily M., Dan Flickinger, and Stephan Oepen (2002). “The Grammar Matrix: An Open-Source Starter-Kit for the Rapid Development of Cross-linguistically Consistent Broad-Coverage Precision Grammars”. In: *COLING-02: Grammar Engineering and Evaluation*. URL: <https://www.aclweb.org/anthology/W02-1502>.
- Berthelsen, Chr. (1996). “*Kalaallisut sungiusaatit*” - *Læsestykker i grønlandsk*. Atuakkiorfik Ilinniusiorfik, Nuuk.
- Bittner, Maria (1994). *Case, scope, and binding*. Springer.
- Borsley, Robert D and Berthold Crysmann (2024). “Unbounded dependencies”. In: *Head-Driven Phrase Structure Grammar: The handbook, 2nd revised edn. (Empirically Oriented Theoretical Morphology and Syntax 9)*, pp. 571–634.
- Copestake, Ann et al. (2005). “Minimal recursion semantics: An introduction”. In: *Research on language and computation 3.2*, pp. 281–332.
- Fortescue, Michael D (1980). “Affix ordering in West Greenlandic derivational processes”. In: *International Journal of American Linguistics* 46.4, pp. 259–278.
- (1984). *West greenlandic*. Croom Helm London.
- Kahn, Lily and Riitta-Liisa Valijärvi (2021). *West Greenlandic: an essential grammar*. Routledge.
- Lybech, Stian (2022). *An Introduction to West Greenlandic*. 2nd ed.
- Manning, Christopher David (1995). *Ergativity: Argument structure and grammatical relations*. Stanford university.
- Song, Sanghoun (2014). “A grammar library for information structure”. PhD thesis.

Appendix

A Additional Example Sentences

- (23) *Ammassalimmi*
Ammassalik-mi
Ammassalik-SG.LOC

Ittoqqortoormiinilu
Ittoqqortoormii-ni=lu
Ittoqqortoormiit-PL.LOC=CONJ
najugallit
najugaq-lək-t
dwelling-have.NMLZ-PL.ABS
Tunumiuppūt.
Tunu-miuq-u-(v)vut
the.east-inhabitant-COP-IND.3PL
‘The people living in Ittoqqortoormiit and Ammassalik are people of the east (Tunumiut).’ (Berthelsen 1996: 79)

B Potentially Unclear Glosses

Gloss	Meaning
LOC/INS/ABL/EQU	locative/instrumental/ablative/equative case
CONJ	conjunction clitic (by default, denoting “and”)
COP	copula
3SG>SG.ABS	a possessive ending where the possessor is 3rd singular and the possessum is singular absolutive
NMLZ	adjective nominalizer and intransitive participle
PASSPART	passive participle
IND	indicative mood
HAB	habitual aspect
PFV	perfective aspect
HTR	half-transitive morpheme (for antipassives)

Table 2: Shorthand notations used in the glosses.

C Kalaallisut Word Structure

The following table provides a (greatly) simplified picture of the structure of Kalaallisut words relevant to the discussion in this paper. For a complete picture, the reader might want to consult Fortescue 1980 and Fortescue 1984.

root		(.....)	v_end	
noun	incorp-v		participle	n_end
	incorp-n			(incorp-v...)

Table 3: Position classes with participles and participle-like affixes included. The “class” (.....) corresponds to all the optional classes (e.g. HTR, modal, tense, aspect, and negation affixes). **incorp-n** means a verb-like noun-incorporating nominal affix, the topic of Section 4.

Words from examples with indices for illustration:

- (2) *paarə-ḍaq-i*: root, participle, n_end
- (13) *aggig-ḍaq-(v)vut*: root, (.....), v_end
- (16) *iglu-gə-sima-ḍaq-a*: noun, incorp-v, (.....), participle, n_end
- (18) *uqpik-lək*: noun, incorp-n