Singlish Where Got Rules One?
Constructing a Computational Grammar for Singlish

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Abstract

Singlish is a variety of English spoken in Singapore. In this paper, we share some of its grammar features and how they are implemented in the construction of a computational grammar of Singlish as a branch of English grammar. New rules were created and existing ones from standard English grammar of the English Resource Grammar (ERG) were changed in this branch to cater to how Singlish works. In addition, Singlish lexicon was added into the grammar together with some new lexical types. We used Head-driven Phrase Structure Grammar (HPSG) as the framework for this project of creating a working computational grammar. As part of building the language resource, we also collected and formatted some data from the internet to create a test suite for Singlish. Finally, the computational grammar was tested against a set of gold standard trees and compared with the standard English grammar to find out how well the grammar fares in analysing Singlish.

Keywords: Head-driven Phrase Structure Grammar, Computational Grammar, Singlish, Parsing

1. Introduction

Singlish (also known as Colloquial Singapore English) is a variety of English spoken in Singapore which contains many non-standard features. This is shown in the example sentence taken from Wiktionary[1] in (1). The first gloss line indicates the origin language of the word with *M*, *H* and *E* standing for Malay, Hokkien and English respectively.

(1) *Wah lau, you damn 'gian peng'.*
    M/H   E   E   H
    EXPL   greedy

    'Damn! You are very greedy.'

The variety has been widely researched in terms of phonetics, sociolinguistics and syntax (Wee, 2008; Cavallaro et al., 2014; Alsagoff, 2010; Ansaldo, 2010). Yet, the legitimacy of this variety has not been as well recognised locally. The use of Singlish has been actively discouraged by politicians during official speeches (Lim, 2009) and the Speak Good English Movement as it is viewed to be 'broken English'. The official campaign was based on the idea that Singlish negatively impacts the image of its speakers and is harmful towards the country's international standing. There has been a belief that there is only one 'right' way of speaking English and standard English had to be chosen over Singlish (Tan, 2017).

The project has been motivated in part to show how this is indeed a structured variety with proper unique features. Thus, in this paper, we write about the different aspects including rules of this new computational grammar of Singlish.

The next section briefly introduces Singlish and the formal grammar framework used - Head-driven Phrase Structure Grammar (HPSG). In the following sections, we will elaborate on various features of Singlish and the processes involved in including them into the computational grammar as a branch of the English Resource Grammar (ERG) (Copestake and Flickinger, 2000; Flickinger, 2000). Lastly, this paper includes a section on parsing to show the performance of this grammar on Singlish text before the conclusion.

2. Background

2.1. Singlish

Singlish is a contact language shaped by the competing features from the different L1s of Singapore's resident population (Tan, 2005). This includes languages from the Malayic, Sinitic and to a smaller extent, Dravidian families. Thus, although similar to English, its pronunciation, vocabulary and grammar has been influenced by the other languages (mainly Malay and Chinese languages (Wong, 2005)). As the most dominant languages from the 1800s to the 1970s were Malay and Hokkien (Tan, 2017), many non-standard English features of Singlish come from these two languages.

In more recent years, English (including Singlish) has become the lingua franca in the nation. It is used as the working language and has a status as an official language in Singapore.[2] This can be attributed to the view that English in necessary for access to the rest of the world in terms of investment and knowledge (Wee and Bokhorst-Heng, 2005).

2.2. Grammar Framework

HPSG is the formal grammar used for this project. A successor of the Generalized Phrase Structure grammar, HPSG is a constraint-based grammar that makes

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This title can be roughly translated as "Singlish has rules?!". *One* is an emphatic particle.

[1] https://en.wiktionary.org/wiki/gian_peng

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[2] The other three official languages are Malay, Mandarin and Tamil.

use of an extensive hierarchical organisation of features. The psycholinguistically motivated grammar is widely developed around the world for the grammar of different languages (Sag et al., 2003).

HPSG uses the constraints to form feature structure models (Uszkoreit et al., 2000) such that a unambiguous sentence would correspond to only one unique feature structure model. In the grammar, words and phrases are viewed as *signs* which come with their own PHON (phonetics) or ORTH (orthography) and SYNSEM (syntax-semantics) vales. These features and their constraints are illustrated through Attribute Value Matrices (AVM).

Specifically, this project has been implemented on the ERG, an open-source, broad coverage HPSG grammar, to create a branch of the English grammar that applies to Singlish. The ERG has been in development since 1994 and has vast amounts of lexical entries and types which allow it to provide syntactic and semantic analyses for most of written English data (Flickinger, 2008). It is also able to parse spoken English constructions, for example, through accepting sentence fragments in its root condition. In the creation of this new Singlish grammar in the ERG, many new rules and additions to the various hierarchies were made to allow it to parse Singlish utterances.

3. Grammar Changes

3.1. Particles

Singlish constructions differ from standard English ones. One of the most apparent differences is the use of non-English expressions such as *gian peng* in (1). In most cases, existing lexical types in the ERG can account for their pattern of usage and the word can simply be included into the Singlish lexicon. However, a new lexical type had to be created for particles such as the Sentence Final Particles (SFP).

Older particles in Singlish came from Hokkien and Malay while newer ones are mostly the result of influence from Cantonese (Lim, 2015). Because of their Chinese origins, many of the SFP are inherently tonal in nature (Lim, 2007) and it is crucial to note their tones in a study of SFPs (Wong, 2014). In particular, many particles which are spelt the same way may come in more than one tone, each with a different meaning. Thus, Hanyu Pinyin diacritics[3] are used in this paper to approximate the particle tones in those cases.

Although pragmatic, SFPs encode propositional information (Ler, 2006) and serve a cultural role in Singapore. They help speakers establish connections among each other and align different ways of thinking (Wong, 2014).

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[3]Hanyu Pinyin is used to mark tone in the romanisation of Mandarin. This is used here even though there likely no direct correspondance between the tones of the SFP and of Mandarin as there is no standardised notation for SFP in Singlish. These diacritics are also used in (Wong, 2014)'s book on Singapore English.
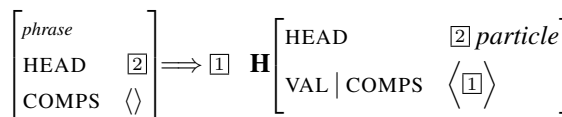
$$\begin{bmatrix} phrase \\ \text{HEAD} & \boxed{2} \\ \text{COMPS} & \langle\rangle \end{bmatrix} \Longrightarrow \boxed{1} \ \mathbf{H} \begin{bmatrix} \text{HEAD} & \boxed{2} \ particle \\ \text{VAL} \mid \text{COMPS} & \langle \boxed{1} \rangle \end{bmatrix}$$

Figure 1: SFP Complement-Head Rule

3.1.1. General features

SFPs, as the name suggests, attach at the end of sentences. They perform a pragmatic role and are syntactically optional. For instance, the sentence remains acceptable even if *wat* in (2) (Chen and Kan, 2013; Chen and Kan, 2015) were to be removed.

(2) *Bugis oso near wat...*

    'Bugis is also near, isn't it?'

                (NUS SMS Corpus, 10120)

In addition, SFPs can also follow one another at the end of the sentence such as in (3).

(3) *U're not going to pang seh me lah hor?*

    'You're not going to abandon me right?'

                (NUS SMS Corpus, 15016)

In these cases, the order of SFP is restricted as a change in the order would not be accepted. Thus, to ensure that the order of SFPs are adequately constrained, we analysed them as heads that are able to take sentences as complements through the Complement-Head Rule in Figure 1.[4] This is because for headed rules in HPSG, most features are passed up from the head daughter - the resultant phrase inherits most features from the head daughter. Having the features from the SFP passed up would mean that the following SFP would be able to directly constrain the SFP in its complement through its COMPS value. For example (3), this would mean that *hor* is able to select directly for what particle heads the sentence preceding it - *lah*.

In addition, since the complements of the SFPs are sentences, they are also constrained with an empty COMPS list, and a HEAD type of verb, adjective or particle ($v\_or\_a\_or\_pt$[5]). These additional details are reflected in the general AVM for SFP in Figure 2.

To ensure the particles follow an accepted order, different sentences were analysed and the SFP were grouped into four categories depending on where they occur in a sentence. In the grouping, *particle type 1* consists of particles that occur only immediately after a bare sentence and *particle type 4* consists of ones that are able to occur after the particles in all other groups. To illustrate this, the diagram in Figure 3 was made. In Figure 3, S_0 refers to a sentence without any SFP attached to it and S_n refers to a sentence with the particle with a

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[4]Additionally, although SFPs are optional in a sentence they are still analysed as heads because in our grammar because they take sentence as complements.

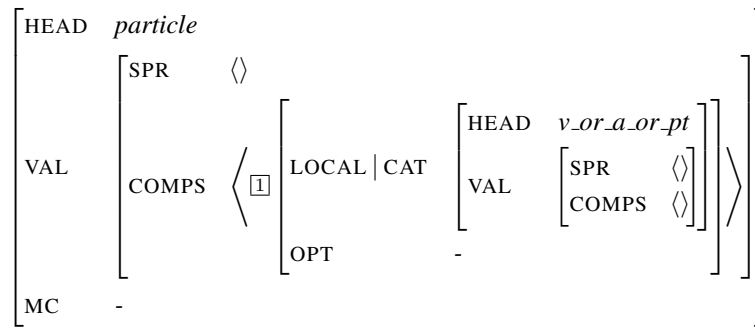[5]This is because adjectives can head sentences in Singlish.

$$
\begin{bmatrix}
\text{HEAD} & \textit{particle} \\[2pt]
\text{VAL} & \begin{bmatrix}
\text{SPR} & \langle\rangle \\[4pt]
\text{COMPS} & \left\langle \boxed{1}\begin{bmatrix}
\text{LOCAL} \mid \text{CAT} & \begin{bmatrix}
\text{HEAD} & \textit{v\_or\_a\_or\_pt} \\[2pt]
\text{VAL} & \begin{bmatrix}
\text{SPR} & \langle\rangle \\
\text{COMPS} & \langle\rangle
\end{bmatrix}
\end{bmatrix} \\[10pt]
\text{OPT} & -
\end{bmatrix} \right\rangle
\end{bmatrix} \\[4pt]
\text{MC} & -
\end{bmatrix}
$$

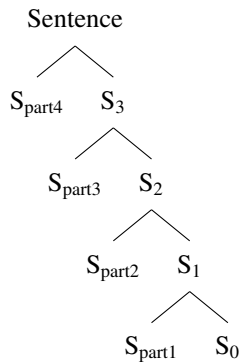Figure 2: SFP Lexical Type

Sentence

Figure 3: Hierarchy of particle sentence types

type n particle attached to it. A particle of type n would then be able to take S_{n-1} as a complement. For example, the SFP *one* is grouped as a type 2 particle and takes S_1 as a complement such as in (4)[6]. This consists of sentences without SFP and sentences ending with a type 1 particle (*already*[7]).

(4) Context: The security guard suspects someone of being suspicious as they exit the store. The cashier informs the guard.

> *He pay already one*
>   COMPL EMPH
>
> 'He has paid!'

One is thus unable to take a sentence with a type 3 particle as a complement although a type 3 particle can take S_{part2} as a complement. An example of this, with the type 3 particle *làh*, is shown in (5).

(5) a.   He always like that one làh

    b. *He always like that làh one
        Intended: He is always like that!

Nevertheless, there are other particle specific constraints such as sentence force that determine if an SFP can take a particular sentence as a complement. Different ways of analysing how particles work have been explored in Ler (2006) and Lee (2018).

Within the grammar, tones are not illustrated in the orthography because tone is not indicated during regular usage of the particle. It is however, noted in the lexical entry. For example, in a case where particles spelt *ah* can be either in the low (*ăh*) or rising tone (*áh*), each belonging to a different type, both are included into the grammar.[8] The tones are indicated through numbers in the lexical entry using an approximated matching to Hanyu Pinyin tones.

3.2. Noun Phrases

Another way in which Singlish differs from standard Englishes is the flexibility in its use of Noun Phrases (NP).

3.2.1. Agreement

While in standard English, plural nouns are plural inflected (usually with the suffix *-s*), in Singlish, "the bare form of nouns is always a possibility" (Hadfield et al., 2007). This means that in its bare form, the number value of nouns seems to be underspecified, which gives it the option of either referencing a plural or singular noun. This feature is depicted in (6) (Hadfield et al., 2007) where the bare noun "school" is able to agree with the plural determiner "those".

(6) *Those atas school all so expensive one!*

> 'Those prestigious schools are all SO expensive!'

This, however, does not mean that the opposite is allowed. Singular determiners like *a* or *that* are not usually permitted to agree with a plural noun like *schools*. This is shown in (7).

(7) *That schools so expensive.

To capture this phenomenon in the grammar, we created a new inflectional rule for nouns in their base form. This rule (in Figure 4) gives the inflected noun a underspecified Person Number (PN) value of *3* (3rd person) instead of *3s* (3rd singular) or *3p* (3rd plural). The PN for the specifier agreement of this noun is also underspecified with the value *3* which allows it to agree with both singular and plural determiners.

The Singlish Noun Inflectional Rule replaces the regular Singular Noun Inflectional Rule in standard English to prevent overgeneration. Thus, in this example, "school" would not unnecessarily pass through the rules and generate both a singular *school* and a *school* with an underspecified number value.

3.2.2. Bare Nouns

Singlish common nouns are also able to exist without determiners. In standard English, this is usually reserved for plural nouns or mass nouns like in example (8) in bold.

(8) a. **Trees** give shade.

   b. I like **rice**.

This is extended to bare nouns in Singlish as shown in (9).

(9) I want to use computer.

This behaviour is captured in the Singlish grammar through a new Unspecified Bare NP Rule in Figure 5. It is similar to the existing one in the ERG; the ERG's Bare NP Rule also takes an inflected noun with a non optional SPR (specifier) and outputs an inflected noun with an optional SPR. The difference mainly lies in how it takes a non-divisible noun marked by a DIV $-$ value. The output of the Singlish rule also includes a quantifier of *def_udef_a_q_rel* in its RELS. This quantifier predicate allows for both definite and indefinite quantifiers (such as *the* and *a*) to be used with the bare NP output as compared to the quantifier predicate (*udef_q_rel*) in the existing bare NP rule. The difference in quantifier predicate allows the output of the rule in Figure 5 to generate combinations of NPs which more accurately reflect the NP's meaning in Singlish. For instance, using *computer* in (9) as an example, the various sentences in (10) can be generated.

(10) a. I want to use **the computers**.

   b. I want to use **a computer**.

   c. I want to use **computers**.

   d. I want to use **the computer**.

3.3. *One*

The word *one* in Singlish has many different functions - one of which is as a sentence final emphatic marker as in (6). It can also function as a relative pronoun,

a nominaliser, and a pronoun. The Singlish functions of *one* are said to have come from the Chinese (Wong, 2005; Bao, 2009), likely from the Hokkien word *e*.

3.3.1. Relative Pronoun

One functions as a relative pronoun in sentences like (11) where it attaches at the end of the relative clause (RC). This differs from other relative pronouns in standard English (*that*, *which*, etc.) which are situated at the beginning of the RC.

(11) *The boy pinch my mother one very naughty.*

   'The boy who pinched my mother is very naughty.'   (Alsagoff & Ho, 1998, p.129)

The NP$_{RC}$ refers to the entire Noun Phrase (NP) which includes the RC modifying it. The structure of NP$_{RC}$ like those in (11) can be characterised by its resemblance to standard English at the higher levels - with the head noun preceding the RC - and to Chinese RC structures at the lower level (Alsagoff and Ho, 1998). This can also be seen in comparison with a Chinese Hokkien example in (12) (with the NP$_{RC}$ in bold) where the RC consists of the attributive clause (AC) followed by the relative pronoun (*e*).

(12) **jiak loolian e   hi-le tabo gina** *jin   pai*
      eat durian RP that boy child very naughty

   'That boy who is eating durian is very naughty.'

This behaviour is captured in a grammar through a new head-filler rule with a reversed structure of arguments as compared to the filler-head rule used for standard English. The *one* Head-Filler Rule is shown in Figure 6. The word order is reflected in the order of elements and the MIN[9] value restriction ensures that only the relative pronoun one can be the second argument in this rule.

3.3.2. Nominaliser

Relative clauses with *one* can also function as nouns like in (13). In this case, the RC *always pinch people one* is analysed first as an RC and then pumped up into a noun via a special rule.

(13) *The always pinch people one never come today.*

   'The one who always pinches people did not come today.'

3.3.3. Pronoun

This grammar also analyses the Singlish *one* as a pronoun. In sentences, it is similar to the standard English pronoun *one* except in the cases with possession. As shown in (14), the possessive clitic *'s* is not required and it does not contain the cardinal *one* meaning.

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[9]This stands for minor head feature which is used for more fine-grained distinctions within the HEAD feature
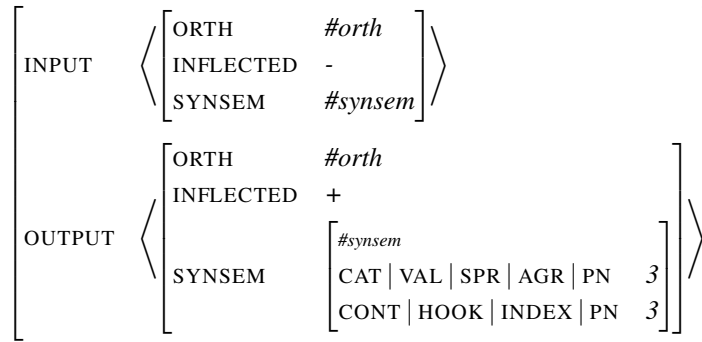
$$
\begin{bmatrix}
\text{INPUT} & \left\langle \begin{bmatrix} \text{ORTH} & \textit{\#orth} \\ \text{INFLECTED} & - \\ \text{SYNSEM} & \textit{\#synsem} \end{bmatrix} \right\rangle \\[2em]
\text{OUTPUT} & \left\langle \begin{bmatrix} \text{ORTH} & \textit{\#orth} \\ \text{INFLECTED} & + \\ \text{SYNSEM} & \begin{bmatrix} \textit{\#synsem} \\ \text{CAT} \mid \text{VAL} \mid \text{SPR} \mid \text{AGR} \mid \text{PN} & \textit{3} \\ \text{CONT} \mid \text{HOOK} \mid \text{INDEX} \mid \text{PN} & \textit{3} \end{bmatrix} \end{bmatrix} \right\rangle
\end{bmatrix}
$$

Figure 4: Singlish Noun Inflectional Rule

$$
\begin{bmatrix}
\text{INPUT} & \left\langle \begin{bmatrix} \text{INFLECTD} & + \\ \text{SYNSEM} \mid \text{LOCAL} \mid \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{VAL} \mid \text{SPR} & \left\langle \begin{bmatrix} \text{OPT} & - \\ \text{LOCAL} \mid \text{AGR} \mid \text{DIV} & - \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{AGR} & \textit{\#agr} \end{bmatrix} \right\rangle \\[3em]
\text{OUTPUT} & \left\langle \begin{bmatrix} \text{INFLECTED} & + \\ \text{SYNSEM} \mid \text{LOCAL} \mid \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{noun} \\ \text{VAL} \mid \text{SPR} \mid \text{OPT} & + \end{bmatrix} \\ \text{AGR} & \textit{\#agr} \\ \text{C-CONT} \mid \text{RELS} & \left\langle \begin{bmatrix} \text{PRED} & \textit{def\_udef\_a\_q\_rel} \end{bmatrix} \right\rangle \end{bmatrix} \right\rangle
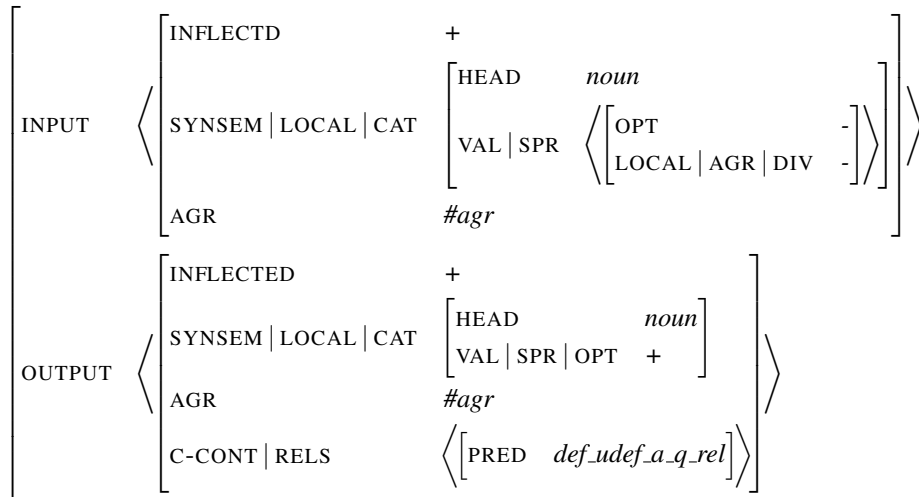\end{bmatrix}
$$

Figure 5: Unspecified Bare NP Rule

(14) *The computer is Kim one.*

'The computer is Kim's'

4. Grammar Performance

4.1. Data

To evaluate the grammar's ability to parse Singlish, example sentences were extracted from Wiktionary entries for Singlish words as a test suite. These examples were taken from a total of 95 lexical entries, each with an average of 4.15 examples (some of which consist of more than one sentence).

The data was then filtered and cleaned up to remove repetitions (as some sentences are used as examples for different Singlish words) and ones that were not relevant (e.g., "Antonym: pillow princess")[10]. The remaining data is publicly available on the Github page for this grammar.[11] In order to ease the parsing, the data was also formatted such that each sentence was line sepa-

rated.[12] At the end, 585 sentences were left in the test suite, some of which are shown in (15)

(15) a. He already paid for my ticket so even if I was busy, boh pien, I would have to go.

   b. He kena fine of $10.

4.2. Results

Using ERG's standard English grammar, the parsing rate was reasonably high at 82.1% (480 out of 585). This parsing rate refers to the percentage of input that the grammar is able to produce at least one satisfactory parse of - an analysis that satisfies the root condition. A large part of this is attributed to ERG's Unknown Word Handling (UWH) feature which allows it to assign parts of speech (POS) to words that are not in its lexicon based on things like their relative positions. This sometimes gives accurate predictions such as for the word "kaypoh" (busybody) in Figure 7 where it is correctly analysed as a verb.

On the other hand, it is also possible for the system to assign the wrong POS to Singlish words such as in Figure 8 for the sentence in (16). As shown in the gloss,

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[10]This also included 16th century English texts like "He that walketh in the darke,... "

[11]The data is located at `https://github.com/siewyeng/SinglishERG/blob/main/data/wikidata/`

[12]Both the line separated and example separated data are available in the folder.

$$\left[phrase\right] \Longrightarrow \mathbf{H} \begin{bmatrix} \text{HEAD} & verb\ or\ adj \\ \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle\rangle \\ \text{SPR} & \langle\rangle \end{bmatrix} \\ \text{SLASH} & \langle\boxed{1}\rangle \end{bmatrix} \boxed{1} \begin{bmatrix} \text{ORTH} & one \\ -\text{MIN} & rp\_one\_rel \end{bmatrix}$$
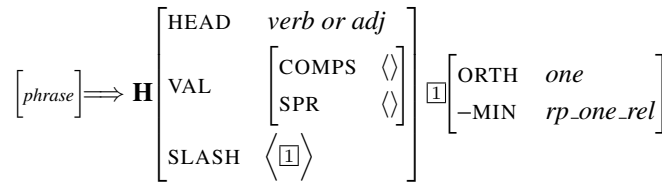
Figure 6: *one* Head-Filler Rule
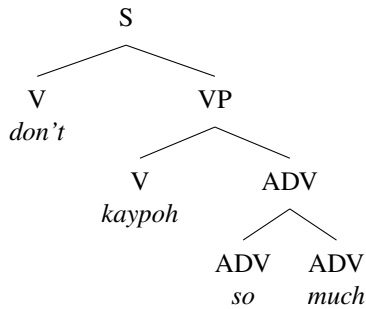
Figure 7: Unknown word parsing of *kaypoh* through English grammar
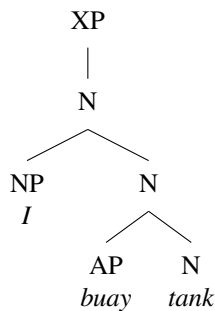
Figure 8: Unknown word parsing of *buay tank* through English grammar

buay tank is a phrase meaning *unable to handle/put up with someone/something*. With the UWH, *buay* is analysed as an adjective while *tank*, since it is in the English lexicon, is analysed as the noun *tank*.

(16) *I buay tank*

   'I can't stand (it)'

The Singlish grammar (with the UWH turned on) gave a parsing rate of 80.5% (471 out of 585) - unexpectedly slightly lower than that of the standard English grammar. This is likely because certain Singlish lexicon were added into the Singlish grammar with too strict a constraint, preventing the sentence from parsing. These words, in contrast, can be assigned a POS that fits the grammar for the English grammar, allowing some of the sentences to parse.

Although the Singlish grammar yielded a lower result at this point, the sentences parsed by the Singlish grammar do not make up a subset of those parsed by the English grammar as Table 1 shows.

Sentence	English parse	Singlish parse
Nearly langgar leh!	✓	✗
Which bastard paotoh to teacher that I carry handphone to school?	✗	✓
This boy damn act cute, I buay tank.	✗	✓
Buay tank how they shamelessly give awards to themselves for being the best.	✓	✗

Table 1: Sentences with difference in parsibility

	English	Singlish
accuracy (%)	46.7	70.0

Table 2: Percentage of sentences with a correct parse (gold)

4.3. Gold Trees

Looking at the sentences that both grammars were able to parse, we then made a set of gold-standard trees consisting of 30 sentences. These sentences had length of less than 20 words and non-standard English features. They were then manually treebanked using the tools by (Packard, 2015).

All the lexicon from the 30 sentences were also added to the two grammars (if the relevant lexical type was available). With this, The Singlish grammar was able to parse 21 trees, and the English grammar 14. The accuracy rate for both grammars with respect to these selected gold trees are shown in Table 2 where the Singlish grammar is shown to perform significantly better.

4.4. Processing

This grammar can be used for translation. This can be done through ACE (the Answer Constraint Engine)[13] (Crysmann and Packard, 2012) which allows for translations between different DELPH-IN[14] grammars which use the same predicates.

For instance, we can easily translate/paraphrase between Singlish and English sentences which use the same predicates. Through this function, the differences between the two grammars are also made apparent. Because of the less constrained rules for nouns, a sentence

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[13]http://sweaglesw.org/linguistics/ace/
[14]This stands for Deep Linguistic Processing with HPSG.

in Singlish with the bare noun can generate many variations in standard English such as in (17b). This can be done as well in the other direction with an input into ERG's standard English grammar and an output through the Singlish grammar.

(17) a.   Singlish Input: Cat eat meat.

    b.   The cat eats meat.
       The cats ate meat.
       The cat will eat meat.
       A cat will eat meat.
       Cats eat meat.
       Meat is eaten by cats.
       . . .

Although this function allows for translations, currently in the grammar, Singlish words are given unique predicates. For example, the word *kaypoh* is given the predicate of *kaypoh_v_rel* or *kaypoh_a_rel* as opposed to an English translation like *nosy_a_rel*. Although this makes direct translations less achievable just by using the grammar, it is done as the words may not be completely equal. The exception to this is for eye dialect spelling of words in Singlish for example *gahmen* meaning *government*. A version of a grammar that has the same predicates as English could also prove to be useful in the future.

5.   Conclusion

We have created the first computational grammar of Singlish. It is based on a robust grammar of standard English, and so already has excellent coverage. Together with the grammar, we distribute a treebank of fully parsed sentences, available under an open license. The computational grammar was built upon a standard English one and many lexical types and rules were added to account for Singlish behaviour. Larger grammatical phenomena of Singlish were tackled in this project and this foundation of Singlish HPSG grammar can be further built upon in the future to address more specific syntactic behaviour.

As Singlish is not a formal language, large resources of textual data is not as easy to obtain. Besides crawling through Wiktionary, Singlish texts can also be obtained from the NUS SMS corpus (Chen and Kan, 2013; Chen and Kan, 2015)[15], ICE-SIN and online forums such as the Singapore subreddit[16] and Hardware Zone[17].[18] The Corpus of Singapore English Messages (CoSEM) (Gonzales et al., 2021), a huge resource significantly bigger than ICE-SIN, has also been planned to be released (p. 16) and will serve to be an extremely valuable resource in Singlish related studies.

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[15]This can be accessed through Github at `https://github.com/WING-NUS/nus-sms-corpus`

[16]There are many Singapore-based subreddits and r/Singapore (`https://www.reddit.com/r/singapore/`) is just one of them.

[17]`https://forums.hardwarezone.com.sg/`

[18]Thanks to the reviewer for this suggestion.

In future work we would like to, firstly, increase the Singlish specific vocabulary and secondly improve the efficiency of the grammar. As Singlish allows uninflected verbs and constrains agreement less than standard English, the grammar is necessarily more ambiguous. This makes it essential to constrain the rules as much as they can be.

The complete grammar and corpus for Singlish are available on the Github page at `https://github.com/siewyeng/SinglishERG` under the MIT license.

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