iTELL: An Update

Intelligent Technological Enhanced Language Learning

by

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Contents

Introduction / Recap

Introduction

- PhD Candidate at NTU, Singapore

- Roughly 1 year to finish

- Topic: "Using Rich Models of Language in Grammatical Error Detection" (English, Mandarin Chinese)

    - using the ERG as the base for an app helping engineering students' academic writing

    - develop Zhong to a point where it can help beginner learners of Mandarin Chinese

Mal-Rules

Definition (Schneider and McCoy, 1998):

- Applicable to computational grammars (e.g. HPSG)

- Hand-written rules that extend grammars

- Increase coverage of the grammar
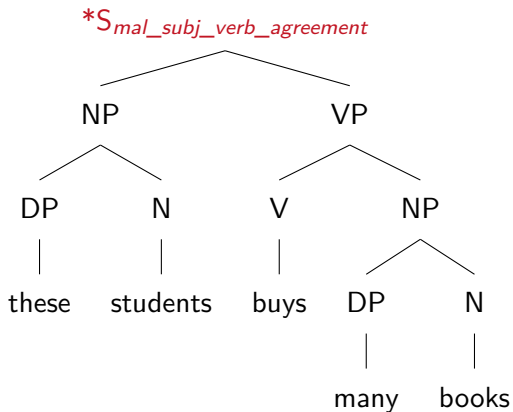
- Allow the parsing of ungrammatical sentences

Uses:

- Identify specific language errors

- Able to reconstruct multiple possible meanings

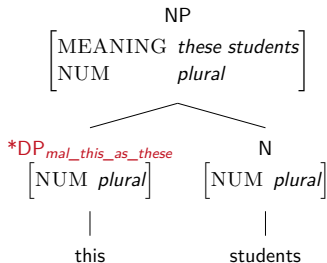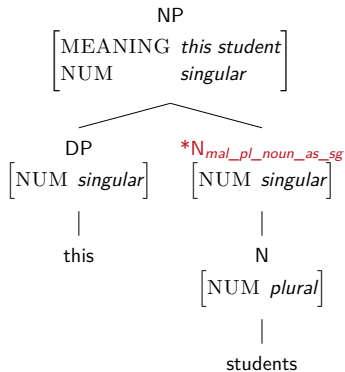- Used for student feedback

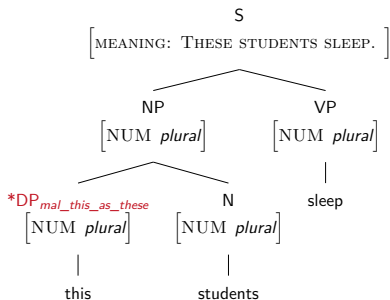# Mal-Rule (Inflectional Rule)

* These students buy books.

Mal-Rule (SVA)
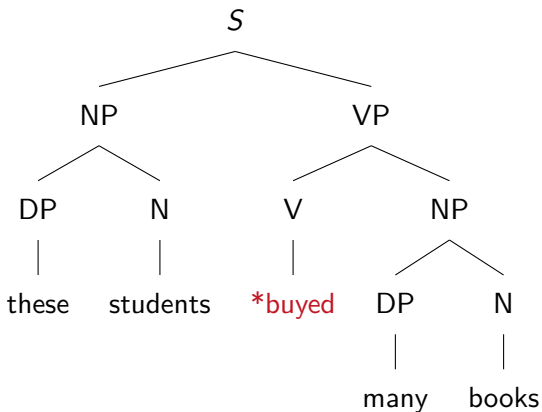
* These students buys many books.

Multiple Corrections

- Reconstructing multiple possible intended meanings

NP
$$\begin{bmatrix} \text{MEANING} & \textit{this student} \\ \text{NUM} & \textit{singular} \end{bmatrix}$$

DP
$$\begin{bmatrix} \text{NUM} & \textit{singular} \end{bmatrix}$$
|
this

*N$_{mal\_pl\_noun\_as\_sg}$
$$\begin{bmatrix} \text{NUM} & \textit{singular} \end{bmatrix}$$
|
N
$$\begin{bmatrix} \text{NUM} & \textit{plural} \end{bmatrix}$$
|
students

NP
$$\begin{bmatrix} \text{MEANING} & \textit{these students} \\ \text{NUM} & \textit{plural} \end{bmatrix}$$

*DP$_{mal\_this\_as\_these}$
$$\begin{bmatrix} \text{NUM} & \textit{plural} \end{bmatrix}$$
|
this

N
$$\begin{bmatrix} \text{NUM} & \textit{plural} \end{bmatrix}$$
|
students

Multiple Reconstructions
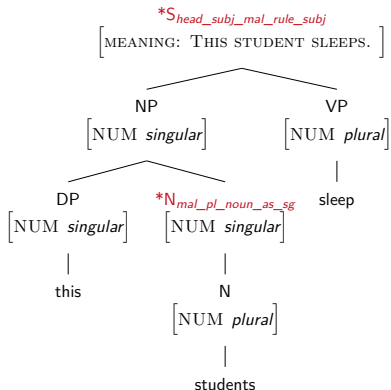
ERG & Automated Student Writing Support

NTUCLE

- NTU Corpus of Learner English (NTUCLE)

- 180 human tagged documents
  - course assignments
  - ~9.50k sents, ~120k words

- New tagging schema
  - based on other schemas (e.g. NUS, Cambridge)
  - 53 error tags divided in 15 categories

- 6 annotators, course lecturers

- ~800 documents 'automatically annotated'
  (growing every semester)

This is what you wrote:

❝ This systems corrects language problem ❞

This is what we think might be wrong with it:

AGREEMENT (plural noun): corrects

- This sentence may have a verb that expects subject which is a singular noun (just one item of something which can be counted, e.g. 'device') , but its subject does not agree with the verb.
- Please check the sentence, and change the verb so it agrees with its subject (e.g. 'The devices cost ...') OR make the subject a singular noun (e.g. 'The device costs ...').

ARTICLE (missing): language problem

- This sentence has a singular noun (one item of something which can be counted, e.g. 'device') without an article ('a', 'an', 'the'), determiner (e.g. 'each', 'this') or possessive (e.g. 'her', 'its') before it.
- Please check your sentence carefully, and add an article, determiner or possessive before the singular noun (e.g. 'the device') OR change the subject to a plural noun (more than one item, e.g. 'devices').

DETERMINER ('this' vs. 'these'): this

- You may have used the determiner 'this' instead of 'these' before a plural countable noun (more than one item of something that can be counted and has a plural form, e.g. devices') in your sentence.
- Please check your sentence for the use of 'this' before a plural noun, and change it to 'these' OR change the plural noun to a singular noun (e.g. 'that device').

LCC Document Feedback

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Anti Food Deserta

Background:

In the recent years, Singapore's food wastage rate shoots rapidly.In all domains of food production and consumption, wastage of food has grown significantly. Article by food waste republic shows that in 2011, each Singaporean can generate 130kg of food waste per year, out of 0.68 million tons of food waste being thrown each year, only 10% could be recycled. [1].

Prob

> ➡ This sentence is much longer than the average sentence. It may be difficult for readers to read the sentence and understand it after reading it once. There is also a higher risk of making grammar mistakes in such a long sentence. You may want to consider breaking up the sentence to make it easier for the reader to follow the text.
>
> ➡ You may used a word or phrase that our lecturers would like you to avoid: tons of. Please double check if it is necessary, and rephrase it if possible.

This p   would be fro
gene
addr   Thus
Anti deserta, meaning anti waste in Latin, is been used as the title.

Solution:

To control the growth of this issue, I propose to setup a convenient way to distribute the wasted edible food. It requires combined effort from organizations, such as Disabled People's Association (DPA), fighting for the welfare of the elderly, disabled and the poor. Often, they are facing problem of food shortage. Instead of wasting food by discarding them, a more reasonable way would be distributing them to these needy groups.These organizations can set up centers all around Singapore to ease the collection of excess food.On the other hand, an app will be created for the convenience of notifying these centers for food collection.This provides a direct interaction between the food owners and the centers, curbing the food wasted from cosmetic filtering as now there is a better way for producers to make use of them.At south it would reduce the amount of edible food wasted daily and instead, put into good use to aid the needy.This can be beneficial especially within short term, while lowering the food wastage, it also provided the buffer time for other possible longer term solution to take effect.

Benefits:

The immediate benefited ones would be the needy groups, directly solving their food shortage.This also cuts burden on NEA's pilot project reported in Channel News Asia [3], in the effort to reduce inedible food wastage.

Implementation:

Automated Student Writing Support

- Collab. with Language and Communication Centre, NTU

- Large cohorts (2000+ engineering students)

- Pedagogical challenges: correction, feedback, timing

- 80+ error types (ERG + iTELL + NLP)

- **Goals:**
  - Error Detection + Feedback
  - Explore and evaluate possible solutions
  - Decide on best corrections on their own

Results and Future Directions

- Learning experiment involving 1600 students (paired assignment) showed promising results
  - Double blind review
  - Positive impact 84% of the time

- Current focus: improving feedback messages

- Slightly expand ERG's error coverage (e.g. prepositional selection)

Zhong & iXue

- 21 error-types based on lecturers' experience

- Data was collected from past-exams ($\approx$ 5,600 sentences)
  - Annotated for error types ($\approx$ 1,600 errors)

  - 1360 sentences (24.3%) contain at least one error

  - $\approx$ 1.2 errors per (problematic) sentence.

- Tagged by two native Mandarin speakers

- Data is not open (i.e. research only)

Extending Zhong

- Document type hierarchy

- Constrain spurious ambiguity
  (e.g. question-phrases, attachment of negation)

- Constrain some flexibility
  (Determiners without CLs, AP without degree modifiers, etc.)

- Added romanization (pinyin) input

- Increase lexical and syntactic coverage
  Separable verbs (e.g. 生病, 生了病), reduplication, vocab acquisition

Extending Zhong (II)

Regression Data:

- Tokyo University of Foreign Studies

- Mandarin Textbook Data

- Zhong's MRS test suite

Regression Results:

- $\approx$ 2.5k Sentences Regression

- $58.36\% \rightarrow 74.55\ \%$

- $\approx 5\%$ structural, $\approx 10\%$ lexical/tokenization
  lexicon acquisition is incomplete

Where is Structure lacking?

- Classifiers and Numeric Phrase predication
  - practically non-existent

- Comparatives
  - practically non-existent

- Better treatment of passives

- 把 Imperatives

- Argument Changing Complements
  - duration, state, result, potential

- Prepositional Complements
  - currently a single token with the verb

Mandarin Common Error Classes

- ★ **Other - Other errors requiring correction**
- ★ **吗 redundancy (V 不 V, 几, etc.)**
- ★ **Adjectival predicate sentence**
  Syntactic position of adverbial clause
  中国 vs 中文
- ★ **Usage of 和 vs. 也**
- ★ 有点儿 vs. 一点儿 mix-up
- ★ Syntactic position of 也 (e.g. before the subject, after the verb)
  Emphasizing sentence 是... 的...
  Adjectival predicate sentence with 不
- ★ **Adjectival predicate sentence without adverbials**
- ★ **Adjective modifier without degree adverbials**
  Missing Measure word after 几
  Incorrect measure word
  Usage of 二 vs. 两
  Syntactic order of multiple adverbials 不, 都, 也, etc.
  Usage of 不 vs. 没有
  Numerical phrase predicate sentence

Semantic Errors

我说中国。
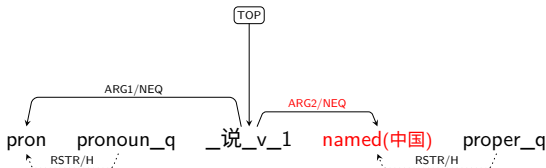
- Some problems are not strictly syntactic
- mal-rules are not the best way to deal with them
- we can use semantic analysis to flag problems like these
- 中国 is not a prototypical argument of 说

DELPH-IN Grammarium

Grammarium

- Web-based toolkit for grammar development

- DELPH-IN Viz libraries

- Grammar Update/Compile (from SVN/GitHub)

- Inspect Profiles

- Basic Regression Testing Support

Quick Demo

"This systems corrects language problem"

Acknowledgments

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Thank you!