The Design and Construction of A Chinese Collocation Bank

Ruifeng Xu, Qin Lu

* Dept. of Computing, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

Introduction

- Design and construct a large scale and accurate collocation bank as a NLP resource for Chinese
- Steps to build the collocation bank
  - Classify Chinese collocations according to their different characteristics and features
  - Design the guideline for collocation bank construction
  - Construct collocation bank through manual annotation
- Scale
  - 3,643 headwords, 23,581 identical collocations in a 1-million word corpus

Collocation: Definition and Properties

- A ***collocation*** is a recurrent and conventional expression containing two or more content word combinations that hold syntactic and/or semantic relations.
  - Both **uninterrupted collocation** and **interrupted collocation**
  - Both **bi-gram collocation** and **n-gram collocation**
  - Properties
    - recurrent and habitual use: 历史包袱（historic baggage vs historic luggage），浓茶（*strong tea*), but not 烈茶（ *powerful tea*)
    - limited compositional： “裁减/v 员额/n” (*reduce the posts*)
    - limited substitutability and limited modifiability：南/f 南/f 合作/vn (*cooperation between south hemisphere countries*)
    - domain-dependent：专家/n 系统/n（expert systems）

Classification of Chinese Collocations

- Four types of collocations according to compositionality, substitutability, modifiability, and internal association

	Type 0 Idiomatic Collocation	Type 1 Fixed Collocation	Type 2 Strong Collocation	Type 3 Loose Collocation
Compositional	No	Limited to yes	Yes	Yes
Synonym substitutable	No	No	Very limited	Limited
Order alter	No	No	Yes	Yes
Modifiable	No	No	Very Limited	Limited
Statistic significance	Not required	Not required	Required	Strongly Required
Examples	缘木求鱼(climb the tree to get fish – wrong method) 蓝牙 (*Bluetooth*)	n外交/n 豁免权/n(diplomat immunity)	缔结/v 同盟/n 缔结/v 联盟/n(form alliances)	合法/v 收入/n 正当/v 收入/n 合法/v 收益/n (lawful income)

Guideline for Collocation Bank Construction

- The annotation follows headword-driven strategy.
- For a given headword, the annotation tasks include:
  - Identify its corresponding bi-gram collocations and n-gram collocations
  - Annotate and verify the occurrence of each collocation
    - Each occurrence must be manually examined because some are not collocations
  - For each bi-gram collocation, annotate its type and syntactic dependency relations

Annotation of Collocation Bank

- Corpus Data Preparation
  - People's Daily Segmented Corpus (By Peking Univ.)
- Headword Set
  - 3,643 headwords selected from "The Dictionary of Modern Chinese Collocation"
- Each headword is annotated in three passes
- Syntactic Dependency Labels

PZA- Noun and its adjective modifier. E.g. 合法/a 收入/n (*lawful incoming*)
PZN- Noun and its nominal modifier. E.g. 道德/n 标准/n (*moral standard*)
SBI- Predicate and its object. E.g. 保护/v 文物/n (*protect culture relic*)
SBU- Predicate and its complement. E.g.医治/v无效/v (*ineffectively treat*)
ZZ - Predicate and its adverbial modifier. E.g. 沉重/ad 打击/v (*heavily strike*)
SD - Serial verb constructions. E.g. 跟踪/v 报导/v (*trace and report*)
ZW - Predicate and its subject. E.g. 财产/n 转移/v (*property transfer*)
AA – Adjective and its adverbial modifier. E.g. 极其/d 惨痛/a (*greatly painful*)

- Pass 1. Concordance and dependent word identification
  - Headword concordance

    确保/v 人民/n 群众/n 的/u生命/n 财产/n **安全/an**

    确保/v 长江/ns **安全/an** 度汛/v
  - Manual identification of syntactically and semantically dependent words surrounding the headword

    确保/v 人民/n 群众/n 的/u生命/n 财产/n 安全/an

    <depend search= “安全/an ”head=”**确保/v**” depend =”**安全/an**” relation =”**SBI**” ></depend>

    <depend search= “安全/an ”head=” **安全/an**” depend =”**生命/n**” relation =”**PZN**” ></depend>

    <depend search= “安全/an ”head=” **安全/an**” depend =”**财产/n**” relation =”**PZN**” ></depend>

    确保/v 长江/ns 安全/an 度汛/v

    <depend search= “安全/an ”head=” **度汛/v**” depend =” **安全/an**” relation =”**ZZ**” ></depend>

- Pass 2. N-gram collocation annotation
  - Identify word combinations frequently co-occur in consecutive positions to be extracted as n-gram collocations.
  - No further analysis on the internal syntactic and semantic information is carried out.

确保/v 人民/n 群众/n 的/u生命/n 财产/n 安全/an

<ncolloc search="安全/an " w1=" 生命/n" w2=" 财产/n" w3="安全/an"></ncolloc>

- Pass 3. Bi-gram collocations annotation
  - All two-word combinations are considered candidates
  - Bi-gram collocations are type labeled according to manual judgment and the following statistical features

    Strength: Reflects the co-occurrence frequency significance
    Spread: Reflects the co-occurrence distribution significance
    Synonym Substitution Rate: Measures the substitutability
    Distribution Similarity: Measures the distribution similarity between a collocation candidate and the statistically expected distribution.

What is the following related to the above statements?

<bcolloc search="安全**/an**" col="确保**/v**" head= "确保**/v**" type="**2**" relation="**SBI**"></bcolloc>

<bcolloc search="安全**/an**" col=" 度汛**/v**" head= "度汛**/v**" type="**3**" relation="**ZZ**"></bcolloc>

Achievements

- From the collocation bank, 23,581 identical bi-gram collocations are identified which is called *PolyU Collocation Collection*(*PCC*).
  - "The Dictionary of Modern Chinese Collocation" provides 35,742 typical collocations for these headwords, which is called *Mei's Collocation Collection* (*MCC*)
  - There are 19,967 common entries in *PCC* and *MCC*, which indicates good linguistic consistency
  - 3,614 new collocations are obtained that are not recorded in *MCC,* which means collocation bank is helpful to enrich collocation dictionary
- Collocation bank provide accurate statistics
  - The manual identification bi-gram collocations and verification of co-occurrence are helpful
  - Statistical information collected from collocation bank is more accurate and can be more useful to linguistic research, and it is essential to improving the automatic collocation extraction systems

A Unicode-based Adaptive Segmenter

Qin Lu[1], Shiu-tong Chan[1], Baoli Li[2] and Shiwen Yu[2]

[1]Department of Computing, The Hong Kong Polytechnic University

[2]Institute of Computational Linguistics, Beijing University

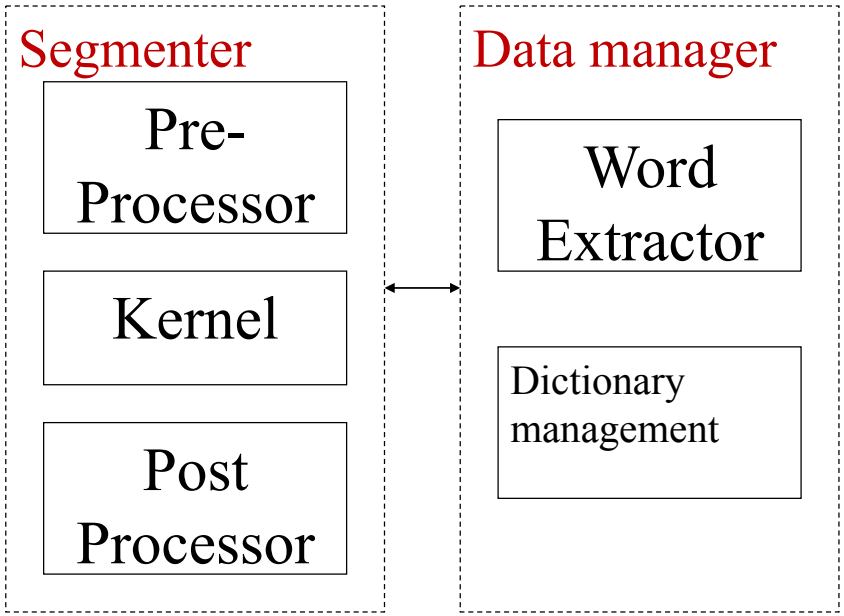
Design Principles

- No restriction to one text coding: Handle both traditional/ simplified characters

  Example: I need to go to school the day after tomorrow

  - Simplified: [我][后日][要][上学]
  - Traditional: [我][後日][要][上學]
  - Mixed: [我][後日][要][上学]
- Output in chosen form
- Reusable and adaptive: Modular design: divide and conquer
  - Training of terms in traditional/Taiwan/HK as additional pluggable dictionaries

System Architecture



Basic System Functions

- Pre-processing: Dealing with Eng-Chinese separation
- Segmentation:
  - Dictionary based with word frequency and conditional probability
  - Chinese name recognizer
  - PoS tagging(optional) based on Peking Univ. standard

Word Extractor

HK Unique terms

Bigram	count	freqforward	freqbackward
差餉	818	0.061425	0.943483
入伙	734	0.007373	0.583002
叱吒	120	0.902256	0.794702
蜆殼	106	0.751773	0.120045
叮噹	44	0.330827	0.473118
普洱	44	0.003138	0.483516
磅礴	34	0.012523	1.000000
孌童	15	1.000000	0.001848
蒟蒻	15	1.000000	1.000000
鏍絲	14	0.933333	0.003801
鯇魚	9	1.000000	0.002222
忤逆	7	1.000000	0.002152

Performance Evaluation: All 4 data sets

Data	R	P	F	R_{oov}	R_{iv}
AS	0.892	0.853	0.872	0.236	**0.906**
CTB	0.853	0.806	0.829	0.578	**0.914**
HK	0.909	0.863	0.886	0.579	**0.935**
PK	**0.94**	**0.911**	**0.925**	**0.647**	**0.962**