

Case Frame Constraints for Hierarchical Phrase-based Translation Japanese-Chinese as an example

Jiangming Liu, Jin'an Xu, Jun Xie, Yujie Zhang

Natural Language Processing group
Beijing Jiaotong University

Outlook

- ◆ Motivation
- ◆ Case Frame
- ◆ Method
- ◆ Experiment
- ◆ Conclusion

Motivation

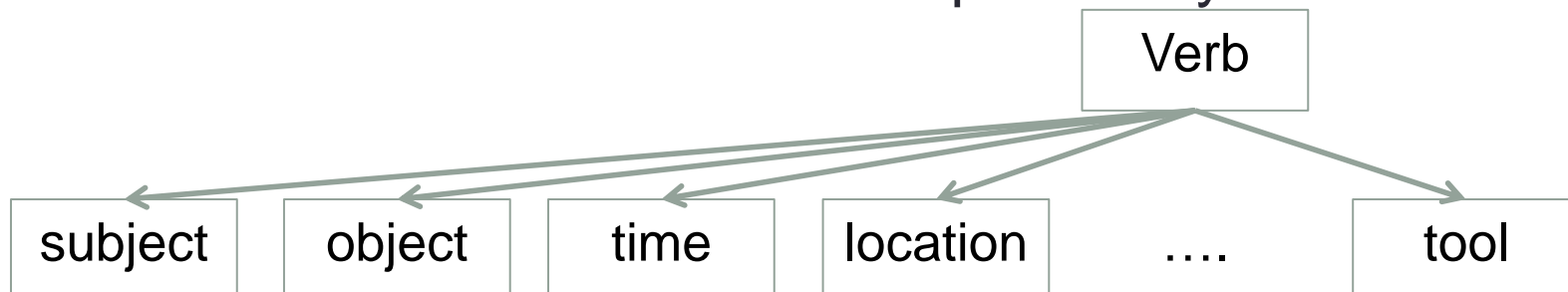
- Hierarchical phrase-based model limit
 - rule length limit (10)
 - variables limit (2)
 - glue rules
- Linguistic features (Japanese)
 - subject – object – verb structure
 - auxiliary words

Outlook

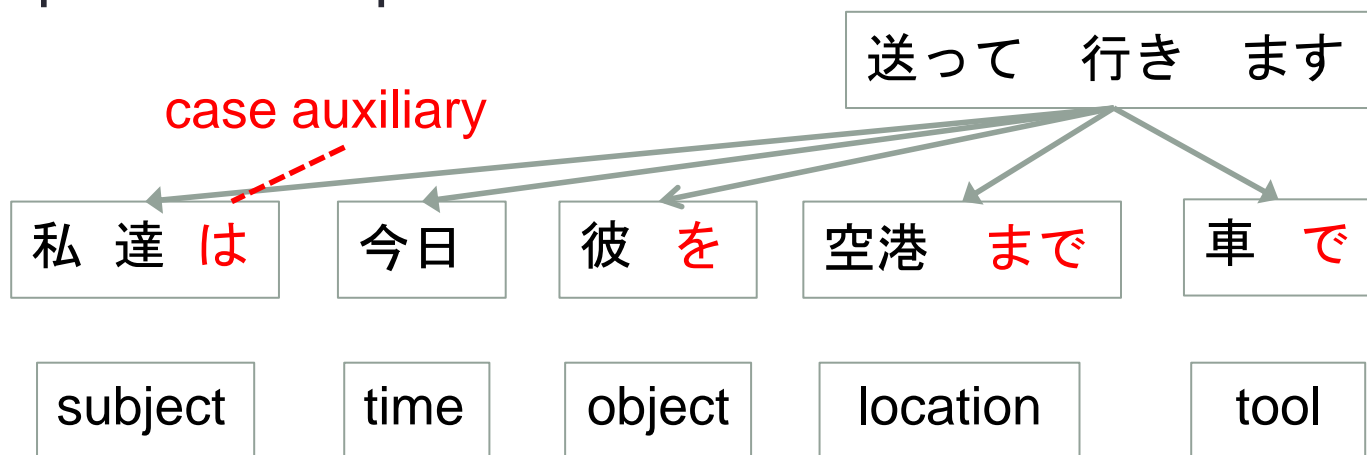
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Case Frame

- Verb case frame is similar with dependency relation



- Specific to Japanese



Outlook

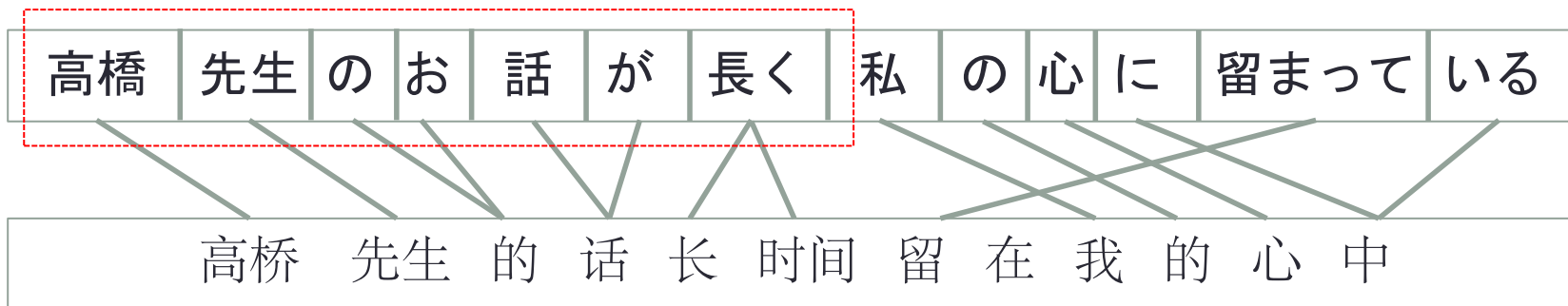
- ◆ Motivation
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- ◆ **Method**
- ◆ Experiment
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Method

- Case frame constraints on hierarchical phrase-based rules (CF-HPBs)
- Case Frame Rules (CF-Rs)
- Decoding
 - Chunk-based Dependency Tree to String

Method

- Hierarchical phrase-based rule constraints

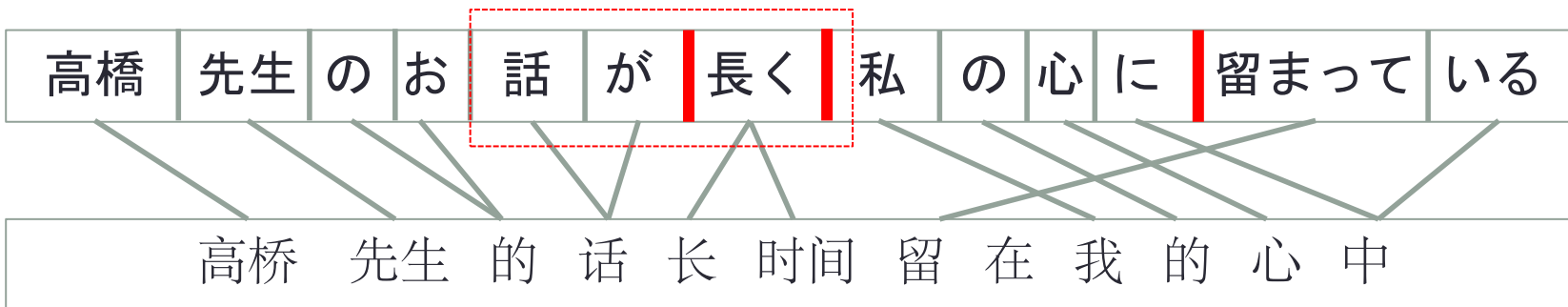


- X->(高橋 先生 X1, 高橋 先生 X1)
- X->(高橋 X1 長く, 高橋 X1 长 时间)
- X->(X1 話 が長く, 话 长 时间)
- Variables is meaningless and can not capture linguistic information

Method

- Hierarchical phrase-based rule constraints

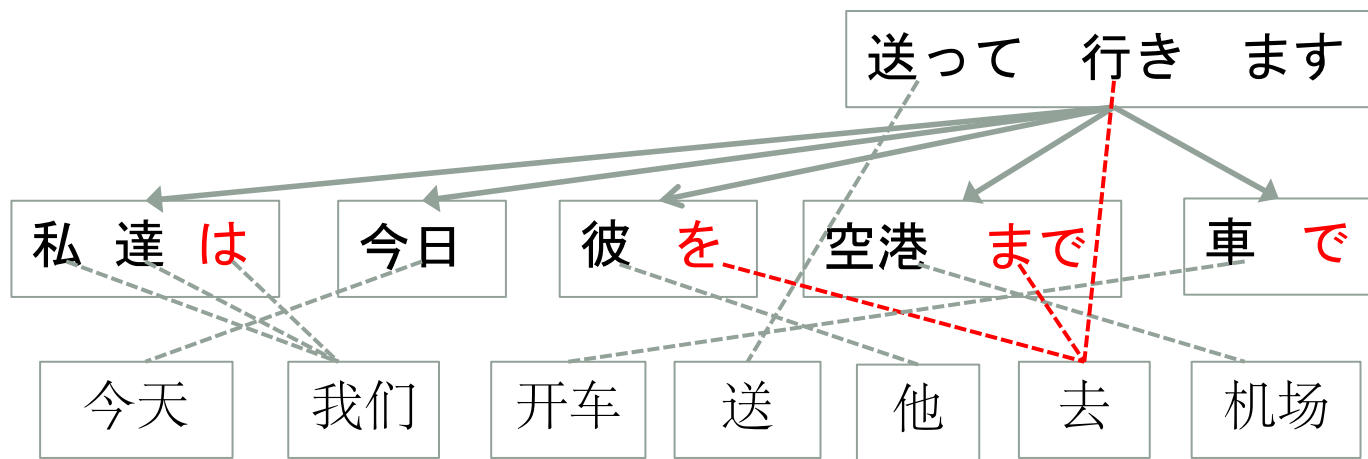
X1 is forbidden



- Variables are constraints to the inside of each case chunk
- X->(高橋 先生 X1 , 高桥 先生 X1)
- X->(X1 の お 話 が , X1 的 话)
- X->(X1 長く , X1 长 时间)

Method

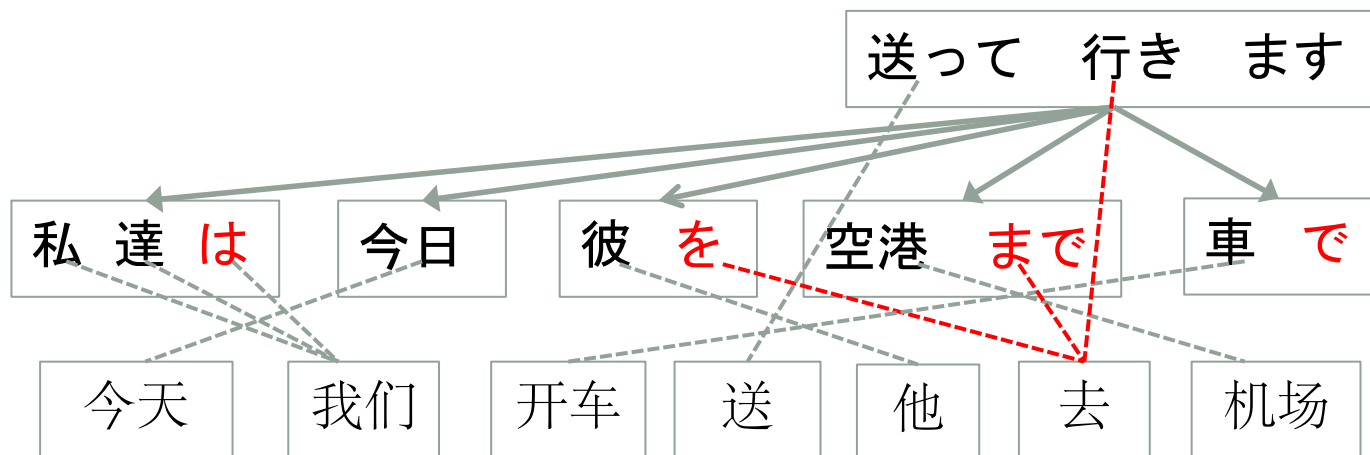
- Case Frame Rules



- Each child chunk is generalized as an variables softly
- head chunk (root) remains to be word level

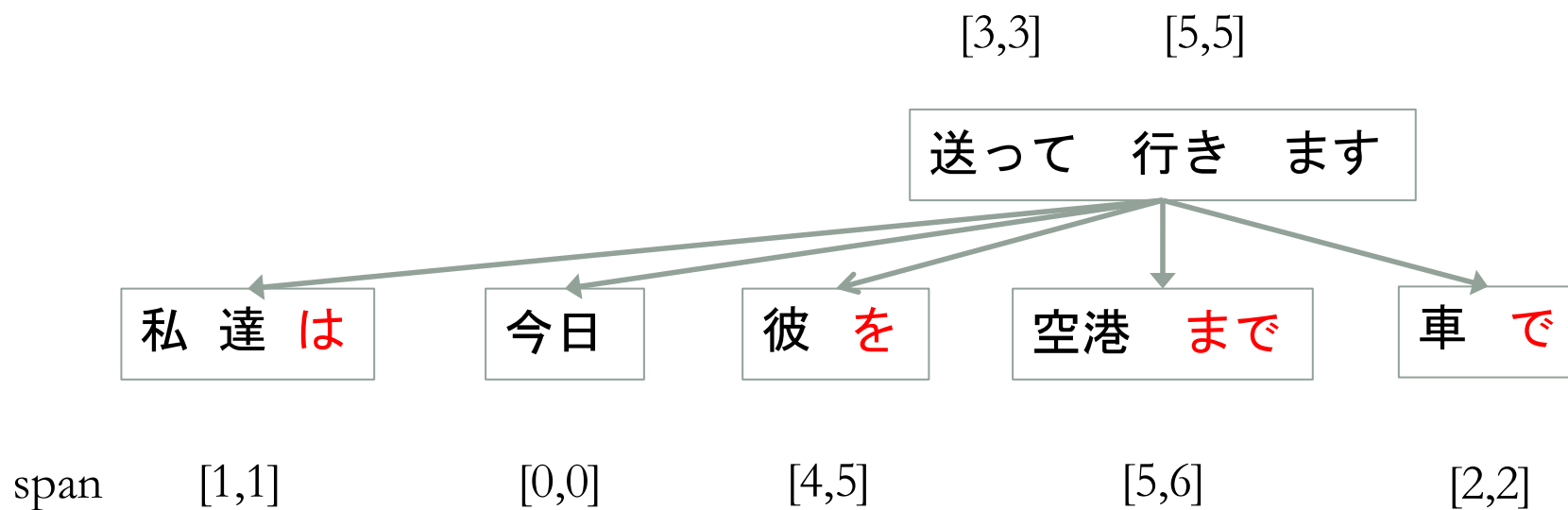
Method

- Case Frame Rules



Method

- Case Frame Rules



Method

- Case Frame Rules

{0,0,1,1,0,0,1}

{0,0,0,1,0,0,0}

[3,3]

[5,5]

送って 行き ます

私 達 は

今日

彼 を

空港 まで

車 で

span [1,1]

[0,0]

[4,5]

[5,6]

[2,2]

position {0,0,1,1,1,1,1}

{1,0,1,1,1,1,1}

{0,0,0,1,0,0,1}

{0,0,0,0,0,0,0}

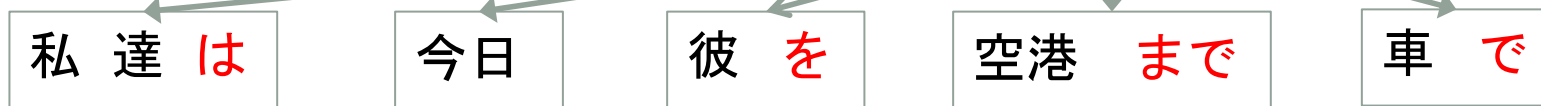
{0,0,1,1,0,1,1}

Method

- Case Frame Rules

	3	1
	{0,0,1,1,0,0,1}	{0,0,0,1,0,0,0}
	[3,3]	[5,5]

送って 行き ます



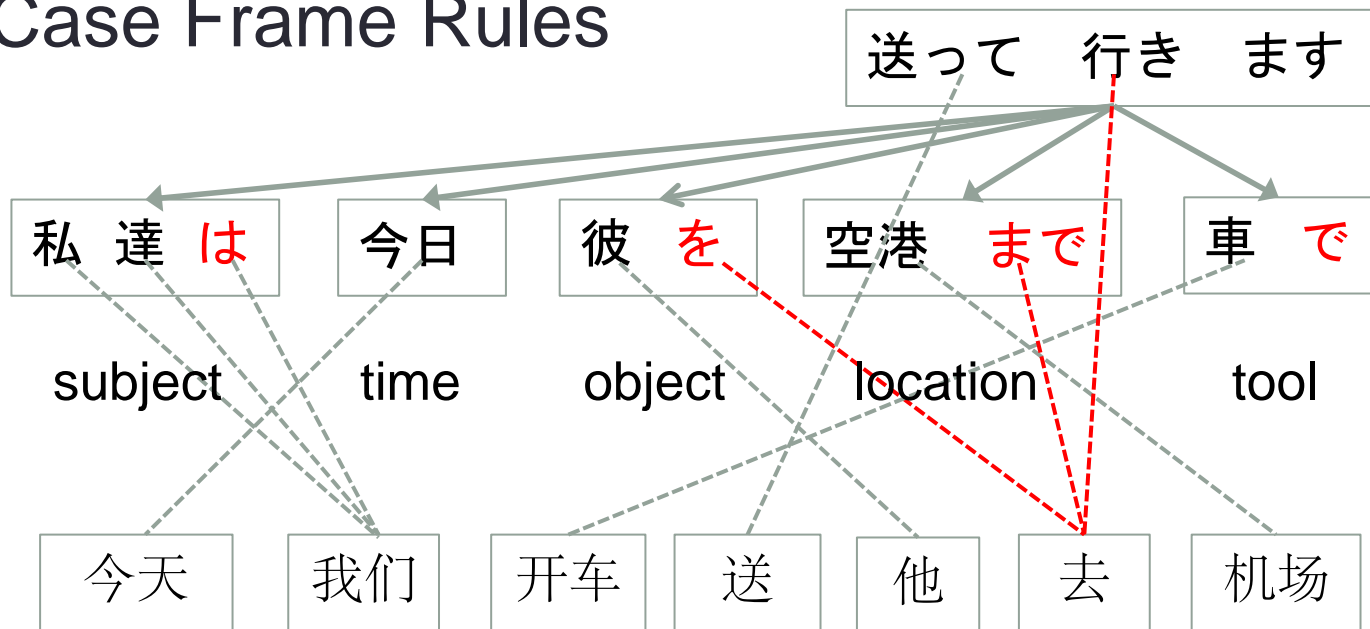
span	[1,1]	[0,0]	[4,5]	[5,6]	[2,2]
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position	{0,0,1,1,1,1,1}	{1,0,1,1,1,1,1}	{0,0,0,1,0,0,1}	{0,0,0,0,0,0,0}	{0,0,1,1,0,1,1}
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rank	5	6	2	0	4
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Method

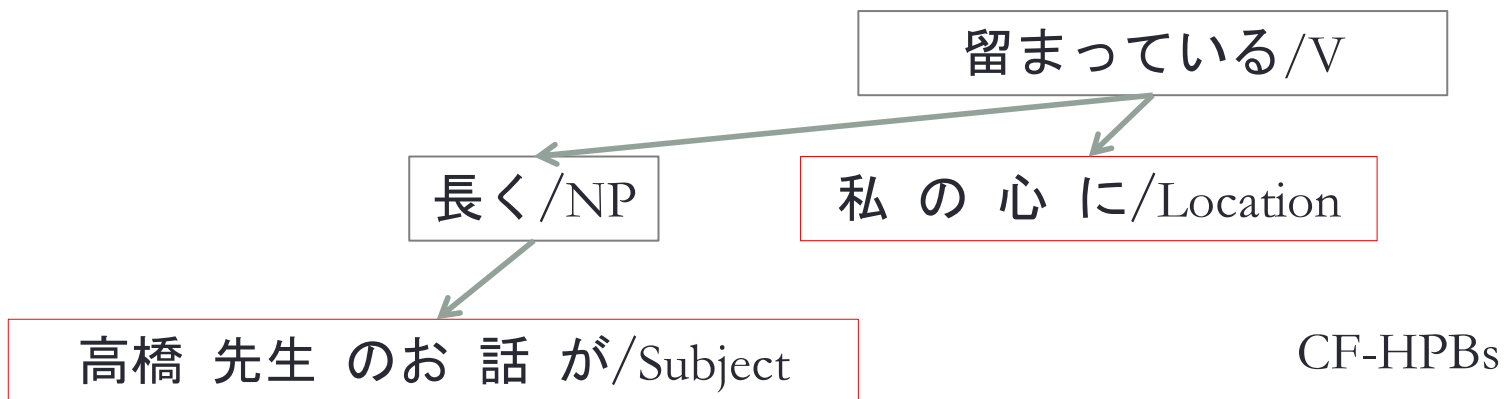
- Case Frame Rules



X-> {(X1:subject) (X2:time) (X3:object) (X4:location) (X5:tool) 送って 行きます,
X2 X1 X5 送 X3 去 X4}

Method

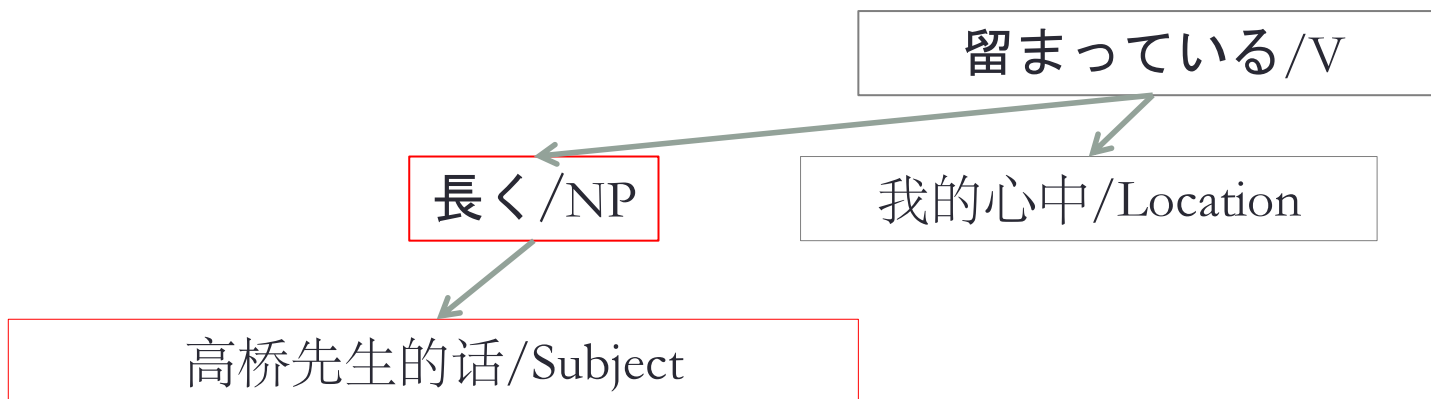
- Decoding
 - Chunk-based Dependency Tree



Method

- Decoding

- Chunk-based Dependency Tree



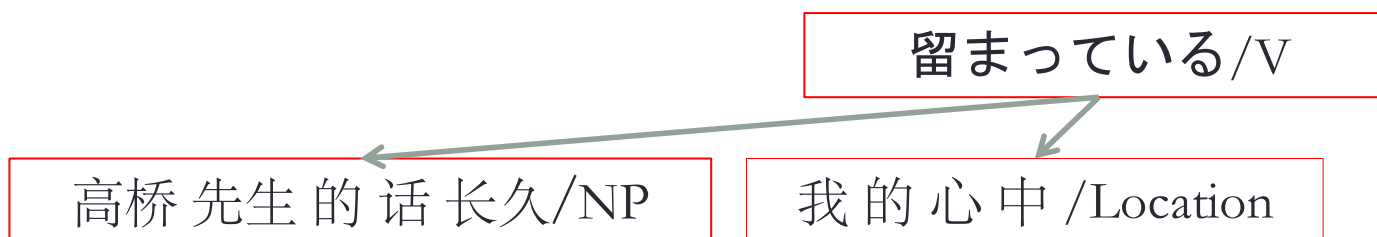
CF-Rs

X-> {(X1:Subject) 長く/NP, X1 长久}

Method

- Decoding

- Chunk-based Dependency Tree



CF-Rs

X->{(X1:NP) (X2:Location)留まっている/V, X1 留在 X2}

高橋先生的話长久留在我的心中

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Experiment

- Experiment data
 - CWMT 2011 Japanese-Chinese Corpus
 - Training data: 280k
 - Development data: 500
 - Testing data: 900
- Baseline system
 - In-house hierarchical phrase-based system (*hiero-re*)
 - Dependency tree to string system (*dep2str*)

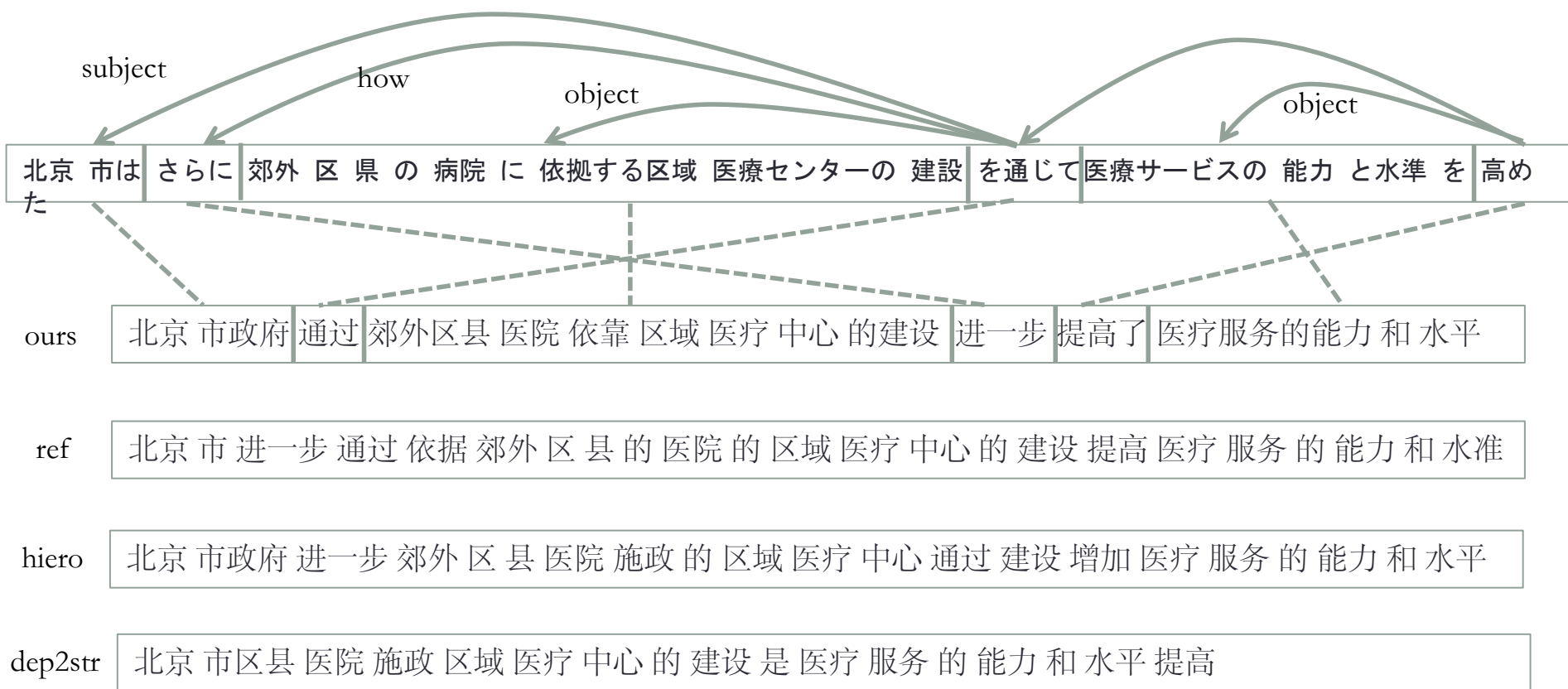
Experiment

- Experiment result

system	Rule #	BLEU
<i>Hiero-re</i>	24.0M	22.26
<i>dep2str</i>	2.8M	19.34
ours	1.4M+10M	22.62

Experiment

- Example



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Conclusion

- Case frame is useful to reduce redundant hierarchical phrase rules, and to ensure the linguistic derivation
- Case frame rules can capture the reordering information instead of the glue rules
- Chunk-based dependency tree can be used to guide the derivation process without limitation of lexicalization (lots of auxiliary word)

Future Work

- Noun case frame may be meaningful
- Consider the relation between hard constraints and soft constraints

Thanks for your attention