

Machine Translation System: TSUKU

Motivation

- Utilizing dependency information in large scale
- But also keep the tree structures in phrase level, which are extracted from CFG tree
- High speed decoding

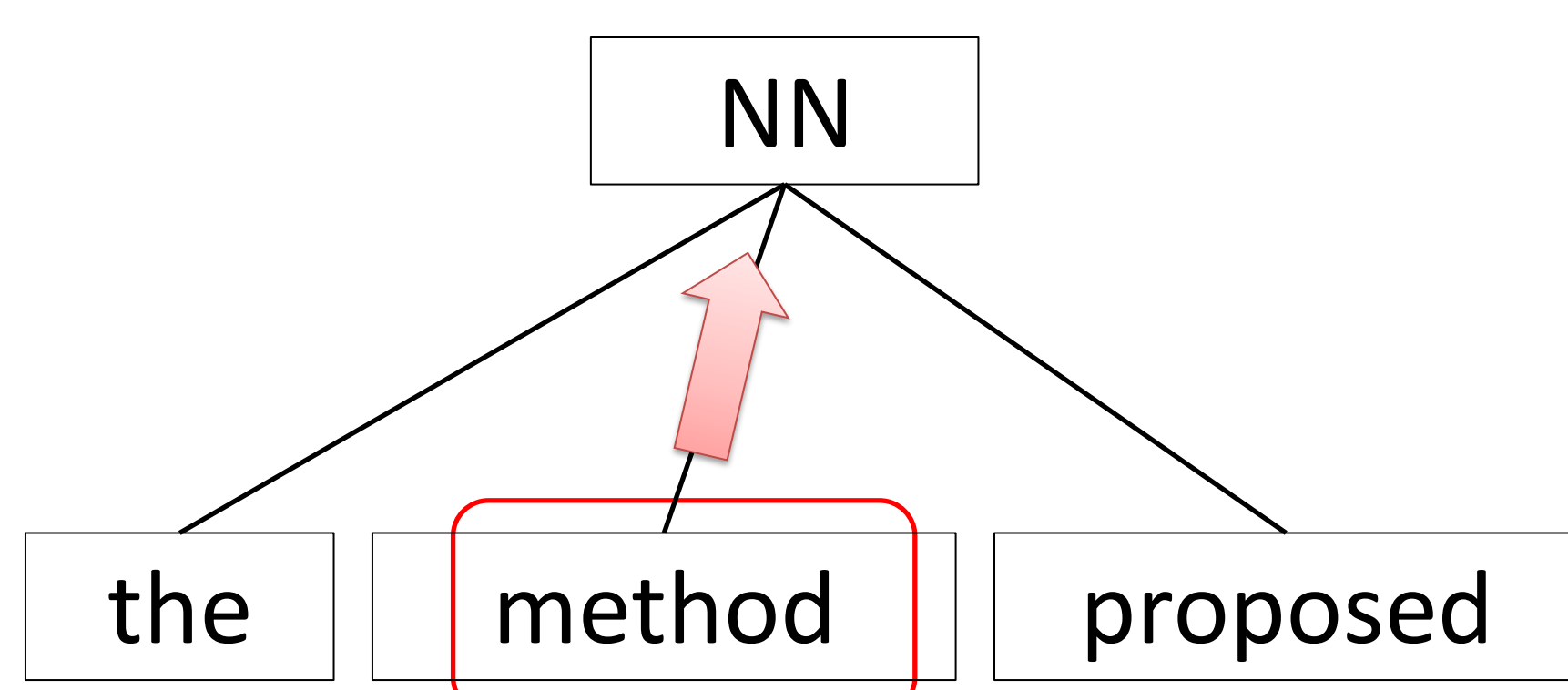
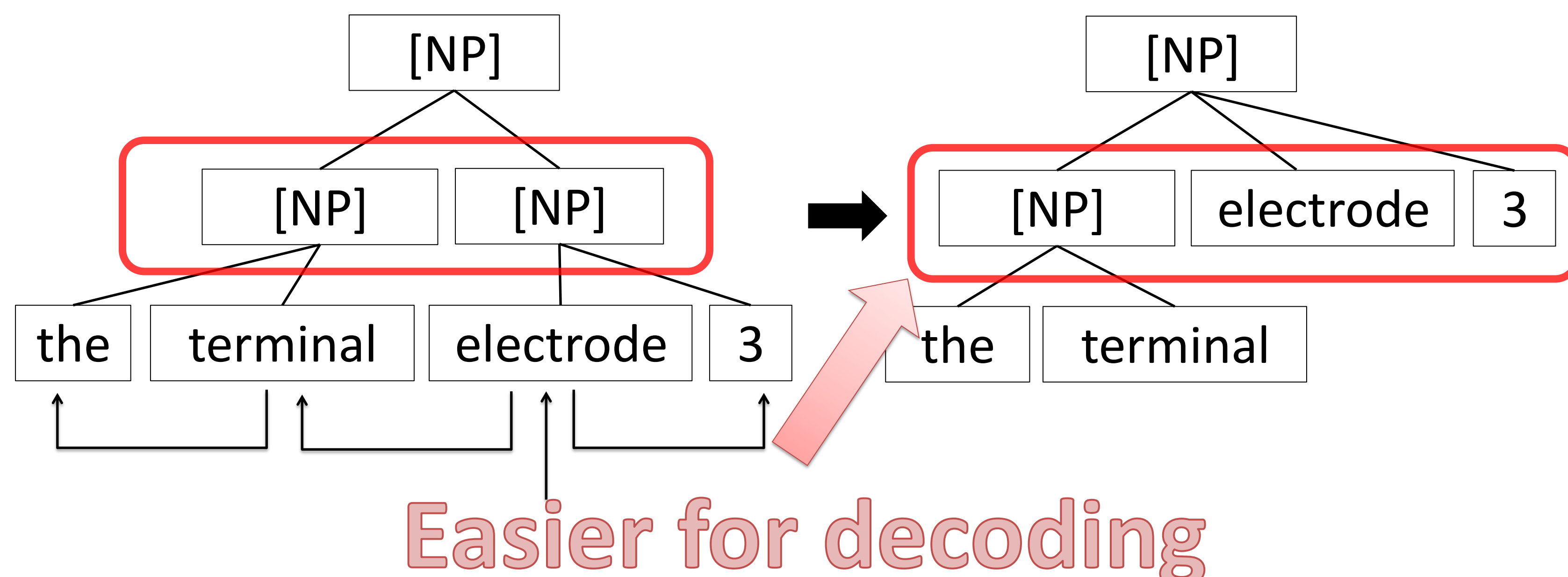
Authors:

Zhongyuan Zhu, Jun-ya Norimatsu, Toru Tanaka, Takashi Inui, Mikio Yamamoto

University of Tsukuba

Tree Combining

- Currently, we made a bunch of rules to combine dependency and CFG parse tree
- For sibling nodes in CFG parse tree, we determine head node according to dependency parse tree, and adjust the positions of chunks by dependency relationships of head nodes



- Replace the tags in CFG parse tree with tags of dependency heads

Results

Systems / Auto Evaluation Scores	BLEU	NIST	RIBES
TSUKU-ej-int-1 (Proposed Model + Small LM with KenLM)	0.3141	8.126	0.7555
TSUKU-ej-int-2 (Proposed Model + Large LM with LSHLM)	0.319	8.1894	0.7565
TSUKU-ej-int-3 (Proposed Model + Large LM with KenLM)	0.3176	8.1769	0.7566
TSUKU-ej-int-1 _{post} (+ Word Penalty)	0.3306	8.0849	0.7242
BASELINE HPBMT	0.3298	8.0837	0.7231
BASELINE PBMT	0.3361	8.1816	0.7042

Systems / Subjective Evaluation Scores	Adequacy	Acceptability
TSUKU-ej-int-1	2.7933	0.4088
BASELINE HPBMT	2.69	-
BASELINE PBMT	2.5333	-

Conclusion

- This tree-to-string translation model could achieve higher translation accuracy when handling long input sentences
- High decoding speed
- Producing about 1/5 translation rules comparing with Moses HPB

LSH language model (LSHLM) is a kind of lossy language model which has a high compression ratio and a low probability of information loss triggered by falsepositives. We used the LSH function to generate a group of similar ngrams(called a "bucket"). The LSH function can map similar ngrams to the same hash value. When a falsepositive occurs, similar ngrams are in same bucket and, therefore, incorrect value should be similar to correct one.

Translation Example

INPUT: specifically , the ff amount is calculated at every second calculation timing based on an average value of fuel injection amounts , as will be described later .

Translation for each node

```
[S] . -> [X0] 。
|--specifically , [NP] -> すなわち , [X0]
  |--the ff amount [VP] -> FF 量 [X0]
    |--is [NP] -> は , [X0]
      |--calculated at [NP] -> [X0] で 算出した
        |--every second calculation timing [VP] -> [X1] 第 2 の 演算 タイミング 毎
          |--based on [NP] -> [X0] に 基づいて
            |--an average value of [NP] -> [X0] の 平均 値
              |--fuel injection amounts -> 燃料 噴射 量
            |--as will [NP] -> [X0] よう に
              |--be described later -> 後述 する
```

Result of proposed model

すなわち、FF量は、後述するように燃料噴射量の平均値に基づいて第2の演算タイミング毎で算出した。

Result of Moses HPB

具体的には、FF量を第2の演算タイミング毎に算出された燃料噴射量の平均値に基づいて、後述するようにされている。