Machine translation for patent documents combining rule-based translation and statistical post-editing

Terumasa EHARA
Yamanashi Eiwa College

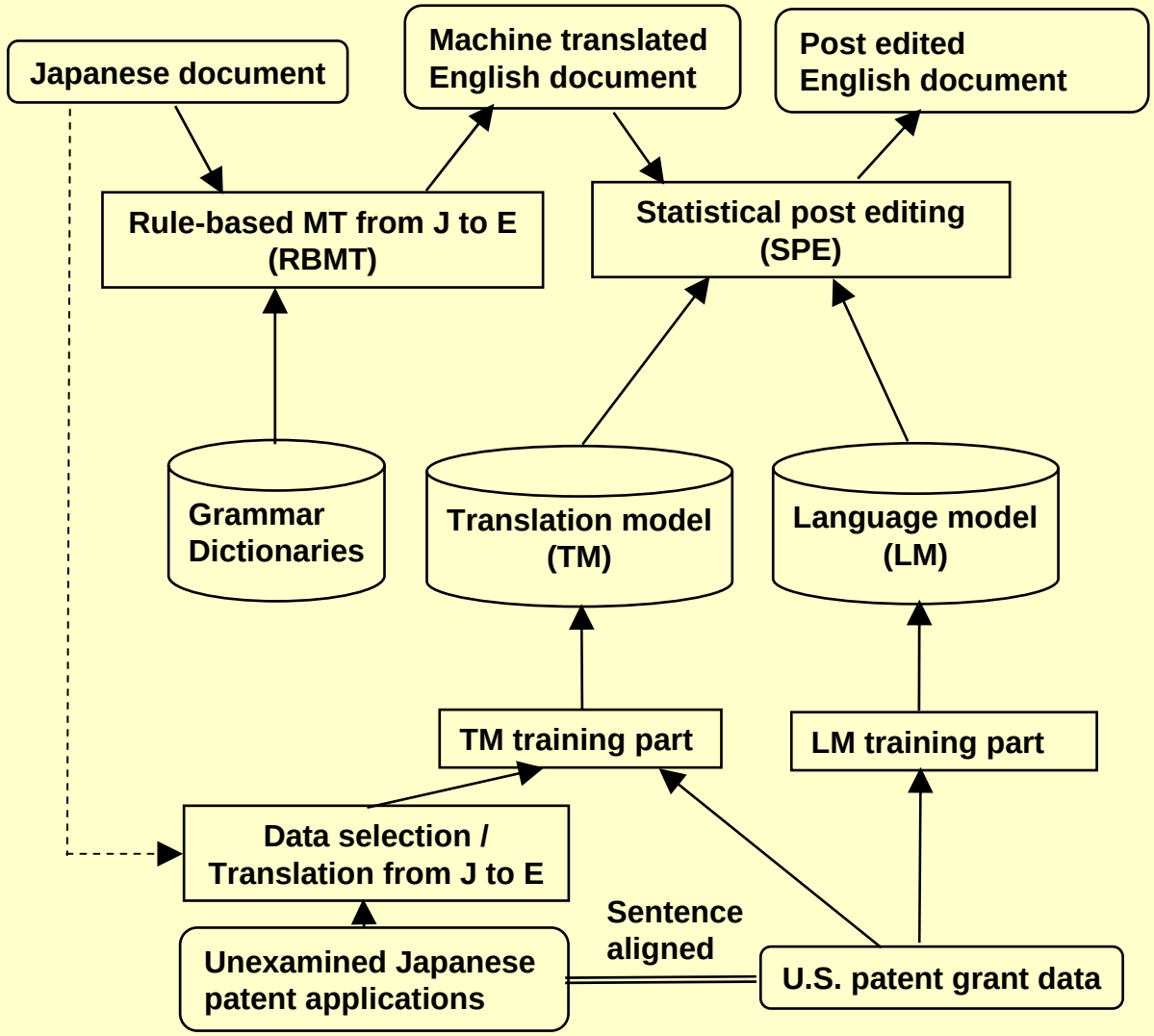
Agenda

- Motivation
- System architecture
- Translation model training
- Experiments
- Conclusion

Motivation

- Rule-based MT technique can use accumulated knowledge from long history of MT researches.
- Statistical MT technique can use large power of computer hardware and database.
- Combining the two techniques can make MT more accurate.

System architecture

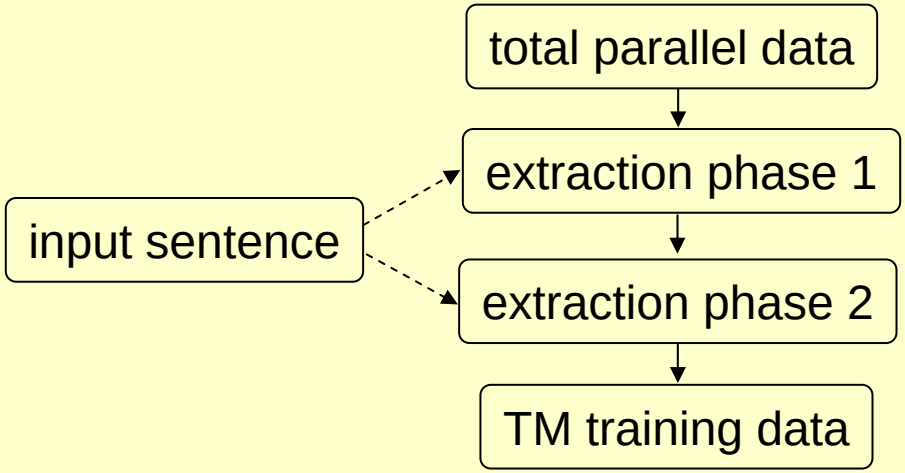


System architecture (2)

- Tools that are used in our system
  - RBMT part: commercial based MT system specialized to patent translation
  - SPE processor: Moses (2007.05.29)
  - LM training tool: Srilm (ver.1.5.5)
  - TM training tool: Giza++ (v1.0.1)

Translation model training

- Extracting only matched data to the input, we make the translation model training data from the total parallel data.
- Matching algorithm is :



$$sim = \frac{2 \times \#(T \cap S)}{\#(T) + \#(S)}$$

Experiments

- Intrinsic evaluation of MT from J to E
  - JE parallel data (NTCIR-8 PAT-MT data)
    old data: 1,798,571 sentence pairs
    new data: 1,387,713 sentence pairs
  - Test data: 1,251 Japanese sentences
  - Development data: 2,000 JE sentence pairs

LM and TM training data

- LM training data: all of English part of new data (1,387,713 sentences)
- TM training data: extracted from old and new data matched to the test data (152,072 sentence pairs)

Results

	BLEU (modified)	NIST
RBMT output	0.1907	6.1466
SPE output	0.3444	7.7538

Translation example

- Test sentence #2

  このような構成になる弾性糸のクランプカッター装置1において、弾性糸SYを把持して切断する動作手順を、図1A、図1B、図1Cに示してある。

- Reference translation

  In the clump cutter apparatus 1 of the elastic yarn configured as described above , the operational procedure to hold and cut the elastic yarn SY is shown in FIG . 1A , FIG . 1B , and FIG . 1C .

Translation example (2)

- Keyword list

  構成 (configured),
  弾性 (elastic),
  糸 (yarn),
  クランプ (clump),
  カッター (cutter),
  装置 (apparatus),
  把持 (hold),
  切断 (cut),
  動作 (operational),
  手順 (procedure),
  図 (FIG),
  示し (is shown)

Translation example (3)

- Extracted TM training data (top 3)
  - 図2に於いて、切断ドラム38にはカッター46が取り付けられる。
  - まず、図1によってクランプ装置の全体構成を説明する。
  - 次にこのように構成した装置の動作を図12、13、14、15に示したフローチャートに基づいて説明する。

  - In FIG . 2 , a cutter 46 is attached to the cutting drum 38 .
  - Firstly , with reference to FIG . 1 , a whole constitution of a clamping apparatus will be explained hereinafter .
  - Next , the operation of a device constructed in this way is explained using the flowcharts shown in FIGS . 12 , 13 , 14 and 15 .

Translation example (4)

- Output of RBMT part

  In clamp cutter device 1 of the elastic yarn which becomes such composition , the procedure of operation of grasping and cutting elastic yarn SY is shown in Drawing 1A , Drawing 1B , and Drawing 1C .

- Output of SPE part

  The clamp cutter device 1 of the elastic yarn structure , the procedure of the operation of holding and cutting the elastic yarn SY is shown in FIG . 1A , FIG . 1B and FIG . 1C .

Conclusion

- Adding statistical post-editing part to rule-based machine translation, we can improve BLEU score from 0.1907 to 0.3444.

- Mean PER (position-independent word error rate) value for the RBMT outputs compared to the SPE outputs is 0.280.

Remaining issues

- To improve the parsing accuracy in the RBMT part.
- Syntactically collapsed outputs from the RBMT part can't be recovered by the SPE part.