

# A Method of Cross Language Question-Answering Based on Machine Translation and Transliteration

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# Outline

- Introduction
- Base system
- Our approach
  - CLQA for E-J task
  - CLQA for J-E task
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# Introduction

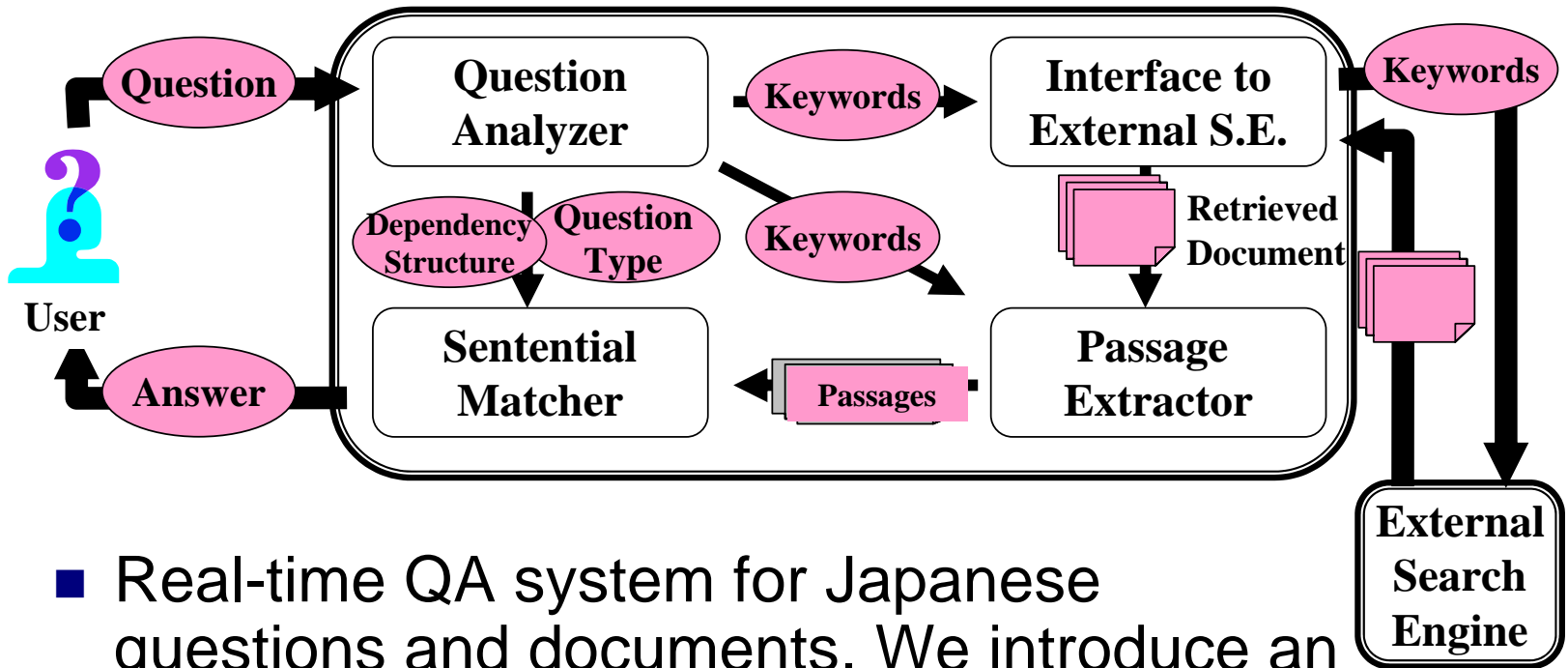
- The methodologies of CLQA
  - Query translation + QA in the target language [1]
    - Separate QA systems on a language-by-language basis.
    - Development of QA system is usually very costly.
  - CLIR + Language independent QA [9]
    - Machine learning approach. A large amount of pairs of questions and their answers with context in CL style.
  - Translation of document + QA in the source language
    - Usually, we have to have N different translated document collections for N languages [2]. Documents have to be under the control of CLQA system.
- Our approach: CLQA systems based on **only one mono-lingual (Japanese) QA and MT systems**.
  - Our Japanese QA system requires **no preprocessing on documents** and **can handle unseen documents** obtained from external search engines.
  - If we can translate a few dozen of passages into the source language with an MT system on the fly, not only E-J CLQA but also J-E CLQA would be possible.

[1] Ahn et al. Cross-lingual question answering with QED. CLEF 2004 Workshop (2004)

[9] Sasaki. A comprehensive learning approach to trainable QA: Toward CLQA. SIG Technical Reports 2004-NL-163, IPSJ (2004)

[2] Bourdil et al. How to answer in English to questions asked in French. CLEF 2004 Workshop (2004)

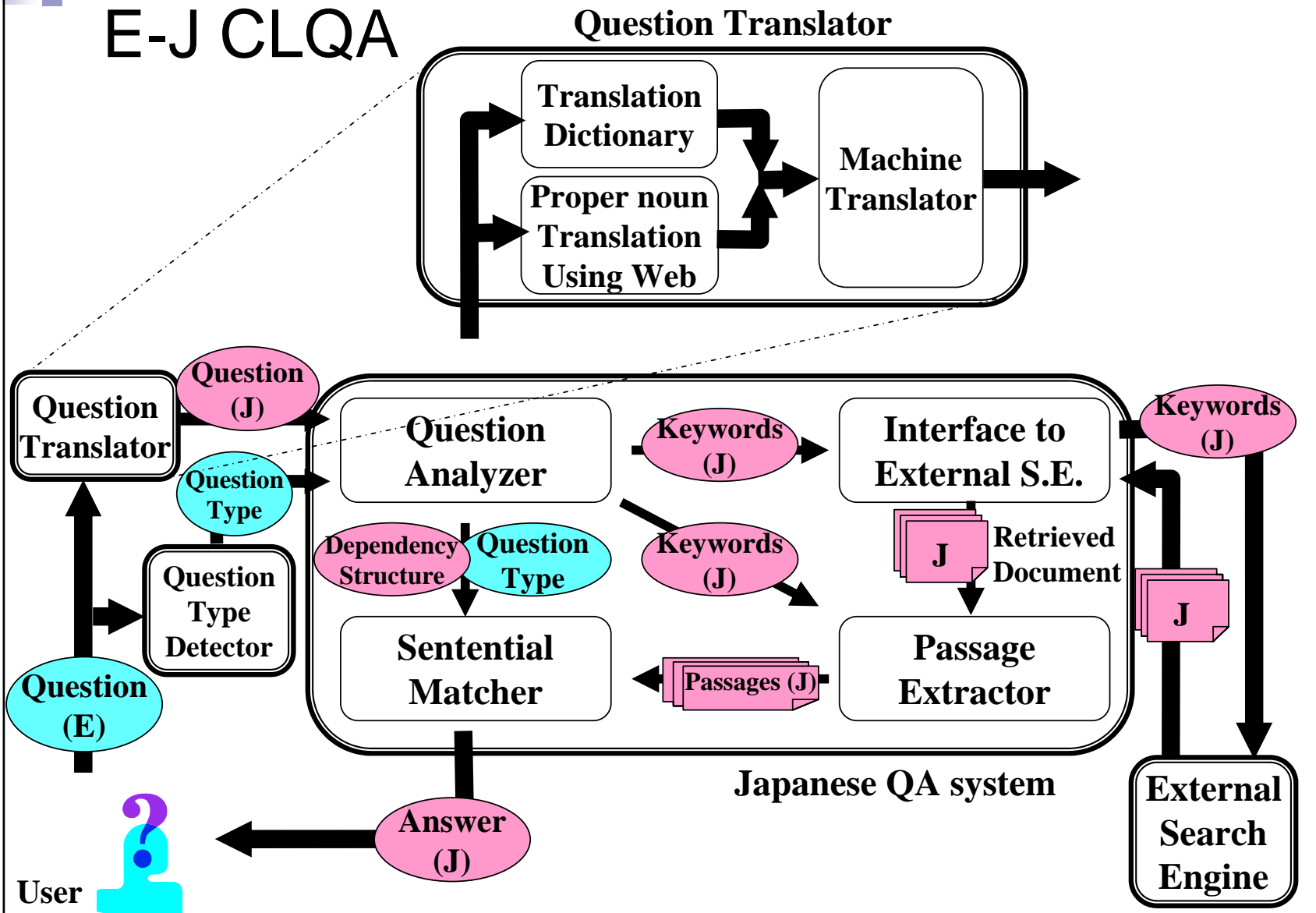
# Base system : Japanese QA



- Real-time QA system for Japanese questions and documents. We introduce an A\* search control in a sentential matching process in order to reduce the turnaround time.

# Proposed method (1)

## E-J CLQA

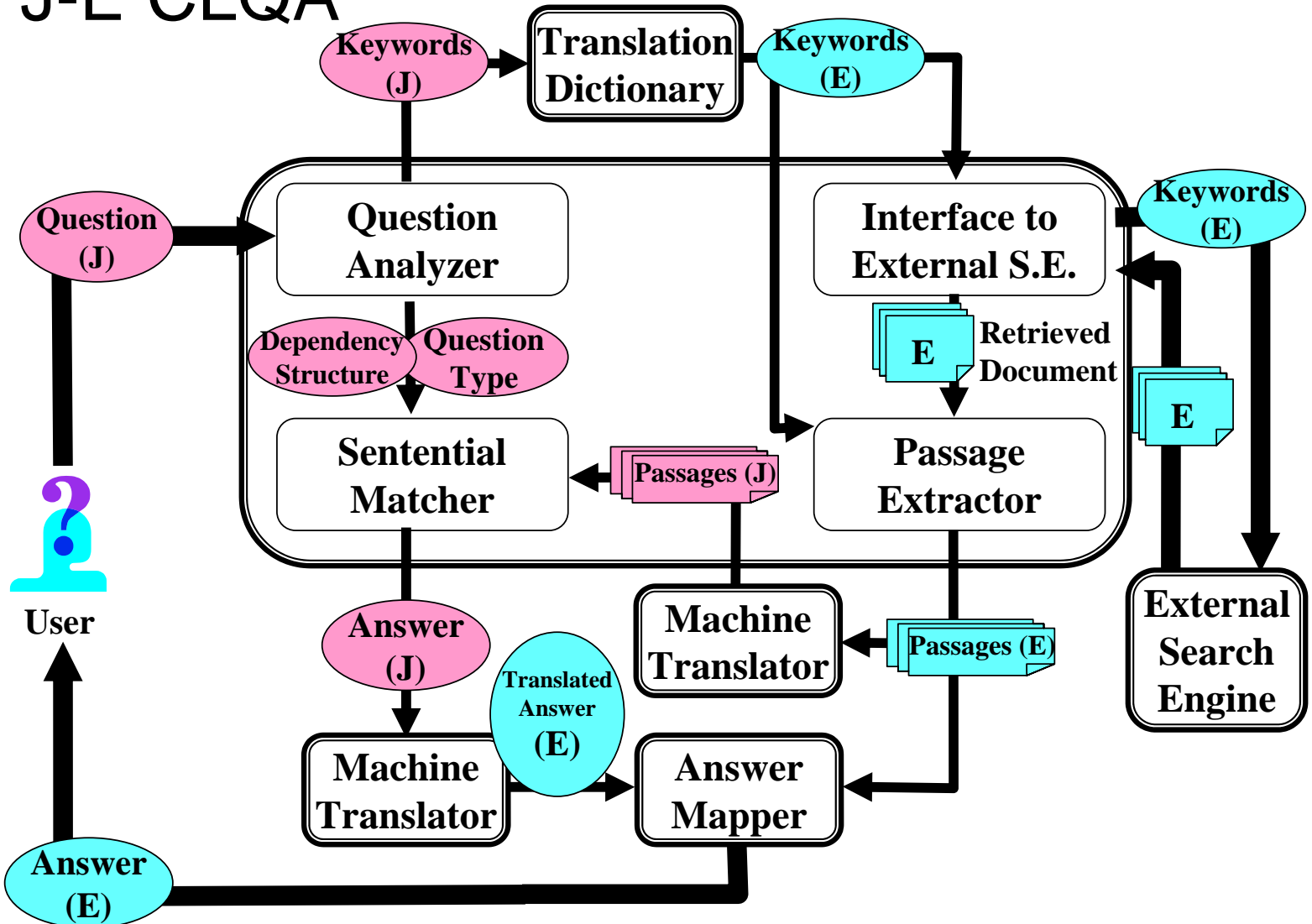


# E-J CLQA

- Basic approach: Translation of English Q. into Japanese using Machine Translation.
  - Problem 1: un-translated word (e.g. proper nouns)
  - Problem 2: failure in the detection of Q. type caused by inaccurate MT
- Newly introduced techniques
  - Translating proper nouns using the Web
    - Proper nouns that are originally Japanese and English proper nouns.
    - Proposed method can find not only transliterations using KATAKANA characters but also the expressions in KANJI characters.
  - Detection of question types in source language (i.e. English)
    - Pattern-matching-based method

# Proposed method (2)

## J-E CLQA



# J-E CLQA

### ■ Basic approach

1. Perform J-E CLIR to retrieve related documents/passages written in English
  - Translate Japanese keywords into English using bilingual dictionary.
2. Translate English passages into Japanese using MT on-the-fly.
3. Find Japanese answers using the Japanese QA system.
4. Translate the Japanese answers into English using MT.

### ■ Newly introduced techniques

- Keyword translation using EDR J-E dictionary
  - **Classification information of translation type** annotated to each possible translation to weight the translated words
  - **Statistical information** derived from target documents
- **Answer mapping**

The answer mapping module finds an English expression in the original English documents that corresponds to each Japanese answer candidate produced by the Japanese QA

- Use of MT.
- Strict answer mapping: the length in words of the English expression should be same as the translated answer.
- Relaxed answer mapping: allowance in the length (+/- 1)



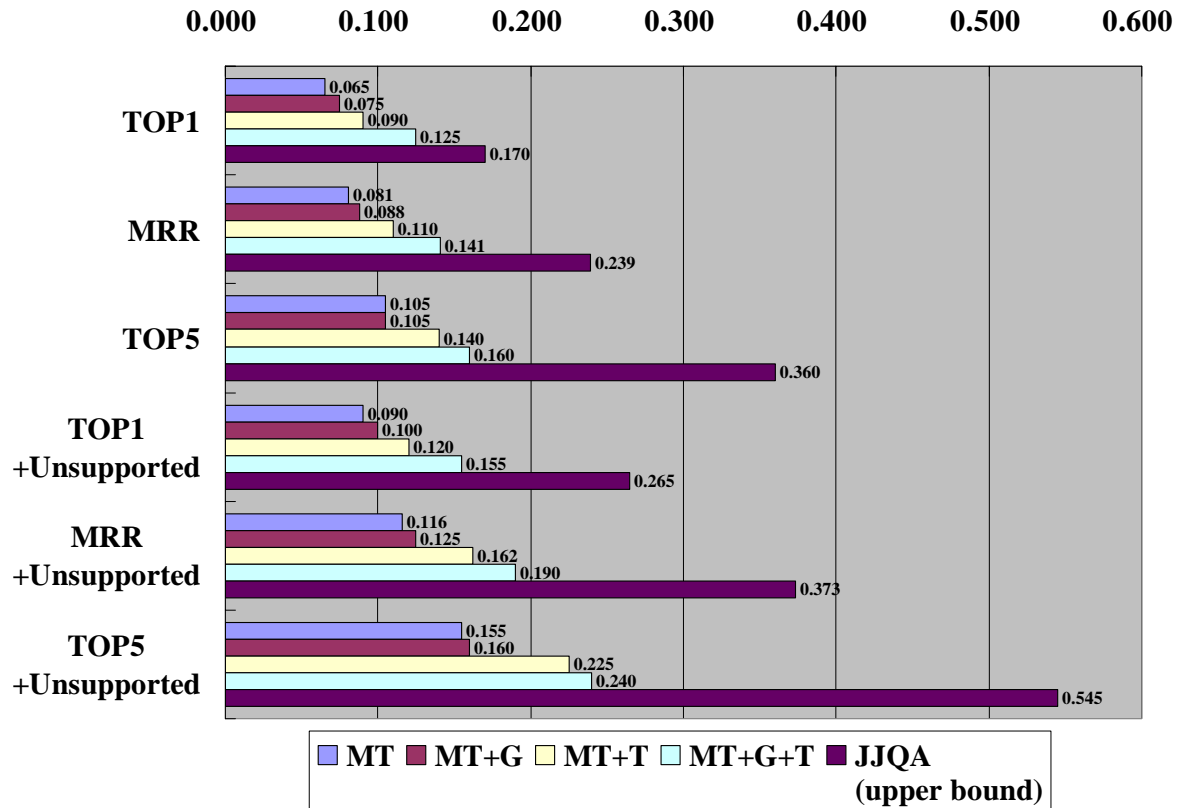


# Experimental Results

- Evaluation of the E-J and J-E CLQA systems
- Settings of experiments
  - Data for developing the system and preliminary evaluation: NTCIR-5 CLQA sample data (300 questions)
  - Data for evaluation: NTCIR-5 CLQA formal run data (200 questions)
  - MT system: an off-the-shelf MT product (Internet Hon'yaku-no Ousama, IBM Japan)
  - Bilingual dictionary: EDR J-E/E-J dictionary
  - Web search engine: Google Web APIs

# Overall evaluation of E-J CLQA (Formal runs)

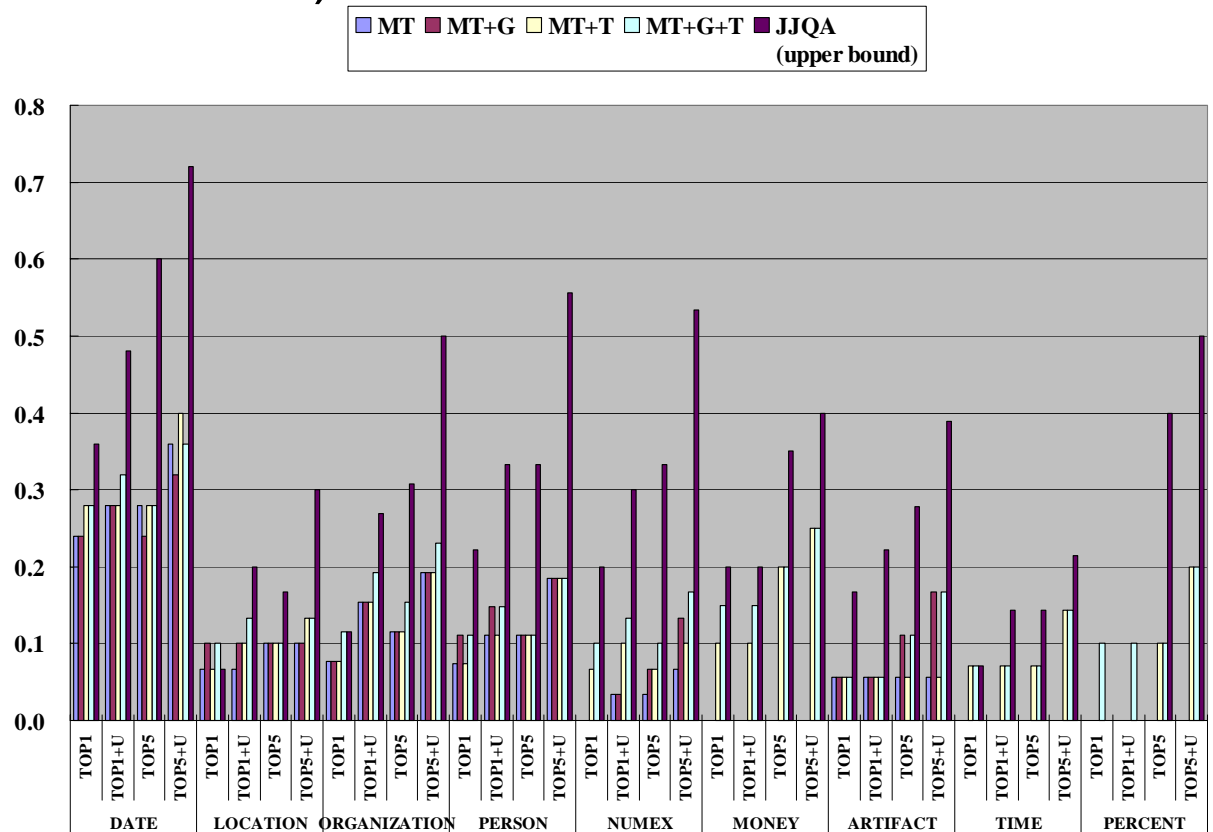
- Proposed method (MT+G+T) outperforms the baseline (MT).
- Both of the translation using the Web and the Q. type detection in the source language contribute to improving the accuracy.



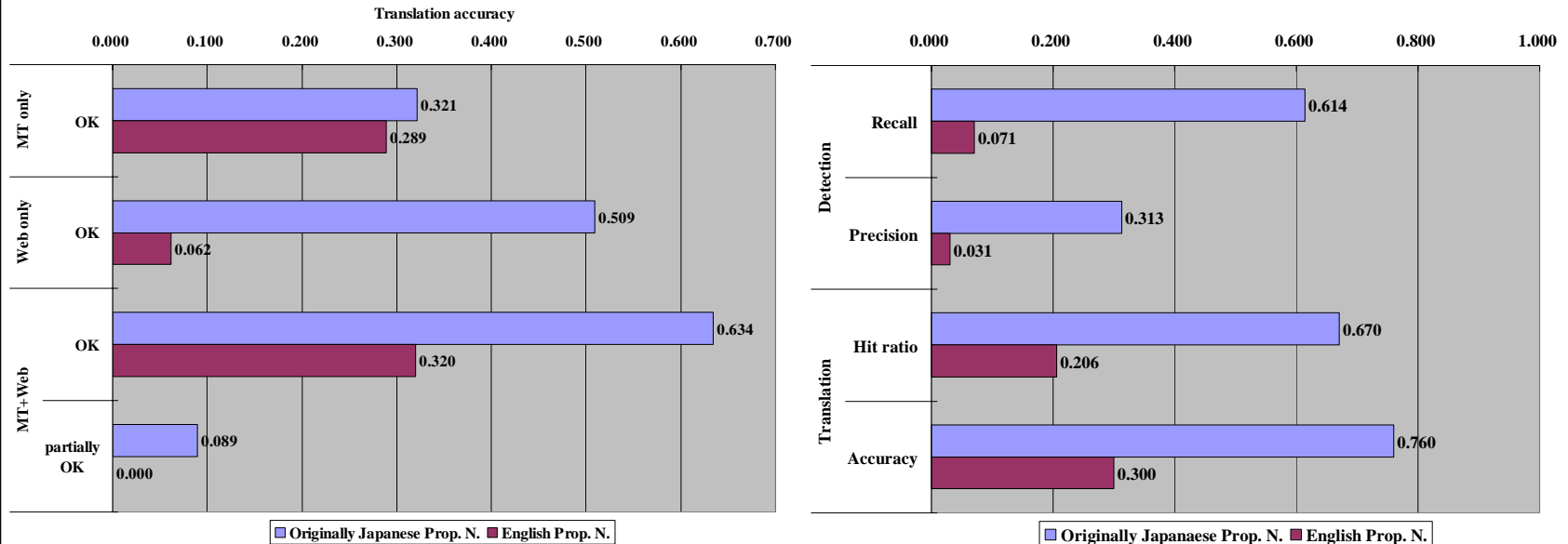
+G: Web translation, +T: Type detection

# Type-by-type evaluation of E-J CLQA (Formal runs)

- With respect to MONEY, TIME and PERCENT, the method without the question type detection in the source language fail to find correct answers.



## Translation using Web (E-J task)

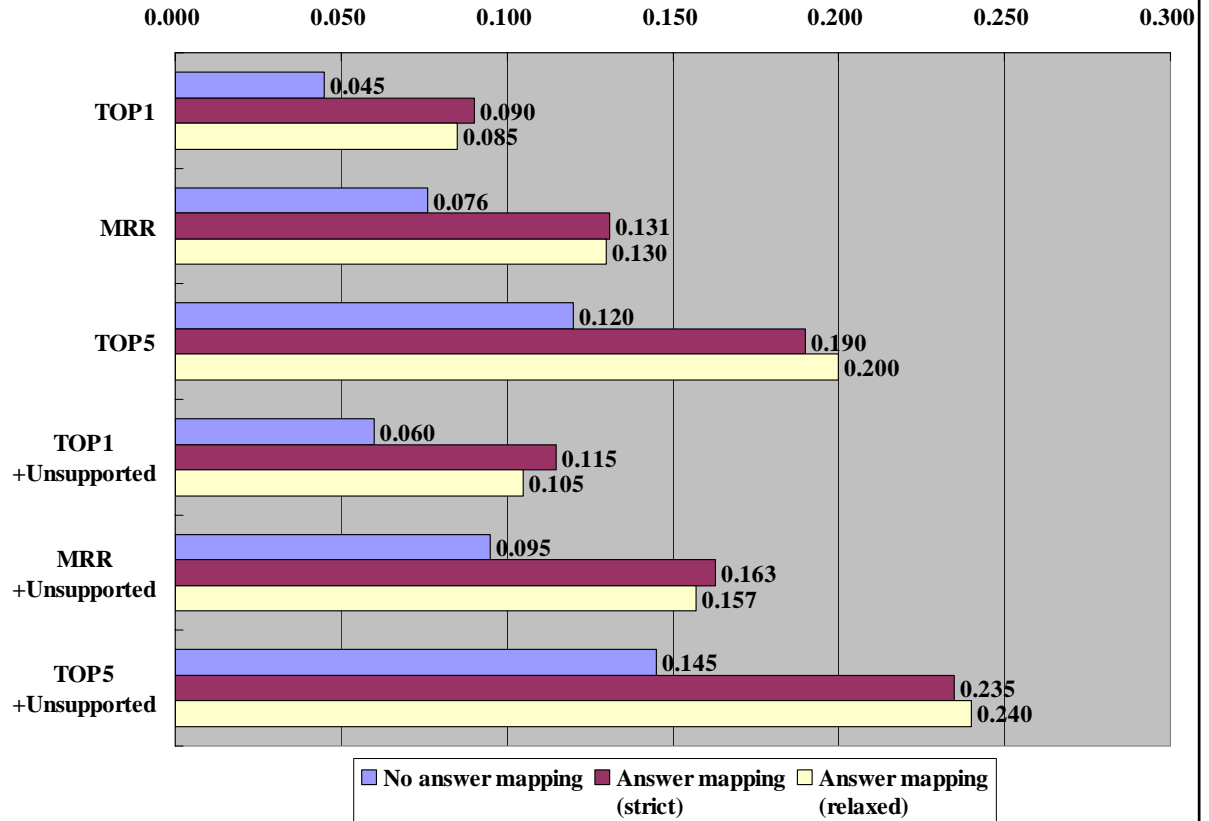


- Japanese proper nouns: many false positives are extracted in the detection phase. Translation phase works relatively well.
- English proper nouns: there is room to improve both the detection phase and the translation phase.

# Answer mapping (J-E CLQA)

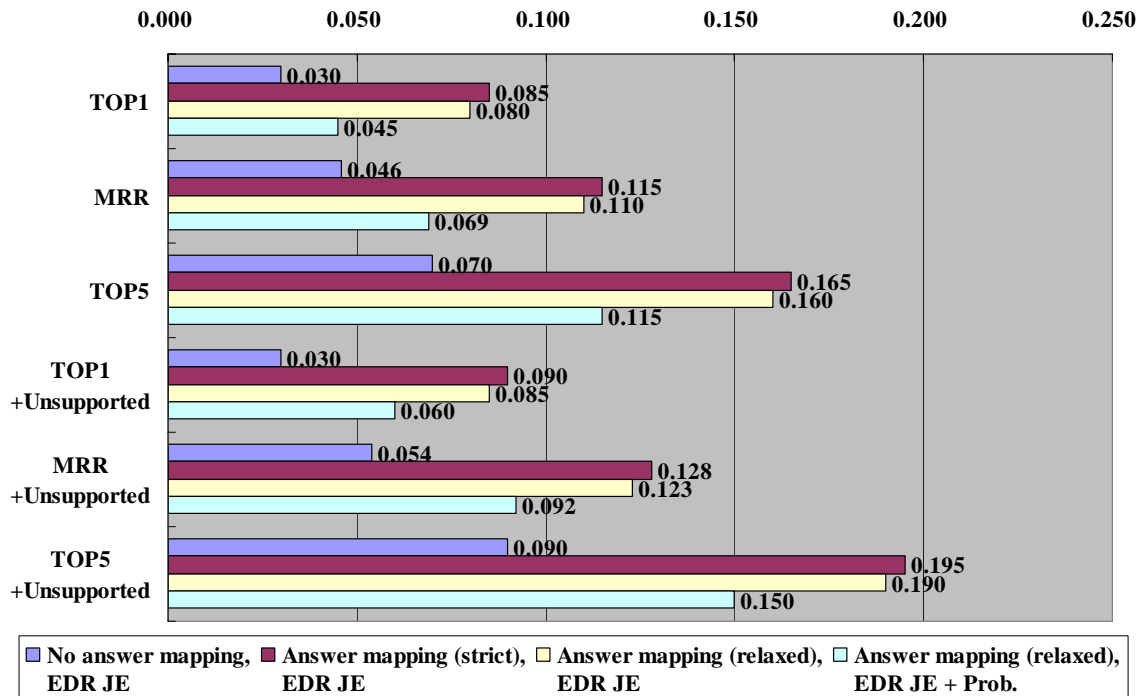
(sample data)

- The answer mapping is needed for answering question in the target language.
- There is no significant difference between the strict mapping and the relaxed mapping.



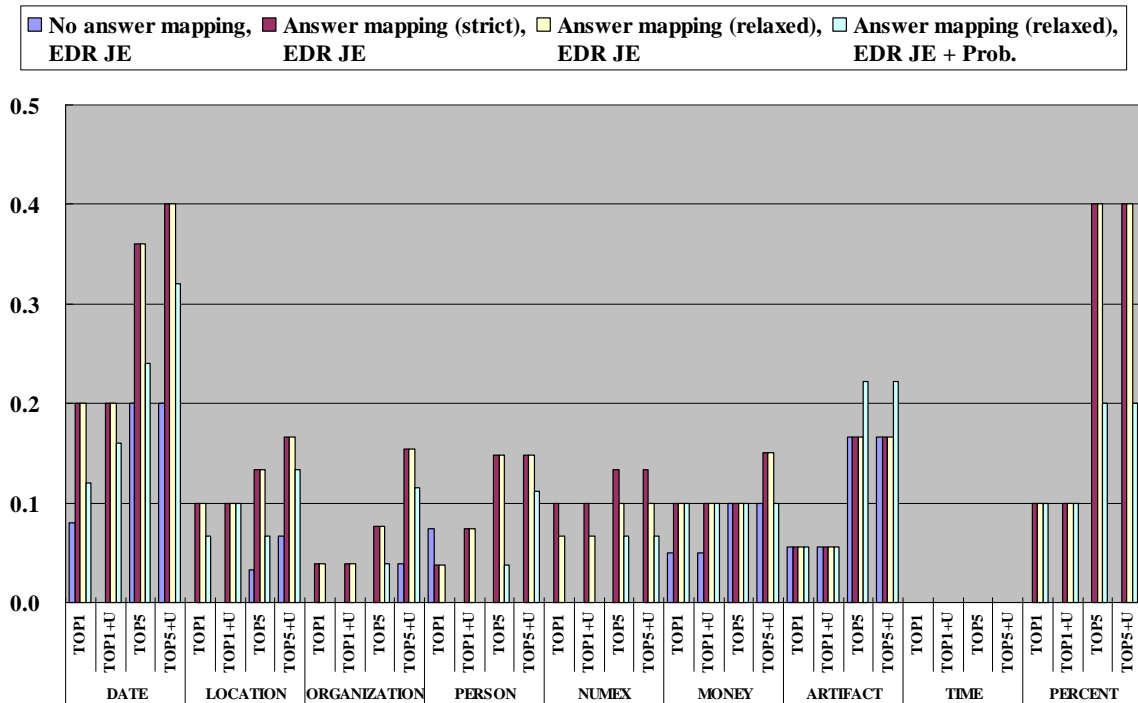
# Overall evaluation of J-E CLQA (Formal runs)

- The answer mapping is effective.
- Probability information of word in the source document degrades the accuracy.



## Type-by-type evaluation of J-E CLQA (Formal runs)

- The system without the answer mapping easily fails to find the answers of DATE, PERCENT and NUMEX, which are usually easy to extract with the NE recognizer. The answers in English documents are different from English translation of (Japanese) answers.
- With regard to TIME, each system fails to find the answers. MT could not translate question expression about TIME properly.





# Conclusion

- CLQA systems based on only one mono-lingual QA and MT systems.
- Several techniques are introduced.
  - For the E-J task:
    - Translating proper nouns using the Web.
    - Detection of question types in source language.
  - For the J-E task:
    - Keyword translation using EDR J-E dictionary and its the classification information about translation type.
    - Answer mapping.
- The method for J-E task still has substantial room for improvement.
  - Difficulty in QA using translated documents.