# NUL System at QALab tasks

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## ABSTRACT

This paper describes the submitted strategy and the methods of NUL team on NTCIR-11 QALab Center examination tasks. Our purpose of joining this task is to evaluate the entailment recognition systems which we made for RITE-VAL tasks. Our strategy is very primitive which directly convert the question to the entailment problem by simply matching the type of question answer pairs. Then, we solve the entailment problem and covert the result to the task answer backwardly. Our final submitted system achieved score 33.

## Team Name

NUL

## Subtasks

## Keywords

named entity recognition, search results ranking, machine learning

## 1. INTRODUCTION

We developed textual entailment recognition system for NTCIR-11 RITE-VAL Fact Validation task (FV task). On FV task, given questions were from university entrance exams of civics, geography and history. Our system searched information from Textbooks and Wikipedia, and determined True/False based on the search result. QALab task questions are from all kind of world history questions from The National Center Test for University Admissions. On the other hand, FV task questions are only True/False question from the same test and those questions are formatted as a problem of textual entailment recognition. QALab task contains questions which need to process images like maps, charts and photos. These questions are not covered by our system this time because they can not be solved by textual entailment recognition. However, most of QALab task questions are made of only text. It is possible that our system apply to QALab task. Our purpose on QALab task is to apply our developed FV task system to real-world university entrance exam questions, thereby to evaluate our system.

## 2. SYSTEM ARCHITECTURE

Our strategy for QALab is converting QALab questions into FV task format, and selecting QALab answers by FV task result. Figure 1 shows our system architecture overview. Our system is divided into three parts (QALab conversion subsystem, FV task subsystem, QALab marge subsystem) roughly. Detailed mechanisms of FV task subsystem is described in our former paper [1]. Hence, we describe "QALab conversion subsystem" and "QALab marge subsystem" in this paper.

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### 3.1 QALab conversion subsystem

QALab conversion subsystem converts following types of QALab questions into FV task.

1. Fill in the blank.
2. Answer Named Entity (NE) which is described in instruction sentences or question sentences. (Hereafter refered to as "Answer NE")
3. Answer truth pairs towards sentences in choice. (Hereafter refered to as "Answer truth pairs")

Each choice of "Fill in the blank" and "Answer NE" type question is converted into t2 sentence of FV task. Therefore, if a question has four choices, that question is converted to four entailment questions. Moreover, words in each choice are passed through to FV task subsystem as additional information. Appendix A shows conversion result of "Fill in the blank" type question. Appendix B shows conversion result of "Answer NE" type question.

About "Answer truth pairs towards sentences in choice." type question, sentences which exist in all choices of the question are converted into t2 sentence. Therefore, if a question asking truth of two sentences (ie each choice has two truth pairs towards the sentences), that question converted to two entailment questions. Appendix C shows conversion result of "Answer truth pairs towards sentences in choice" type question. Moreover, when we make t2 sentence of FV task, we eliminated some unnecessary phrases by using regular expresson.

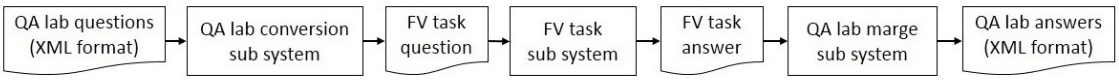


**Figure 1: System architecture**

### 3.2 QALab marge subsystem

QALab marge subsystem converts FV task answer into QALab task answer. "Fill in the blank" and "Answer NE" type question has plural FV entailment results which are corresponding to the choices of the question. Each FV entailment result has confidence factor, our system use that information to estimate correct of choice. If a question asking for correct choice, our system select a choice which has highest confidence factor. On the other hand, if a question asking for false choice, our system select a choice which has lowest confidence factor. About "Answer truth pairs" type question, each choice of that type of question has setence-TF pairs, our system select a choice which is same as FV task results. If confidence factor of FV entailment result is 0.5 and more, our system judges its sentence is true. If confidence factor of FV entailment result is less than 0.5, our system judges its sentence is false.

### 3.3 Training

We used center exam(1997, 2001, 2005, 2007, 2009) of world history as training data of our system. About learning mechanism and features, see our previous paper [1].

## 4. RESOURCE

We use following Resources and tools to develop our system.

Resources

1. Wikipedia.
2. Nihongo Goi-Taikei.
3. Wikipedia hypernym-hyponym pairs from hyponymy extraction tool.
4. Japanese WordNet.

Tools

1. mecab.
2. cabocha.
3. normalizeNumexp.
4. Apache Solr.

## 5. EXPERIMENTAL RESULTS

Follow table shows our score of each run of QALab task. Table 1 shows our score of each run of QALab task. Moreover, our system could not convert three questions (Q19, Q37, Q40) into FV task question, because these QA-Lab questions do not ask truth of sentences.

| RUN_ID | SCORE(100) | CORRECTNESS (41) |
|---|---|---|
| Center-2003–Main-SekaishiB_NUL_JA_QA_01.xml | 33 / 100 | 13/41 |

**Table 1: Experimental result**

## 6. DISCUSSION

On our approach, our system simply converts QALab questions into FV questions. Moreover, our FV task system creates search query from words included in a FV question sentence, and selects pair sentence to compare from search query results. Subsequently, our FV task system judges entailment of these two sentences by word corresponding rate. This approach does not recognize relations between entities which is represented by word in sentence. Therefore, to answer for a question which needs recognizing precise relationships between entities like QALab question, we consider our system needs additional function to recognize relationships of entities in sentence. Moreover, our system converts factoid type question into FV question. However, because factoid type questions ask an entity which satisfies conditions in the instruction of question, we need another strategy for factoid type question.

## 7. CONCLUSION

We applied our system developed for FV task to QALab task, evaluated our system. As a result of that, to solve real world question like QALab question, We made clear that recognizing relationships between entities written in sentences and identifying question type are necessary.

## 8. REFERENCES

[1] A. Ishii, H. Miyashita, M. Kobayashi, and C. Hoshino. NUL System at NTCIR RITE-VAL tasks. In *Proceedings of the 11th NTCIR Conference*, 2014.

## APPENDIX

## A. FILL IN THE BLANK

```
QALab task question.
 :
<data id="D1" type="text">
<label>B</label> 第一次世界大戦による...しかし,1929年
10月の<blank id="B1"><label>(4)</label></blank> 株式
市場の株価大暴落... 道を歩んでいた。<br/><br/>
 </data>
 <question anscol="A5" answer_style="multipleChoice"
 answer_type="term_location" id="Q6" knowledge_type="KS"
 minimal="yes">
 <label>問5</label>
 <instruction>空欄 <ref comment="" target="B1">(4)
```

</ref> に入れる地名として最も適当なものを，次の①～④のうちから一つ選べ。</instruction>
<ansColumn id="A5">5</ansColumn><br/>
<choices anscol="A5" comment="">
<choice ansnum="1"><cNum>①</cNum>ロンドン</choice>
<choice ansnum="2"><cNum>②</cNum>パリ</choice>
<choice ansnum="3"><cNum>③</cNum>ベルリン</choice>
<choice ansnum="4"><cNum>④</cNum>ニューヨーク</choice>
<br/>
</choices>
</question>
:

FV task format.
:
<pair id="5_1" label="N"><t2 nes="ロンドン">B 第一次世界大戦による...1929 年 10 月の ロンドン 株式市場の株価大暴落... 道を歩んでいた。</t2></pair>
<pair id="5_3" label="N"><t2 nes="ベルリン">B 第一次世界大戦による...1929 年 10 月の ベルリン 株式市場の株価大暴落... 道を歩んでいた。</t2></pair>
<pair id="5_2" label="N"><t2 nes="パリ">B 第一次世界大戦による...1929 年 10 月の パリ 株式市場の株価大暴落... 道を歩んでいた。</t2></pair>
<pair id="5_4" label="Y"><t2 nes="ニューヨーク">B 第一次世界大戦による...1929 年 10 月の ニューヨーク 株式市場の株価大暴落... 道を歩んでいた。</t2></pair>
:

## B. ANSWER NE

QALab task question.
:
<data id="D0" type="text">
:
...<uText id="U3"><label>(3)</label>ヨーロッパのみならず，アジア・アフリカ・アメリカの多くの国々も，様々な理由からこの戦争にかかわり，文字どおりの世界戦争となったことがある。</uText>...
:
</data>
<question anscol="A3" answer_style="multipleChoice" answer_type="term_location" id="Q4" knowledge_type="KS" minimal="yes">
<label>問 3 </label>
<instruction>下線部<ref comment="" target="U3">(3)</ref>に関連して，同盟国側として参戦した国を，次の①～④のうちから一つ選べ。</instruction>
<ansColumn id="A3">3</ansColumn><br/>
<choices anscol="A3" comment="">
<choice ansnum="1"><cNum>①</cNum>スイス
</choice>
<choice ansnum="2"><cNum>②</cNum>イタリア
</choice>
<choice ansnum="3"><cNum>③</cNum>ベルギー
</choice>
<choice ansnum="4"> <cNum>④</cNum>ブルガリア
</choice> <br/>
</choices>
</question>

FV task format
:
<pair id="3_1" label="N"><t2 nes="スイス">ヨーロッパのみならず，アジア・アフリカ・アメリ> カの多くの国々も，様々な理由からこの戦争にかかわり，文字どおりの世界戦争となったことがある。 ，同盟国側として参戦した国を， スイス </t2>
</pair><pair id="3_3" label="N"><t2 nes="ベルギー">ヨーロッパのみならず，アジア・アフリカ・アメリカの多くの国々も，様々な理由からこの戦争にかかわり，文字どおりの世界戦争となったことがある。 ，同盟国側として参戦した国を， ベルギー </t2></pair>
<pair id="3_2" label="N"><t2 nes="イタリア">ヨーロッパのみならず，アジア・アフリカ・アメリカの多くの国々も，様々な理由からこの戦争にかかわり，文字どおりの世界戦争となったことがある。 ，同盟国側として参戦した国を， イタリア </t2></pair>
<pair id="3_4" label="Y"><t2 nes="ブルガリア">ヨーロッパのみならず，アジア・アフリカ・アメリカの多くの国々も，様々な理由からこの戦争にかかわり，文字どおりの世界戦争となったことがある。 ，同盟国側として参戦した国を， ブルガリア </t2></pair>
:

## C. ANSWER TRUTH PAIRS

QALab task question.
<question anscol="A11" answer_style="multipleChoice" answer_type="(symbol-TF)*2" id="Q12" knowledge_type="KS" minimal="yes">
<label>問 11</label>
<instruction>下線部<ref comment="" target="U11">(11)</ref>の国について述べた次の文<ref target="L1">a</ref>と<ref target="L2">b</ref>の正誤の組合せとして正しいものを，以下の①～④のうちから一つ選べ。</instruction>
<ansColumn id="A11">11</ansColumn><br/>
<data id="D16" type="text">
<lText id="L1"><label>a</label> 第一次世界大戦の際，同盟国側の軍隊が侵入した。<br/></lText>
<lText id="L2"><label>b</label> 第二次世界大戦の際，枢軸国側の軍隊が侵入した。<br/></lText>
</data>
<choices anscol="A11" comment="">
<choice ansnum="1"><cNum>①</cNum><ref target="L1">a</ref>正<ref target="L2">b</ref>正</choice>
<choice ansnum="2"><cNum>②</cNum><ref target="L1">a</ref>正<ref target="L2">b</ref>誤</choice>
<choice ansnum="3"><cNum>③</cNum><ref target="L1">a</ref>誤<ref target="L2">b</ref>正</choice>
<choice ansnum="4"><cNum>④</cNum><ref target="L1">a</ref>誤<ref target="L2">b</ref>誤</choice> <br/>
</choices>
</question>

FV task format
:
<pair answer_type="(symbol-TF)*2" id="2003_11_X_0">
<t2 nes="">a 第一次世界大戦の際，同盟国側の軍隊が侵入した。</t2></pair>
<pair answer_type="(symbol-TF)*2" id="2003_11_X_1">
<t2 nes="">b 第二次世界大戦の際，枢軸国側の軍隊が侵入した。</t2></pair>