Multiple-choice automatic answering systems in QA Lab-2 were improved by implementing query generation methods in accordance with the answer types.

**NAMED-ENTITY** QA systems were designed that focus on the category prediction using word prediction models and the evaluation score based on the graph of dependency relations.

**ESSAY** automatic answering methods were proposed that combines the document retrieval depending on the instructions of how the essay should be summarized, and the knowledge sources constructed from various simple sentences.

Please notice that this poster only describes the named-entity and essay question subtasks and Results for Phase-2 due to the limitations of space.

**PROPOSED METHOD**

**NAMED-ENTITY**

**Factoid**
- Estimating the focus based on the rules
- Estimating the answer category based on the rules
- Estimating the answer category based on the word prediction models
- Generating the query for document retrieval

**Slot-Filling**
- Estimating the answer category based on the word prediction models
- Generating the query for document retrieval

**DOCUMENT RETRIEVAL**

**Factoid & Slot-Filling**
- Document retrieval to the knowledge source (using q)

**Answer Candidate Extraction**

**Factoid & Slot-Filling**
- Extracting the answer candidate words from document

**Answer Candidate Evaluation**

Calculating scores of each answer candidate word using following indicators

**Factoid**
- Okapi BM25 rank
- Focus match judgement

**Slot-Filling**
- Okapi BM25
- Backward match judgement

Specifically, for each node of candidate on the graph, the minimum distance from the node of the word used in the query generated in Question Analysis module is calculated using Dijkstra’s algorithm, as this score.

That is, the score becomes smaller as the words used in candidate word and query exist closer to each other on the graph.

**RESULT & DISCUSSION**

**NAMED-ENTITY**

As shown in Table 1, the main difference of each RUN is whether the indicator based on the graph minimum distance score was used. Table 2 shows the result of their comparison and it indicates that the correct answer rate of the RUN with the graph minimum distance score becomes slightly higher that of the RUN using the value of BM25.

**Table 1**: Indicators used in each RUN.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>RUN1</th>
<th>RUN2</th>
<th>RUN3</th>
<th>RUN1-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM25 rank</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
</tr>
<tr>
<td>Focus match</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
</tr>
<tr>
<td>Graph minimum distance score</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
</tr>
<tr>
<td>Okapi BM25</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
</tr>
<tr>
<td>Backward match</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
<td>Q</td>
</tr>
</tbody>
</table>

1 Slot-filling type questions existed only in the test data for Phase-2.

2 This indicator was used only when score of candidate was equal after being evaluated using other indicators.

Examining the cases where the questions were correctly answered, it was confirmed that the distance between each named entity and the correct word was relatively small.

However, it was also confirmed that the system tends to give incorrect answers in the following cases: when there were few named entities in the question, when the named entity in the question does not exist on the knowledge source of the first place, or when the distance between the named entities on the graph happens to be long.

As a cause of these problems, insufficient correspondence to spelling variations of words in each node is considered, because the collation is based on the exact match of the surface strings.

Therefore, it is expected that these problems are alleviated by normalization with thesauruses and/or by introduction of partial match.