Response Generation for Grounding in Communication at NTCIR-13 STC Japanese Subtask

How to share mutual information?

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Background

The start point is that we cannot see eye to eye. We still cannot even understand Minions [1] conversation now. So we have a question why our communication is broken at the beginning for QA, Chatbot and others.

The reasons are …

1. Comment text has ambiguity of **vocabulary**.
2. Comment text has ambiguity of **domain knowledge**.
3. Intent types of the comment text are **untrusted**.
4. Lack of **knowledge** in the responder.

Grounding in Communication

Approach

Our approach intends to make sure of grounding in communication [3] with an initiator in Yahoo! News comments data. The method of auto-responder consists of three steps, labeling, finding, and generating.

Step 1: Labeling five intent types to a comment text.

Step 2: Finding associated information.

Step 3: Generating responses based on rules.

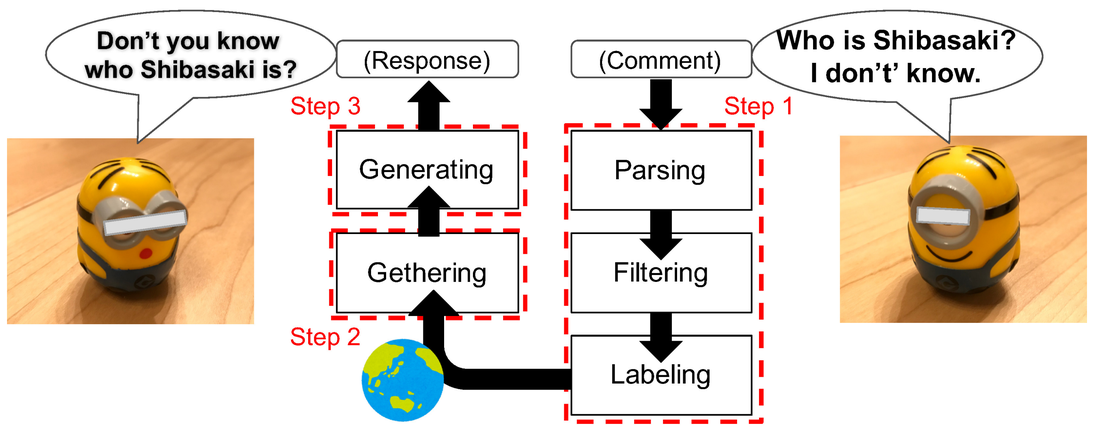

Figure 1: Flow chart of the approach. Minions try to comminicate each other in Banana Language.

0.1 Grounding in Communication

Our strategies are on the presupposition that there is not enough information regarding the first comment text in the auto-responder. The following cases need to ground by an appropriate response.

Case 1: Comment text has ambiguity of vocabulary.

Case 2: Comment text has ambiguity of domain knowledge.

Case 3: Intent types of the comment text are untrusted.

Case 4: Lack of knowledge in the responder.

The case 1 is an ambiguity problem in syntax. The case 2 is an ambiguity problem in semantics. The case 3 is an accuracy problem in prediction. The case 4 is an information amount problem in database of the auto-responder system. The system is assumed to be knowledge-based such as search engine, and the knowledge to the comment text is not included in in the database.

0.2 Labeling with Support Vector Machine

At the first step, every comment text of the target training data is parsed to segmented terms by MeCab [5] with the ipadic [1], and filtered by the part of speech shown in Table 2.

Table 1: Part Of Speech (POS) list for filtering.

Type	Subtype
Noun, Adjective-base	General, Verbal, Proper, Adverbial, Number, Suffix
Verb	Independent
Adjective	Independent
Adverb	Independent
Auxiliary	Aux special-nai
Prefix	Normal
Adjective	Auxiliary
Filler	*
Interjection	*

Support Vector Machine [4] approach is applied for labeling to the comment text with five types of intent labels; *positive* or *negative*, *who*, *opinion*, and *impression*. The part of comment texts of train data are labeled by hand, and learned the the labeled comment texts by libsvm [2] with RBF Kernel.

$$\text{minimize} \quad \frac{1}{n}\sum_{i=1}^{n}\zeta_i + \lambda\|w\|^2 \tag{1}$$

$$\text{subject to} \quad y_i(w \cdot x_i - b) \geq 1 - \zeta_i \text{ and } \zeta_i \geq 0, \text{ for all } i. \tag{2}$$

[1]Minions is a trademark and copyright of Universal Studios. Licensed by Universal Studios Licensing LLC. All rights reserved.

0.3 Generating Responses

Generating responses with candidate words and five response rules, which are based on grounding strategies.

> ➢ Why rule-based?
> Because, we tried the generating sentence with LSTM.
> However, the sentence is not enough fluent.

Table 2: Grounding strategies and rules.

Strategy	Rule	Keyword
A: Explicit confirm	[1] Yes/No question	parroting
B: Implicit confirm	[2] Repeating affirmative sentence	alternative keywords
	[3] Repeating affirmative sentence (Parroting)	parroting
C: Continuation	[4] Responding a question	alternative keywords
	[5] Responding a question with extracted keywords	extracted and alternative keywords

Results

Generating responses with five response rules are pretty good at Rule-1. However, those responses are extremely bad at Rule-2.

Table 3: Top five of Mean $Acc_{L1,L2}$@1 in Rule-1 including AITOK-J-R1.

Run ID	Mean nG@1	Mean nERR @2	Mean Acc_{L2} @1	Mean Acc_{L2} @2	Mean $Acc_{L1,L2}$ @1	Mean $Acc_{L1,L2}$ @2
AITOK-J-R1	0.4468	0.4838	0.0280	0.0660	**0.9840**	**0.9710**
GOLD-J-R1	**0.7753**	**0.7757**	**0.4720**	**0.4430**	0.8980	0.8840
KIT16-J-R1	0.5014	0.5580	0.1800	0.1690	0.8240	0.7980
KIT16-J-R4	0.4804	0.5372	0.1660	0.1610	0.8000	0.7700
YJTI-J-R2	0.4893	0.5468	0.2040	0.2030	0.7620	0.7310

Table 4: Top five of Mean $Acc_{L1,L2}$@1 in Rule-2 and AITOK-J-R1.

Run ID	Mean nG @1	Mean nERR @2	Mean Acc_{L2} @1	Mean Acc_{L2} @2	Mean $Acc_{L1,L2}$ @1	Mean $Acc_{L1,L2}$ @2
GOLD-J-R1	**0.7646**	**0.7639**	**0.4720**	**0.4430**	**0.8660**	**0.8430**
YJTI-J-R2	0.4726	0.5288	0.2040	0.2030	0.7200	0.6900
KIT16-J-R1	0.4173	0.4676	0.1800	0.1690	0.6320	0.6050
KIT16-J-R4	0.4014	0.4549	0.1660	0.1610	0.6200	0.5900
YJTI-J-R1	0.4171	0.4544	0.1860	0.1490	0.6100	0.5750
AITOK-J-R1	0.0816	0.1758	0.0280	0.0660	0.1400	0.3100

Whats difference between RULE-1 and RULE-2?

```
RULE-1:
IF fluent & coherent = L1
  IF context-dependent & informative = L2
    THEN L2
  ELSE L1
ELSE
  L0
```

If the response is not related to the comment and the response is not informative to continue and extent the dialogue, **the response is evaluated by fluent and coherent**.

```
RULE-2:
IF fluent & coherent = L1
  IF context-dependent & informative = L2
    THEN L2
  ELSE IF context-dependent or informative = L0
    THEN L0
  ELSE L1
ELSE
  L0
```

If the response is not related to the comment and the response is not informative to continue and extent the dialogue, **the response is evaluated by fluent and coherent except in case of not related to the comment or not informative at all.**

Figure 2: Comparison between Rule-1 and Rule-2.

Conclusions

- Our approach can make sure of grounding in communication to Yahoo! News comments.
- The formal-run result was extremely good in Rule-1, although the approach is very simple. The result showed that It's important to be a good listener.
- Besides, the result was not enough in Rule-2 due to not to extend the dialogue, because the response has less expanding information.

We have found out that the continuation strategy should be extended more with associated information. Hence, the auto-responder system has to acquire a function of sophisticated revelance information retrieval.

References

[1] IPA dictionary: mecab-ipadic-2.7.0-20070801, 2007. (Accessed 4 Aug 2017).

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[4] C. Cortes and V. Vapnik. Support-vector networks. *Mach. Learn.*, 20(3):273–297, Sept. 1995.

[5] T. KUDO. Mecab : Yet another part-of-speech and morphological analyzer. 2005.