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Generalization-based Learning Support System for Understanding Way to Use English Words

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Abstract: In order to choose appropriate words, especially in foreign language, we need to understand the usage situation for each word precisely. Usage situation of words can be inferred by co-existing words in the example sentences with the target words. Co-existing words in example sentences are not always the same, so in order to understand usage situation from co-existing words, it is necessary to generalize them. This research proposes the learning method of usage situation of words by the generalization of co-existing words (keywords) in the example sentences. The system for managing the keywords and generalized words should be delveloped in order to promote this learning method. This system also has a generalization support mechanism to provide concepts of words acquired through WordNet as hints.

Keywords: English word learning, usage situation, generalization, WordNet, example sentence

1. Introduction

When we learn second language, it is sometimes difficult to understand the usage situation of words, especially if there are more than one words of the similar meaning. For example, English words *create*, *make*, *build*, and *design* are all translated into the same Japanese word *tsukuru*, but their meanings are slightly different. If we only understand the meanings of these English words by corresponding Japanese words, we cannot tell their differences and hence, are not able to use these words at the correct situation. This research aims to propose a learning method for understanding the usage situation of the English words and develop its learning support system.

Various multimedia contents were introduced to facilitate remembering words, such as pictures and animation (Sun et al., 2004). These contents might promote the memorization of the meaning of English words, but did not support deep understanding of the meaning of words including their usage situations. Nation suggested to introduce example sentences so as to master words through reading (Nation, 2001). In example sentences, words that we want to learn and words by which we can understand usage situation of the target words are included together, so learning using example sentences leads to understanding of the usage situation.

Benson et al. proposed learning steps to understand the words, including their usage situation (Benson et al., 1999). They insisted that to generalize the meaning of English words is important for deep understanding of the word. Matsubara et al. suggested that to observe several example sentences promote understanding of the usage situation of the words and proposed the retrieval system of example sentences (Matsubara et al., 2008). This system implicitly expected us to generalize situation of the example sentences given by the system, but did not explicitly support the generalization. In this research, we propose a learning method to understand usage situation of English words by generalizing words in example sentences.

Since this learning method is not trained in the school, it is difficult for us to put in the habit of generalizing words every time we learn with example sentences. In order to acquire this learning method, we need to consciously executing this learning method. This research proposes the system through which we can externalize our generalization process. In the system, we can manage the

generalized words as a graph structure. Externalizing our own generalization process through the system makes us easier to derive the generalized words and consider the importance of the generalization. However, we are not always able to derive the generalized words easily, so the support method for generalizing words may be needed. In order to cope with this problem, our system provides conceptual knowledge of words acquired from concept dictionary as hints to derive generalized words.

2. Learning Steps for Usage Situation of English Words based on Generalization

In order to learn the usage situation of English words from its example sentences, it is necessary to: step1) extract words expressing the situation from the example sentences as *keywords* and step2) generalize them as our own words as *generalized word*s.

In step 1, keywords are determined according to the part of speech of the learning words. For example, if the part of speech of the learning word is *verb*, *object of the verb* becomes the keyword. In step 2, generalized words should include all keywords of the learning word, but do not include keywords of other words of the similar translation. In order to derive such generalized words, we sometimes need to generalize the generalized words as well, to include generalized words of all keywords.

Figure 1 shows example of practicing these learning steps. In this example, the learning words are *bake* and *generate*, both representing *tsukuru (making)* in Japanese. The encountered example sentences are; *"I bake cake"*, *"I bake bread in the oven."*, and *"I generate an electricity."* In step 1, the objects of these verbs are selected as keywords from the example sentences, such as *cake*, *bread*, and *electricity*. In step 2, generalized words are generated from the specified keywords. For example, *food* is generated from *cake* and *bread*. If *solid matter* is derived from keywords of *bake*, and *intangible* is derived from *generate*, we can take *bake* when creating a sentence whose object is *potato*.

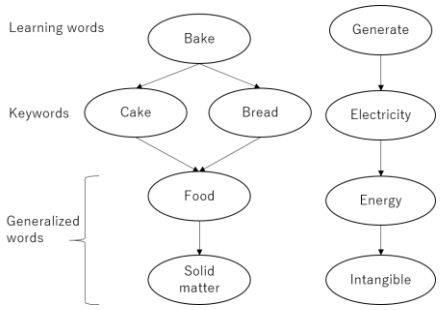

Figure 1 Example of generalization

In this research, the correctness and appropriateness of the generalized words are not considered. As we learn many examples sentences, generalized words may reach to the usage situation.

3. System for Supporting Generalization of Keywords

We have developed the system, which provides an interface through which learning words, keywords, and generalized words can be organized by graph structure, which is called a classification graph. By expressing relationships among learning words, keywords, and generalized words using a classification graph, the generalization may be promoted and the comparison between words becomes easier. The system is implemented with programming language C#.

Figure 2 shows the interface. The interface is composed of a classification graph display section, a keyword input section, and a concept search section. In the classification graph display section, the classification graph created by the user is displayed. The "learning word" node is depicted as yellow, the "keyword" node is blue, and the "generalized word" node is green. A keyword input section is for inputting a learning word, a translation of a learning word, an example sentence, and keywords extracted from the example sentence. When the user inputs the learned example sentences and the keywords extracted from them into the keyword input section and pushes the add button, the nodes representing the learning words and keywords are displayed in the classification graph display section, and the links are added between them. ID of node is assigned automatically by the system and is shown in the node.

When the generalization button of the keyword input section is pushed, a generalization interface for creating generalized words is emerged. By specifying IDs of keywords or generalized

words to be generalized, entering a generalized word for it and pushing the decision button, a node representing generalized word is generated in the classification graph.

A concept search section is used for getting the hints for the generalization. In order to derive generalized words, we need to know the meanings of words to be generalized. However, depending on the vocabulary skills, sometimes we do not understand the meaning of words and we cannot produce generalized words. In order to cope with the situation, this system introduces a concept dictionary, Japanese WordNet (Bond, 2018), and gives concepts of the inputting words as hints for understanding their meanings. Let's assume that we try to generalize the meaning of "*cake*" and "*bread*." The concept of the bread is "*food made from dough of flour or meal and usually raised with yeast or baking powder and then baked*" and that of the cake is "*baked goods made from or based on a mixture of flour, sugar, eggs, and fat.*" In these concepts, "bake" and "flour" are commonly used. If we can notice of these commonly used words, we can produce generalized words by using these words, such as "*something made from flour*" or "*baked good.*"

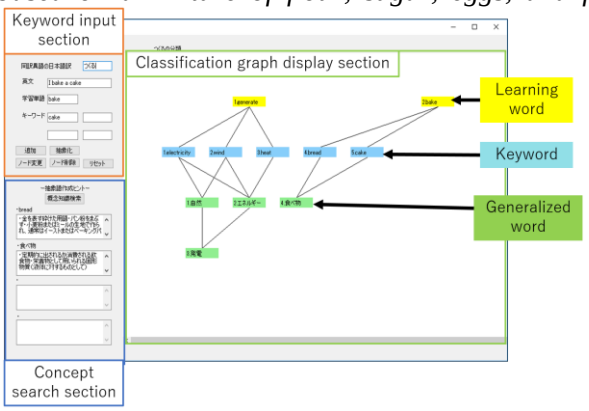

Figure 2 System interface

In a concept search section, when the search button is pushed, the window for searching the concept knowledge is displayed. By inputting the type of word and node IDs, the concepts of the selected words are acquired from Japanese WordNet and are shown at the concept search section.

4. Conclusion

This research proposed the learning method for understanding usage situation of English words by the generalization of keywords in the example sentences. The learning system has been developed in which generalized words are managed as a classification graph. In addition, for users who have difficulties in generalizing words, the generalization support mechanism that provides concept knowledge of words acquired by Japanese WordNet have been developed. We need experiments to evaluate the effectiveness of our system and the learning method.

The authors assumed that as we keep learning using huge number of example sentences, the generalized words become similar to the usage situation. We need to evaluate this assumption whether we can reach to the correct usage situation if we repeatedly learn with many example sentences. If not, the mechanism should be developed that selects appropriate sentences as example sentences, so as to promote the derivation of the generalized words that are similar to the usage situation.

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