Support for Learning Concise Expressions with Affective Features Extracted from Context of Usage

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Abstract

In our insight, we often experience a case like interpreting a given situation (reading a news article, etc.) into a few concise expressions and share empathy with others. The term "concise expression" stands for a phrase/sentence that is rather simple yet comprehensive enough to achieve intuition about the target affairs. Its instances are idioms, proverbs, quotes, and poetic phrases that arouse rich associative images for native speakers and enable effective communication. Such concise expressions would include a deeper sense than surface meaning. In order to understand the implications, second language learners should be accustomed to the core sense or nuance from actual uses of the target expressions in the appropriate contexts, though it is hard to study a lot of examples in a short time. Thus, it is desirable to provide suggestive information to learners so as to grasp the correct or central meaning of various concise expressions. Considering the above background, we propose a new method of teaching/ learning concise expressions as follows.

For the purpose of preparing useful information for learners, we collected the text surrounding each concise expression, e.g. text where the pertinent expression is quoted with co-occurrent keywords that often correspond to related affective features. Based on using a large-scale text corpus, we can estimate the relative affinities with those features. For instance, relationships between a certain concise expression and the respective basic emotions (happy, sad, angry, scared, tender, and excited) or other features can be visualized as percentages. In our preliminary investigation, such a distribution of affective features for a given concise expression correlates with human subjective intuition, which yields individual differences.

Even if the lexical meaning of a concise expression is presented with a sample sentence, it would be still insufficient to achieve proficiency in the second language. Besides, one example with context might show only one of the variations in the subjective impressions. Accordingly, the above-mentioned indication of affective features distribution would be helpful for second language learners to acquire the nuance or significance of the target concise expression when it will be actually used. In other words, one can learn with the least examples (with context) in support of the proposed technique. At the present stage, we are aiming at examination of our hypothesis-based idea for applying certain learning scene of English as the second language in cooperation with experts in language education. We will also discuss related issues referring existing studies, with concluding remarks towards future directions.

1. Introduction

In any language, there are certain fixed expressions that are used, such as idioms or clichés, to definitely explain the target situations. Knowing such expressions is convenient for verbal communication to reduce the cognitive load and for easy sharing of empathy with others. We are using the term "concise expression" for them. One of the typical uses of a concise expression (phrase/sentence) may be popular sayings that indicate the given situation. Its form is not limited to a specific grammatical style, but various categories (types) are assumed, such as idioms, proverbs, quotes, and poetic phrases, that are rather well-known and would evoke common empathy among dialogue and conversation participants.

Though concise expressions would often include an implicit sense other than surface meaning, it is difficult for second language learners to grasp the nuance from actual uses of the target expressions. Therefore, it might be a possible support the means to provide suggestive information to learners so as to understand the dominant association of each concise expression in various contexts. Based on this insight, we propose a new method of teaching/ learning concise expressions to be described later. Here we note an example of actual concise expressions.

(a) "Let it be"

(b) "Let it go"

Both are fixed (idiomatic) expressions and are well known as the titles of popular songs. Though the grammatical structure and surface meaning seem to be similar, the nuance and use might be slightly different. For certain given situations, people would probably prefer either to the other for understanding. Non-native (or culturally different) speakers may think it hard to distinguish the implication of both expressions because the suggestive meaning of each expression might be learned by way of encountering various written episodes or actual experiences for native speakers. Moreover, individual understanding or intuition (especially affective aspects) of each expression would be varied according to their own social or cultural background. Accordingly, if only a few example contexts are shown with an expression, it is difficult to judge whether they are typical or not. Thus, if the whole distribution of affective features are gathered and categorized, it could be a sort of collective intelligence on the expression. Based on the recent techniques of statistical natural language processing, such collective knowledge can be extracted from a large text corpus. That is, referencing many contexts, including certain concise expressions, we can observe the relative affinities between the expression and each remarkable affective feature, such as emotion and evaluation. In the above case, the distribution of those affective features would be different for "Let it be" and "Let it go."

2. Proposed method

For the purpose of realizing reasonable ICT support to learning concise expressions, we propose the following steps, considering the above described concept.

2.1 Preparation

At first, a certain number of concise expressions should be selected for learning, considering their significance, which may differ according to learners' level and personal attributes. For example, popular sayings in historical essays, or known phrases in novels may be suitable candidates. Next, using a large text corpus (like blogs) as the resource containing the context of usage, each concise expression is retrieved. From such a context (surrounding text of concise expression), co-occurrences are countable for affective feature-related keywords that have significant associations with the concise expression. Though selecting which kinds of affective features is important and will be discussed later, here we will explain with a typical combination of basic emotions: happy, sad, angry, scared, tender, and excited [1]. As many adjectives may be connected to one (or two) of those emotions, respectively, relative affinities to each emotion can be calculated from raw distribution for each concise expression. Fig.1 illustrates the basic concept: relative affinities between a concise expression and each affective feature. Subsequently a sample calculation result for two concise expressions will be indicated in Table.1.
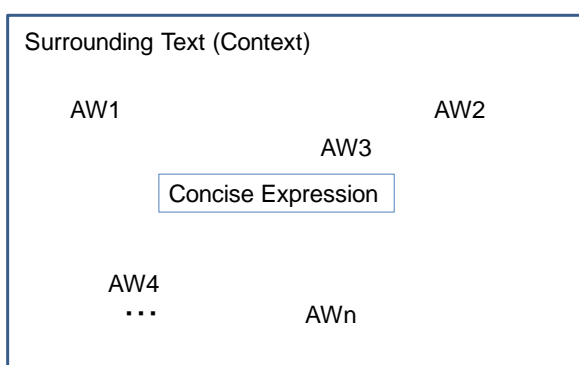
In Fig.1, there would be observed several affective-related (mostly adjective) words (AW), such as AW1, AW2, …AWn. They can be categorized into a certain number of pre-defined *affective features* (AFs). For example, AW1 and AW3 for AF1, as well as AW2 for AF2, AW4 for AF3, and so on. If the number of pre-defined affective features is six, related affective words are also previously connected to ether of them. Thus, the relative affinities of the concise expression to each affective feature can be computed, considering the relative co-occurrences.

Fig.1 An example context for a concise expression

Example: Input Concise Expression: "Let it be" vs. "Let it go."

The number of documents that contain "Let it be" and "Let it go" are shown in Table 1, which is only used for an explanation of the procedure. Besides, though individual adjective words are merged into certain associative affective features respectively, this example is a case where one affective feature corresponds to a word (one-by-one).

Table 1. Distribution of Co-occurrences with emotional words (retrieved in blog corpus)

	total number of appearance (document frequency)	simple co-occurrences with each emotion					
		happy	sad	angry	scared	tender	excited
		*9,110	*3,260	*2,270	*1,550	*588	*13,000
Let it be	1,220,000	65,900	118,000	39,800	31,600	18,000	26,400
	(mutual info.)	1.340	3.663	2.617	2.835	3.421	- 0.493
Let it go	1,500,000	218,000	117,000	68,700	60,600	20,100	53,600
	(mutual info.)	2.768	3.353	3.107	3.476	3.283	0.231

* 1,000 times of the indicated value for independent appearance of each emotional word

For the observed frequency of co-occurrence, it should be normalized according to a comparison with the independent appearance frequencies. Then, the relative affinities with each affective feature will be calculated as mutual information. The following equation is the definition of mutual information, that is introduced from three probabilistic values: $p(x)$ and $p(y)$ as the independent appearance probabilities of x and y respectively, while $p(x, y)$ as the simultaneous (co-occurrence) probability of (x and y).

$$I(x_i, y_k) = \log \frac{p(x_i, y_k)}{p(x_i)p(y_k)}$$

The values in italic font in Table 1 indicate the mutual information between the concise expressions ("Let it be" or "Let it go" in this case) and each emotional word. The values designate the relative affinities of the pertinent concise expression with the respective emotions. The distribution would be considered as reflection of collective intelligence (on the internet).

2.2 Visualization and Learning Support
Based on the calculated relative affinities for each basic emotion, each concise expression is characterized according to its distribution. Such several affinities may be indicated as a radar-chart, such as Fig. 2. Through such a kind of visualization, one can grasp the use environment intuitively.
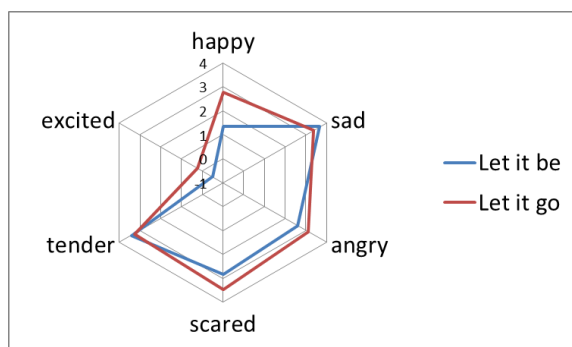

Probably there might be various presentations or explanations of the new expression in second language learning: concise expression itself (pronunciation) and example sentence(s) using the expression and longer context. Our proposal is to enhance the learning material with the above (visualized) information, including affinities with certain affective features, such as emotion for each concise expression. There would be the possibility of using this as supplementary material for learning in the classroom.

Fig.2 Visualization of Emotional Association

3. Assessment
3.1 Preliminary Investigation
Prior to the idea of application in the language learning domain, we made an attempt to extract the associative features for given concise expressions using a large text corpus. As shown in many cases, a concise expression often contains no/few affective words, yet we feel some images related to certain emotion. Our motivation was to extract associative affective features from the surrounding text (context) with regard to the pertinent concise expression. Thus, we made a trial analysis of co-occurrence between affective feature-related Japanese words and "nice words available in daily life" (a sort of concise expression, in Japanese), based on retrieval from a blog corpus. As the affective features, 50 emotional words were listed (as concise-tags). Twenty university students participated in the subjective evaluation experiment. For each of 36 concise expressions, the five emotional words

(extracted from the corpus) with the highest affinity were presented, and the subjects selected a suitable (the most appropriate) one of them as the implicit feature of the expression.

The result shows that more than half (10 of 20) of the subjects' judgments matched 19 of 36 (53%) expressions. Though the details of the analysis precludes this article, it suggests that extracting implicit affective features is sometimes not easy (difficult to evaluate), yet individual impressions are varied for each expression than previously anticipated. Therefore, it would be reasonable to collect context of use referring to the large corpus from the viewpoint of knowledge mining as well as application to language learning.

3.2 Towards Evaluation of Learning Effect

Our objective is to evaluate the effectiveness of providing the above (visualized) information including affinities to certain affective features, such as emotion. At the present stage, we are aiming at an examination of our hypothesis-based idea for application in certain learning scenes of English as a second language in cooperation with experts in language education. As a pre-condition, certain appropriate target concise expressions should be prepared. Then the associative features to be presented (in a way of visualization) might be selected, taking the following points into consideration.

(1) What kind of features should be nominated as candidates?
(2) Which features (of the candidates) can be actually extracted with high reliability?

Accordingly, the comparison of two cases: with or without associative features visualization will be examined. Concerning this issue, it is important:

(3) How will the learning material be presented for each condition?
(4) How will the skill or proficiency be measured for each learning condition?

The related issues will be discussed in the next section.

4. Discussion and Related Studies

As also mentioned in the introduction, we consider concise expressions as having remarkable descriptive power that would arouse the imagination in human communication. However, ordinary second language learners might encounter only a few examples of use in a usual textbook or course material. Therefore, it is desirable for them to achieve an outline of the implication from collective knowledge extracted according to the described procedure. Based on this idea, we are going to examine the validity of the proposal. For the moment, several existing studies seem to be related as follows.

From the viewpoint of educational theory based on cognitive linguistics, certain idiomatic expressions should be learned within the context of useage. Tomasello suggested its theoretical significance in language acquisition [2].

Next, recent natural language processing (NLP) techniques enable us to acquire even implicit knowledge from a large scale corpus, namely as text-based knowledge mining. There have been research activities concerning sentiment analysis for certain domain of service- or product-related information retrieval [3].

Finally, our research focus was started from research on concise communication that would be a sort of communication style using short expressions with abundant image arousing. One extreme possibility is to estimate the symbol kanji-character of the year and the related issue was discussed in [4].

In conclusion, we would like to emphasize the significance of learning concise expressions in daily life, and ICT-based support will be entering in the field of view, using the proposed approach with selecting appropriate affective features to be presented.

References

[1] Ekman, P.: An argument for basic emotions, *Cognition and Emotion*, Vol. 6, Issue 3-4, pp.169-200, 1992
[2] Tomasello, M.: *Constructing a language: A usage-based theory of language acquisition*, Cambridge, MA: Harvard University Press, 2003.
[3] Bo Pang and Lillian Lee: Opinion Mining and Sentiment Analysis, *Foundations and Trends in Information Retrieval archive*, Volume 2 Issue 1-2, 2008.
[4] Suzuki, M., Hattori, G. and Ono, C.: Towards Concise Review of Online Communication with Reference to "Kanji of the Year", *Culture and Computing 2012*, Hangzhou, 2012.