

# Attractive Phrase Detection from Musical Lyric Focusing on Linguistic Expressions

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**Abstract:** This paper describes a method for extracting attractive phrases of lyric focusing on linguistic expressions. Not only chorus but also linguistic expressions seem to be a cause of attractive phrases. We conducted impressive evaluation experiments to clarify the important factors of attraction of phrase. As the result, it was confirmed that “uniqueness of co-occurred terms” and “repetition” especially influenced attraction. Therefore, we modeled the uniqueness of co-occurred terms and repetition as seven mathematical features. And the proposed method detected attractive phrases using support vector machine with the modeled features, which is known as a high performance pattern recognition method. Through the attractive phrase detection experiments, we confirmed availability of the proposed method: the accuracy level and the precision was each 69% and 86%, respectively. Moreover, we discussed about the correctly detected attractive phrases comparing key sentences detected by the existing summarization methods. As the result of the discussions, the proposed method correctly detected the phrases that were ranked in low by the conventional methods though human evaluated the phrases as attractive. From these facts, it was suggested that lyrical linguistic expressions were well modeled in the proposed method, and the proposed method detected the attractive phrases better than the existing summarization method.

**Keywords:** Music, Lyric, Attractive Phrase, Natural Language Processing.

## 1. INTRODUCTION

People have been enjoying music since ancient time. Music can be briefly classified into two types: music played with only musical instruments and the one with singing. In music played with only musical instruments, acoustic features, which are tone, rhythm and melody, represent scenery and psychological descriptions. Meanwhile, in music with singing, feelings of lyric writer can be

represented by terms used in lyric. For example, emotions and moods for precious ones and nature have been often written in ancient song as well as pop music. When people listens to song, the acoustic features, lyrical features and combination of the both features influence human impression for the song. Then, some of phrases remain in listener's heart; we defined such a phrase as an attractive phrase. Attractive phrase can be assumed as an index of music, because the attractive phrase is strongly connected with human emotion.

In the most of the existing studies that try to relate music with emotion, acoustic features have been related with emotions (Lu et al., 2006; Yamanishi et al., 2011). Acoustic feature is truly one of the most important factors related with musical impression. However, it is assumed that meanings of term and linguistic expressions also greatly influence human emotion for music with singing. Therefore, we believe that we have to take lyric features in our consideration in order to clarify the relationships between music with singing and emotion. The existing studies about relationships between acoustic features and emotions do not cover lyric features. And, there are few studies focusing on emotion caused by only lyric, though there are some studies about both acoustic and lyrical features (Eric et al., 2009; Mayer & Rauber, 2011).

Chorus, which is a high point of music, is known as an attractive phrase of music, and several existing studies that estimate chorus based on acoustic features have been reported (Goto, 2006). However, naturally enough, attractive phrase is not always chorus. For example, in "Your song" by Elton John, both "I hope you don't mind" that is chorus and "It's a little bit funny this feeling inside" that is the first phrase of the song are known as attractive phrases. It is considered that lyrical features such as linguistic expressions cause attraction of a phrase that is not chorus.

In this paper, we target at Japanese songs, which language is native language for authors, and try to clarify relationships between attractive phrase and linguistic expression in musical lyric. And, we propose attractive phrase detection method focusing linguistic expression especially found in musical lyric. We define a line in musical lyric as a phrase in this paper; hereafter, phrase means line.

## **2. LINGUISTIC EXPRESSIONS IN LYRIC AND ATTRACTION**

Scenery and psychological descriptions that are represented in lyric might influence impressions. Linguistic expressions including repetition of chorus, which are especially observed in musical lyric, impress the phrase on people listening to music. In order to detect attractive phrase from musical lyric, It is considered that the first thing to do is clarification of the features related with impressions of musical lyric; some of the features might be the features often used in natural language processing. However an existing study proposed Japanese lyric writing support system focusing on syllable number and rhyme (Abe & Ito, 2012), it has no mention of relationships between linguistic expressions and attractive phrase in musical lyric.

In the field of natural language processing, summarization is realized by extracting key sentences based on Term Frequency and Inverse Document Frequency: TF-IDF, which shows an important degree of a term in a document. In the existing studies focusing on musical lyric, important terms were extracted from musical lyric based on TF-IDF (Wang et al., 2011; Zaanen & Kanters, 2010). However, TF-IDF covers only term frequency and does not cover lyrical expressions. In order to detect attractive phrase from musical lyric, we consider to have to define lyrical expressions that are not shown in general documents and model the expressions as mathematical features.

## 2.1. Linguistic expressions in Lyric

The following expressions are described as key factors to make a sentence be lyrical, according to instructional books for writing musical lyric, e.g., lecture book (Ueda, 2010).

- Uniqueness of co-occurred terms;

Terms that are rarely combined in general document are often combined in musical lyric. Using terms that are uniquely combined in general document, a sentence can be an attractive phrase even though the sentence is semantically unnatural. And, it is considered that the terms that the combination is unique in general document artistically represent scenery and psychological descriptions.

- Repetition;

Repeated phrase attracts people. Repetition is effectively used in musical lyric; chorus phrase is generally repeated among song, and some terms are often repeated in a phrase. Unnecessary repetition is not shown in general document.

- Analogy;

Analogy can be categorized into two types: simile and metaphor. Simile means a sentence like “X such as Y”, and then Y is explained using X. Metaphor is also a type of analogy, however, term that shows directly analogy (e.g., “such as” and “like”) is not used in a sentence. Analogy is often used in musical lyric and makes musical lyric more artistically.

- Characteristic reading;

Particularly for Japanese musical lyric, lyric writer sometimes gives special reading to Kanji. This is sometimes depended on melody, however, special reading to Kanji provides us with unconventional semantics and makes a phrase be more attractive. Lyric writer adapts four types of character and reading to Kanji in order to well represent feelings of the lyric writer.

- Rhyme;

Rhyme is a technique often used in musical lyric, and means that same or similar pronunciation is used at given interval. Rhyme makes lyric be rhythmical and comfortable sound.

It is considered that linguistic expressions in musical lyric described above greatly influence impressions. Thus, in order to detect attractive phrase from musical lyric, it is needed to clarify which the linguistic expressions are strongly related with human impressions of musical lyric.

## 2.2. Relationship between linguistic expressions and attraction

In order to clarify the relationships between impressions and linguistic expressions detailed in section 2.1, we conducted impressive evaluation experiments for Japanese musical lyric. Eight subjects in their twenties read musical lyrics and selected attractive phrase based on their feelings. Then, 10 musical lyrics used in the experiments were randomly selected from top 10 songs in each year’s Japanese song sales ranking from 1992 to 2012, that is 200 songs in all. In this experiment, we defined the phrase that more than four subjects evaluated as an attractive phrase as a correct attractive phrase.

Experimenter subjectively analyzed the attractive phrases selected by subjects in the experiment, and the relationships between attractive phrase and linguistic expressions used in musical lyric were discussed. **Table 1** shows ratios that each linguistic expression is related with attractive

**Table 1:** Ratio of influence of each linguistic expression to attractive phrase (%).

	Uniqueness of Co-occurred terms	Repetition	Analogy	Characteristic reading	Rhyme
Ratio of influence	23	45	23	7	6

phrase. The ratio was calculated as follows; number of phrases that each linguistic expression occurred is divided by number of attractive phrases in a musical lyric.

From **Table 1**, it was suggested that uniqueness of co-occurred terms, repetition and analogy have strong relation with attractive phrase. Therefore, in this paper, we focus on uniqueness of co-occurred terms and repetition, and modeled these linguistic expressions as mathematical features. Here, this paper does not cover analogy because semantic explanation is needed to use analogy as mathematical features.

### 3. MODELING OF LINGUISTIC EXPRESSIONS

Lyric of song  $s$  can be expressed as a sequence of phrase  $ln$ , and shown as the following equation.

$$s = ln_1, ln_2, \dots, ln_N, \quad (1)$$

where,  $N$  shows the number of all phrases in song  $s$ . In this paper, one feature concerning uniqueness of co-occurred terms and six features concerning repetition, which influences attraction of phrases in musical lyric and was detailed in section 2, are calculated for each  $ln_{i \in N}$ . Seven-tuple feature set of linguistic expressions for phrase  $ln_i$  in song  $s$ :  $Exp_{ln_i}^s$  can be shown as the following equation (2).

$$Exp_{ln_i}^s = (NUqL_{ln_i}^s, RepL_{ln_i}^s, Imp_{ln_i}^s, FRepW_{ln_i}^s, SRepW_{ln_i}^s, TRepW_{ln_i}^s, RPoS_{ln_i}^s), \quad (2)$$

where,  $NUqL_{ln_i}^s$  shows a feature concerning uniqueness of co-occurred terms, and the others show features concerning repetition. Calculation of each feature will be detailed in the following subsections.

We use MeCab (Kudo et al., 2004) for morphological analysis. Then, we prepare a dictionary for morphological analysis that entry names in Wikipedia are added as proper noun. In this paper, we combined case-making particle and binding particle with the previous noun, and assumed the combined one as one word. Also, if a conjugated form of a given part-of-speech is imperfective, conjunctive and hypothetical, the part-of-speech is combined with the following part-of-speech and the combined one is assumed as one word. This process is conducted in order to analyze musical lyric in increments of that human recognizes musical lyric.

The target in this paper is Japanese written musical lyric. We would rather not modify the original data, and also would like to provide readability with readers. Thus, examples are shown as the following style; [original Japanese title/phrase] ([romanized spelling Japanese]: [the translation by authors]).

#### 3.1. Uniqueness of co-occurred terms

As conducting morphological analysis of phrase  $ln_i$  in song  $s$ , independent words are extracted from the phrase and a sequence of independent words of the phrase is generated. Here, we use independent word because it has singularly has semantics. Referring newspaper corpus for one year (100,609 data), which is collected from Mainichi newspaper (Nichigai Associates, 2004). In the

corpus, ordered co-occurrence frequency of independent words  $id_p$  and  $id_{p+1}$ :  $CoOc(id_p, id_{p+1})$  is calculated. It is shown that the lower  $CoOc(id_p, id_{p+1})$  is the more ordered combination of  $id_p$  and  $id_{p+1}$  is unique. Ordered uniqueness of  $id_p$  and  $id_{p+1}$ :  $Uq(id_p, id_{p+1})$  can be calculated as the following equation (3).

$$Uq(id_p, id_{p+1}) = \frac{1}{CoOc(id_p, id_{p+1})+1}. \quad (3)$$

Uniqueness of co-occurred terms in phrase  $ln_i$  in song  $s$ :  $UqL_{ln_i}^s$  can be calculated from the following equation (4).

$$UqL_{ln_i}^s = \frac{\sum_p Uq(id_p, id_{p+1})}{NCid_{ln_i}^s - 1}, \quad (4)$$

where,  $NCid_{ln_i}^s$  shows the number of independent words in phrase  $ln_i$  in song  $s$ . Note, however, that  $UqL_{ln_i}^s = 0$  when  $NCid_{ln_i}^s \leq 1$ .

Range of  $UqL_{ln_i}^s$  greatly differs depending on theme addressed in each song. Therefore, normalized  $UqL_{ln_i}^s$  for each song  $s$ :  $NUqL_{ln_i}^s$  is calculated according to the following equation (5). In this paper, we used  $NUqL_{ln_i}^s$  as a feature concerning uniqueness of co-occurred terms of phrase  $ln_i$  in song  $s$ .

$$NUqL_{ln_i}^s = \frac{UqL_{ln_i}^s}{\sum_i UqL_{ln_i}^s}. \quad (5)$$

### 3.2. Repetition

In this paper, we represent repetition of musical lyric as the following four features: “repetition of phrase,” “string repeated among phrases,” “repetition of word in a phrase” and “number of kinds of morpheme in a phrase.”

#### 3.2.1. Repetition of phrase

In this subsection, phrase that is repeated in a song is modeled. Phrase that is repeated in a musical lyric accounts for large portion of the musical lyric. In song  $s$  consisted of  $N$  phrases, the portion that a phrase accounts for:  $RepL_{ln_i}^s$  can be calculated as the following equation (6).

$$RepL_{ln_i}^s = \frac{\sum_{j(j \neq i)} EqL_i^s}{N}, \quad (6)$$

where,  $EqL_i^s$  shows the number of phrase that is in absolute agreement with the phrase  $ln_i$ . For example, in musical lyric of “ひまわり (*Himawari*: Sunflower)” by 遊助 (*Yusuke*), “青い空と雲 (*Aoi sora to kumo*: Blue sky and cloud)” is occurred at the first phrase for the first time. This phrase is occurred for 4 times in all the song, thus  $EqL_1 = 4$ .

#### 3.2.2. String repeated among phrases

In this subsection, string that is repeated among phrases is modeled; this feature shows the importance of string in a phrase for all phrases in the song. The importance of string in phrase  $ln_i$  in song  $s$  consisted of  $N$  phrases:  $Imp_{ln_i}^s$  can be calculated as the following equation (7).

$$Imp_{ln_i}^s = \frac{\sum_{j(j \neq i)} ComL_{ln_i, ln_j}}{N}, \quad (7)$$

where,  $ComL_{ln_i, ln_j}$  shows the portion that terms occurred in both  $ln_i$  and  $ln_j$  account for in phrase  $ln_i$ , and is calculated as the following equation (8).

$$ComL_{ln_i, ln_j} = \frac{2 * EqTerm_{ln_i, ln_j}}{NTerm_{ln_i} + NTerm_{ln_j}}, \quad (8)$$

where,  $EqTerm_{ln_i,ln_j}$  shows the number of words that occurred in both phase  $ln_i$  and  $ln_j$ , and  $NTerm_{ln_i}$  and  $NTerm_{ln_j}$  each shows the number of words in phase  $ln_i$  and  $ln_j$ , respectively.

For example, in musical lyric of “ありがとう (Arigatou: Thank you)” by いきものがかり (*Ikimono gakari*), the first phrase is “ ‘ありがとう’ って伝えたくて あなたを見つめるけど (‘Arigatou’ tte tsutaetakute anata wo mitsumeru kedo: I stare at you to tell my thanks, but...)” and the 21th phrase is “ ‘愛してる’ って伝えたくて あなたに伝えたくて (‘Aisiteru’ tte tsutaetakute anata ni tsutaetakute: I want to tell you ‘I love you,’ I want to tell you).” In the two phrases, “って (tte),” “伝えたくて (tsutaetakute)” and “あなた (anata)” are common, thus  $EqTerm_{ln_1,ln_{21}} = 3$ . And, the number of words is each 7 and 6 in the 1st and 21th phrase, respectively:  $NTerm_{ln_1} = 7$  and  $NTerm_{ln_{21}} = 6$ . Therefore, it can be calculated that  $ComL_{ln_i,ln_j} = 0.462$  according to equation (8).

### 3.2.3. Repetition of word in a phrase

The repetition of word in a given phrase is modeled in this subsection. The word frequency of word  $w_k$  in phrase  $ln_i$  in song  $s$ :  $RepW_{ln_i,w_k}^s$ , which is normalized by the number of term in the phrase:  $NT_{ln_i}$ , can be calculated as the following equation (9).

$$RepW_{ln_i,w_k}^s = \frac{Freq_{w_k}^{ln_i-1}}{NT_{ln_i}}. \quad (9)$$

For each phrase  $ln_i$ , the top three words that have high  $RepW_{ln_i,w_k}^s$  are selected, and then the three feature values are assumed as the features concerning the repetition of word of phrase  $ln_i$ :  $FRepW_{ln_i}^s$ ,  $SRepW_{ln_i}^s$ , and  $TRepW_{ln_i}^s$ .

For example, in musical lyric of “And I love you” by Mr. Children, the 33th phrase is “未来がまた一つ ほらまた一つ (*Mirai ga mata hitotsu hora mata hitotsu*: A future again, here a future again).” In this phrase,  $NT_{ln_{33}} = 6$  (note, “が (*ga*)” is just a postpositional particle and not assumed as word in this paper), and “また (*mata*)” and “一つ (*hitotsu*)” are occurred for 2 times. Thus, the features concerning repetition of word in the phrase can be calculated as  $FRepW_{ln_{33}} = 0.167$ ,  $SRepW_{ln_{33}} = 0.167$  and  $TRepW_{ln_{33}} = 0$ .

### 3.2.4. Number of kinds of morpheme in a phrase

Relation between numbers of morpheme and kinds of morpheme in phrase:  $ROP_{ln_i}^s$  is calculated as the feature concerning repetition of morpheme in a phrase.  $ROP_{ln_i}^s$  is calculated as the following equation (10).

$$ROP_{ln_i}^s = \frac{VPOS_{ln_i}^s}{NPOS_{ln_i}^s}, \quad (10)$$

where,  $NPOS_{ln_i}^s$  and  $VPOS_{ln_i}^s$  each shows number of morphemes and kinds of morpheme in phrase  $ln_i$  in song  $s$ , respectively. It means that the lower  $ROP_{ln_i}^s$  is the more repeated morpheme in phrase  $ln_i$ .

## 4. EVALUATION EXPERIMENTS

In order to verify the availability of the proposed method, we conducted evaluation experiment to detect attractive phrases from musical lyric. At first, we conducted subjective evaluation

**Table 2:** The result of attractive phrase detection experiment (%).

	Accuracy	Precision	Recall
Values	69	86	25

experiments in order to obtain human affective evaluations about phrases in musical lyric.

Relationships between the proposed linguistic expressions in musical lyric and human affective evaluation obtained through the subjective evaluation experiment were learned, and then attractive phrases were detected by the proposed method.

#### 4.1. Subjective evaluation requirement experiments

20 participants in their twenties read lyrics of 50 songs and evaluated each phrase whether the phrase was attractive or not. The songs used in the experiment were randomly selected from the top 10 songs in each year's Japanese song sales ranking from 1992 to 2012, that is 200 songs in all. Here, the songs used in the experiment were not included in the songs used in the impressive evaluation experiment detailed in subsection 2.2. In this paper, the phrase that more than five participants evaluated as an attractive phrase was assumed as correct attractive phrase. Then, 504 phrases were evaluated as correct attractive phrases in all 1493 phrases.

#### 4.2. Attractive phrase detection experiments

In this paper, we used support vector machine (SVM), which is known as a classifier that has high performance for two classes classification. We calculated seven-tuple features  $Exp_{in_i}^S$ , which is linguistic expressions modeled for musical lyric and shown as equation (2), for each phrase of 50 songs prepared for the experiment. The relationships between the calculated features and human affective evaluation were learned using SVM. Then, we used "SVM light" (Joachims, 2008) as SVM tool, and radial basis function was used as kernel function. We conducted five-fold cross validation and verified the availability of the proposed method.

**Table 2** shows the result of the attractive phrase detection experiment: average of the results of five-fold cross validation. From **Table 2**, it was confirmed that the attractive phrases were detected for 69% accuracy. And, it was confirmed that the precision was 86%, thus the phrases detected by the proposed method were largely the correct attractive phrases. Meanwhile, the recall was 25% and it can not be said as good result but is considered as natural. From the result of preliminary experiment shown in **Table 1**, it was confirmed that the level that uniqueness of co-occurred terms and repetition influence human attraction, which were modeled as mathematical features in this paper, was each at the highest 23% and 45%, respectively. Considering these facts, we believe that the proposed method achieved an adequate level of recall.

#### 4.3. Discussions about the results comparing with existing summarization methods

In this subsection, we discuss about the detected result while comparing with the key sentences detected by conventional summarization methods that are made for natural documents. We use "Panoramic view system" (Sunayama & Yachida, 2005) and "Hinata System" (Nishihara & Sunayama, 2011) as the conventional methods, and phrases in a musical lyric are ranked by the conventional methods based on the importance of the phrases.

##### 4.3.1. Conventional methods and the points for discussion

Panoramic view system is a system for extracting key sentences with discovering keywords featuring a document. The system does not impose a limitation about length, genre and field of a document to be summarized. From a document to be summarized, the system extracts high frequency noun, verb and adjective as keywords that show a theme and the related words with the

keywords as keywords that show feature. The system ranks sentences in a document based on the importance of keywords.

*Hinata* System is a system for visualizing texts using light and shadow based on topic relevance (“*Hinata*” means sunny place in Japanese). The system assumes a set of nouns in a title as a topic of a document, and calculates the relevance to the topic for each sentence. The system visualizes texts that have high relevance to the topic as light, and the ones that have low relevance to the topic as shadow. In *Hinata* system, as reading lines in a document, the words co-occurred with the topic are dynamically added into a set of the related words with the topic. That is to say, sentences in a latter part of a document have more related words with the topic for calculating importance, thus the sentence in the latter part of a document tends to be evaluated as more important.

The difference between the proposed method and the two conventional summarization methods can be marshaled as the following three points: 1. The proposed method covers the uniqueness of co-occurred terms. 2. Repetition of word in a phrase is expressly modeled in the proposed method. 3. The proposed method absolutely evaluate a phrase whether the one is attractive or not, while the conventional methods rank all phrase in a lyric. Focusing on these points, we discuss about the attractive phrases correctly detected by the proposed method.

#### 4.3.2. Comparison of results between the proposed and conventional methods

We consider that uniqueness of co-occurred terms was effective through the discussions about the detected results. The proposed method correctly detected “ほろり・ほろり ふたりぼっち (*Horori Horori futari bocchi*: shed, shed, we two are in loneliness)” as an attractive phrase from “もらい泣き (*Morai naki*: cry in sympathy)” by 一青窈 (Yo Hitoto). In this phrase, “ふたりぼっち (*futari bocchi*: we two are in loneliness)” was generally unused in natural Japanese document and conversation; instead of the phrase, we generally use “ひとりぼっち (*hitori bocchi*: I am in loneliness).” Therefore, the combination of “ふたり (*futari*: two)” and “ぼっち (*bocchi*: loneliness)” was unique. It was considered that the proposed method realized to well model uniqueness of co-occurred terms, thus this phrase was correctly detected by the proposed method. Meanwhile, the conventional methods do not cover uniqueness of co-occurred terms at all, and ranked this phrase in low; panoramic view system and *Hinata* system each ranked this phrase as 23th and 15th in all 40 phrases of the song, respectively.

Also, the proposed method realized to well detect attractive phrases in which a given term was repeated in the phrase better than the conventional methods. For example, the phrase: “人生 人生 人生 夢で生きてる (*Jinsei jinsei jinsei yume de ikiteru*: Life, life, life, we live with dream)” in “羞恥心 (*Shuchishin*: Shame)” by 羞恥心 (Shuchishin) was subjectively evaluated as an attractive phrase and correctly detected as an attractive phrase by the proposed method. Meanwhile, panoramic view system and *Hinata* system each ranked this phrase as 23th and 18th in all 42 phrases, respectively. Thus, this phrase should be not included in a summary generated by the two conventional methods though the one is attractive for human. Likewise, from “宙船 (*Sorafune*: Spaceship)” by TOKIO, “何の試験の時間なんだ 何を裁く秤なんだ (*Nan no shaken no jikan nanda Nani wo sabaku hakari nanda*: Is this the time for any examination? What is judged by the scale?)” and “何を狙って付き合うんだ 何が船を動かすんだ (*Nani wo neratte tsukiaunnda Nani ga fune wo ugokasunnda*: What is the target of the relation? What is the power source of the ship?)” were also subjectively evaluated as attractive phrases and correctly detected as attractive phrases by the proposed method though these phrases evaluated in low rank by the two conventional methods.



## 5. CONCLUSIONS

In this paper, we proposed attractive phrase detection method focusing on linguistic expressions of musical lyric. In musical lyric, characteristic expressions that are rarely used in general document are used. Such linguistic expressions enrich affective and scenery descriptions, and make musical lyric be artistically. We conducted affective evaluation experiment as preliminary experiment, and clarified the relationships between linguistic expressions characteristically used in musical lyric and attraction; “uniqueness of co-occurred terms” and “repetition” highly influenced human attraction. And, we modeled the two types of linguistic expressions as seven-tuple mathematical features, and conducted attractive phrase detection experiment using the modeled features with SVM.

As the result of the detection experiment, the attractive phrases were detected for 69% accuracy and 86% precision, and the availability of the proposed method was confirmed. Through the discussions about the detected results comparing with the existing summarization methods, it was suggested that the proposed method realized to detect attractive phrase that has uniqueness of co-occurred terms and repetition of terms in a phrase better than the conventional methods. We believe that linguistic expressions that are especially occurred in musical lyric were well modeled in the proposed method, thus the attractive phrases were well detected by the proposed method.

In this paper, we showed examples in Japanese and conducted experiments for Japanese musical lyrics, however, the linguistic expressions modeled in this paper can be calculated regardless of language. And, we consider that the linguistic expressions in musical lyrics are often common also in other languages. Therefore, it is expected that the proposed method can be applied to other languages. The followings can be considered as the directions for future research.

- Using a corpus of lyrical expressions;  
In this paper, a newspaper corpus was referred to calculate uniqueness of co-occurred terms in general documents. The uniqueness of co-occurred terms in musical lyric would be possible to be evaluated by using a corpus of musical lyric. Then, the attraction of phrase will become to be evaluated referring two different domains: newspaper and musical lyric. We believe that this improvement would increase the performance on attractive phrase detection.
- Covering a variety of expressions in Japanese;  
One meaning has so many varieties of expressions in Japanese, and it causes an issue specific to Japanese. For example, the first person is shown as only “I” in English, however, the one is shown as “私 (*watashi*),” “僕 (*boku*),” and so on in Japanese. Moreover, 3 types of character are generally used in Japanese: *Hiragana*, *Katakana* and *Kanji*. Thus, “あなた (*anata*)” can be also expressed as “アナタ (*anata*),” “貴方 (*anata*)” and other *Kanji*. We consider that the attraction of a phrase differs depending on the used terms and its character even though the message in the phrase is same.
- Introduction of semantic relations among terms;  
In musical lyric, semantically similar and distant relative terms are often used in a phrase. For example, using both “like” and “love” in a same phrase, semantic and affective contrast can be generated. We would model semantic relations among terms, and improve linguistic expressions model for attractive phrase detection.

We will address the above issues and improve the attractive phrase detection method. Moreover, we will develop a songwriter support system that evaluates whether a given lyric is attractive or not as an application of the proposed method.

## ACKNOWLEDGMENTS

This paper referred some phrases in Japanese lyric as an example, for which we are most appreciative.

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