

# Automated Song Selection System Complying with Emotional Requests

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**Abstract.** Recently, we have a lot of musical pieces due to a large capacity of storage. However, it would be difficult to select the song with bibliographic data as the capacity of the music database increases. Therefore, we proposed an emotional song selection system. In this study, the Acoustic - Emotion model was composed by relating the acoustic fluctuation features that can explain the time variation of music with the emotional evaluations of music obtained through the subjective evaluation experiments. Based on the model, the emotional evaluations of music were calculated from their acoustic features. Using the proposed system, user can select the song with the adjective words and their degrees.

**Keywords:** Music, Emotion, Melodic database retrieval technique, Fluctuation features.

## 1 Introduction

The development of the data processing technology has enabled us to have and carry the portable music player with a large capacity of storage. The song has been selected with bibliographic data; however it would be difficult as capacity of the database increases. Thus, some music retrieval techniques based on human instinct have been studied [1, 2]. It has been known that the mood of the music influences human feelings and behaviors. From these facts, we believe that the emotional song selection system is needed in order to enjoy more entertainment of music. In this paper, we propose the automated song selection system complying with the emotional requests, which is based on "Acoustic - Emotion" model.

Fig.1 shows the general idea of the proposed system. The system previously labels each emotional evaluations of a song by its acoustic features. As users input their requests with the adjectives and their degrees, then the system outputs suitable songs for the requests. The proposed system needs only the degrees of the adjectives, and may be user-intuitive.

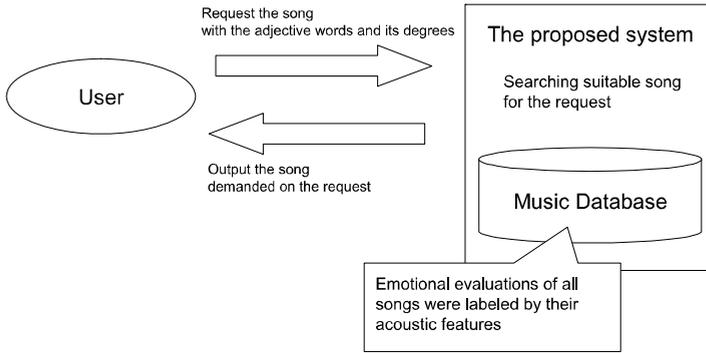


Fig. 1. The general of the proposed system

## 2 Fluctuation Features

The primary consideration in music should be the temporal variation of sounds. The temporal concept of music has been regarded as the one of the more important factors for music in the field of the cognitive psychology [3]. Then it was used that the fluctuation features that can explain the temporal variation of music as the acoustic features of music.

Melody, rhythm, and harmony are the three major factors for composing music. They are signed and sealed as the structures of both the pitch and volume, and are different among songs. It has been believed that the emotional evaluation of the song can be influenced by their differences. As the acoustic features of music, the thirty six fluctuation features were prepared, which concern the time variation of pitch, volume, and rhythm. They can be extracted from fluctuation spectrums calculated from music, and detailed in our previous works [4].

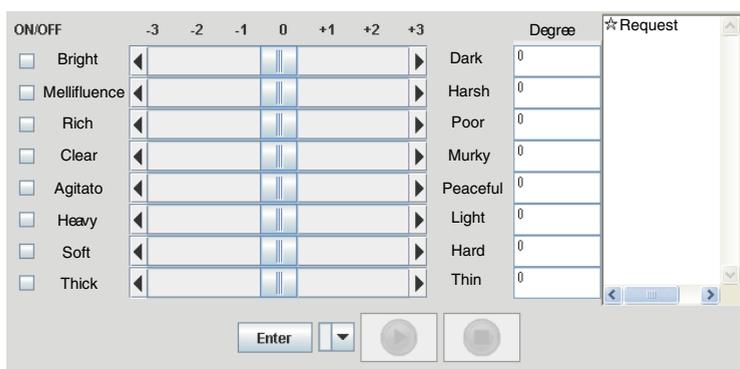
## 3 Emotional Evaluation

The emotional evaluations of music were obtained through the subjective evaluation experiments. One hundred and fifty songs were prepared to be evaluated, which were arbitrarily selected from several genres, e.g., Pop, Classical, Jazz, Rock, and so on. Arbitrarily-prescribed phrase in a song was used as the object to be subjectively evaluated, and the evaluations were assumed as the emotional evaluation of the song.

Eight pairs of adjective were prepared for evaluation, and are listed in Table.1. All the prepared songs were evaluated on a scale one to seven for the each adjective based on the Semantic Differential method. Eighteen males and females in their twenties participated in our evaluation, and were asked to listen to and evaluate all the songs in random order.

**Table 1.** Adjectives for emotional evaluation

Adjective index	Evaluation on a one-to-seven scale
1	Bright - Dark
2	Melliflucence - Harsh
3	Rich - Poor
4	Clear - Murky
5	Agitato - Peaceful
6	Heavy - Light
7	Soft - Hard
8	Thick - Thin

**Fig. 2.** The Interface of the proposed system

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Fig.2 shows the interface of the proposed system. As user selects adjectives and the corresponding degrees, the songs complying with the emotional request are outputted.

### 4.1 Acoustic – Emotion Model

The acoustic – Emotion model was composed by relating the fluctuation features and the emotional evaluations of the song. Then the contributory features for labeling the degrees of the each adjective were selected from the thirty six features using a step wise method, and the linear discriminant function was used as the evaluation function. The estimate space for each adjective was generated by conducting canonical discriminant analysis, where each the explanatory and dependent variables were the selected contributory features and the degrees of each adjective, respectively. The estimate spaces for each adjective were stored in the proposed system, and labeled the emotional evaluation of a song with the acoustic fluctuation features. The effectiveness of the model was validated in our previous works [4].

**Table 2.** Demonstration results

Request	Selected song
Bright - Dark: +3	<i>Symphony No.5 in Cminor</i>
Clear - Murky: -3	/ Ludwig van Beethven
Rich - Poor: -3	<i>Merry Chrimas, Mr. Lawrence</i>
Clear - Murky: -3	/ Ryuichi Sakamoto (1983)
Rich - Poor: -3	
Clear - Murky: -3	<i>SWEET MEMORIES</i>
Heavy - Light: +3	/ Seiko Matsuda (1983)
Rich - Poor: +1	
Heavy - Light: +3	<i>Can you Celebrate?</i>
Soft - Hard: -3	/ Namie Amuro (1997)

## 4.2 Song Select Demonstration

Using the proposed system, Japanese male in his twenties freely selected songs from his own music database, which stored one hundred songs that were not used in subjective evaluation experiment for constructing Acoustic – Emotion model. The requests and the corresponding selected songs by the proposed system are shown in Table.2. It seems that the selected songs are complied with the requests, and most people may be satisfied with the results.

## 5 Conclusion

In this paper, we proposed the automated song selection system complying with emotional requests, which was based on the Acoustic – Emotion model. In the proposed system, the emotional evaluations of music are dynamically labeled from their acoustic fluctuation features. Since users can select songs from large storage of music with only adjectives and their degrees.

In the future direction of this study, alleviation of the user’s request constraints will be covered with applying the database retrieval techniques. And conducting the BGM attaching experiment, the usability of the proposed system will be verified.

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