

Music Recommendation System Based on User's Sentiments Extracted from Social Networks

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Abstract— This paper uses a sentiment intensity metric, named *Sentimeter-Br2*, to extract users' sentiments from different Social Networks. The framework of the recommendation system is shown in order to extract the users' phrases, which permit song recommendations based on the user preference or present sentiment intensity. Experimental subjective tests have shown that the metric produces satisfactory results.

I. INTRODUCTION

The use of social networks now allows for the sharing of content between people in an easier and faster way. People express themselves through texts, music, and videos, and can share this content with other people.

There is much existing research regarding the extraction and analysis of sentiment intensity from social networks texts [1]. The sentiment intensity of a person can be represented by texts, images and videos, and, depending on the person's sentiment, different content can be recommended to him or her.

Whissell's dictionary of affective language [2] uses an intensity scale with 4000 emotional words. WordNet is another dictionary of words that can be used for sentiment analysis. A manual dictionary is presented in [3], in which each word has a respective classification, e.g., a positive scale from +1 to +5 or a negative scale from -1 to -5.

The sentiments can be extracted from texts and analyzed by either a dictionary of words or by machine learning technique, but the drawback of the latter method is that the training model must have a high number of examples to obtain a good classification without noises [4].

Unlike the study [5] which extracts emotion from lyrics and in [6], which extracts the frequency of words from a body of songs, our paper extracts sentiments from social network texts, and recommends previously classified songs, as the texts posted by people on social networks are easier and more feasible to analyze than lyrics and songs. In effect, the poetic content of a song is much more subjective and complex to analyze either by using a word dictionary or the machine learning technique. The latter method is harder to use when analyzing songs' lyrics, because the training model only covers a few words for each song.

Social network, blogs and other Internet services are beginning to use the recommendation systems more and more to improve the personal content to be recommended, since, in many systems, the user only fills in a basic profile and other information on the user must be discovered automatically. Recommendation systems based on polarity are used in [7],

which uses positive and negative opinions, but this paper works with a specific trusted network; and in [8] semantic information is used to recommend pages to people with semantically similar content. Our paper presents the use of a music recommendation system based on polarity and user sentiments extracted from social networks, because this area of research has yet to be explored in detail.

This paper's main aim is to propose the use of the sentiment intensity metric, named *Sentimeter-Br2*, to improve the performance of a music recommendation system, in which the user's musical preference is associated to a positive, negative or neutral sentiment intensity extracted from the user's phrases on social networks.

The metric *Sentimeter-Br2* is based on *Sentimeter-Br* [1], which is a word dictionary with respective sentiment values of positive or negative. In [1], the *Sentimeter-Br* showed superior results when compared to the *SentiStrenght* word dictionary.

A framework is presented to the user, in which the person completes their registration, adds their social network login details, and phrases are subsequently collected from social networks, analyzed and classified by the sentiment metric *Sentimeter-Br2*. Consequently, the person receives song recommendations based on his or her preference, or based on the present state of sentiments of the person.

In this context, the remainder of this paper is structured as follows. Section II presents the proposed recommendation system based on sentiments. Section III shows the results. Finally, section IV presents the conclusions.

II. PROPOSED RECOMMENDATION SYSTEM BASED ON SENTIMENTS

This section presents the methodology of the recommendation system based on the sentiment metric.

The word dictionary, *Sentimeter-Br2*, applied in this solution, considers n-grams, adverbs, removes stopwords (words which do not add sentiment) and the differing value of sentiments depending on the verbal tenses, in which a verb in the past tense is of lesser sentimental value than a verb in the present tense.

The recommendation system's framework is presented in Fig. 1, in which the user's profile database already contains the user's music preference, as filled in when the user entered the system for the first time.

The framework follows a cycle whereby after a certain period of time the phrase posted by the user on social networks is extracted. Consequently, the phrase is analyzed by the *Sentimeter-Br2* metric, and the sentiment intensity of the sentence is calculated, and sent to the Recommendation

System (RS). If a phrase is scored with a negative score of sentiment intensity, then a different type of music can be recommended. Conversely, if a positive score is calculated, then a happier or more enjoyable song can be recommended.

In this study, the social network phrases are extracted from Facebook and Twitter by an automatic script written in the Hypertext Preprocessor (PHP programming language and JavaScript Object Notation (JSON).

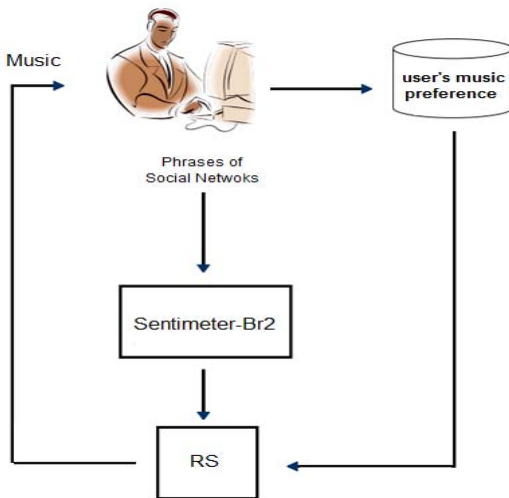


Fig. 1. Framework of the proposed Music Recommendation System based on user sentiments analysis.

The musical categories of the framework are based on [9], and consist of happiness, sadness, anger, romance and gentleness.

III. RESULTS

In this study, the subjective tests were performed in a laboratory environment using the framework presented in Fig. 1. A total of 40 subjects participated in the subjective test, of whom 27 were women and 13 men, each participant gave their musical preference, and he or she also posted phrases on social networks. Later, these phrases were analyzed by the Sentimeter-Br2.

The social networks phrases were collected and analyzed every hour over 3 weeks. If no phrase was posted then a song of his or her preference style was recommended, otherwise a sadder or happier song was recommended depending on the negative or positive sentiment intensity obtained.

Table I presents the results obtained by subjective tests applying the Sentimeter-Br2 in the proposed recommendation system (proposed RS). These results are also compared with a RS that does not take into account the sentiment analysis of the users (traditional RS). In the subjective tests were asked to people if the system had a good, medium or bad performance.

TABLE I
PERFORMANCE ASSESSMENT OF THE PROPOSED MUSIC RECOMMENDATION SYSTEM

	Good	Medium	Bad
Proposed RS	29	6	5
Traditional RS	11	15	14

The study shows that when a person expressed phrases with negative sentiment intensity, they remained negative for a period of time, before moving to another polarity after this period of time, showing certain regularity.

There is no evidence to prove that the user's satisfaction improves if their current emotional state, as extracted from social networks, it taken into account; nevertheless, the RS performance shows clear improvement. The experimental results showed that the number of assessors that considered the proposed RS to be useful consisted of 72.5% of the total number of assessors. This result shows a clear advantage over the 27.5% reached by the traditional RS.

IV. CONCLUSIONS

The results show that the proposed recommendation system based on Sentimeter-Br2 produced good and medium performances in most cases.

This paper shows that a person's emotional state can be reflected in the music that this person would like to listen to. It shows how people's sentiments can change over a period of time and can be expressed on social networks; these sentiments, which include the current emotional state of a given person, can be extracted, and help the recommendation system.

Many applications can be of use of in relation to the sentiment intensity obtained from social networks, and in this paper a music recommendation system was introduced; this uses the phrases extracted from social networks, but the use of sentiment analysis in a recommendation system can be also applied to commerce, video services, telecommunication services or other areas.

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