WEB 2023

The Eleventh International Conference on Building and Exploring Web Based Environments

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WEB 2023 Editors

Laura Garcia, Universidad Politécnica de Cartagena, Spain

WEB 2023

Foreword

The Eleventh International Conference on Building and Exploring Web Based Environments (WEB 2022), held between March 13 – 17, 2023, continued the inaugural conference on web-related theoretical and practical aspects, focusing on identifying challenges for building web-based useful services and applications, and for effectively extracting and integrating knowledge from the Web, enterprise data, and social media.

The Web has changed the way we share knowledge, the way we design distributed services and applications, the way we access large volumes of data, and the way we position ourselves with our peers.

Successful exploitation of web-based concepts by web communities lies on the integration of traditional data management techniques and semantic information into web-based frameworks and systems.

We take here the opportunity to warmly thank all the members of the WEB 2023 Technical Program Committee, as well as the numerous reviewers. The creation of such a high quality conference program would not have been possible without their involvement. We also kindly thank all the authors who dedicated much of their time and efforts to contribute to WEB 2023. We truly believe that, thanks to all these efforts, the final conference program consisted of top quality contributions.

Also, this event could not have been a reality without the support of many individuals, organizations, and sponsors. We are grateful to the members of the WEB 2023 organizing committee for their help in handling the logistics and for their work to make this professional meeting a success.

We hope that WEB 2023 was a successful international forum for the exchange of ideas and results between academia and industry and for the promotion of progress in the field of Web-based environments.

We are convinced that the participants found the event useful and communications very open. We also hope that Barcelona provided a pleasant environment during the conference and everyone saved some time for exploring this beautiful city.

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Song Recommendation System on Mobility Based on Geotagged Tweets and User Preferences

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***Abstract*—In this paper, we propose a method for recommending songs that match the atmosphere of spots along the route and the user's preferences. The proposed method extracts the ambiance around the spot from Social Networking Service data, the artist's atmosphere from a set of songs, and the user's preferences from the play history. We evaluate the proposed method of artist extraction for a spot.**

I. Introduction

When playing a song while moving, the surrounding conditions and atmosphere, such as scenery and crowd size, play a significant role in song choice. Therefore, in this study, we propose a method for recommending songs that match the atmosphere of spots along the route and the user's preferences.

A recommendation system recommends songs that match the context, such as recommending songs based on the location information [1]. Shang et al. [2] focused on the emotional and affective connotations of a piece of music and study new issues in music retrieval. While most studies determine lyrics and audio separately, Rachman et al. [3]. integrate lyrics and audio to detect the emotion of a song. Murata et al. [4] proposed a music recommendation system based on time-series topic analysis of lyrics. Because the climax of a song frequently depicts story development, the system extracts story development as topic transitions and recommends songs based on their similarity. The similarity calculation is based on the Dynamic Time-Warping (DTW) method.

In this paper, we propose a method for detecting the atmosphere around a moving spot based on a spot vector generated by geotagged tweet data. To reduce the processing cost of calculating the similarity between the spot vector and tens of thousands of lyrics, an artist vector is generated from the lyrics obtained from the Uta-Net [5], and the similarity between the spot vector and the artist vector is calculated. Furthermore, the artist who is closest to the user's preferences and similarity in the spot is extracted by generating a user vector from the user's playback song and calculating the similarity between the user and the spot. Finally, the song with the highest similarity between the extracted artist's lyrics vector and the user vector is recommended as the moving song at the spot.

II. Song Recommendation System on the Move

Figure 1 shows the user interface for music recommendation. When the user enters a destination, the shortest route and the transit spots are displayed. When the user starts moving, songs are recommended and played to the intermediate points of the departure point, each transit spot, and the destination point, based on the information at the current (departure) point. Since the music recommendation is based on the information of tweets near the spot, the recommended music differs depending on the location and time of the year.

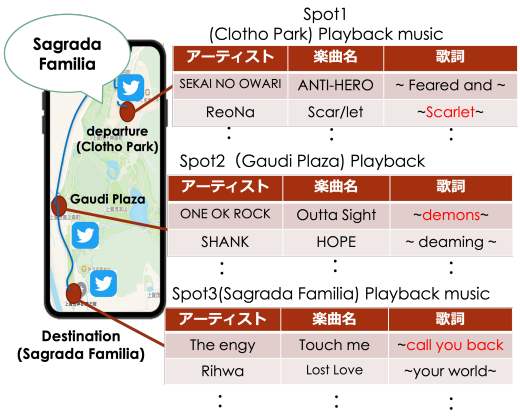

Fig. 1. Schematic diagram of the on-the-move song recommendation system.

TABLE I
User Playback History (Profile)

Artist Name	Title	Lyrics
Masumi	Apple Song	apple red
Mori Calliope	Off With Their Heads	I'm savege
Mori Calliope	Dance Past Midnight	Don't call me lazy

In Figure 1, when the destination is the Sagrada Familia, the starting point, Clotho Park, and Gaudi Plaza are extracted as spots on the shortest route, and multiple artists are extracted for each spot. For spot 1, they are "SEKAI NO OWARI" and "ReoNa", etc. In the case of a user whose music history is shown in Table I, an artist who is close to the multiple artists in the spots and the user's preferences is selected, and "Scar/let" is selected for Spot 1. In addition, a song by that artist is recommended, and the song is played until the intermediate point between the next spot and the next spot.

III. Song Recommendation Method

We propose a method of recommending songs that match the atmosphere of a spot and user preferences, using the

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information on the spot's location, song, and geotagged tweets.

A. Artist Recommendation for Spots

The proposed method generates three vectors: a user vector, a spot vector, and an artist vector calculates the similarity between the artist and user preferences for spots and determines the artist with the closest similarity.

First, to recommend the user's favorite artists, we obtain the user's playlist of songs, extract nouns and adjectives from the lyrics, and generate a feature vector for the user by word2vec. Next, for the spot vector, the latitude and longitude of the spot obtained from Open Street Map (OSM) are used to obtain tweets within a dm radius of the spot, and a feature vector is generated from nouns and adjectives in the content of the tweets using word2vec. The third, artist vector, integrates lyrics information for each artist and generates a feature vector of lyrics from nouns and adjectives using word2vec.

After generating the three vectors, the similarity between the spot features and the user features is calculated from the cos similarity between the user vector and the spot vector. For each spot, the similarity to the artist is calculated from the cos-similarity between the artist vector and the spot. Finally, the artist with the closest similarity to the user is determined.

B. Song Recommendation for Spots

From the previous section, artists suitable for the atmosphere of the spot and user preferences were determined. For music recommendation, the similarity between the feature vectors generated based on the user's playback history and each artist's music is calculated. A vector for each song is generated from the lyrics of each song by the artist, the cosine similarity is calculated, and the song is determined.

IV. Verification of Song Recommendation Method

Verify a song recommendation method based on the artists and spots recommended for a spot and the user's preferences.

A. Datasets and Evaluation Methods

A total of 8,203 spots were obtained using Overpass Turbo for the city of Kyoto. A total of 49 groups of artists and 535 lyrics were retrieved. The number of geotagged tweets was 277,030. In this experiment, we targeted spots with 30 or more tweets per spot, and a total of 4,926 spots (60%) in Kyoto City were selected for recommendation. The spots targeted in the experiment were Kinkakuji Temple and Ginkakuji Temple as temples and shrines, Kyoto Station and Kuramaguchi Station as public institutions, and Doshisha University (Imadegawa Campus) and Kyoto Sangyo University as universities.

To validate the proposed method, we evaluated the recommended artists against the atmosphere of the spots.

B. Artist Validation for Spots

To validate the recommended artists against the atmosphere of the spot, subjects read the chorus of songs by five groups of artists, ranked the artists in order of compatibility with the atmosphere of the spot, and evaluated them from Normalized Discounted Cumulative Gain (nDCG) based on the ranking results.

TABLE II
Results of artists' evaluations of spots

Spot Name	#Tweets	nDCG@5
Kinkakuji Temple	943	0.8672
Ginkakuji Temple	782	0.9545
Kyoto Station	18,889	0.9538
Kuramaguchi Station	990	0.9342
Doshisha University	1,564	0.8439
Kyoto Sangyo University	125	0.8906

The results of nDCG@5 for spots and artists are shown in Table II. The nDCG was between 0.84 and 0.9 for Kinkakuji Temple, Doshisha University, and Kyoto Sangyo University, while it was above 0.9 for Ginkakuji Temple, Kyoto Station, and Kuramaguchi Station. In the categories of temples and shrines, the Kyoto station, and universities, the accuracy was higher for stations containing a variety of commercial facilities than for universities with less age bias. The extraction of artists should also take into account the preferences of users such as the characteristics of spot visitors of the proposed method.

V. Conclusion

This research proposed a method for recommending songs based on the atmosphere around a spot and the user's song preferences while moving between spots. The proposed method recommends songs that are similar to the spot and the user's preferences by extracting the ambiance around the spot from Social Networking Service data, the artist's ambiance from a set of songs, and the user's preferences from the play history. Evaluation experiments showed that artist extraction for a spot was successful. In the future, we plan to improve the accuracy by recommending songs with the length of the song as a weight.

Acknowledgment

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A Personalized Scoring Method for Rental Property Search Considering the Surrounding Environment

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***Abstract*—Nowadays, a growing number of people use real estate and housing information websites to search for rental properties. However, it is difficult to specify searching conditions according to specific individual needs, such as community safety and barrier-free environment. In this study, we propose a personalized scoring method that takes into account the surrounding environment and can appropriately evaluate properties to match the target user's age, gender, hobbies, and preferences. We also conducted a preliminary experiment to compare the ranking of the proposed method and the baseline methods based on nDCG@5, we found that the proposed method achieved the best performance.**

***Keywords*—rental property, recommendation system, personalization, surrounding environment analysis**

I. Introduction

Many users use real estate and housing information websites to search for rental properties. Conventional real estate and housing information sites provide users with the services of searching properties based on criteria, such as rent, size, age, layout, and the distance from the nearest train station [1]. However, it is difficult to specify search conditions according to specific individual needs, such as community safety and accessibility. In the existing studies, Suwa et al. proposed a method for quantitative and intuitive comparison and evaluation of noise and daylighting using IoT devices [2]. Motomura et al. proposed a method for searching and ranking rental properties based on user evaluation features [3]. However, these approaches did not consider the surrounding environment of the house and the user characteristics. In this study, we propose a personalized scoring method for rental properties based on the consideration of the surrounding environment that takes into account the family structure including age and gender, as well as their interests and preferences.

The remainder of this paper is structured as follows. In Section 2, we introduce the proposed personalized scoring method for rental properties. Afterward, in Section 3, we describe the details of the preliminary experiment. Finally, in Section 4, we conclude this study and discuss future works.

II. Personalized Scoring Method

We introduce the proposed method in this section.

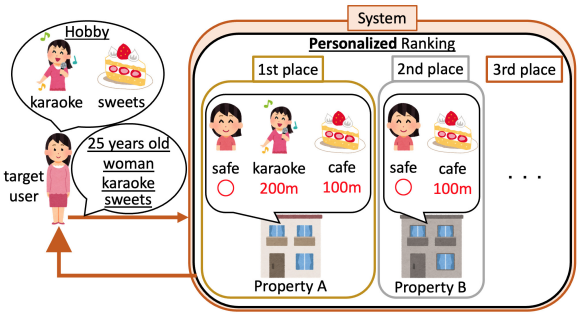

Fig. 1. The overview of the personalized scoring method considering various preferences.

A. Overview of the Proposed Method

An overview of our proposed method is shown in Figure 1. In the case of a female (who likes karaoke and sweets), the proposed system can recommend properties based on a personalized score ranking that takes into account "security, karaoke, cafe" and other evaluation items considered essential to the target user among all evaluation items of rental property. In the case of a couple in their 70s (gateball and chess enthusiasts), it is possible to create a ranking based on the personalized score that can recommend barrier-free properties located near a community center or park.

B. Implementation of Personalized Scoring Method for Rental Properties

In this study, we are going to address the following four main issues in order to implement personalized scoring.

- **Data Collection**
  Data on publicly available rental properties, map information and reviews of stores and spots (Google Maps), public safety information (local governments, SNS), barrier-free information (Ministry of Land, Infrastructure, Transport and Tourism, SNS), etc. are collected and stored in the database with location information.
- **Detection of important evaluation items based on the user information**

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The important evaluation items are determined based on the target user's age, gender, tastes, and preferences. Next, we use the trained Word2Vec model [4] to obtain the vectors of hobbies and surrounding facilities from the collected data and calculate the similarity. For instance, for a 25-year-old female who likes karaoke and sweets, the important evaluation items are security as the surrounding environment, and distance from karaoke stores and cafes as surrounding facilities.

- **Determination of important evaluation items based on family structure**
  In the case of a multigenerational home, we calculate each important evaluation item of each person. However, for safety-related evaluation items, such as security and barrier-free access, we will consider the importance of the evaluation items instead of the average of them.
- **Implementation of Personalized Scoring method**
  Scores of rental properties are calculated for each of the above-mentioned critical evaluation items, and the scores are integrated considering the importance of each evaluation item.

III. Preliminary Experiment

We conducted a preliminary experiment to discuss the effectiveness of the proposed method by comparing the conventional simple ranking with the ranking based on the Personalized Scoring method (proposed method).

A. Experimental Details

- Target Rental Property Data
  10 Properties for Rent in Nakagyo-ku, Kyoto (1K, Bathroom/Toilet)
- Subjects
  12 University Students in their 20s
- Evaluation Items
  Rent, Living Space, Convenience of Transportation, Convenience of Shopping, Surroundings Related to Hobbies

B. Calculation Method for Each Evaluation Item

- Rent
  The score of the evaluation item regarding the rent of the property below the upper rent limit (set by subjects) is set as 100, and if the rent is above the upper limit, it ranges from 0 to 100 (Upper limit + 30% or more: Score 0).
- Living Space
  The score of the evaluation item regarding the living space (which is wider than the requirement) is set to 100, and if it is below the lower limit, it is set in the range of 0 to 100 ($0m^2$: Score 0).
- Transportation Convenience
  Depending on the walking distance to the nearest train station and bus stop, scores for the evaluation items range from 0 to 100 (50 for train station, 50 for bus stop) (1000m (train station)/500m (bus stop): Score 0).
- Shopping Convenience
  Scores of this evaluation item are set in the range of 0 to 100 depending on the walking distance to the nearest convenience store and supermarket (50 for convenience store, 50 for supermarket) (500m (convenience store)/1000m (supermarket): Score 0).
- Surroundings Related to Hobbies
  According to the walking distance to the nearest spot related to the subject's hobbies, set evaluation item scores in the range of 0 to 50 (1000m: Score 0).

The sum of these five evaluation item scores is applied as the personalized score of the rental property.

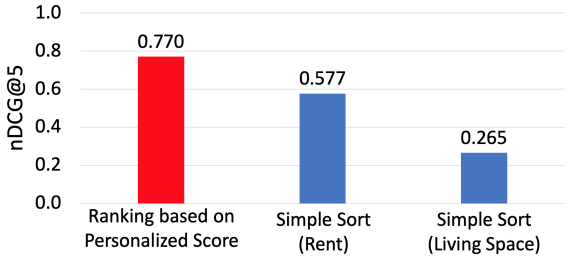

Fig. 2. Comparison of the ranking between the proposed method and baseline methods based on nDCG@5.

C. Experimental Results

Figure 2 shows the comparison of ranking accuracy between the proposed method and the baseline method based on nDCG@5. (Before the experiment, each subject was asked to rank 10 rental properties in which they would like to live, and it was used as the ground truth). We noticed that the nDCG@5 of personalized ranking for the proposed method is the highest.

IV. Conclusion

We proposed a personalized scoring system that takes into account the surrounding environment of rental properties. The personalized scoring method (proposed) achieved better results than the baseline method. The experimental results demonstrate the effectiveness of a personalized scoring method that takes into account multiple evaluation items (e.g., hobbies and nearby related facilities). In the future, we are going to add new evaluation items and improve the calculation method of each evaluation item.

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