A Method for Extracting Related Information around Walking Routes and Automatic Generation of Explanatory Text

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***Abstract*—The recent health boom and the lack of exercise due to the Corona pandemic has led to an increasing awareness of walking among users. However, there are some users who do not find walking enjoyable and cannot continue walking. Therefore, we aim to develop a system that enables users to enjoy walking continuously. In this study, we developed a system that uses generative AI to create a summary of a spot's appeal based on spot information and word-of-mouth, and present it to users in written or spoken form to help them find enjoyment in walking. This paper reports on the specific method used and preliminary experiments carried out to develop the system. ®**

***Index Terms*—Generative AI, GPS, Walking Route Information**

I. Introduction

The recent health boom has raised awareness of walking as a way to lose weight and improve or maintain physical fitness[1][2] . In this context, walking is recommended as a form of physical activity to promote health.[3] However, many users do not find walking enjoyable and find it difficult to continue walking[4]. Therefore, we are aiming to develop a system that can make users feel positive about walking, one which makes them feel enjoyment and happiness while walking. Recently, there are many existing pedestrian navigation systems that recommend walking routes. An example is a map application such as Google Maps. When launched, it displays a map of the area around the current location, and the user sets the destination he or she wishes to reach. After performing a route search and selecting walking as the method of travel, directions to the destination are displayed. However, existing walking support systems such as these tend to recommend only the shortest route to the destination specified by the user, and do not aim to make walking itself enjoyable. Therefore, we propose a method of using generative AI to create a summary of the attractions of spots near a route based on spot information and word-of-mouth information, and present it to the user in text or voice to make walking more enjoyable. In this paper, we report on our proposed method for extracting relevant information around a route and automatically generating descriptive text, as well as preliminary experiments conducted to develop this method.

[1]https://www.mext.go.jp/sports/content/20240327-kensport01-000034690_1-1.pdf

[2]https://www.dlri.co.jp/files/ld/205362.pdf

[3]https://www.mhlw.go.jp/content/001194020.pdf

[4]https://www.mhlw.go.jp/content/10900000/000687163.pdf

II. Related Work

Kim et al. [1] suggest avoiding areas with extremely negative sentiment and finding safer and more enjoyable routes with a slight increase over the shortest distance, rather than the sentiment inferred from real-time geotagged tweets. In addition to this, the study also validates route recommendations to bypass crime spots using

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Fig. 1. Overview of the method for extracting relevant information around walking routes and automatic generation of explanatory text

the sentiment of social media, based on a significant correlation between crime rates from the crime history data of the Chicago city portal and areas where negative tweets were heavily sent.

Bhumika et al. [2] developed and tested the effectiveness of a risk-aware multi-purpose route recommendation framework called MARRS. In contrast to conventional methods that recommend routes for a single purpose or coarse-grained multi-purpose routes, this study extracts specific criminal features from multiple data sets and incorporates them into a learning model for route recommendation.

Quercia et al. [3] use social data (meta information from Flicker) to recommend routes that users would find quiet, beautiful, and happy, rather than the shortest route. In this study, recommendations are based on emotions that apply to all users, such as beauty and quietness.

Johnson et al. [4] created Scenic Routes for aesthetics, Safety Routes for safety, and Simple Routes for route simplicity and compared them to traditional route recommendation methods.

Joy et al. [5] considered the elements that make the streets of Cairo, Egypt, a good place to walk from a pedestrian perspective. The results showed that a good place to walk requires convenience, safety, and cleanliness. Therefore, it is concluded that safety aspects and visually recognizable features could motivate walking.

Daniele et al. [6] determined which route is preferable based on the two photos, used machine learning to predict what kind of road is preferred, and recommend not only the shortest route similar to conventional navigation systems, but also a route that feels beautiful.

Zheng et al. [7] propose a GPSView that considers visual and scenic attributes and plans driving routes that include beautiful scenery and points of interest, allowing travelers to enjoy sightseeing while driving.

Previous studies have proposed route recommendations that take into account scenery and emotions. However, the reasons and rationale behind considering these factors are not conveyed to users. This study introduces novelty by providing descriptive texts that explain the appeal of spots while users are walking, making walking more enjoyable and enriching, and supporting its continuation.

III. A Method for Extracting Related Information around Routes and Automatic Generation of Explanatory Text

Figure 1 shows an overview of the method used to extract route-related information and automatically generating explanatory text. If a spot exists, a description based on the spot information is generated. In addition, the system presents location information and a brief description of a new spot that belongs to the same category as the current spot, and recommends it.

A. a Method for Extracting Related Information around Routes

1) How to define and search for a spot: This system is designed to obtain the user's location information based on GPS and search for attractive spots in the vicinity. Therefore, the following points need to be considered.

- How to define a spot
- Setting search range
- How often to perform the search
- How to search (circular range or linear distance)

Spots are defined using the word-of-mouth score of Google Maps, and the search range, frequency, and search method are defined based on objective evaluation through a questionnaire survey.

2) How to define and search for a spot: To generate attractive descriptions of spots, we utilize word-of-mouth information from Google Maps. The word-of-mouth information is manually selected based on whether the generated descriptions make people want to visit the spot or not, and whether they want to drop by the spot while walking or not. We also consider using the

Google Place API, a service provided by Google that allows users to obtain information about places and facilities based on geographic information. By using this service, it is possible to obtain the top 5 word-of-mouth related to a spot.

3) How to select categories: The categories were selected manually from the Wikipedia table of contents and Google Maps. The Wikipedia table of contents lists the main sections of a page, and the sections that contain information related to the characteristics of a spot are selected and used as categories.

B. Automatic Generation of Explanatory Text

To generate attractive descriptions about a spot, we utilize categories about the spot, Wikipedia articles, and word-of-mouth information from Google Maps. Then, prompts based on these three pieces of information are given to ChatGPT to generate the descriptions.

In Chapter IV, we report on a questionnaire survey we conducted after generating the explanatory text.

IV. Investigation of the Adequacy of the Description

In this chapter, we report the results of a survey questionnaire based on the content described in section III-B. In this experiment, we generated descriptions of spots by combining categories, Wikipedia articles, and word-of-mouth information from Google Maps, and conducted a questionnaire survey of 12 university students (in their 20s) to see whether the generated descriptions adequately explained the attractions and features of the spots.

The survey was conducted in the following three spots.

- Kamigamo-jinja Shrine
- Kyoto Botanical Gardens
- ”STARDUST”(Cafe)

A. Generation of Explanatory Text

Spot descriptions are generated using ChatGPT. The following combinations of spot categories, Wikipedia articles, and word-of-mouth information from Google Maps were used as prompts to generate the descriptions. Table I shows a list of combinations.

The categories of Kamigamo-jinja Shrine, Kyoto Botanical Gardens, and ”STARDUST”(Cafe) are “history,” “flowers,” and “food,” respectively. However, since there was no Wikipedia article on ”STARDUST”(Cafe), no description was generated for ”STARDUST”(Cafe) for combinations that included Wikipedia content (CWS, CBW, CRW, CRAW).

TABLE I
Combination List

Name	Combination
NG	Nothing Given
CO	Category Only
CWS	Category and Wikipedia Summary
CBW	Category and Based on Wikipedia
CR	Category and Review
CRA	Category and Review using API
CRW	Category and Review and Wikipedia
CRAW	Category and Review using API and Wikipedia

B. Evaluation Method

In the questionnaire survey, participants were presented with explanatory text generated based on eight combinations and asked the question, “Do you think this is an appropriate description of the attraction and features of a spot when you are walking around the spot?”, “Do you think it is appropriate as a description of the attraction and features of the spot when walking around the spot?”. A five-point Likert scale was used to evaluate the descriptions, with five points being given for “strongly agree” and one point for “completely disagree. The average score for each description was then calculated and compared. The participants were then asked to rank the top three explanations that were adequately explained, and they were asked to select the top three explanations. The explanations ranked first were given three points, second two points, and third one point, and the total score was calculated and compared.

C. Results

Figures 2 and 3 show the results for Kamigamo-jinja Shrine. Both the questions using the Likert scale and the ranking were lower for the explanatory texts (CWS, CBW, CRW, and CRAW) generated by utilizing Wikipedia.

Figures 4 and 5 show the results for the Kyoto Botanical Gardens. All the questions using the Likert scale were highly rated in all the explanatory texts.

Figures 6 and 7 show the results for ”STARDUST”. All of the questions using the Likert scale were rated highly for all the explanatory texts. However, in the ranking, the explanatory text generated by combining categories and the Google Place API (CRA) received a

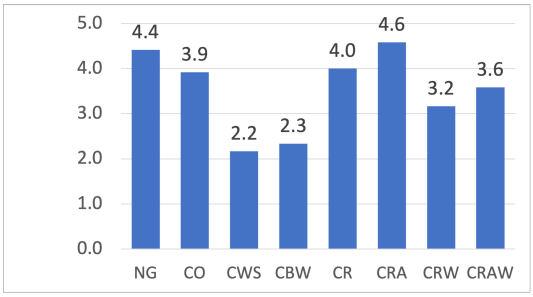

Fig. 2. Results of Validity Assessment Using Likert Scale at Kamigamo-jinja Shrine

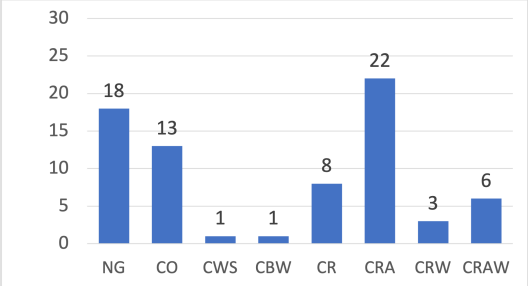

Fig. 3. Comparison results of rank total score of explanatory text about Kamigamo-jinja Shrine

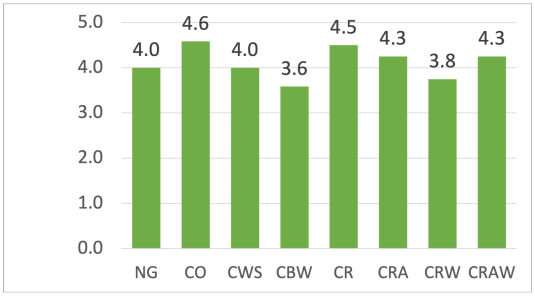

Fig. 4. Results of Validity Assessment Using Likert Scale at Kyoto Botanical Gardens

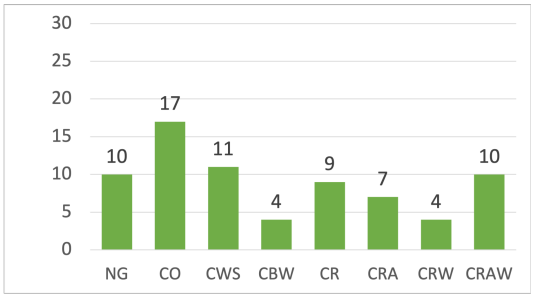

Fig. 5. Comparison results of rank total score of explanatory text about Kyoto Botanical Gardens

lower rating, and the method combining only categories received the highest rating.

D. Discussion

In Kamigamo-jinja Shrine, the explanatory text (CWS,CBW,CRW,CRAW) generated by utilizing Wikipedia received a low evaluation. This is because the Wikipedia article contained detailed historical information which made the explanatory text more difficult to understand, and thus was not appropriate as content to be provided during the walking tour. The fact that there were no history buffs among the participants may also have contributed to the low evaluation.

In the Kyoto Botanical Gardens, all the questions using the Likert scale produced high ratings for all the descriptive phrases. This is thought to be because the category of flowers was selected, which generated words such as “beautiful” and “healing,” making the respondents want to stop by during their walking.

In ”Stardust,” the evaluation of descriptions (CRA) generated by combining categories with the Google Place API was lower in the ranking, while the method that combined only categories received the highest evaluation. This outcome is likely because the reviews covered a variety of food items, leading to overly detailed descriptions that were not considered appropriate. In contrast, descriptions generated using only categories were simpler and more engaging, likely resulting in higher scores.

From the results of the survey of the three spots, there was no significant difference in the validity score depending on the method of acquiring word-of-mouth information. Therefore, we believe that there is no problem in utilizing the Google Place API, which can automatically acquire word-of-mouth information.

V. Conclusion

In this paper, we propose a method for extracting relevant information around a route and automatically generating explanatory text to encourage users to continue walking by making them feel enjoyment and happiness. We also investigated the validity of the explanatory text generated through a questionnaire.

In the case of Kamigamo-jinja Shrine, both the questions using Likert scale and the ranking were lower for the explanatory text generated by using Wikipedia. This may be because the detailed articles in Wikipedia made the contents more difficult to understand, and therefore, appropriate explanatory texts could not be generated. The Kyoto Botanical Gardens received high ratings for all the explanatory texts. This may be because words such

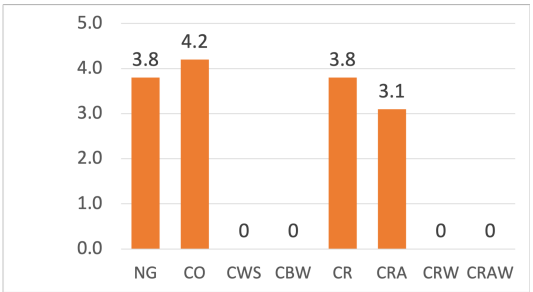

Fig. 6. Results of Validity Assessment Using Likert Scale at "STARDUST"

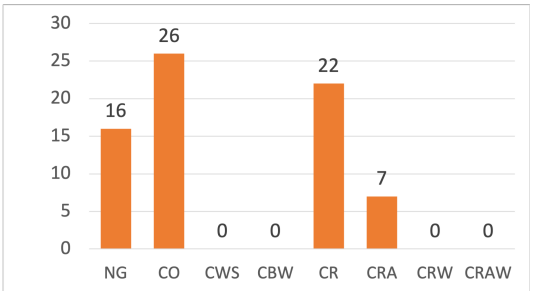

Fig. 7. Comparison results of rank total score of explanatory text about "STARDUST"

as "beautiful" and "healing" generated by the flower category made visitors want to stop by the botanical garden when walking. For "STARDUST", the method that used only the categories was the most highly rated. This is thought to be because the category-only method generated simpler and more interesting descriptions.

The survey results also indicate that a single description of a spot is not sufficient, so it is necessary to generate multiple categories of descriptions for each spot. Therefore, we will consider how to select the categories for each spot, and compare and evaluate which method is best. At present, we are considering three methods. The first method is to use categories defined by the user in advance. The first is to select categories based on whether they reflect the characteristics of the spot and whether they make walking more enjoyable. The second method is to select a category from the table of contents of the Wikipedia page. The Wikipedia table of contents lists the main sections of the page, and the sections that contain information related to the features of the spot are selected as categories. The third method is to use the categories generated by ChatGPT. The user enters the name of the spot in the prompt and asks the system to list several keywords related to the spot. The keywords are used as categories. We aim to compare and evaluate which of these selection methods are best.

Moreover, since each user has different interests, we believe that considering personalization is crucial for enabling the system to be effectively utilized by a broader range of users. At present, we envision not only a method for extracting related information around routes as proposed, but also utilizing data about walkers, such as their gender, age, and interests. By providing this information to ChatGPT and generating descriptions, we believe it may be possible to achieve personalization.

Moreover, the safety of the system during use also requires consideration. Looking at a smartphone while walking poses significant risks. Therefore, we plan to develop a system that delivers descriptions through audio. This approach allows walkers to proceed without looking at their smartphones, thereby enhancing safety.

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