

Embodying Latent Requirements with Unexperienced Attractions through Selection of Travel Point Photographs

Momoko Kato

Graduate School of Information Science and Engineering
Ritsumeikan University
Shiga, Japan
Email: momochii@de.is.ritsumei.ac.jp

Kenjo Yasui, Hiromitsu Shimakawa

Ritsumeikan University
Shiga, Japan
Email: {kenjo, simakawa}@de.is.ritsumei.ac.jp

Abstract—People who want to travel search for travel points satisfying their travel requirements. They search for travel points such that they feel attractions to fulfill the requirements. They want to search for them easily and quickly. In recent years, there are many people who use the Internet to collect information on travel points. They use the Internet because they can collect the information on the travel point anytime and anywhere. On the other hand, there are various kinds of information on a lot of travel points on the Internet. Users have to embody conditions to specify the travel point they want to visit. True pleasures of travels are to experience what they have never experienced. Requirements for travel points to seem to be attractive are quite unclear. For the recommendation of travel points, people want a tool to embody easily and quickly the conditions specifying the travel point they want to visit. Current search engines for travel points on the Internet utilize the user based collaborative filtering from travel histories of travelers. However, they cannot grasp what latent requirements travelers have and what kinds of attraction they expect, because they analyze travel histories. The paper proposes a recommendation method which enables users to embody each potential requirement for their travel beforehand. The method utilizes photographs of travel points to infer what latent travel requirement users have and what kinds of attractions they expect to fulfill the latent requirements. An experiment has proved that almost two thirds of subjects are satisfied with travel points recommended using this method. Furthermore, the method allows all of the subjects to decide on travel points they want to visit in a shorter time than the method they usually use.

Keywords—Travel; Trip; searching keyword; recommendation; preference;

I. INTRODUCTION

Some people go on a trip to relax their body and mind worn out in real life, while others aim to change their moods. They decide on vacation places based on events which incline them to trips. After they decide on vacation places, they would search for details of what they can experience there. For example, they would check foods specific to the places, famous sightseeing areas, accommodation facilities, and so on. The information collection continues until they are satisfied as long as their time allows. In these years, many people gather the vacation information with Internet, because they can search for the travel information anytime and anywhere with it. On the other hand, there is too much travel information on the Internet. A user must select appropriate travel information to decide on a vacation place. It is required for all users to find out

the travel information useful to decide on vacation places, in a short time and with little effort. Specifying keywords relating to vacation places to search engines on the Internet, people planning trips browse the vacation information to decide on a vacation place with Internet. The information collection does not need much effort, if users of search engines have embodied keywords which enable them to narrow candidate vacation places meeting with their requirements. However, the information collection is not easy in many cases, because users are likely to have only unclear requirements in the beginning of planning of their trips. To make the best use of the tools to collect travel information, we should support them to embody keywords representing their vacation requirements in their minds.

The pleasure of planning trips is the process of choosing vacation places, imaging themselves enjoying the places they search with the Internet. Some users find new vacation goals or their latent preference for trips, when they attain unknown vacation information which excites them in the planning. The new goals or latent preference for trips make it more difficult to embody keywords. Users with little knowledge on vacation cannot precisely embody keywords to represent vacation places meeting their goals and preference. They have little chance to find suitable vacation places matching their images. On the other hand, users with a lot of vacation experiences have often fixed their preference. They are likely to specify same keywords in all cases. They are disappointed with stereotyped trip images brought by search results. They fail to expand their expectation for a trip. Several travel recommendation systems have been developed with the user-based collaborative filtering from the travel histories [8] [9] [10]. But, it is the real pleasure of trips to visit places which provide entertainments users have never experienced. Users often have new goals and latent preference for trips. For new goals, the users have no knowledge to achieve them. For latent preference, the users often find them in places they visit by chance. Any existing system using travel histories cannot recommend vacation places matching with new goals and latent preference, because they are not attained from places they have visited in their past trips. It is likely to recommend users vacation places similar to what the users have been to. Users cannot be excited when the system recommends those vacation places.

This paper proposes a method to embody user requirements for a trip, which are ambiguous in the beginning of trip

planning. The method estimates goals and preference of user for trips, using photographs showing what users can experience in specific vacation places. In the process of searching for vacation places using photographs, it is easy for users to image themselves there. Suppose a user is pleased with a photograph of a specific vacation place, after imaging herself there. It is assumed that the photograph implies her goals and preference for trips, including not only apparent ones but also the latent ones. The proposed method has collected various goals and preference from many people, beforehand. Each photograph matches with some of them. The method associates terms representing them with the photograph in advance. It regards associated terms as keywords to embody her requirements for trips. The method lets the user specify the keywords in the search bar of existing Internet search engines for vacation places. It presents vacation places recommended in high ranking, which enable the user to decide on the vacation places matching with her goal and preference of trip.

The remaining of the paper is organized as follows. Section 2 describes the present state and problems of the searching for vacation places with the Internet. The method and the usability of the photograph are presented in Section 3. Section 4 illustrates experiments to verify the usefulness of the method. The paper discusses the experiment result in Section 5. Section 6 gives the conclusions and future works.

II. HOW USERS SEARCH TRIP PLACES

A. Requirements in search of trip places

This paper defines a trip goal as what a user wants to experience in a vacation place. For example, a user wants to relax her body and mind with a hot-spring or refresh her in nature. In addition to that, the paper defines a trip preference as what the user wants to experience in the trip to achieve her trip goal. For example, she prefers outdoor hot springs to others, or wants to view a deep-blue sea from a height to refresh in nature. Before the trip, the user would enjoy imaging the way she would experience when she visits a specific vacation place to achieve her trip goal with her trip preference. The paper refers to a trip image as what she envisions for experience she would take in the trip. Suppose a user desires to relax her mind and body, or to refresh her viewing deep-blue sea from a height. She would search for a vacation place, imaging her experience of them. Before a trip, a user would mostly plans for the trip. She plans a trip according to conditions in the trip such as trip goals, partners, their preference, and so on. Imaging concrete situations in the trip under the conditions, the user chooses a specific vacation place. Let us consider a trip with intimate friends for a long time. The trip planner comprehends well common preference between her and the intimate friends. She would make a trip plan, choosing vacation places which make both of her and the friends enjoy. When she thinks those vacation places, she images herself and her friends enjoying scenes and their conversation at those vacation places. When she thinks that one of those vacation places is suitable in this trip, she decides to go on a trip in that place. In this way, the user enjoys the process of deciding a vacation place imaging situations in the trip, as well as the trip itself. It is due to the increase of her expectation for their trip by the imaging. She gets excited, while she is making concrete trip images along with the trip goals and trip preference. Sometimes, she finds new trip goals or trip preferences which excite her,

because she attains unknown vacation information. It enhances options in the trip, which makes the trip plan more pleasant for her. On the other hand, if she fails to make her trip goals and trip preference clear, she can never proceed to the step to decide on an exciting vacation place, because she imagines no concrete situation. Travel agencies would recommend vacation places, interviewing travelers. In the interviews, they would make unclear trip goals and trip preference to clear ones to excite the travelers, in order to find good vacation places. One of roles of travel agencies is to provide unknown vacation information for customers, increasing their expectation for their trip.

B. Searching for vacation places with Internet

We have conducted a questionnaire to survey user requirement for time used for the search of vacation places, in advance. In the questionnaire, users are asked whether they prefer search in a short time if they can find suitable vacation places. About 92% people respond “yes” in this question. It reveals people want methods with which they can find information to decide on vacation places in a short time and without efforts. As one of those methods, a lot of people use the Internet. According to the investigation in 2012 [1], 45.2% people gather the vacation information using Internet, which means the Internet is more frequently used than any other major medias such as TVs, radios, and newspapers. One of reasons which make the Internet the most popular tool is that we can search for the travel information anytime and anywhere with it. For example, if users ask travel agencies to make travel plans, they must visit the agencies during their business hours. In other words, they cannot make plans for trips if they have no time in the business hours. Using the Internet, they can search for travel information even in the midnight. On the other hand, there is too much travel information on the Internet. A user must select appropriate travel information so as to decide on a vacation place she wants to visit. Keywords on vacation places must be specified in the existing search engines, such as Google [2] and major support sites for travel planning [3]. Suppose a user desires to visit hot springs she can visit within 3 hour driving from her home town. She specifies the keywords such as the province names around her home town and “hot spring” in the search bar of Google. It provides many web pages including the province names and keyword “hot spring” in their titles and contents. She looks for useful information in order to plan her trip from the Web pages.

C. Problems in Internet search

In the Internet search with keywords, a user must embody her trip goals and preference in advance, so that she can specify them in the search bar. It means that she can search for suitable vacation place using the Internet only if she has embodied her trip goals and trip preference. The constraint brings about harmful influences. Users with little knowledge on trips would have difficulties to embody their goals and preference for trips. The lack of embodied goals and preference prevents them from expanding trip images. Without expanded trip images, they cannot conceive good keywords to be specified in search with the Internet. Consequently, they have little chance to find suitable vacation places matching their trip images. On the other hand, users with a lot of trip experiences have often fixed their trip preference. When they search for vacation places

in the Internet, they are likely to specify same keywords in all cases. They are disappointed with stereotyped trip images brought by search results. They would not be excited in conventional events which they experienced in different places. They experience nothing novel. They fall into a condition that there is no places which they want to visit although they want to go on trips. There is a common issue in both of users lacking trip experiences and ones abundant in trip experiences. They cannot figure out clear trip goals and preference enough to make them excited, when they make trip plans. In order to make search of vacation places with the Internet beneficial to them, it is inevitable for them to embody their trip goals and preference.

D. Related works

There are existing studies to recommend vacation places to users using the Internet [4][5][6][7]. As it is described in the previous section, users have to embody their goals and preference of trips so as to express them as keywords. In order to solve this problem, the works in [8], [9] and [10] address to recommend suitable vacation places matching their trip goals and preference. These works use location information of pictures the users have taken in vacation places as their travel histories. The works recommend vacation places through the user-based collaborative filtering from the travel histories. However, they leave 2 issues unsolved. First, they cannot provide any vacation places matching new trip goals or preference, because they use travel histories. Users cannot be excited when they recommend the users vacation places similar to what the users have been to. Second, users get excited when they are going to experience something matching their latent trip goals and preference. However, it is not easy to embody latent trip goals and preference so that they can express them as keywords. In order to solve these issues, we need to let users get aware of their unknown trip goals and preference they have never experienced. In addition, we need to reflect their unknown trip goals or preference to the result of recommendation. Furthermore, according to Section II-A, it is important for all users to identify their trip goals and trip preference, in a short time and with little effort.

III. METHOD TO EMBODY TRIP GOAL AND PREFERENCE

A. Categories and tags

The paper proposes a method to embody trip goals and preference of users from their browsing logs of trip place photographs on a web site. When the users see photographs of vacation places, users can momentarily judge whether they want to visit or not there, because photographs give users more intuitive impressions than texts. In addition, photographs represent vacation places as they are. Users can expand easily their trip images through photographs of vacation places. Photographs express moods, which are difficult for texts to convey. Consequently, users can expand their trip image from photographs more concretely than text. The paper assumes that a photograph presented to users on a web site has one big object and background, as depicted in Figure 1. When users looking for vacation places see photographs of specific sightseeing points, they immediately judge whether vacation places in the photographs match with their trip goal or not. If they match, the method assumes they want to enjoy the mood big objects and backgrounds in the photographs bring. This



Fig. 1. Photograph using proposed method

paper refers to the mood as a category. It is expressed with a phrase such as "hot springs" and "landscape". The category is used to estimate a trip goal of an user. In addition to that, this paper refers to the object shown in the photograph as its core as a tag. The tag is also expressed with a phrase such as "outdoor bath" and "sunset". The tag plays an important role to estimate trip preference of the user. When a user searches for vacation places using photographs, it is easy for her to image herself in the vacation place. Imagining herself in the vacation place, she considers whether the background and the object in the photograph suit her trip preference. In this process, she embodies her unclear trip preference, seeing the object in the photograph.

Photographs used in this study have more than one category and tag. For example, the photograph in Figure 1 has the categories, "nature" and "Buddhist temple", and the tags, "tinted autumnal leaves" and "temple". Various categories and tags are chosen to represent trip goals and preference common to many users. We prepare so many photographs that they should cover all common trip goals and preference without loss. We make correspondence of each photograph to some of trip goals and preference. Users can embody their unknown trip goal and preference when they see the photograph in the process of imagining their trips.

B. Embodying trip goal and preference from photographs

The method makes trip goals and preference of users clear so that vacation places can be easily searched with exciting search engines on the Internet. It lets users embody their trip goals and preference, which would be used as keywords for search engines. Users are supposed to specify the keywords for search engines to find vacation places suitable for the users. Figure 2 illustrates the overview of the method. In the method, users increase points of photographs which contain her favorite combination of objects and backgrounds. The increment is referred to as "evaluation" by users. The points are provided for categories and tags associated with the photographs. In the screen where many trip photographs arranged in a random order, the method lets users evaluate her favorite ones. The trip photographs are arranged on the screen, according to the order calculated with Equation (1). p_m is the probability category m is selected. E_t is the entropy of time point t .

$$E_t = - \sum_m p_m \log_2 p_m \quad (1)$$

Through the user evaluation of photographs, the method estimates their trip goals and preference. As Equation (1)

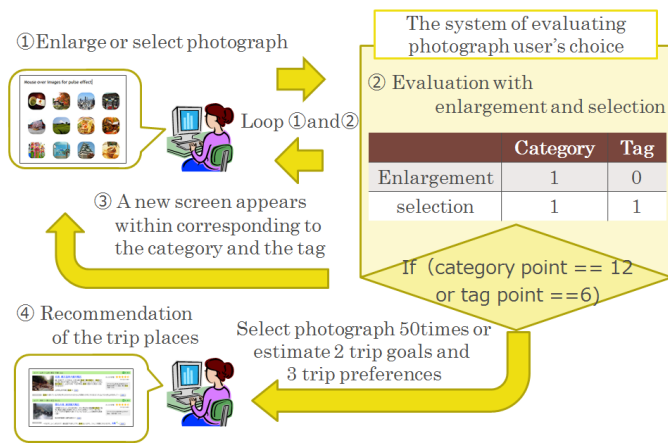


Fig. 2. Overview of method



Fig. 3. Screen of evaluation

shows, trip photographs on one screen are arranged so that the entropy in the screen is maximized in terms of trip goal and preference. When users choose specific ones from randomly arranged photographs, they are biased against the particular trip goal and preference represented with the photographs. Suppose a specific category or tag reach is evaluated more than a predefined threshold times by a user. The user is estimated to have interests in a trip goal or preference corresponding to the category or the tag. At that time, a new screen appears. The screen is filled up with new photographs corresponding to the category or the tag chosen in the previous screen. The method lets the user evaluate photographs in the new screen, again. It aims at estimating other trip goals or preference, assuming the uses have the chosen trip goals and preference. When the number of estimated trip goals and preference reach to predefined one, the method finishes evaluation of photographs by user, considering it has already gather trip goals and preference sufficiently. After that, it passes estimated trip goals and preference as keywords of search engines to recommend vacation place.

C. Evaluation with enlargement and selection

The method estimates trip goals and preference of a user by evaluating photographs. Figure 3 shows the screen for evaluation with photographs. From the screen, a user is assumed to enlarge or select photographs which suit her trip goals and preference.

A photograph is enlarged when its main object pleases her, as depicted in figure 3. Since the size of photographs for the evaluation is 64 pixels in both of the length and width, the user would desire to make their image clearer with a simple way, when they focus on them. A user can enlarge photographs when the mouse pointer hovers over them more than 1 second. When the user enlarges the photograph, the method adds a point to the categories the photograph corresponds to, because the method regards she likes the mood it presents.

The photograph is selected when the enlarged photograph is clicked. When the user judges the photograph suits her trip preference after her enlargement, she selects it to confirm its detail. The method considers the user takes the selection action, because she has strong interests in the photograph after the enlargement. The method regards she tries to confirm its detail

with the selection, when she has judged its object suits her trip image well.

Suppose a user enlarges and selects the photograph having a hot-spring category and an outdoor bath tag. The method estimates that she is pleased with the mood the photograph presents. It adds a point to the hot-spring category. At the same time, the selection makes the method estimate that photograph suits her trip preference. The Outdoor bath tag gains a point.

D. Recommendation of vacation places

The trip goals and preference of the user are extracted as categories and tags represented with phrases. Using extracted phrases as keyword, the method searches for vacation places with a major travel support site [3] for travel planning. The site provides vacation places associated with the keywords in their information and reviews from other travelers. The method recommends the top 5 vacation places in the recommendation ranking. It recommends more than one vacation places because the user can choose geographically suitable places for her trip. Suppose the categories and tags finally estimated as trip goals and preference of the user are “hot spring”, “outdoor bath”, “sunset” and “sea” through the evaluation of photographs. The method searches for vacation places, presenting the estimating phrases as keywords. As a result of the search based on the keywords, some hot spring resorts are presented such as ones allowing traveler to enjoy sunset from the outdoor bath.

IV. USABILITY OF RECOMMENDATION USING PHOTOGRAPHS

A. Threshold for evaluation times

We have developed a Web based system to evaluate the usability of the method. The system presents numerous photographs using several screens. When a user evaluates a specific category or a specific tag more than predefined times, another screen appears, filled with new photographs. The thresholds for the evaluation times for categories and tags are θ_c and θ_t , respectively. We have conducted a preliminary experiment in order to decide on the thresholds. The preliminary experiment examines the combination of the 2 kinds of thresholds which brings the largest satisfaction of users for vacation places. Let us refer to the number of enlarging or selecting photographs associated with a specific category or a specific tag as the number of evaluation times. Table I

TABLE I. COMBINATION OF THE NUMBER OF EVALUATION

	A	B	C	D
Number of evaluation for category	8	10	12	14
Number of evaluation for tag	4	5	6	7

TABLE II. LIST OF CATEGORIES AND TAGS (1)

landscape	nature	hot springs
seaside	tinted autumnal leaves	outdoor bath
native province	cherry blossoms	indoor bath
prospect	bamboo forest	hot spring district
river	pine-covered area	public bath
star sky	valley	
night view	forest	

shows 4 kinds of combinations of the number of evaluation times for categories and tags examined in the preliminary experiment. 100 Vietnamese university students from 19 years old to 20 years old have joined to the experiment as test subjects. The 100 test subjects are divided into 4 groups, each of them consists of 25 people. Let us refer to them such as “A”, “B”, “C” and “D”. In the preliminary experiment, subjects use the web site, imaging the place which they want to visit in Japan. They choose their favorite vacation places among recommended ones. They express their satisfaction degrees for each vacation place recommended as a final result in a questionnaire. Since combination C brings the highest satisfaction, the thresholds for the evaluation times to present a new screen are $\theta_c = 12$, $\theta_t = 6$.

B. Experiment to verify usability of photographs

We have conducted a main experiment to verify the usability of this method, under the following condition. When the number of estimated trip goals and preference reach to predefined thresholds for trip goal, θ_p , and for trip preference, θ_o , the method finishes evaluation by a specific subject. In the main experiment, $\theta_p = 3$ and $\theta_o = 2$. Furthermore, the method finishes the evaluation in case a subject evaluates photographs more than the predefined maximum number. In the main experiment, the maximum number of the evaluation is 50. Table II and Table III show the categories and tags used in this experiment. The categories and tags are determined referring to the items of trip genre in a travel support site for travel planning [3] so that any prejudice affects the arbitrariness of the experiment. To prepare trip photographs used in the experiment, the names of categories and tags in the Table II and III are specified as keywords in Google visual search [11]. From photographs the site presents, we manually select photographs suitable for trip photographs from viewpoints of comprehensibility.

There are 4 points to be verified in this experiment. The first point is the ability of trip photographs to allow users embody their trip goals and preference. The second one is the satisfaction degree of users for vacation places recommended based on the embodiment of their trip goals and preference. Third, we have examined whether users can search for vacation places matching their trip goals and preference in a short time. Finally, we verify the method enables users to search for more easily vacation places, compared with the major support sites

TABLE III. LIST OF CATEGORIES AND TAGS (2)

event	sport	Buddhist temple
carnival	camp	temple
illuminations	water sports	shrine
the Star Festival	mountain climbing	
tradition	ski slope	
	sea bathing	

TABLE IV. LIST OF CATEGORIES AND TAGS (3)

leisure spots	vehicle	history	Japanese-style hotel
amusement park	sightseeing boat	Japanese castle	seafood
aquarium	ropeway	historic spot	food of the mountain
zoo	truck	historic building	tea lunch
botanical gardens		old highway	atmosphere
shopping		garden	European
art gallery			
pasture			

for travel planning. The test subjects are 18 male students and 7 female students of universities in Japan. Their ages range from 18 years old to 26 years old. The experiment compares the proposed method with the way with which people generally search for vacation places with search engines through the Internet. The paper refers it to as the conventional way. This experiment supposes 2 situations. The first one supposes a user searches a spring trip in a place where she and her friends have never been. In the second one, a user searches for vacation places which please her close friend or her boyfriend in their winter vacation. In this experiment, 25 test subjects are divided into 2 groups: A and B. The grouping aims to reduce the influence of test subjects which have variance in their ability to image the specified situation easily. The experiment lets one group apply the proposed method to the spring situation and the conventional method to the winter situation, while the other searches for vacation places for the spring situation with the conventional method and for winter situation with the proposed method. This experiment lets each of test subjects search for a single vacation place which best suits for an image the test subject has for each situation.

In the experiment, first, a user searches for one vacation place which satisfies her best for the specified situation, using the conventional method. Second, using the proposed method, the user chooses one vacation place which best suits for the other situation. Finally, in regard to the vacation places they find out in the process above, we have asked several questions to the user. After the proposed method estimates the trip goals and preference of the user, we have prepared 3 sets of keywords; the first one consists of only the trip goals, the second includes only the trip preference, and the last is composed of both of the trip goals and the trip preference. For each of 3 keyword sets, we have collected 5 vacation places at most. Since the number of collected vacation places varies with keyword sets, the total number of recommended vacation places ranges from 5 to 15. Each test subject determines a single vacation place he or she wants to visit most.

C. Embodiment of trip goals and preference

We examined whether users can embody their trip goals and preference with trip photographs. In the questionnaire

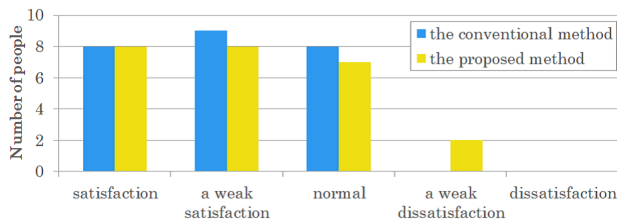


Fig. 4. User satisfaction

TABLE V. Average and dispersion of working time

	Conventional method	Proposed method
Average	35.32	7.045
Dispersion	387.25	12.39

asking “Can you embody your trip image with the trip photographs?”, about 92% users said “yes”. It showed users were able to embody their trip image. It seemed that users enlarged or selected trip photographs to see the details of what were presented in the photographs. They examined the details to see whether the photographs met their goals and preference. Operations of enlarging or selecting photographs implied trip goals and preference of users. Furthermore, in interviews after the experiment, some users uttered that the photographs made them aware trip preference they had never found. As a result, users were able to find out their latent trip preference from the photographs.

D. Satisfaction for vacation places

Let us see whether users were satisfied with vacation places recommended based on their trip goals and preference. According to the results of the experiment, about 64% of users were satisfied with recommended vacation places. Figure 4 compares the number of users satisfied with the proposed method with that of users satisfied with the conventional method for the same situations. The comparison of the 2 results indicates the proposed method recommended vacation places with the same level of satisfaction as the conventional method.

E. Time for searching

Since most users need a recommendation method which presents vacation places with few operations, it is important whether users can search for vacation places corresponding to their trips goals and preference in a short time. Table V compares the proposed method with the conventional method in terms of the working time, and its mean along with the deviation, respectively. Users took 7 minutes in average to find out favorite vacation places with the proposed one, while 35 minutes in average with the conventional one. Moreover, all of users were able to find out the vacation places in shorter time with the proposed one than the conventional one. Together with the result of the previous section, the proposed method contributes to finding as much satisfying vacation places as the conventional method in a shorter time.

F. Effort for searching

It makes no sense if users need lots of effort to search for vacation places using this method. There are the results

of the questionnaire asking the following 2 points. The first question is “which method makes you go into deep thought, the conventional method or the proposed method?” The second is “which do you think impose more bothersome operations, the conventional method or the proposed method?” In the first question, about 72% users said “the conventional method”. In the second question, about 76% users said “the conventional method”. In regard to the result, we have tested any difference of this method from the conventional method with the chi-square test. The null hypothesis was that there was no difference between the conventional method and the proposed method, while the alternative hypothesis was that there was a difference between them. Table VI and VII show the test results. Regarding to the first question, there was a difference at the significant level of 5%. There was a significant difference in at the 1% level as for the second question. From both viewpoints, the proposed method allowed users to search for easily vacation places than the conventional method.

TABLE VI. RESULT OF FIRST QUESTION

	Answer
Chi-square	4.84
Flexibility	1
p-value	0.0278069

TABLE VII. RESULT OF SECOND QUESTION

	Answer
Chi-square	6.76
Flexibility	1
p-value	0.009322376

V. DISCUSSION

A. Improving precision of estimation

Let us consider to improve the precision for the estimation of trip goals and preference of users. In the questionnaire to be answered in 5 grades, about 36 percent of users answered “normal” or “a weak dissatisfaction” with vacation places the proposed method recommends. As reasons of the dissatisfaction, some users mentioned the followings.

- 1) “It does not seem photographs I have chosen are not reflected to determine vacation place candidates.”
- 2) “Though I have chosen many food photographs, the method mainly presents photographs of ruins or red leaves of autumn in the next screen.”

The dissatisfaction may attribute to low quality in estimating trip goals and preference of users using categories and tags associated with photographs.

Reason 1 implies a problem on the way to select new photographs to be presented for users from their operations on previous photographs. New photographs are selected using categories and tags attached to previous ones. It is suspected categories and tags are determined based on the arbitrariness of the implementers of the proposed method. Suppose a user prefers a photograph because she likes the sky presented in it, while tags indicating a temple and red leaves are attached

to it. Though the method values tags indicating a temple and red leaves, it never picks up the trip preference of the user directing the sky. In this experiment, the implementers have determined manually categories and tags, which allows the arbitrariness of the implementers to be reflected strongly on them. Consequently, it is conceivable trip goals and preference are estimated using photographs whose categories and tags are biased. It prevents the method from estimating proper trip goals and preference users have. We need an objective way to determine relevant categories and tags.

Reason 2 notifies us of unfairness in the evaluation of photographs. The method evaluates all categories and tags with a constant weight, when a user enlarges or selects a photograph. Objects on photographs have large variety in their size. Depending on the size, they provide different impressions. For example, if a user looks at a photograph with cherry blossoms expanding, she necessarily focus on the cherry blossoms. However, if a photograph shows cherry blossoms in small size in front of big Mt.Fuji, a user may not always focus on cherry blossoms. The evaluation with constant weights is unfair for photographs containing objects of various size. One way for the improvement is to reflect the size ratio of objects to weight to evaluate photographs.

Solutions on these problems would improve the precision in the estimation of trip goals and preference of users.

B. Improving satisfaction for vacation places

Some users show dissatisfaction for recommended vacation places, because the method presents only places they have already visited, or the method recommends vacation places they cannot visit. A main reason for the dissatisfaction is lack of consideration of travel histories and hometowns of users. Without the consideration, the method may recommend vacation places users have been to, or cannot visit geographically. The method can avoid the problems, taking travel histories and hometowns of users into consideration in advance. It needs to construct a data base reflecting travel histories and hometowns of users. The data base should classify vacation places associated with categories and tags into geographical areas to calculate the accessibility of users. It should also register vacation place each user has been to in advance. Recommendation of vacation places using the data base satisfies more users.

VI. CONCLUSION

This paper has proposed a method to embody user requirements for trips. The method estimates trip goals and preference of users who enlarge and select trip photographs during they are making trip plans. After the estimation of the trip goals and preference, the method specifies them as keywords in a major support site for travel planning, to get recommends on vacation places which suit for trip goal and preference of each user. An experiment has proved about 64% users are satisfied with vacation places recommend using this method, which is as reliable as conventional methods. All of users can materially shorten the time to decide on their vacation places with the proposed method than with the conventional one. Users can decide on trip plans suitable for them in a short time with the method. We have also discussed objective categories and tags, as well as construction of a data base to enhance user satisfaction as our future works.

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