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A Suggestive Recommendation Method to Make Tourists "Feel like going"

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Abstract: Stroll becomes a major style of sightseeing. Most conventional systems for navigation or recommendation of sightseeing spots in such sightseeing style support efficient sightseeing by giving users detailed information of spots or routes. However, such detailed information may restrict movement and chance of discoveries for tourists. It is supposed that if tourists walk freely in a sightseeing area then they discover their favorite spots by themselves. Such experience may remain in tourists' memories more strongly than that in which they visited recommended spots. Accordingly, our goal is to propose a system which shows recommended spots in a suggestive way. That is, our system gives a chance to walk to a direction of recommended spots, does not recommend a spot or a route to the spot obviously. In this paper, we consider how to provide information about spots on a map to make tourists feel like going to the direction on their own will. More precisely, we propose abstraction level of information about spots. The less information is inconvenience, the more opportunities for discoveries may be given to tourists. As a result of experiments, it was demonstrated that a medium-level of abstraction has a good balance of guidance and free activity.

Keywords: User Interfaces, Suggestive Methods, Recommendation, Support Systems, Tourists

1. INTRODUCTION

1.1 Background

The tourism industry has grown on a mass global scale in recent years, and has a significant role to play in the industrial activities of modern society. In Japan, economic expectation toward tourism are also rising, and various measures have been implemented for the realization of a tourism-oriented country. That is, tourism is expected to be one of the key industries of the twenty-first century.

In the previous tourism trends, many tourists participated in tourism where all of a destination, route, and time were predetermined by a travel agency. However, in recent years, many tourists decide on their destinations and route by themselves and enjoy their trip freely. One of reasons for this is that sharing information has become popular among the general population due to the spread of web services. Tourists are easily able to obtain information about their destinations in advance because much information are posted by others on web services. Ishimori (2001) says that tourism conducted in this way is called "autonomous tourism", whereby tourists design their own itineraries to their preference. In other words, the present trend is for tourists to visit their preferred places at their preferred times.

However, many navigation systems for sightseeing that have been developed in recent years place a high value on efficiency. One of the example is the showing the shortest route to a destination. Another example is the recommendation of route based on information sharing on web services. Lucchese et al. (2012) and Lu et al. (2010) have devised algorithms for personalized route recommendation in tourist destinations utilizing photos posted on photo-sharing sites, for example flickr (2004) and Panoramio (2005). It is very convenient for tourists who visit a sightseeing spot that they are unfamiliar with. However, tourists who use such systems only follow the route proposed by the system, and opportunities for new discoveries in the sightseeing spots by enjoying strolling within the available time decrease.

It is certainly convenient for tourists to obtain a variety of information before sightseeing. However, Maeda et al. (2006) says that the best part of sightseeing is to discover something unique to the destination and to experience it. In addition, attractive tourist destinations tend to vary depending on the circumstances of the moment, such as changes in seasonal scenery and weather. That is to say, we can indicate the possibility of missing out on interesting tourist attractions in the locality due to the tourism plan being restricted by the recommendation in advance.

It is supposed that if tourists walk freely in a sightseeing area then they discover their favorite spots by themselves. Such experience may remain in tourists' memories more strongly than that in which they visited recommended spots. However, if tourists have no information about spots, they act only on their own preference. That is, no support by a system may give free activity to tourists, but the fact remains that no recommendation by a system also restrict the possibility of new discoveries for tourists.

1.2 Our contribution

Accordingly, our goal is to propose a system which gives both of free sightseeing and recommendation of spots. That is, our system shows recommended spots in a suggestive way, i.e., give a chance to walk to a direction of a recommended spot, does not recommend a spot or a route to the spot obviously. Not to restrict activity of tourists, the system should not provide the detailed information about routes or recommended spots. In this paper, we consider the least amount of information about spots and how to provide the information on a map to make tourists feel like going to the direction on their own will. More precisely, we propose abstraction levels of information about spots. For example, as for positions of spots, we set four levels, a point, a direction, an area and no information.

The less information is inconvenience, but it may give opportunities for discoveries to tourists because their movement does not restricted by a predetermined plan. As a result of experiments, it was demonstrated that a medium-level of abstraction has a good balance of guidance and free activity.

A brief outline of this paper is as follows. In Section 2, we introduce other research related this study. Sections 3 describes our system proposal and system. Section 4 describes an evaluation of the system and consideration. Finally, we state our conclusions in Section 5.

2. RELATED WORKS

In the research area about navigation systems, there are some studies that try to give tourists chances of new discoveries by restricting information given to the tourists. These systems are based on the theory of the "FUrther BENEfit of a Kind of Inconvenience" (FUBEN-EKI) explained in Kawakami and Hiraoka (2012), which suggests that inconvenient things bring benefits in some cases. With advances in information technology, the notion of "anytime, anywhere" is taken for granted in modern society. In such convenient society, there are benefits which are overlooked because of too much emphasis on efficiency. The studies focusing on FUBEN-EKI, for example Nozaki et al. (2013), try to find these benefits by creating inconvenience intentionally.

Nakatani and Ichikawa (2010) proposed a sightseeing navigation system in which a user writes a sightseeing plan and its routes by hand before his/her sightseeing, and then uses it as a reference during his/her sightseeing. Since the handwritten routes have many distortions, the user cannot know the exact routes on site. Tanaka and Nakatani (2010) proposed a navigation system which hides the map of area within a radius of 100 meters around the user in accordance with the users' movement. Moreover, Takagi et al. (2012) developed a system that navigates users only using information on direction and spots that are scattered throughout the tourist destination, without any detailed map information (Fig. 1). These systems restrict map information given to tourists in order to promote interaction with environment. If tourists have insufficient information about their routes, they try to find it by themselves. As a result, they can find new discoveries. In these navigation systems, they focus on the information about map (i.e., route), not landmarks or recommended spots. For spots, these systems show detailed information, that is, their locations, photos, or introductory sentences.

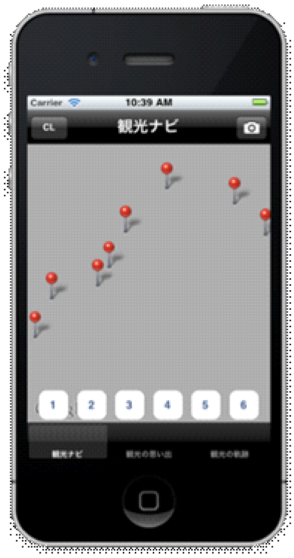


Fig. 1. An example of system screens in navigation system without route information

As for recommendation systems of sightseeing spots, there are studies that consider various conditions of spots or tourists. Oku et al. (2015) proposed the methods to recommend spots based on posted information (e.g., tweets in Twitter, or photos taken in the spots). Sugiura et al. (2014) evaluated the effect of the sightseeing application for smart phones which provides spots in Kyoto based on the current feelings of the tourists. However, these studies focus on which spots should be recommended to users at the time, but how to provide the information about the recommended spots. In the most of previous studies about recommendation systems, the detailed information about the recommended spots, such as their names, locations and photos are given to users.

Our goal is to provide some information in order to make tourists "feel like going", rather than the detailed information about the recommended spots. That is, we provide just a trigger to change their movement. Shikakeology, proposed in Matsumura et al. (2015), is the design method in which suggestive triggers change human behaviors or consciousness. "Nudge", explained in Yamane (2014), is one of the weakest triggers in Shikakeology. Nudge gently encourages human to take a particular decision or action. In the Shikakeology and Nudge, triggers do not prevent free behavior of users, and encourage them to a desired configuration. Our proposed system is the same concept of Nudge.

Kurata (2012) proposed the sightseeing support system, "Potential-of-Interest Maps", which have the similar characteristic to our purpose. The system visualizes the degree of attraction of tourist destinations at each spot from the vast amounts of information that have been posted on photo-sharing sites. That is, the area of which more photos are posted to the site are illustrated by deeper red. Users can know that the area has attracted attention of others, but cannot know what spots is in the area.

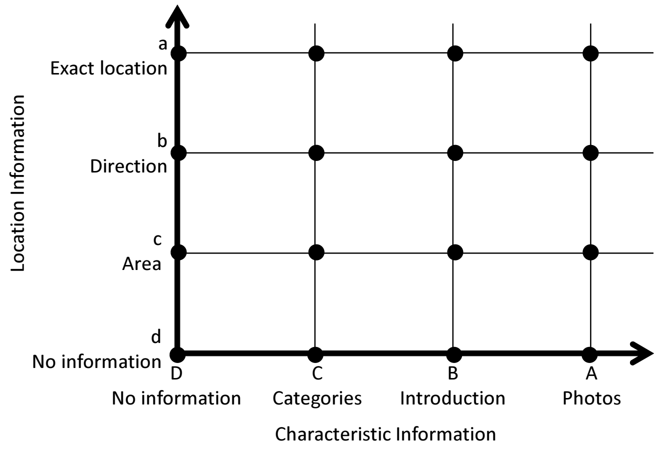


Fig. 2. Abstraction levels of characteristic and location information.

However, Kurata (2012) does not consider various methods of display potential areas.

3. PROPOSED RECOMMENDATION METHODS

3.1 Abstraction levels of information

Our goal is to propose a method which has a good balance of recommendation of spots and keeping free sightseeing activity of tourists. It is considered that if a system shows detailed information expressly about recommended spots then users read the information carefully, and follow the recommended routes to the spots. In this case, their activities are restricted by the system. On the other hands, if a system shows less information about spots, users may not be able to notice chances of new discoveries. Therefore, in this study, our system recommends sightseeing spots to users by providing least amount of information about them. That is, we consider what is the least amount of information that leads users to recommended spots, and how to provide the information on a map to make tourists feel like going to the direction on their own will.

Information about sightseeing spots is divided to information about what and where the spot is. The first one is called *characteristic information* and the other is called *location information* of the spot. For each of these two information, we propose abstraction level of the information. Figure 2 shows patterns of what information about spots is provided in our system.

The horizontal axis in Fig. 2 shows provided information about characteristics of spots. We propose the four levels defined by amount of information. In a general guide book about sightseeing, information about the spots consists of category (e.g., restaurants, historical architectures), detailed introductory sentences, and photos of it. Among these information, photos have the largest information and it gives tourists practical visual images of spots. Introductory sentences have the second largest information, and categories have the least amount of information about spots. Therefore, we set the following four levels about characteristic information:

- A: Photos: The system shows photos of recommended spots.
- B: Introductory sentences: The system shows introductory sentences of recommended spots (no photo is shown).
- C: Categories: The system shows categories of recommended spots, which is represented by colors.
- D: No information: The system shows the same alert for all recommended spots.

The vertical axis in Fig. 2 shows provided information about locations of spots. We propose the four levels defined by dimension to represent locations. That is, the zero dimensional information has the largest information because it shows the exact location of a spot. The one dimensional information shows the direction of a spot, and the two dimensional information shows the area of a spot. The higher dimensional information has less information about location. Therefore, we set the following four levels about location information:

- a: Exact location of spots: The system shows the locations of recommended spots by pins on a map.
- b: Direction of spots: The system shows the directions of recommended spots by arrows on a map.
- c: Area of spots: The system shows the surrounding areas of recommended spots by circles on a map.
- d: No information: The system does not shows information about location of recommended spots. That is, users can notice that the system recommends a spot, but cannot know where the spot is.

We propose the sixteen patterns of provided information about recommended spots by combination of one of the methods for characteristic and location information. For example, in a way combined by C (Categories) and c (Area), a circle colored by the category of the recommended spot is drawn on the surrounding area of the spot on a map. Table 1 shows the sixteen patterns of displays we proposed. Our system recommends a spot and shows information about it by using one of the patterns.

3.2 System screens

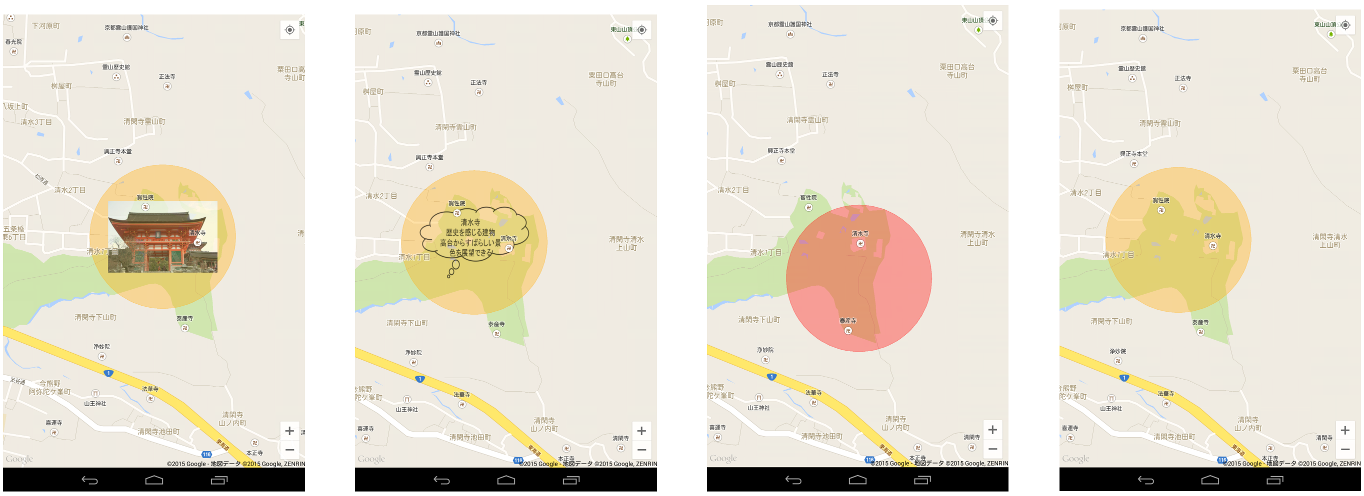
This section shows the actual system screens of our system which is based on the policy described in the previous section. Due to the limited space, we show eight patterns among the sixteen patterns.

Figure 3 shows the screens of four patterns which have the same abstraction level for location information, i.e., the surrounding area of the spot is represented by a circle. That is, each figure in Fig. 3 is A-c, B-c, C-c, and D-c. In Fig.3(a), the photo of the temple is shown on the circle, and the introductory sentences of the temple are shown on the circle in Fig. 3(b). The color of the circle in Fig.3(c) is red, which represents that the recommended spot is a historical architecture. The color of a circle is defined by categories of sightseeing spots. Table 2 shows the assignment of colors to the categories in our system. If our system does not show the category of a spot, the circle is drawn by orange. Figure 3(d) shows only the surrounding area of the spot by showing the orange circle.

Figure 4 shows the screens of four patterns which have the same abstraction level for characteristic information,

Table 1. Sixteen display patterns

Combination	Provided information
A-a	A photo of a spot are shown on a point at its location.
A-b	A photo of a spot are shown on an arrow representing its direction.
A-c	A photo of a spot are shown on a circle on its surrounding area.
A-d	A photo of a spot are shown on a circle at the current location of a user.
B-a	Introductory sentences of a spot are shown on a point at its location.
B-b	Introductory sentences of a spot are shown on an arrow representing its direction.
B-c	Introductory sentences of a spot are shown on a circle on its surrounding area.
B-d	Introductory sentences of a spot are shown on a circle at the current location of a user.
C-a	A point representing a location of a spot is drawn by a color of its category.
C-b	An arrow representing a direction of a spot is drawn by a color of its category.
C-c	A circle representing a surrounding area of a spot is drawn by a color of its category.
C-d	A circle representing the current location of a user is drawn by a color of its category.
D-a	A point is drawn at a location of a spot.
D-b	An arrow representing direction of a spot is drawn.
D-c	A circle is drawn on a surrounding area of a spot.
D-d	A circle is drawn at the current location of a user.



(a) A-c (b) B-c (c) C-c (d) D-c

Fig. 3. Examples of the system screen for each level of characteristic information.

Table 2. Color assignment for each category

Color	Category
Red	Historical architectures
Blue	Restaurants or cafes
Yellow	Stores for shopping goods or souvenirs
Green	View points of beautiful sight
Purple	Entertainment facilities
Orange	No category information

i.e., no information about the spot. That is, each figure in Fig. 4 is D-a, D-b, D-c, and D-d. In Fig.4(a), the exact location of the spot is shown by a pin, and its color is orange because no information about the category. Figure 4(b) shows the orange arrow representing the direction of recommended spot. In Fig. 4(c) and 4(d), the circle shows the surrounding area of the spot and the current location of the user respectively.

4. EXPERIMENT RESULTS

We developed a prototype system that has the sixteen interfaces for providing information about recommended spots, and conducted a survey experiment.

4.1 Experiment site

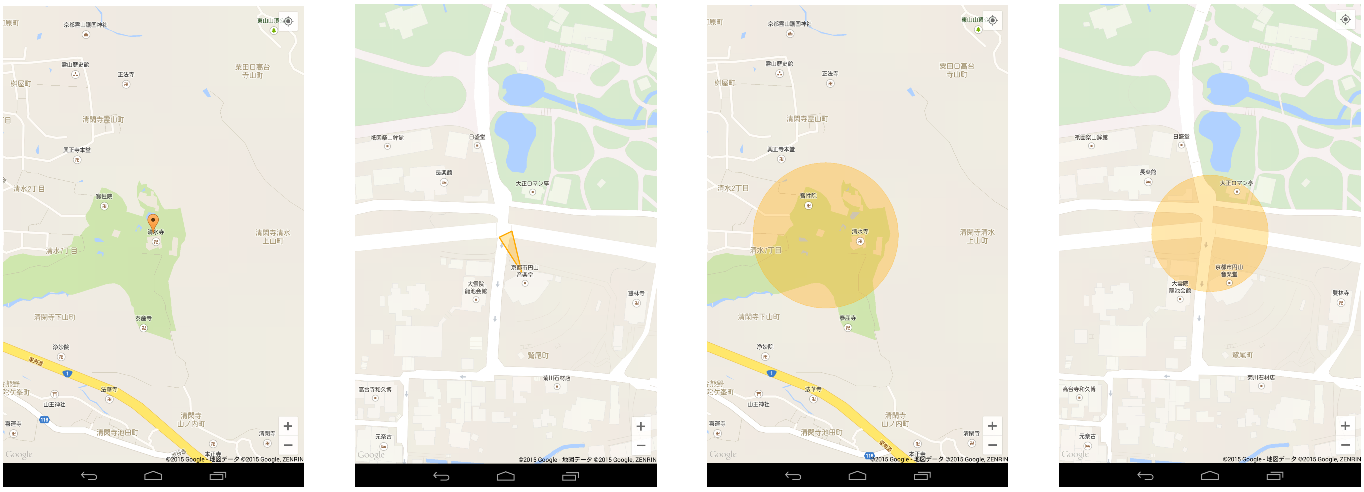
In our evaluation experiment, we set the sightseeing area as Gion and Kiyomizu area in Kyoto. The reasons for conducting the experiment area are:

- There are many streets suitable for casual sightseeing on foot.
- There are many sightseeing spots for every categories, including historical architectures, shops for goods and souvenirs, restaurants, and view points.
- These spots can be visited on foot.

The distance of North-South side of the area is about 1.5km, and one of East-West side is about 1.0km.

4.2 Recommendation algorithm

To recommend a spot to user, we use some recommendation algorithm. However, the availability of the applied algorithm is not focused on in this study. So, we use a simple recommendation algorithm: For each spot, conditions of season, weather, time or status of a tourist when he/she wants to visit a spot are listed up. The conditions and its degree when tourists want to visit a spot are assigned to



(a) D-a (b) D-b (c) D-c (d) D-d

Fig. 4. Examples of the system screen for each level of location information.

the spot. If a condition should be satisfied when he/she wants to visit a spot then the degree of the condition for the spot is 5. On the other hand, if he/she does not want to visit a spot under a condition, then its degree for the spot is 0. The middle degree is 3. The system recommends a spot to which a tourist can reach within 15 minutes on foot with a probability represented by the degrees of the satisfying conditions at the time.

To decide the degrees of conditions for each spot, we conducted the preliminary experiment in April, 2014. The evaluators were six university students (four males and two females). We listed up the sightseeing spots in the experiment site, and for each spot, the evaluators answered the degrees of each condition that should be satisfied when they visit the spot. The average degrees of them are used in our experiment.

4.3 Experimental procedure

We conducted this experiment with the cooperation of twelve university students (four males and eight females). The experimental procedure was as follows: First, evaluators were instructed on how to use the prototype system. The experiment site were divided to four areas, and in each area, each evaluator walked freely by using the system of which the interface fixed to one of sixteen proposed interfaces. In each area, each evaluator inputed his/her conditions, and the system recommended three spots based on the conditions sequentially. Each evaluator were applied different four interfaces with the same abstract level in terms of characteristic or location information in the different area. For example, one evaluator used A-a interface in the first area, A-b in the second area, A-c in the third area and A-d in the last area. Another evaluator used A-a in the first area, B-a in the second area, C-a in the third area, and D-a in the last area. Applied interfaces for evaluators was as follows:

- Two evaluators used the following interfaces:
  - · A-a, A-b, A-c, and A-d.
  - · B-a, B-b, B-c, and B-d.
  - · C-a, C-b, C-c, and C-d.
  - · D-a, D-b, D-c, and D-d.
- One evaluators used the following interfaces:
  - · A-a, B-a, C-a, and D-a.
  - · A-b, B-b, C-b, and D-b.
  - · A-c, B-c, C-c, and D-c.
  - · A-d, B-d, C-d, and D-d,

That is, each interface were applied to three evaluators, and the system of each interface recommended nine spots totally.

An observer walked with each evaluator, and checked whether the evaluator went to the recommended spots or not. After the sightseeing for each area, we asked the evaluators to answer a questionnaire for each interface they used.

4.4 Experiment results

Table 3 shows the ratios of the numbers of recommended spots the evaluators visited to the numbers of spots recommended by the system for each interface. For both of characteristic and location information, the visiting ratios tend to be higher if the amount of the given information is larger. As for the location information, the cases that the exact locations are given to the evaluators (pattern a) have high visiting ratios regardless the characteristic information of spots. Therefore, the evaluators tended to go the recommended spots based on the location information even if they did not know what the spots were. Notice that the area (c) and direction (b) information also have good visiting ratios averagely. So, the evaluators walked to the recommended direction or in the recommended area, and searched the their interesting spots. As the results, some spots where the evaluators visited were the same as the recommended ones.

As for the characteristic information, the photos and introductory sentences of the spots (pattern A and B) have high visiting ratios. The reason of this is guessed that the evaluators could have practical images for the recommended spots by seeing photos or reading sentences and that the images made finding the spots easy.

Table 3. Visiting ratios for each of 16 patterns

	A	B	C	D
a	8/9	8/9	6/9	7/9
b	6/9	6/9	3/9	1/9
c	5/9	5/9	3/9	3/9
d	3/9	2/9	1/9	0/9

Table 4. Average scores for each question

		A	B	C	D
Did you pay your attention to the recommendations from the system?	a	5.00	4.33	5.00	5.00
	b	5.00	3.33	4.00	3.33
	c	4.67	4.00	4.33	1.67
	d	4.67	4.00	4.67	1.00
Did you walk depending on the recommendations from the system?	a	4.67	4.00	4.33	2.67
	b	4.67	3.33	3.67	4.00
	c	4.67	2.67	2.67	1.00
	d	4.00	2.33	3.00	1.00

Table 4 shows the average scores for each question in our questionnaire. The first question about whether the evaluators paid their attention to the system or not, and the second question about whether they decided their movement based on the recommendation from the system. For the first question, most of the evaluators answered that they concerned about the photos from the system regardless location information. In the case that the photos of the spots were given, their movement were affected by the recommendations (see the answers for the second question). Since photos of spots give users visual images, it is possible that the evaluator walked looking for the spots. These tendencies are also shown in the case that the system provides exact location information. On the other hand, the evaluators did not give their attention to the system in the case that no information about both of location and characteristic information. Such a system that tourists do not watch its screen is inefficient. In the case that the location information of spots are given by their area or direction and their characteristic information are given by sentences or categories, the evaluators saw the recommended information but decided their movement based on not only the recommendations but also their own will.

From the results above, the interface satisfying our goal is one that characteristic information is given by introductory sentences and location information is given by an area of or a direction to a spot. When users see a photo of a spot, they have its clear image, but they create various images for the spot when they read only the introductory sentences. By given the area or the direction information, they can walk in the restricted area where the system recommends, and look for their interesting spots including the recommended spots.

5. CONCLUSION

This paper considered the recommendation methods in a suggestive way in order to give a chance to walk to a direction of recommended spot, not to recommend a spot or a route to the spot. We proposed abstraction levels of information about spots in terms of their characteristics and locations. As a result of a survey experiment, it was shown that the sentences for characteristic information and the area or the direction for location information have a good balance of recommendation from the system and free activity of the evaluators.

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