Chapter 7
Tourism Engineering for Supporting Stroll—What Is True Travel?

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Abstract Today, the types of tourism are diversifying, and tourists have different needs and their own style of sightseeing. Since tourists can obtain their interesting information about sightseeing area before their sightseeing, they make sightseeing plans to maximize their enjoyment within a limited time schedule before going sightseeing. However, from another point of view, this process seems to lose opportunities for new discoveries and encounters at the local sites of the tourist destination because the tourist follows the pre-planned sightseeing route. That is, it can be said that tourist behavior is restricted by information obtained in advance. In this chapter, the information systems based on Benefit of Inconvenience, which are proposed to generate the lost opportunities for new discoveries, are introduced. However, the great degree of inconvenience would be caused too great an effort to use the system. Therefore, we consider a mechanism with "allowable inconvenience" for sightseeing support. We discuss the allowable inconvenience from various perspectives: in terms of the details of information about sightseeing spots, the locations and timing of presenting information, and the design of presenting textual information about spots.

7.1 What Is True Travel?

I have been working on research to support tourism in the field of information engineering for about 10 years. During this period, my research has focused on tourism navigation systems, tourism information sharing systems, and so on. However, I myself still do not understand that "what tourism is." I face even more difficulty in answering the question, "what is 'true' travel?", which is the subtitle of this chapter.

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The history of tourism is said to be as old as the history of human civilization. Tourism styles have changed significantly due to the deregulation of transportation and the development of transportation networks such as railroads and expressway. Furthermore, major changes in tourism styles have occurred over the past 20 years due to the spread of the Internet and the increased use of social networking services (SNS) such as Twitter and Instagram. Today, a huge amount of information about sightseeing spots is available on the Internet, and SNS share information about things and experiences that other tourists have encountered actually in sightseeing spots. Much of such information includes photographs and video clips, which give viewers a visual sense of the sightseeing. In addition, information retrieval and recommendation technologies have also developed, and it is now possible to efficiently obtain information that the viewer prefers from among a huge amount of the information. Because of the availability of these technologies, many tourists often research information on sightseeing spots well and make sightseeing plans to maximize their enjoyment within a limited time schedule before their sightseeing.

Since tourists select sightseeing spots to visit from a vast amount of information, the use of these technologies seems to be enriching tourism. On the other hand, however, the tourist behavior of conforming to a predefined sightseeing plan also seems to lose opportunities for new discoveries and encounters at the local sites of the tourist destination. Before the Internet became widespread, tourists could only obtain information from pamphlets and guidebooks published by sightseeing spots, and they often obtained information on-site and planned their next sightseeing activities. However, advances in information technology have transformed tourism into an act of confirming that the local experience is "surely the same" as the previously obtained information. As a result, opportunities for interaction between tourists and local communities in sightseeing areas, such as communication with the local people and knowing the local environment, may be decreasing. That is, it can be said that tourist behavior is restricted by information obtained in advance.

7.2 Design of Inconvenient Tourist Navigation System

If the opportunities for interaction between tourists and local communities in sightseeing areas are decreased by giving large amounts of information to tourists in advance through the use of information technology, what can be done to regain the opportunities for interaction? The design theory of regaining benefits lost by convenient technologies and services by making them inconvenient is called "Benefits of Inconvenience" (Kawakami, 2019). As an example of system designs based on the Benefits of Inconvenient for supporting tourism, there are system designs that target navigation systems (Takagi et al., 2013a). In these systems, the opportunity for lost interaction is generated by purposely making some of the navigation functions inconvenient. In this section, some of the systems are introduced.

The function that a tourist navigation system should provide is to guide tourists to a desired sightseeing spot. These systems based on Benefits of Inconvenience aim to encourage tourists themselves to become aware of their surroundings through an inconvenient mechanism while providing this functionality. The idea for the inconvenient mechanism is derived from the sightseeing maps installed in sightseeing areas. On sightseeing maps, well-known or landmarked sights are indicated prominently. Thus, the direction and scale vary from map to map, and sometimes even on the same map. That is, the maps have no consistent description. Therefore, tourists look around them and compare the information on the map with their surroundings in order to confirm their own position on the map, the scale and direction of the map. Looking around them means paying attention to what is around them. In other words, this may make it easier for tourists to increase opportunities for interaction with the surroundings and to find interesting spots. The inconvenient tourist navigation systems (Takagi et al., 2013b) are proposed from this ideas.

Nakatani et al. proposed a navigation system using a hand-drawn sightseeing map created by tourists themselves before sightseeing (Nakatani et al., 2011). In the sightseeing using the hand-drawn map, tourists place icons of sights and landmarks they will visit on the electronic map and handwrite their travel routes before sightseeing. When they go sightseeing, the electronic map in the background disappears, and so they move along the route and landmarks that they have drawn. The hand-drawn map, as well as sightseeing maps installed in sightseeing areas, is less accurate than general maps. Thus, the hand-drawn map be expected to have the same effect as sightseeing maps, encouraging tourists to look their surroundings. Tanaka et al. also proposed a sightseeing navigation system that hides a map of a 100-m radius around a tourist (Tanaka & Nakatani, 2010). Because the hidden area is set based on the tourist's current location, the tourist cannot always see the area 100 m around him or her on the map. Of course, the map around the destination is also hidden when the tourist approach it. So, the tourist is required to search for the invisible route or environment on the map. Furthermore, a sightseeing navigation system that does not display maps and does not give any map information at all has been proposed (Takagi et al., 2012a, 2012b). In this navigation system, only the starting point, destination, and landmarks information on the route are provided. Tourists can confirm the appearance of the landmarks by the provided photos, and they can reach the final destination by visiting the landmarks in order. In all of these studies on supporting tourism, detailed map information is intentionally not shown to encourage tourists to take their eyes off the map and look at their surroundings and to promote interaction with the surrounding environment.

However, while these systems provide information to reach a destination, they require significant effort to reach the destination. In fact, in an experiment using a system that did not provide any map information (Takagi et al., 2012b), while it takes about 20 minutes at a typical walking speed to reach a certain destination by the shortest route, it took some collaborators two hours to reach that destination. While free exploration in sightseeing areas without the constraints of time is appealing, these cases were taking too long time. Hiraoka et al. provide a definition of Benefits of Inconvenience in (Hiraoka & Kawakami, 2019), in which they state that Benefits

of Inconvenience must have a subjective, objective effort and a subjective, objective benefit. The systems introduced in this section satisfy this definition of Benefits of Inconvenience, because, while they require more physical and psychological effort to reach the destination, they also have the benefit of enabling tourists to encounter various sights and experience enjoyment. However, if the effort required before the benefits are realized as great, it is difficult to motivate people to use these systems.

7.3 Sightseeing Support using Allowable Inconvenience

From the studies introduced in the previous section, it is shown that the introduction of an inconvenient mechanism into a tourist navigation system increases the interaction between tourists and surrounding environments and encouraging discoveries. However, if the effort for tourists caused by the inconvenient mechanism increased significantly, it would be difficult to motivate them to use the mechanism. On the other hand, if a convenient system is used to efficiently provide tourists with sufficient information, their behavior will be limited to the activities suggested by the system. Because of this observation, our research group has been considering a mechanism with "allowable inconvenience" that increases opportunities for interaction between tourists and the surrounding environment while providing a certain degree of convenience through system functions. This section discusses the allowable inconvenience from various perspectives: in terms of the details of information about sightseeing spots, the locations and timing of presenting information, and the design of presenting textual information about spots.

7.3.1 Allowable Inconvenience for Information of Spots

In this section, we consider a system that recommends surrounding sightseeing spots to tourists who enjoy strolling. Even in such a system, giving tourists detailed information about recommended spots will encourage them to visit the recommended spots, which seems that their behaviors is limited by the information. In contrast, if tourists are given too little information, since the effort to find interesting spots is high, various behaviors of tourists cannot be induced and new interactions cannot be encouraged.

From this motivation, we conducted a comparative study to determine the level of detailed information that would encourage tourists to change their behavior, but not take limited actions such as only visiting specific recommended spots (Hiraishi et al., 2018). For this purpose, we divided the information on sightseeing spots into two categories, that is, characteristics information and location information, and defined four levels of information detail for each categories. The characteristic information on recommended spots is classified based on the information written in general guidebooks to introduce sightseeing spots. Specifically, the information is

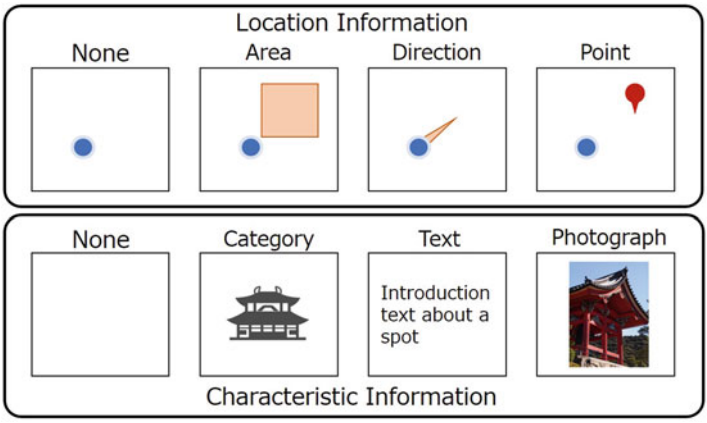

Fig. 7.1 The categories of the characteristic and location information.

classified by photographs or text and categories that indicate what type the sightseeing spot is. Photographs give tourists a concrete visual image of a sightseeing spot and thus have the highest level of detail in information. Text is the second most detailed because, although tourists have difficulties understanding the visual image of a spot from the text, they can guess about the spot from the text. The category shows the type of a spot, such as temples, shrines, cafes, etc., and so has the lowest level of detail. For location information, the levels of detail is set to the degree that location of a spot can be limited. That is, we set three types of information, a point for the exact location of the spot, a direction, and a range of the area in which the spot is located. For each category, we classified the information into four levels of details, including the case in which no information is given to a tourist. Figure 7.1 shows these categories of the characteristic and location information.

The comparative verification was conducted on 16 patterns of information presentation combining characteristic and location information. We asked the participants of the experiment to use each system of the pattern for sightseeing and analyzed their behavior. In the experiment, recommendation spots were selected by a recommendation method based on collaborative filtering using NMF (Non-negative Matrix Factorization). Twenty-four university students (18 males and 6 females) participated in the experiment. To enjoy sightseeing through conversation with a partner, we paired the participants. A total of 12 pairs were asked to explore a sightseeing area in Kyoto, Japan using one of the systems. Figure 7.2 shows an example of system screens in which it provides area and category information of a recommended spot. The location information is displayed in the upper half of the screen and the characteristic information in the lower half. We evaluated the impact of the system on the behavior of the participants based on their travel routes, observation of their behavior, and the results of their responses to the questionnaire. The results showed that a pattern combining area information indicating the approximate location of a spot and category information indicating

Fig. 7.2 An example of system screens: this screen shows the combination of area and category information for location and characteristic information, respectively.

the type of spot may guide the participants not only to the recommended spots but also to various other spots.

7.3.2 Allowable Inconvenience for Locations of Providing Information

As mentioned above, sufficient information about sightseeing spots is available on SNS and tourist information websites. Thus, before visiting a sightseeing area, most tourists research the sightseeing spots they are interested in and select spots to visit. In this case, tourist behavior is limited within a tourism plan because tourists follow the well-developed plan in advance. If tourists are not given information on sightseeing spots, they do not know what spots are available where. The tourist's behavior will be limited only to the area they coincidentally visit, and in this case, their behavior is also limited. Hence, we proposed to restrict locations to share information about sightseeing so that tourists are given information on tourist spots but not restricted in their activities (Takagi et al., 2013b).

Since tourists are restricted in their behavior by obtaining information before sightseeing, we consider making it impossible for them to obtain information before sightseeing. In other words, the tourists obtain information about sightseeing spots on-site at sightseeing area. There are various means through which information

Fig. 7.3 A journey note placed in a sightseeing spot.

is provided by sightseeing area, such as pamphlets, billboards, sightseeing maps, etc. The difference between these means and SNS is whether or not information is shared with other tourists. Information about actual experiences of other tourists is very useful for tourists who are deciding their future sightseeing activities. One existing tool for sharing information among tourists on-site at sightseeing spots is the "Journey note" (Fig. 7.3). This is simply a notebook placed in hotels and other facilities at sightseeing spots, and any tourist who visits the spot can freely write in and read the notebook. The minor information in the notebooks is interesting to the tourists who visit the spot, and unique communication is taking on among the tourists who read and write in the notebook. By restricting the locations where information is available, the value of the information is increased, and tourists are more interested in the information.

The proposal is described in detail. A virtual journey note is set up at a certain location, and access to that note is restricted to only those within a radius of a few tens meters from that location. There are no constraints on the location of the journey notes, but we assume that they will be placed at stations, locations of sightseeing maps, stores, and so on. Tourists who are within the accessible area can submit information to the virtual note and can view the shared information using their smartphones and other devices. They can also reply to shared information with reactions and comments. Thus, by sharing information locally at a sightseeing spot, it encourages tourists to stroll around the sightseeing area to obtain information, and then to stroll further based on the information they obtain there.

7.3.3 *Allowable Inconvenience for Timing of Providing Information*

The journey note introduced in the previous section only considers restrictions on the locations of providing information and does not consider the flow of the sightseeing. Tourists often set their main destinations, which are mostly well-known sightseeing spots, for sightseeing. They use transportation to get near their destinations, walk around the area, go to the destinations, and when they finish their visit, they move on to the next destination. Many tourists repeat this flow. In this section, we consider the location and the timing of providing information considering this flow of the sightseeing. Concretely, we proposed to delay the timing of providing information until after reaching of the main destination (Izumi & Takemoto, 2019).

Figure 7.4 indicates the flow of sightseeing when the providing information of sightseeing spots is delayed until after the visit to a destination. In this section, we consider a tourist strolling the area surrounding a destination spot. In many sightseeing areas, there are many souvenir stores and restaurants surrounding well-known sightseeing spots. Then, tourists visit the famous spot as their destination and explore the surrounding area. For such sightseeing area, the journey note in the previous section is set at the destination sightseeing spot. That is, tourists are given the restriction of being able to share and view information about surrounding spots only at that destination spot. In other words, they can obtain information on sightseeing spots in the surrounding area only after arriving at the destination. It can be expected that, after arriving at the destination, information about interesting spots that have not yet been visited will encourage additional sightseeing behavior. Furthermore, the information shared at the destination spot is constrained to be collected within a certain distance to the spot. That is, when tourists enter within a certain distance from the destination, they can collect information to be shared at that destination. In order to collect information before visiting a destination, which is a place for information sharing, tourists stroll around with no prior knowledge at the time of information collection. This approach is believed to encourage tourists to stroll the surrounding area to share valuable information at

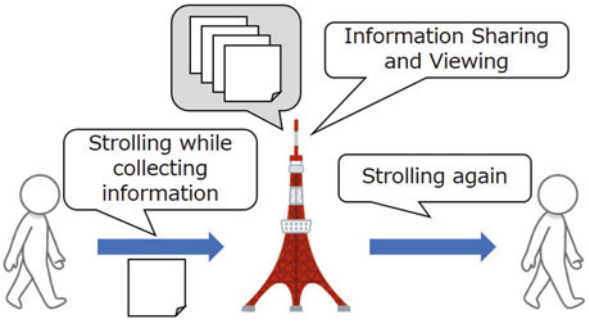

Fig. 7.4 Mechanisms for delaying the timing of information presentation.

their destination sightseeing spots, because of the desire for approval seen in SNS. Furthermore, obtaining new information at the destination could encourage strolling behavior again on the return way from the destination. Experiments were conducted around Kiyomizu-dera Temple and Gion area in Higashiyama-ku, Kyoto, Japan, using a prototype system that realizes this proposal. The results indicate that some participants made decisions about their next sightseeing activities based on the shared information at their destinations.

7.3.4 Allowable Inconvenience for Presenting Textual Information about Spots

One of the on-site information providers for tourists is an information board that introduces sightseeing spots. These information boards introduce the historical background and characteristics of the spots. Information boards can provide information to tourists on-site at the spots and are easy to introduce. However, the information boards installed in temples, shrines, and other historical buildings in Japan are very difficult for tourists to read because many of the words on the boards are unfamiliar to them. For this reason, some tourists have low motivation to read the text on the information boards.

In order to get tourists interested in reading the text on the board, a method of providing information that would attract the interest of them is necessary. For this purpose, it is better to provide information in a way that includes interaction with tourists and to present content that will attract their interest. One way to achieve this is to change the content on the board, but in our study (Izumi et al., 2020), we discussed a method to change only the presentation method without changing the content of the text on the original board.

We consider an interactive system in which words derived from the original text presented sequentially. More concretely, the next word is output when a visitor taps on the screen of a touch-panel digital signage. However, presenting the sentences in the order in which they are originally written is not enough to attract the interest of tourists. The proposed system presents words of interest to tourists as keywords first, in order to attract their attention even if the sentences contain words that are difficult for them to understand.

In the following, please note that this study is for the Japanese language. There are researches on interest in words for catchphrases or information exchanged in online chats. Catchphrases are similar to the role of the words we focus on in this study, because they need to attract the reader's interest in a short sentence. The results of the linguistic engineering analysis conducted by Yamane and Hagiwara (2012) show that catchphrases often have part-of-speech sequences such as "noun-particle-noun" and "noun-particle-verb." Ishii et al. (2004) discuss topics of interest to users in the message sequence for online chat. This study focuses on noun phrases connected by "no" (in Japanese, which is similar to the word "of"' in English)

between nouns and proper nouns as words that attract the user's interest. In these studies, nouns and noun-phrase words are used to attract viewers' interest. Thus, as a preliminary experiment, we extracted nouns and noun phrases containing proper nouns from temple and shrine information boards to investigate which words would attract the interest of tourists. The results indicate that noun phrases, which are combinations of verbs, adjectives, and nouns and nouns, are more likely to attract tourists' interest than proper nouns.

Based on the results of the preliminary experiment, our proposal is to present the noun phrases in an information board as keywords at the beginning. However, a tourist cannot understand what the original sentences express through the noun phrases only. Then, when the tourist selects the noun phrase presented first, other words related to the phrase are presented to help the tourist understand the meaning of the original sentence. In the related studies (Yamane & Hagiwara, 2012; Ishii et al., 2004), nouns are also shown as words of interest to users. Then, in our proposal, after one of the noun phrases is selected, other nouns in the same sentence are displayed. Furthermore, when that noun is selected, the verbs in the same sentence are displayed.

It would be difficult to understand the content of the text if the words in the text are presented in the order that tourists' interest, as in the proposed method. On the other hand, when words are presented in the order of their appearance in the original text, a tourist could easily understand the structure of the text, but the tourist would not be very attracted to it. We therefore conducted a comparative experiment using three systems to verify the degree of readability and attractiveness. The first system separates the sentences into phrases and provides the words one by one in the order they appear in the text on the information board. In the first system, the tourists easily understand the structure of the sentence because the words on the screen are always single and are provided in the order of appearance in the original board. The second system divides the text on the board into sentences, delimits each sentence into phrases. Then, for each sentence, the system presents the separated words in the order of their appearance in the original sentence. In this case, the words are presented for each sentence, so there are as many words on the screen as the number of sentences. In the system, the structure of individual sentences is easy to understand, but the structure of the whole texts is difficult to understand. The third system is based on the proposed method: Words of noun phrases of interest to the tourists are presented first, and then words related to those words are subsequently presented (Fig. 7.5). In this system, the order in which words appear is different from the order in which they appear in the original text. So, it is difficult to understand the content of the original text. However, since a large number of interesting words are displayed at the beginning, tourists may actively try to read and understand the content.

We conducted a comparative experiment using these three systems (Izumi et al., 2020). The results showed that the second system, in which words are displayed for each sentence, may make the user feel enjoyable and understandable of the sentences. The third system was evaluated as the most difficult to understand the contents of the original texts. At the same time, however, the third system showed

Fig. 7.5 Signs presenting only keywords of interest. The characters in the circles are keywords from the text written in Japanese

the possibility of encouraging the tourists to check many words and to take action to find interesting words among them.

7.4 Conclusions

This chapter introduces a tourism support system that includes an inconvenient mechanism. The existing studies introduced inconvenient mechanisms to increase opportunities for interaction between tourists and the surrounding environment. However, there were problems with the large amount of effort required of tourists caused by this mechanism which prevented them from being motivated to use the system. In contrast, this chapter presented case studies of how to support tourism through allowable inconvenient mechanisms that also provide some convenient functions.

Today, the types of tourism are diversifying, and tourists have different needs and "true travel" in terms of what they are looking for in tourism. The development of information systems provides tourists with high-performance functions, but the wrong direction or degree of support may interfere with the tourists' original trip. I believe that supporting tourists without restricting their actions or removing their choices of action is supporting their "true travel." In the field of behavioral economics, a mechanism for voluntarily guiding people in a desirable direction, rather than forcing them to do so, is called a nudge (Oliver & Ubel, 2014; Yamane, 2014). Similarly in tourism support, a system in which tourists voluntarily work on the surrounding environment to find new discoveries and opportunities is desirable, because it is an approach to support each tourist without changing their own travel style. I suggest that one of these approaches may be allowable inconvenient

mechanism. While many tourism support systems and applications have been proposed, how to realize such an allowable inconvenient mechanism is still an open question.

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