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Investigation User Attributes to Select Contents for Behavior Change on Sightseeing Application

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Abstract. Currently, many sightseeing spots and local governments have developed independent Web sites and mobile applications for promotion to tourists. However, local governments have developed Web sites and mobile application independently, it is causes difficult to manage the wide area content which integrate each content. The useful contents for a tourist should integrate sightseeing spots on wide region with each municipality. For reasons mentioned above, we have developed a common platform of application that can solve this problem. The application can work as a launcher application of individual web application provided by local governments. However, there is a problem that the launcher application cannot display all the contents on the screen due to limited size of the smartphone. Therefore, we considered that a method which selects the contents focusing on the user's behavior change. We guess the content which induces the behavior change differs depending on the user. Thus, we needed to clarify that user's attributes are correlated with activities on the sightseeing application. In this study, we clarified that the influence of contents could be different depending on user's attributes. As a result, we clarified the statistically significant relationship between some of user's attributes and each content.

Keywords. behavior change, mobile application, sightseeing, recommender system, urban sensing

1. Introduction

Currently, Web sites and mobile applications have been utilized in various situation by the spread of smartphones. It is causes changes on tourist behavior. Previously, tourists gathered information of the sightseeing spots from the pamphlets and so on. Currently, the tourists can obtain the latest information by Web sites and mobile applications. Therefore, many sightseeing spots and local governments who paying much attention for tourism have developed independent Web sites and mobile applications for promotion to tourists. However, local governments have developed independent Web sites and mobile application, it is causes the difficult to manage wide area contents which integrate each content. To solve the problem, the prefecture's Tourism Division have developed portal

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Web sites and portal applications to integrate the information of the sightseeing spots in each municipality. The problem now arises: the amount of information that the portal Web sites and portal applications can provide is reduced than information of independent Web sites and mobile applications. To solve the problem, we have developed the applications with a common platform. This application works as launcher of independent contents that provided by local governments.

In Japan, expectations for tourism projects such as the Tourism-based Country Promotion Basic Act and the Olympic Games in 2020 have been gradually increasing, and various sightseeing spots should cooperate to develop the tourism business. In addition, the Japan Tourism Agency promotes DMO (Destination Management Organization) as an organization for accelerating to develop sightseeing spots. For reason given above, tourism business should integrate the region sightseeing spots with each municipality.

However, as we have mentioned before, it is difficult to develop the Web sites and mobile applications that integrate the information on the sightseeing spots. Our applications with a common platform can solve this problem. Meanwhile, there is a next problem: the launcher application cannot display all the contents on the screen due to limited size of the smartphone. This problem is common problem for the mobile applications using many contents not only for the sightseeing applications. A large number of studies have been made on this problem [1,2]. Among them, many existing applications adopted especially system that recommend contents from user's preferences and attributes. The most of these applications mainly focused on investigating record of user's activity on virtual world such as Web shopping or Web browsing. Thus, there are many researches which investigate the effect verification by using a log on Web sites or smartphone operation. However, it is difficult to verify the effect of recommendation to the tourist because it needs actual activity of user on real world. Therefore, there are much less researches that the recommend of tourism contents is correlated with tourist behavior. In this paper, we investigate that user's preferences is correlated with activities on the sightseeing application.

2. Purpose

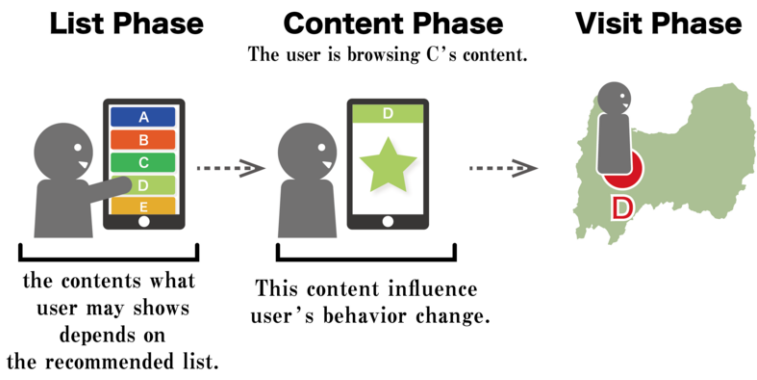

Figure 1. Three phase of sightseeing application.

First, we considered the user's behavior change on sightseeing applications. The term "the user's behavior change" can be defined as follows: the user actually visits the sightseeing spot after browsing the relevant contents and induced by the contents in the application. The user's behavior changes of our sightseeing application consist of three phases. Figure 1 shows that three phases of that.

The term "List Phase" can be defined as the phase that the users browse and select the page which has listing several links of the contents. The term "Content Phase" can be defined as the phase that the users browse the page which has the individual content for the relevant sightseeing spot. The term "Visit Phase" can be defined as the phase of the users actually visits the sightseeing spot. We have to introduce some recommendation mechanism in the List Phase and the Content Phase in order to induce the user's behavior change.

In this study, as we have mentioned before, there are the problem that the mobile application cannot display all the contents on the screen due to limited size of the smartphone. Accordingly, we focus on the mechanism of the List Phase. Our application can select suitable contents for user's preferences in the List Phase and show the list of links to the actual contents. The selection of contents in List Phase is important because the contents that user may show depends on the recommended list. Namely, the mechanism of recommend links can induce the user's behavior change for sightseeing applications. Moreover, we guess the content which induces the user's behavior change differs depending on the user. To take a simple example, sightseeing spots which induce the behavior change are different in youth and elderly users.

The purpose of this study is to examine relations between contents and user's attributes when the application user occurs the behaviors change.

3. Discover TOYAMA

In this study, we have developed Discover TOYAMA that is the smartphone application for sightseeing in Toyama Prefecture, Japan. This application is officially provided by Toyama DMO. Discover TOYAMA can integrate multiple contents of many sightseeing spots in Toyama. Each individual content is provided as a Web-based application (Child App). As shown figure 2, the top screen of Discover TOYAMA provides two facilities. One is Child App List that shows list of links to individual contents. Another shows the Recommend Spots List that shows list of recommended spots by the application based on user's attributes. The user can input their attributes into the application. The attributes include user's gender, age, residence, purpose of trip, travel plan and so on.

Discover TOYAMA has functions to record the log of user's actual behavior. This application can record user's location by GPS, and operation log on the application. Therefore, we can investigate by using both information whether user's behavior changes are induced or not.

The user can view information of sightseeing spot through the Recommend Spots List and Child App. The difference of them is the degree of detail about presented information. Child App has comparable functions to general mobile applications to browse detailed information about the spot such as overview, location, access, pictures, related event schedule and so on. On the other hand, Recommend Spot has function to show only simple information in single window.

Figure 2. Discover TOYAMA has two types of content.

4. Methods for Calculation of Induced Users

The user's behavior change may be induced by both two functions described above. However, Child App has more detailed information than Recommend Spot. Therefore, we assumed that the Child App is more effective than Recommend Spot. In the section, we calculate number of induced users who changed their activity affected by the application. Moreover, we investigate the effectiveness of each functions and confirm the assumption.

4.1. Definition of the Content That Induces the User's Behavior Change in Discover TOYAMA

The user's behavior change by the Discover TOYAMA means that the user actually visits the sightseeing spots which is not include in the travel plan after browsing the contents of the application. Therefore, Discover TOYAMA necessary to recommend the content of sightseeing spot that not include in the user's travel plan in order to induce the user's behavior change. The recommended sightseeing spots are selected based on questionnaire described before.

Based on the above, the contents that induce the user's behavior change in Discover TOYAMA should meet the following condition 1 to 3.

1. The contents of the sightseeing spots that are not included in the travel plan
2. The user browses the contents meets condition 1
3. Visit the sightseeing spot meets condition 1, 2

4.2. Recommend Spots List

Recommend Spots List recommends sightseeing spot which is not included the travel plan input by the user. Therefore, the Recommend Spots satisfy condition 1.

For checking condition 3, we should obtain users location to confirm whether the user visited sightseeing spots by Discover TOYAMA's GPS function.

Next, we obtained the Recommend Spots of all user's Discover TOYAMA, and we examined the number of users who visited the Recommend Spots. The result is shown in Table 1.

Visited Users was defined as the number of users who visited Recommend Spots. In addition, Not Visit Users was defined as the number of users who did not visit Recommend Spots even spots are shown in application. In addition, Rate was defined as the ratio of Visited Users in the sum of total users.

Table 1. The number of users who visited Recommend Spots.

Visited Users	Not Visit Users	Rate
15	1222	1.21%

4.3. Child App List

Currently, the number of Child App is not so many as they do not fit in the top screen. Therefore, Child App List shows all contents of the sightseeing spot that even if the spot includes the user's travel plan.

Next, we can obtain the number of activation for Child App from the each user's operation log. The activation means that the user browses the relevant sightseeing spot.

For checking condition 3, we obtained the user who visited the sightseeing spot by Discover TOYAMA's GPS function after activating Child App. The result is shown in Table 2.

Visited Users was defined as the number of users who visited the sightseeing spots after activating Child App. In addition, Not Visit Users was defined as the number of users who did not visit the sightseeing spots after activating Child App. Moreover, Rate was defined as the ratio of Visited Users in the total number of users who activate of any Child App.

Table 2. users who visited the sightseeing spot of Child App after activating Child App.

Visited Users	Not Visit Users	Rate
146	261	35.87%

4.4. Child App List for Different User's Attribute

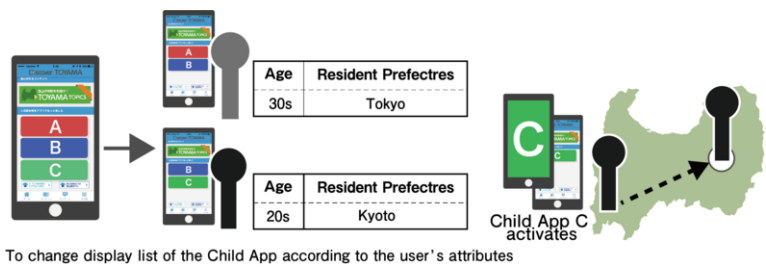

Figure 3. Child App List focusing on the inducing the behavior change.

As shown in Tables 1 and 2, the ratio users who induced the behavior change by Child App was larger than the ratio users who induced the behavior change by the Recommend Spots List. It is cause that ease to induce the user's behavior change depends

on the degree of detail about presented information. Therefore, in this study, we focused on Child App List. In addition, we clarify that the user's attributes are correlated with induce the behavior change by Child App.

Next, we assume that the tendency of Child App to induce activity changes differs depends on the user's attributes. In Figure 3, there are two users who have different attributes of residence and age. Therefore, it causes different tendency of Child App to induce for each user. In this case, Discover TOYAMA may change that Child App List depends on the difference of the tendency. For example, the tendency of Child App A and B to induce above users is relatively high, and the application preferentially shows only the two applications on the top screen.

To realize above application facilities, we clarify a type of user's attributes that mainly affect tendency of Child App which induced the behavior change.

5. Results

Table 3. Child Apps on Discover TOYAMA.

Child App's name	Sightseeing spot	Description
tulip app	Tonami Tulip Gallery	This application introduces the Tulip Fair in Tonami city. This application has view of stamp rally and view of model courses.
mikuruma app	Takaoka Mikurumayama Museum	This application introduces the festival in Takaoka city. This application has view of map.
jouhana app	Johana Shinmeigu	This application introduces the Johana Hikiyama Matsuri Festival in Nanto city. This application has view of map.
tkk app	Tateyama Kurobe Alpine Route	This application introduces the Alpine Route. There is wall of snow in Alpine Route.

We describe how to obtain the user's attributes that induce the behavior changes by each Child App. In this study, we focused on four Child Apps that are the tulip app, mikuruma app, jouhana app and tkk app. Those Child App's description is shown in Table 3. Discover TOYAMA obtained the user's 18 attributes by Web questionnaire. Among them, we focused on three questions that are the resident prefectures, gender and age. We can analyze that induced the behavior change by each Child App using obtaining these attributes. In addition, we clarify whether it is different that inducement the behavior change each Child App by analyzing of user's attributes. Next, we clarify whether the items of each attribute shown in the Tables 4 to 6 have significant different characteristics between Child Apps. We analyzed using the Chi-square test [3,4]. The Chi-square test is a verification method using chi-square distribution. In this study, we determined that this tests statistic is significant at the 0.1 significance level. As a result, we clarified the statistically significant relationship exists that is correlated with the resident prefectures and age for each Child App. In addition, we clarified the statistically significant relationship exists that each Child App is correlated with the age. On the other hand, we did not clarify the significant characteristic exists that is correlated with the gender for each Child App.

Table 4. In the resident prefectures, the number of users who induced behavior change by each Child App.

	Hokkaido	Iwate	Miyagi	Fukushima	Chiba	Tokyo	Kanagawa
tulip app	0	1	0	1	1	0	0
mikuruma app	1	0	0	0	0	2	1
jouhana app	0	0	0	1	0	0	0
tkk app	0	1	0	1	1	0	0

	Toyama	Ishikawa	Nagano	Shizuoka	Aichi	Kyoto	Total
tulip app	11	0	0	1	2	2	19
mikuruma app	22	1	0	0	0	0	27
jouhana app	5	0	2	0	0	0	8
tkk app	5	0	0	0	0	1	9

Table 5. In the gender, the number of users who induced behavior change by each Child App.

	Male	Female	Total
tulip app	13	6	19
mikuruma app	21	6	27
jouhana app	6	2	8
tkk app	8	1	9

Table 6. In the age, the number of users who induced behavior change by each Child App.

	Under 20s	20s	30s	40s	50s	60s	70s	Total
tulip app	2	5	2	5	5	0	0	19
mikuruma app	0	3	2	8	7	5	2	27
jouhana app	0	0	2	4	2	0	0	8
tkk app	0	0	1	2	6	0	0	9

6. Conclusions

In this paper, we clarified that the influence of Child App could be different depending on user's attributes. As a result, we clarified the statistically significant relationship between Child App and specific attributes that are resident prefectures and age. Therefore, we considered that we can realize the Child App List focused on the inducement the behavior change shown in the Fig. 3. However, there were not enough data to obtain sufficient results. Thus, in the future, continuous examination of this study would more clarify Child App is correlated with the user's attributes. Child App is expected to continue to increase, because we will be developing some Child App. Moreover, we will find out some the condition that induce the behavior change by many data and various Child Apps. In the next, we incorporate the system using these conditions into Discover TOYAMA in order to experiment to induce the user's behavior change. In addition, we will advance study on another method that induce the user's behavior change.

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