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Food Tourism Planning Support System within Urban Sightseeing Areas in Japan

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Abstract

The present study aimed to design, develop, operate and evaluate a tourism planning support system that can be used to decide on places to eat lunch and dinner, sightseeing spots to visit along the way, and routes for visiting these destinations. This system was developed by integrating a web geographic information system (Web-GIS) and a sightseeing plan creation system (an eatery search system and a sightseeing route creation system). Additionally, the system was operated for one month in Central Yokohama City of Kanagawa Prefecture in Japan, and the total number of users was 79. Based on the results of the web questionnaire survey, user evaluations were particularly high for the function of sightseeing spot selection and the function of display of sightseeing plan information, and also for the entire system. From the results of the access analysis of users' log data, the total number of sessions in the system was 263, 67% used mobile devices, and smartphones were used most frequently. Therefore, it is evident that the system was used by different types of devices just as it was designed for, and that the system was used according to the purpose of the present study, which is to support the food tourism planning of users.

Keywords

Food Tourism Planning System, Web-Geographic Information Systems (GIS), Sightseeing Plan Creation System, Eatery Search System, Sightseeing Route Creation System

1. Introduction

In recent years, the objectives tourists have for visiting sightseeing areas are becoming more diverse all over the world. The form of tourism known as "food tourism" has become especially widespread. According to Everett [1], Kikuchi

[2] and Nakamura *et al.* [3], food tourism is composed of activities that provide experiences of consumption and appreciation of food and beverages, presented in such a way that values the history, the culture and the environment of a particular region. In Japan, Japan Food Tourism Society was founded in 2008. Additionally, food tourism was selected as a theme of projects conducted by the Japan Tourism Agency [4] for attracting tourists to provincial areas between 2016 and 2020. According to Yasuda [5], Yeoman *et al.* [6] and Hall *et al.* [7], every region has its own particular cuisine and culinary culture, which are unique tourism resources. Because of this, hopes are high for the spread of food tourism to revitalize local economies and communities, and a variety of related measures have been carried out in urban and rural areas all around Japan.

Though the number of tourists has fallen as a result of the COVID-19 pandemic, when the situation returns to normal, the rebound following the period of voluntary self-restraint is predicted to produce an increase in the number of tourists. In a questionnaire survey by Kadokawa Corporation [8], 78% of respondents answered "travel inside Japan". Of these, 54% said that they wanted to go on a "regional gourmet trip". Given data such as this, demand for food tourism is expected to heighten further in Japan. However, as mentioned in next section, few systems that support food tourism have been developed so far, and it would be quite a stretch to say that existing systems are suited to creating sightseeing plans whose main objective is food.

Against the above social and academic background, targeting the urban sightseeing area in Japan, the present study aims to develop a food tourism planning support system that can be used to decide on places to eat lunch and dinner, sightseeing spots to visit along the way, and routes for visiting these destinations. A system that combines a web geographic information system (Web-GIS) and a sightseeing plan creation system (an eatery search system and a sightseeing route creation system) will be designed and developed (Sections 3 and 4). The Web-GIS is used to visually indicate eateries, sightseeing spots, and the sightseeing routes to reach them on a digital map. The eatery search system is used to search for eateries that match users' own preferences. The sightseeing route creation system is used to create sightseeing routes for destinations (eateries and sightseeing spots). Additionally, the system will be used by various people from both inside and outside the operation target area during the operation period (Section 5), and improvement strategies will be submitted after the issues are identified by evaluating the system on the results of a web questionnaire survey to users and an access analysis of their log data (Section 6).

Regarding the operation target area, Central Yokohama City of Kanagawa Prefecture in Japan, was selected. The first reason for this selection is that many tourists visit Yokohama City as it is a popular urban sightseeing area, and there is an abundance of information submitted and released, making it difficult for tourists to efficiently obtain the necessary information. The second reason is that a citizen group called the YOKOHAMA FOOD LOVERS [9] spontaneously conducts the activity to increase the attraction of the culinary culture in Yokohama

City. The third reason is that the system can be used to efficiently search for eateries and sightseeing spots that match the many preferences of each user, because the great variety of such information is already accumulated in the system. Namely, as there are new eateries and sightseeing spots discovered one after another, it can be anticipated that the system will be used to efficiently gather such information and create sightseeing plans.

2. Related Work

The present study relates to three research fields: 1) studies related to sightseeing support systems, 2) studies related to eatery recommendation systems, and 3) studies related to food tourism support systems. Below, representative preceding studies related to these three areas in recent years are introduced, and the originality of the system developed in the present study is demonstrated.

Regarding (1) studies related to sightseeing support systems, Maruyama *et al.* [10] developed a system that creates sightseeing routes tailored to user's preferences and that provides navigation functions. Kurata *et al.* [11] developed the CT-planner system, a dialog-based system which recommends sightseeing spots and sightseeing routes tailored to user's preferences and then creates detailed plans based on them. Sasaki *et al.* [12] developed a mobile application to support sightseeing adopting psychological approach. Sonobe *et al.* [13] propose a tourism support system for tourists' migratory behaviors using AR (Augmented Reality). Sasaki *et al.* [14] [15] and Abe *et al.* [16] developed sightseeing support systems using AR and pictograms. Hidaka *et al.* [17] developed an on-site trip planning support system adopting dynamic information concerning sightseeing spots in addition to tourist' preferences and profiles.

Regarding (2) studies related to eatery recommendation systems, Tanigawa *et al.* [18] developed a recommendation system for eateries considering user's preferences. Doi *et al.* [19] developed a travel game application with the aim of enabling users to have fun while gathering information concerning regional gourmet fare. Okamura *et al.* [20] developed a searching system for eateries that serve local food. Chu *et al.* [21] proposed a system to recommend restaurants considering user's preferences, restaurant attributes and socio-demographic behaviors. Gomathi *et al.* [22] developed a restaurant recommendation system for user's preference and services adopting a machine learning algorithms. Ishimura [23] developed a developed a web service "Syoku-Tan", food explorer referring to others' reviews. Munaji *et al.* [24] proposed a restaurant recommendation system adopting a collaborative filtering algorithm based on references and information obtained from users. Melese [25] presented a recommendation system for restaurants and food using a hybrid filtering mechanism.

Regarding (3) studies related to food tourism support systems, Kosugi *et al.* [26] developed a system that calculated interest on Twitter and recommended sightseeing routes for visiting eateries that serve regional gourmet fare. Miyoshi *et al.* [27] developed a system that provided knowledge-based recommendations

of eateries that serve local foods, taking into consideration the preferences and situations of tourists. However, in this research field, because food tourism is a new form of tourism, few systems that support food tourism have been developed so far.

Tough the systems in 1) studies related to sightseeing support systems had functions for creating sightseeing plans that reflected user's preferences, it did not have registered eatery information, and was not intended to provide support for tourism focused food. Of the systems in 2) studies related to eatery recommendation systems, and 3) studies related to food tourism support systems, the system developed by Kosugi *et al.* [26] recommended sightseeing routes for visiting eateries that serve regional gourmet fare as a secondary adjunct to ordinary sightseeing. The present study, on the other hand, aimed to develop a system that supports the creation of sightseeing plans whose primary objective is dining. Additionally, the system developed by Miyoshi *et al.* [27] was intended to supply information concerning regional gourmet fare. The present study, on the other hand, is also intended to provide support for sightseeing plan creation.

Compared to the preceding studies mentioned above, the first element of originality in the present study is that it integrates an eatery search system and a sightseeing route creation system to develop a system that provides support for food tourism. The second element of originality is that not only users can select where they will eat lunch and dinner, they can also select sightseeing spots to visit along the way and create sightseeing routes for going to these destinations. This system therefore efficiently supports the creation of sightseeing plans whose primary objective is dining by users.

3. System Design

3.1. System Features

This system is composed of a Web-GIS and a sightseeing plan creation system (an eatery search system and a sightseeing route creation system). **Figure 1** shows the characteristic of each part of the system. The first time someone uses the system, they select an ID and password and register their user information in the database of the system. The goal of the system is to assist with the creation of sightseeing plans whose primary focus is dining. Therefore, a web system that is used to decide on places to eat lunch and dinner, sightseeing spots to visit along the way, and routes for visiting these destinations is designed. First, users select the train stations that are the start and end points of their trips. They then search for and select eateries at which to have lunch and dinner. Next, they use the digital map of Web-GIS to select sightseeing spots near the sightseeing routes that connect these locations. The system then creates a sightseeing plan.

3.2. Target Devices

Though this system is expected to be accessed using PCs and mobile devices, same functions can be used from any device as there is no difference in functions

depending on the device used. The use from PCs, which are mainly indoors, is assumed to be the sightseeing planning support, by gathering the information concerning eateries and sightseeing spots already accumulated in the system. On the other hand, the main use from mobile devices both indoors and outdoors is assumed to be the assistance of sightseeing activities by means of gathering sightseeing information, and referring to the information concerning sightseeing plans created by users.

3.3. System Operation Environment

The system is operated using a web server, a database server and a GIS server. Figure 2 shows the system operating environment. Heroku, which is a PaaS provided by the Salesforce company, was used for both the Web server and the database server. ArcGIS Online, which is provided by the Environmental Systems

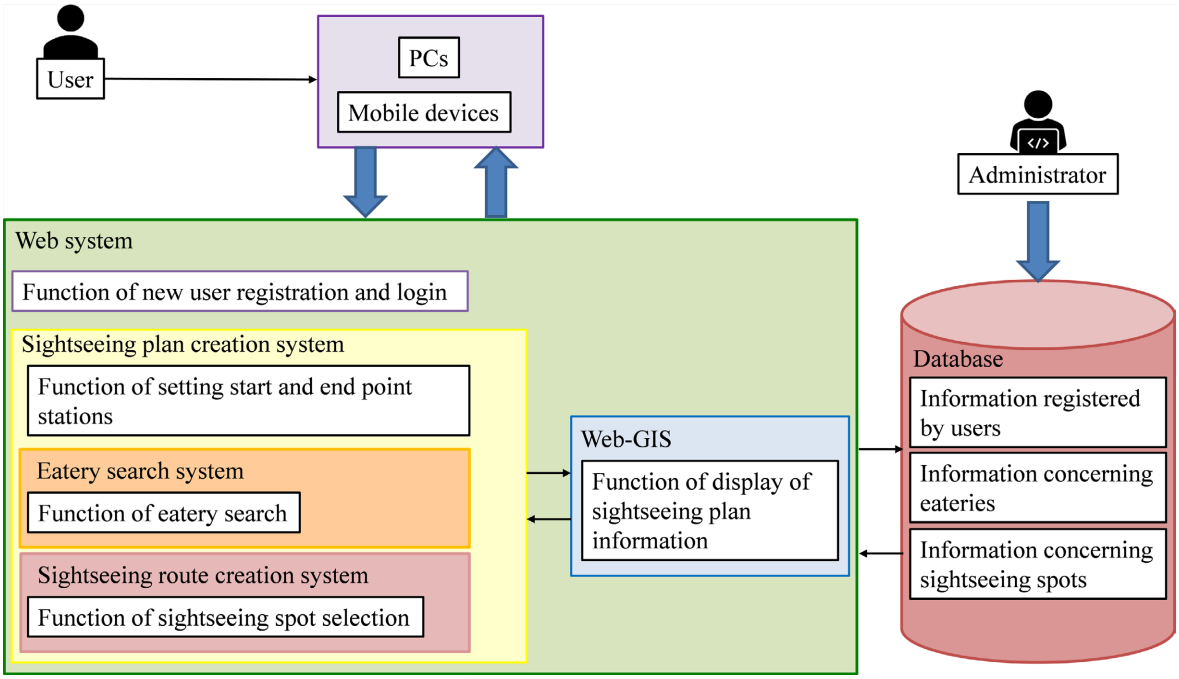


Figure 1. System design.

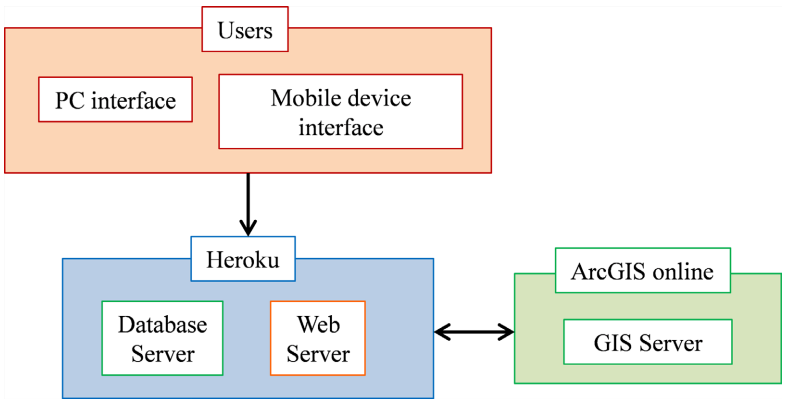


Figure 2. System operating environment.

Research Institute, Inc. (ESRI), was used for the GIS server. Additionally, the web application developed with the system was implemented using PHP, JavaScript and HTML.

3.4. Design of Each System

3.4.1. Web-GIS

Though there are many types of Web-GIS, this system uses ArcGIS API for JavaScript provided by the ESRI to display the locations of eateries and sightseeing spots selected by users, as it is convenient to access the websites without the installation of any software. Additionally, Leaflet, which is the JavaScript open-source map library using JavaScript, is used to display the locations of eateries and sightseeing spots and sightseeing route.

1) Display of eateries and sightseeing spots accumulated in the database

The information concerning eateries and sightseeing spots that is accumulated in this system is displayed on the digital map of Web-GIS, so that users can easily grasp the geographical relationships between them. Eateries and sightseeing spots are also displayed as icons on the digital map. Clicking these icons causes a pop-up to appear, and this pop-up can be used to add the location as a new destination in the sightseeing plan.

2) Display of Sightseeing route

Once created, sightseeing routes are shown as lines on the digital map of Web-GIS. This makes it possible to visually confirm sightseeing route on the digital map.

3.4.2. Sightseeing Plan Creation System

A sightseeing plan creation system is divided into two sub-systems. One is an eatery search system, and the other is a sightseeing route creation system

1) Eatery Search System

Users can set conditions and perform searches for eateries at which to have lunch or dinner, thereby selecting eateries that match their own preferences as trip destinations. Detailed information concerning eateries is displayed in list form and can be viewed on the website of each eatery.

2) Sightseeing route creation system

Users create routes connect the train stations that are the start and end points of their trips, the eateries at which they will have lunch and dinner, and sightseeing spots they will visit along the way. The system also calculates, as part of the sightseeing plan information, the total distance they will cover by walking the routes and the total time they will spend walking using ArcGIS API for JavaScript that is configured with a movement speed of 4.8 km/h.

4. System Development

4.1. The Frontend of the System

This system will implement unique functions for users, which will be mentioned below, in response to the purpose of the present study, as mention in Section 1.

In order to implement these several unique functions, the system was developed by integrating plural systems into a single system. Additionally, the system was operated targeting Japanese people and those who can understand Japanese, while selecting Central Yokohama City of Kanagawa Prefecture in Japan as the operation target area. Therefore, all pages included in the system are written in Japanese with English notations.

4.1.1. Function of New User Registration and Login

In order to utilize the system, users will transit from the page for the function of login to the page for the function of user registration to register with the system. On this page, users will register their IDs and passwords as their information. Once the information is submitted, users will log in with the registered information and go to the page for the function of sightseeing plan sharing page. Figure 3 shows the process of user registration and login.

4.1.2. Function of Setting Start and End Point Stations

Figure 4 shows the page for the function of setting start and end point stations. After logging into the system, users select "set start and end point stations" from the menu at the top of home page. The system changes to this page, and users can set the start and end point stations. Stations can be selected using the dropdown boxes or by clicking on an icon on the digital map of Web-GIS and selecting the station in the popup that is displayed.

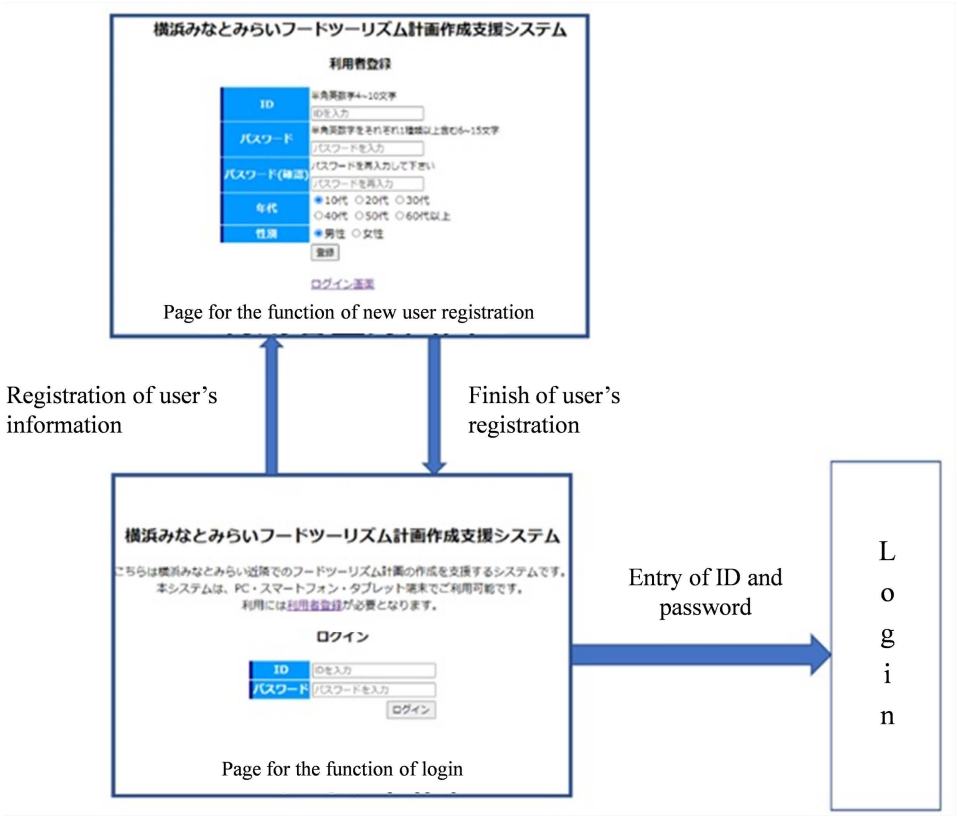
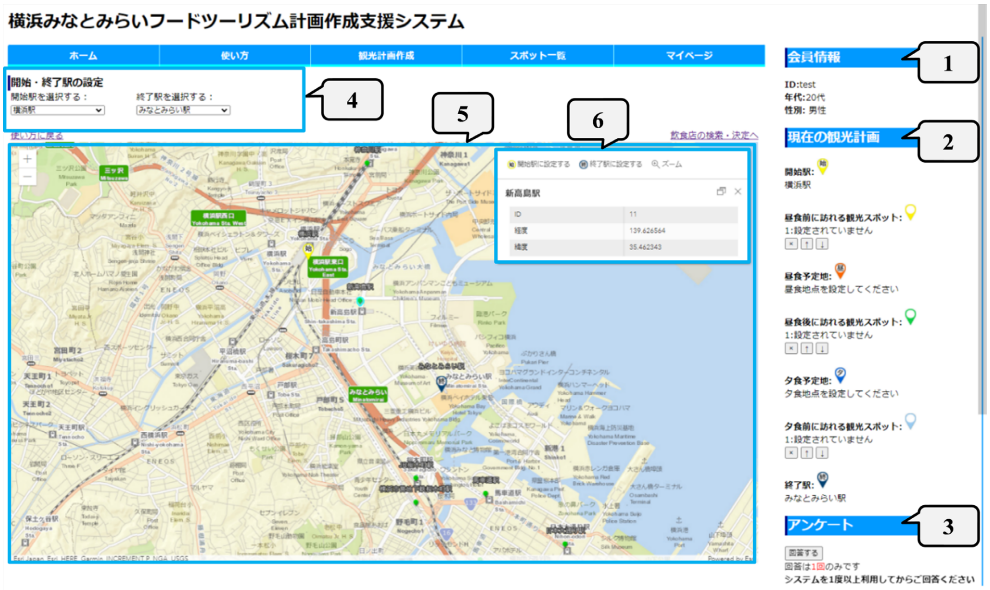


Figure 3. Page for the function of new user registration and login.



No.	Description
1	User's information
2	Sightseeing plan including eateries and sightseeing spots
3	Questionnaire survey
4	Setting start and end point stations
5	Selected station on the digital map of Web-GIS
6	Detailed information of selected station

Figure 4. Page for the function of setting start and end point stations.

4.1.3. Function of Eatery Search

Figure 5 shows the page for the function of eatery search. Figure 6 shows the page for the results of eatery search on the digital map of Web-GIS. Users can set search conditions and search for eateries. They can then set the eateries at which they wish to have lunch and/or dinner. Five search conditions can be applied: reservation acceptance, lunch budget, dinner budget, genre and search keyword. The results of eatery search are displayed in list form and on the digital map of Web-GIS. In the list shown in Figure 5, selecting "set as lunch location" or "set as dinner location" will cause the eatery to be added to the sightseeing plan as a lunch or dinner location. On the digital map view shown in Figure 6, when an icon is selected, information concerning the corresponding eatery will be displayed in a popup. Selecting the corresponding icon in the popup will add the eatery to the sightseeing plan as a lunch or dinner location.

4.1.4. Function of Sightseeing Spot Selection

Figure 7 shows the page for the function of sightseeing spot selection. Figure 8 shows the page for the results of sightseeing spot selection. Users can set selection conditions and select sightseeing spots. They can then set the sightseeing spots at which they wish to visit before lunch, after lunch and after dinner. Two selection conditions can be applied: distance from current location and category of sightseeing spot. The results of sightseeing spot selection are displayed in list form and on the digital map of Web-GIS. In the list shown in Figure 7, selecting

No.	Description
1	User's information
2	Sightseeing plan including eateries and sightseeing spots
3	Questionnaire survey
4	Search for and select eatery Five search conditions (reservation acceptance, lunch budget, dinner budget, genre and search keyword)
5	Results of eatery search in list form
6	Add the eatery for lunch or dinner location to the sightseeing plan

Figure 5. Page for the function of eatery search.

No.	Description
1	User's information
2	Sightseeing plan including eateries and sightseeing spots
3	Questionnaire survey
4	Search for and select eatery Five search conditions (reservation acceptance, lunch budget, dinner budget, genre and search keyword)
5	Results of eatery search on the digital map of Web-GIS
6	Detailed information of selected eatery

Figure 6. Page for the details of a sightseeing plan.

No.	Description
1	User's information
2	Sightseeing plan including eateries and sightseeing spots
3	Questionnaire survey
4	Search for and select eatery Five search conditions (reservation acceptance, lunch budget, dinner budget, genre and search keyword)
5	Results of eatery search on the digital map of Web-GIS
6	Detailed information of selected eatery

Figure 7. Page for the function of sightseeing spot selection.

No.	Description
1	User's information
2	Sightseeing plan including eateries and sightseeing spots
3	Questionnaire survey
4	Sightseeing spot selection Two selection conditions (distance from current location and category of sightseeing spot)
5	Results of sightseeing spot selection are displayed on the digital map of Web-GIS
6	Detailed information of selected sightseeing spot

Figure 8. Page for the results of sightseeing spot selection.

"visit before lunch," "visit after lunch," or "visit after dinner" will cause the sightseeing spots to be added to the sightseeing plan at the corresponding time. On the digital map view shown in Figure 8, when an icon is selected, information concerning the corresponding sightseeing spot will be displayed in a popup. Selecting the corresponding icon in the popup will add the sightseeing spots to the sightseeing plan before lunch, after lunch or after dinner.

4.1.5. Function of Display of Sightseeing Plan Information

Figure 9 shows the page for the function of display of sightseeing plan information. Users can view the sightseeing plans created by them. The sightseeing plan information consists of the eateries and sightseeing spots selected by users, the sightseeing routes for visiting these destinations, the total walking distance and the total walking time. Selecting "save sightseeing plan" will cause the sightseeing plan to be saved.

4.2. The Backend of the System

In the backend of the system, the following 4 processes are conducted in response to the 5 functions in the frontend.

1) Processing concerning the function of new user registration and login

User information is accumulated in the Heroku PostgreSQL database. When registering, the password entered by the user is hashed using the PHP hash function, and the hashed password is saved in the database. When logging in, hashing

No.	Description
1	User's information
2	Sightseeing plan including eateries and sightseeing spot
3	Questionnaire survey
4	Detailed information concerning sightseeing plan (Eateries, sightseeing spots, sightseeing route, total walking distance and total walking time)
5	Sightseeing route on the digital map of Web-GIS

Figure 9. Page for the function of display of sightseeing spot plan information.

is performed on the entered password in the same way, and if the results match the ID and password accumulated in the database, the user is logged in. If they do not match, an error message is displayed and the user can enter their login information again.

2) Processing concerning the function of eatery search

An ID number is assigned to each eatery accumulated in the database. On the back-end, the function of eatery search selects the IDs from the database for eateries which match the search conditions set by the user, and displays the results of eatery search in list form and on the digital map of Web-GIS.

3) Processing concerning the function of sightseeing spot selection

As with eateries, an ID number is assigned to each sightseeing spot accumulated in the database. On the back-end, the function of sightseeing spot selection selects the IDs from the database of sightseeing spots near the sightseeing route which match the selection conditions set by the user, and displays the results of sightseeing spot selection in list form and on the digital map of Web-GIS.

4) Processing concerning the function of display of sightseeing plan information

On the back-end, the sightseeing plans created using the function of setting start and end point stations, the function of eatery search, and the function of sightseeing spot selection are accumulated in the database. Additionally, referring to the sightseeing plan information, the sightseeing routes are displayed on the digital map of Web-GIS, and the total walking distance and total walking time are calculated.

4.3. System Interface

The interface of this system has two types: the PC and mobile device screen of users, and the PC screen of the administrator. For the users' screen, a responsive design was selected, and two types of interfaces were prepared according to the screen size of the devices used. For the administrator's page, users' information can be managed. By utilizing Graphic User Interface (GUI), malicious users can be deleted without being affected by the information technology (IT) literacy of the administrators.

5. Operation

5.1. Operation Target Area

As mentioned in Section 1, Central Yokohama City of Kanagawa Prefecture in Japan was selected as the operation target area in the present study. **Figure 10** shows the location of this area.

5.2. Data Gathering

Data concerning eatery and sightseeing spot needed to be gathered and accumulated in advance in order to use this system. Eatery data was gathered from an eatery information website (the gnavi Kanagawa) [28] for 745 eateries in Central

Yokohama City. Sightseeing spot data was gathered from Ikeda *et al.* [29], Mizutani *et al.* [30] and Mukasa *et al.* [31] for 113 sightseeing spots in Central Yokohama City.

5.3. Operation Results

This system was put in operation for a period of one month, for use by people both inside and outside the operation target area. The authors called for people to use the system via the lab's website, Twitter, Facebook, Instagram, etc. Table 1 shows the overview of system users. There were a total of 79. Users aged 20 - 29 accounted for 33% of all users, followed by users aged 60 and over at 22%, and then users aged 30 to 39 at 16%. This clearly shows that the system was used by people of a wide range of ages.

6. Evaluation

In this section, first of all, the system developed in the present study will be evaluated

Figure 10. Location of Yokohama City of kanagawa Prefecture in Japan.

Table 1. Breakdown of system users and questionnaire survey respondents.

Age groups of Users	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60-	Total
Number of system users	7	26	13	10	6	17	79
Number of web questionnaire survey respondents	0	20	12	10	4	12	58
Valid Response Rate (%)	0.0	76.9	92.3	100.0	66.7	70.6	73.4

based on the results of a web questionnaire survey to users and an access analysis of users' log data. Next, based on the results, improvement strategies for the system will be submitted.

6.1. Evaluation Based on the Questionnaire Survey

6.1.1. Overview of the Questionnaire Survey

According to the purpose of the present study, a web questionnaire survey was carried out in order to conduct an (1) evaluation of system usage as well as an (2) evaluation of the main functions and the system. This questionnaire survey was carried out on the website one week after the operation commenced. Table 1 shows the overview of web questionnaire survey respondents. As shown in Table 1, 58 people out of the 79 users answered which is an 73% valid response rate. The second evaluation focused on the main functions and the system used by users on their own initiative.

6.1.2. Evaluation of System Usage

1) Evaluation of methods for gathering sightseeing information

Analysis of the methods used to gather sightseeing information (multiple answers allowed) found that 93% of respondents gathered information from the internet, 36% from friends and acquaintances, 33% from word of mouth on social media, 24% from guidebooks, and 12% from tourism bureaus. This shows that information can be gathered through recommendations by friends and acquaintances, from guidebooks and from tourism bureaus. However, the vast majority of users gathered sightseeing information from the internet. This shows that the system, in which users connect to the internet from their PCs or mobile devices and gather sightseeing information via the web, is effective for providing tourism support.

2) Evaluation of system usage conditions

66% of the access to the system was by smartphones, 33% was by PCs, and 2% was by tablet devices. This shows that smartphones were the main type of device used to access the system. This demonstrates that the decision to use an interface designed for not only PCs but also mobile devices was an effective decision.

3) Evaluation with regard to food tourism

Tough 67% of respondents were not familiar with the term "food tourism", 73% had previously engaged in tourism with the objective of dining. This shows that the majority of respondents had actually engaged in food tourism themselves. Therefore, it was effective to develop a system with the purpose of providing support for the creation of food tourism plans.

6.1.3. Evaluation of the Main Functions and the System

1) Evaluations of the usability of the main functions and the entire system

Figure 11 shows the evaluation result of usability of the main functions and the entire system. Regarding the usability of the function of sightseeing spot selection and the function of display of sightseeing plan information, 90% and 89% of respondents answered "I think so" or "I somewhat think so". This means that

these two main functions were highly usable. However, regarding the usability of the function of eatery search, 79% of respondents answered "I think so" or "I somewhat think so". This was lower than the other two main functions. Based on the free comments in the responses to the questionnaire survey, it was clear that the function needs more detailed information concerning eateries, and a sub-function for performing more detailed eatery searches. Regarding the usability of the entire system, 94% of respondents answered "I think so" or "I somewhat think so". Therefore, the entire system was highly usable.

2) Evaluation of the System as a whole

Figure 12 shows the evaluation results of the system as a whole. Regarding the easiness of creating sightseeing plans and the appropriateness of the sightseeing plans created by the system, 88% and 87% of respondents answered "I think so" or "I somewhat think so". This shows that the system can be used to easily create sightseeing plans, and that the plans created by the system match user's preferences. Regarding the easiness of grasping the geographical relationships between spots displayed on the digital map, 95% of respondents answered "I think so" or "I somewhat think so". This shows that using Web-GIS to display the locations of eateries and sightseeing spots on a digital map was effective. Regarding the usability of the system for food tourism, 93% of respondents answered "I

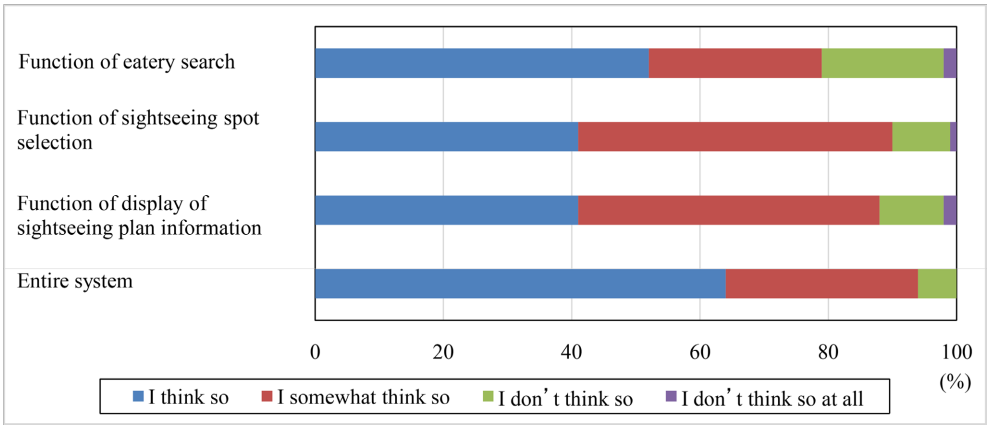


Figure 11. Evaluations result of the usability of the main functions and the entire system.

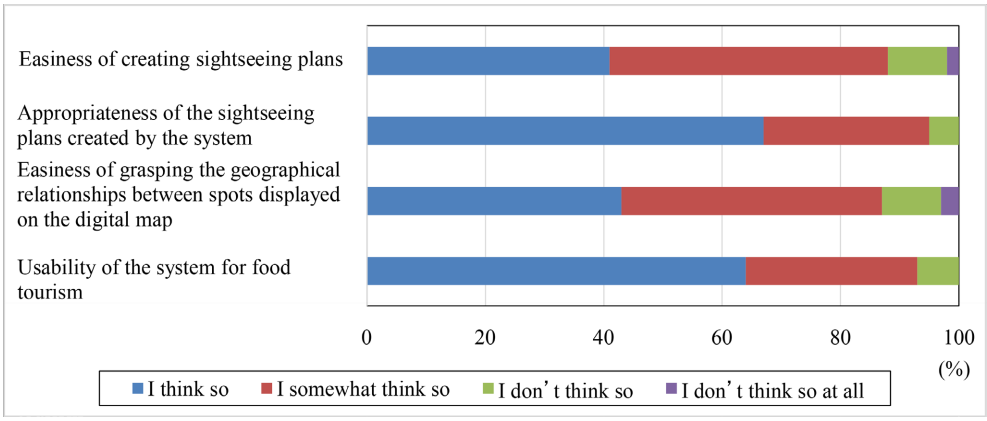


Figure 12. Evaluations results of the system as a whole.

think so" or "I somewhat think so". This means that the system was usable for food tourism. Ongoing operation of the system therefore has potential for multifaceted use by users.

6.2. Evaluation Based on the Access Analysis

An access analysis was conducted in the present study using the log data of users during the operation period. The present study used the Google Analytics of Google. The access log can be obtained by calling the Python Program, which contains the analysis code created with Google Analytics, from the HTML file read on each page within the website subject to the access analysis.

The system had a total of 263 sessions. 33% of the devices used to access the system were PCs and 66% were smartphones. As this makes clear, the main type of device used to access the system was the smartphone. A small number of users also accessed the system using tablet devices. Based on this, we can conclude that the design approach of using the same system regardless of device was an effective one.

Table 2 shows the top 9 most accessed pages. As Table 2 shows, except for the access page, the home page and the page for the function of new user registration, which are the pages that are always visited first, the most-visited pages were the ones for the function of eatery search, the function of setting start and end point stations, and the function of sightseeing spot selection. This shows that visitors decided on eateries and sightseeing spots to visit and then created sightseeing plans that took them to these locations. It would thus be fair to say that the system was used in line with the purpose of the present study.

However, the number of visits to the page for the function of sightseeing spot selection was lower than the number of visits to the function of new user registration, which indicates that there were users that registered but never reached

Table 2. Number of visits per page (Top 9).

Rank	Page name	Number of visits by page	Percentage (%)
1	Access page	413	22.8
2	Home page	284	15.6
3	Page for the function of eatery search	235	12.9
4	Page for the function of setting start and end point stations	207	11.4
5	Page for the function of new user registration	185	10.1
6	Page for the function of sightseeing spot selection	159	8.7
7	Page for the function of display of sightseeing plan information	122	6.7
8	Page for the method of using the system	120	6.6
9	Page for the function of login	94	5.2

the sightseeing plan creation stage. In order to promote the creation of sightseeing plans by more users, it is essential that improvements must be made to the UI of the system, and that clear and easy to understand the method of using the system must be displayed.

6.3. Improvement Strategies for the System

Based on the results of the questionnaire survey and the access log analysis, after the issues are identified, improvement strategies for the system can be submitted. These are summarized below.

1) Webpage design

The webpage design should be changed to make it easy for users to perform various settings in all pages. By creating a webpage design that is easier for users to understand, it is possible to reduce the burden of the system operation placed on them.

2) Function of eatery search

Regarding the function of eatery search, it is desirable to add detailed information concerning eateries (nearest station, comments and reviews), and increase the number of search conditions that can be used. These improvements could enable users to perform more detailed searches, and display eateries that better match their preferences. The way that search results are displayed should also be improved to make it easier for users to find eateries that match their preferences.

3) Function of sightseeing spot selection

Regarding the function of the sightseeing spot selection, it is desirable to add conditions for filtering sightseeing spot information and a sub-function for entering the amount of time to stay at a location. These improvements could enable users to perform more detailed searches, display sightseeing spots that better match their preferences, and create more detailed sightseeing plans.

7. Conclusions

In the present study, a system was designed and developed (Sections 3 and 4), the operation was implemented (Section 5), and evaluations and the submission of improvement strategies were conducted (Section 6). In comparison with the systems in sightseeing spot services for tourists developed in the preceding studies mentioned in Section 2, the system developed in the present study can provide support for food tourism integrating multiple systems. Using the system, not only users can select where they will eat lunch and dinner, they can also select sightseeing spots to visit along the way and create sightseeing routes for going to these destinations. This system therefore efficiently supports the creation of sightseeing plans by users.

The present study can be summarized in the following three points.

1) In the present study, a system was designed and developed by integrating a Web-GIS and a sightseeing plan creation system (an eatery search system and a sightseeing route creation system) in order to assist with the creation of sightsee-

ing plans whose primary objective is visiting eateries. The effective elements of the system are that it makes it possible to efficiently decide sightseeing routes, it makes it easy to create sightseeing plans, and it makes the geographical relationships between destinations easily visible. The system was designed as a web system that can be used simply by accessing it via a web browser over the internet. The same functions can be used on both PCs and mobile devices.

2) Central Yokohama City of Kanagawa Prefecture in Japan was selected as the operation target area of the system developed in the present study. The operation of the system was conducted over the course of one month with people inside and outside the operation target area as subjects, and the total number of users was 79. The system contained information concerning 745 eateries and 113 sightseeing spots, accumulated in a database. A web questionnaire survey was conducted for users. Based on the results of this questionnaire survey, user evaluations were particularly high for the function of sightseeing spot selection and the function of display of sightseeing plan information, and also for the entire system. Regarding the system as a whole, evaluations were high for the ease with which the geographical relationships between locations shown on the digital map overall could be understood, and also for the effectiveness of the system for food tourism.

3) Access analysis was also conducted using users' log data. Based on the results of this access analysis, it was found that the approach of designing the system such that the same functions could be used regardless of the type of device one is using was an effective design approach. The total number of sessions in the system was 263. Regarding the devices used to access the system, 67% used mobile devices, and smartphones were the most frequently used. However, we also determined that some users registered but did not advance as far as the sightseeing plan creation stage.

Regarding future research tasks, the improvement of the system according to the findings in Section 6.3 as well as the improvement of its utilization significance by increasing performance records of the system in other urban sightseeing areas can be raised. Additionally, Yasuda [32] and Yagasaki [33] pointed out that the main purpose of foreign tourists is to taste various kinds of Japanese foods in recent years. Therefore, after these improvements, it is necessary to configure the system in response to multi-languages.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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