Provoking a Subtly Deviated Routing to Enrich Environmental Understanding

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***Abstract*—This study proposes a method for provoking a subtly deviated routing using a mobile application. In daily life, people often visit the same place repeatedly using a fixed route, and there are few chances to change this fixed behavior. It means that they lose opportunities to deepen their understanding of these surroundings. Our proposed method tries to solve this problem by provoking users to take a subtly deviated route. To achieve this, we developed a mobile application that provides a location-linked story that can only be read at a specific location. This application aims to guide users to places of which they are not usually aware. The user reads the content linked to the location and is expected to develop an understanding of that environment through immersion in the content. This paper describes the concept and implementation of the application.**

***Index Terms*—mobile application, subtle deviation, literary tourism**

I. Introduction

People often visit the same places (e.g., school, office, a favorite store) repeatedly. When such visits are repeated frequently, the action to get there tends to fall into a similar pattern that meets criteria such as *take the fastest route* or *take a train that arrives at just the right time*. These can be understood as actions aimed at optimizing the individual's time. These actions are taken by users to efficiently use their time. On the flip side, the repetition of these same *optimal* actions often results in a stereotyped routine. It is not necessarily a bad behavior to have a patterned routine as people can come to feel a sense of attachment to a place and see it as their territory.

Such a perception, however, often creates a fixed and restricted understanding of the place. For example, a fixed commuting route restricts departure from that route and keeps alternative routes unknown, even if they are near the current route. Furthermore, the state of not knowing is not conscious and is interpreted as knowing. This state is considered to have fallen to the local minimum in terms of information gain obtained from the environment. In such a case, users have not noticed a nice cafe nearby for a long time, or they have gone a long time without discovering new interesting places.

Essentially, a little outside the area where an individual usually visits is unknown to the person. The same is true for time. A little outside of the time (i.e., before and after the time) a person often visits a place is an unknown time zone to that person. Knowing these *a little outside* zones will have the positive effect of deepening understanding of the environment. Based on this hypothesis, we aim to provoke users to visit *a little outside* zone during their daily commute and thus make them more aware of their surroundings to enrich their daily life. We refer to the user's change in behavior as *subtle deviation* and explore a method to provoke a subtly deviated routing using a mobile device such as a smartphone.

As one design solution for this objective, this study presents a mobile application that provides a location-linked story to be read only at a specific location.

II. Related works

This section describes research aimed at provoking excursions and content based on geolocation.

A navigation system to deepen the understanding of the environment has been proposed [1]. The previous system is packaged as a treasure hunt game. The system shows only the direction and the distance of the destination. The user walks around the environment toward the hidden destination. The system is able to provoke a deviated routing from a known environment. However, the user's context is rarely considered in this system. In addition, the system does not present a specific destination to the user even though the system guides the user toward it. This makes it difficult for the user to reach the goal.

Wakao *et al.* proposed an application-linked stamp rally for provoking tour behavior in shopping malls. In this study, objects installed in real space are linked with mobile applications. The mobile application is provided to the participants of the study as a game that accumulates scores when they visit objects, which serve as checkpoints, installed in the building. It is provided to participants as a game that accumulates scores by visiting the objects installed in the building as checkpoints. The application can guide the users to spots with a low footfall rate. This proposal can be implemented in a controlled space such as a shopping mall or sections of a limited area. The cost of taking control increases when this method is used over a wide area.

In recent years, smartphone games linked to geolocation are common. Ingress is a typical, place-linked, smartphone game [2]. This game guides the players to places such as landmarks and public spaces in the real world. At these locations, the players can get items to use in the game. Applications

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packaged with game content are effective in provoking tour behavior. However, it is necessary to generalize each spot to establish the game rules. This results in losing the necessity of why the place was chosen.

III. Subtle deviation

The following points need to be understood to implement an application that provokes subtle deviation.

- What is a subtle deviation?
- How to make people deviate?
- What are the benefits of subtle deviation?

The following section organizes the deviation aimed at in this study.

A. Formation factors of deviation

As mentioned above, the behavior of people moving to their destinations tends to be optimized in terms of time. This is not always the best scenario when considering the experiences, they will undergo during the commuting. Moving to a specific place or moving at a certain time is a common frame of people's social life. Changing this frame requires a lot of energy, and may be very stressful. For example, it is impossible to guide people in the direction opposite to that of their destination while commuting, as it will frustrate them. By taking this frame into account, it is better to lead people to deviate subtly from their known space.

In this study, defining the degree of *subtle* is necessary to design the subtle deviation. For this, the focus was on one's own spatial and temporal context as a known space. The degree of *subtle* is defined by the ratio of deviance from these contexts. Spatial context means a route that users frequently take. Temporal context means the time zone that the user takes along the route. The route and time zone must be considered as independent variables. In this idea, general deviations are subtle deviations as spatial context. In addition, the use of a known space for an unknown time zone can be regarded as a deviation in the *temporal context*. For example, on a route that is used every evening, the user can witness an unknown view in the early morning.

In order to provoke a subtle deviation, the time margin cannot be ignored. For those who act on a time-optimized schedule, it is difficult to experience a subtle deviation. It is necessary to change the time-optimized action schedule to accept subtle deviations. This must be achieved before a subtle deviation is provoked. This study does not discuss specific solutions, but only describes them as one of the factors to achieve subtle deviations.

B. How to deviate

The following two methods are generally used to induce behavior in space.

- Proposing specific actions in the space
- Proposing any point in space and inviting the user there

An example of the former is the voice guidance system in a car navigation system. In order to achieve guidance with this method, the benefits gained from these actions need to be clarified. Examples of the latter include various spot recommendation systems and games using location. The key to achieve subtle deviation with this method is whether there is a preference for the destination of deviation. If there is a preference, the deviation is likely to be achieved. For example, at lunchtime, it is easy for a user to secure to a spot near a restaurant area. However, these preferences change so quickly that it is difficult to identify the hidden needs on the spot.

It is also popular to achieve a deviation by packaging and accepting the system as a content. This is a technique adopted for games using geolocation.

C. benefits of deviation

This study includes interaction with a known environment from a different perspective by provoking subtle deviations. To achieve this, the content to be provided must be linked to the real environment. In a general location-based game, the location is used as a tool, and the content in the game world is rarely associated with the real world.

Such a design enables the user to reach the intended destination. The user's interest is, however, focused on the in-game content, this does not lead to understanding of the surroundings. Associating the content with the real space provokes the interaction between the user and the real space. For example, increased observations that leads to the acquisition of new knowledge and experience about the place.

IV. Provoking subtle deviation by mobile application

As a method of leading a subtle deviation, this study adopts an approach of location-linked stories that work on a mobile application. By using a location-linked story, the user's behavior is triggered by a desire to read the story, resulting in deviations from the ordinary behavior.

Visiting the place of story stage is known as *literary tourism* [3]. It can be said that the story has aroused interest in the place. In recent years, the use of literary tourism has been studied as a means of branding the place and improving its visibility. Especially in Japan, literary tourism for popular culture contents such as animation and comics is called *content tourism* [4] and contributes greatly to the promotion of the places. This supports the use of stories to develop an understanding of an environment. In the following, specific content designs are considered.

A. Contents Design

When a story is used to provoke a behavioral change, empathy with the story acts as a motivator for the user to deviate from the ordinary route. In the proposed method, the place where the user reads the story is synchronized to the stage of the story. This makes it as if the user is experiencing what the character sees in the story, and this promotes immersion in the novel.

Since the location where the content can be read varies from chapter to chapter, the continuation can only be read at the location. This mechanism requires the user to move to that

location, and the preciousness that the story can only be read at that location becomes the incentive to move to that location.

The criteria for choosing a location include the following:

Places where attention is not paid due to low traffic
: Users are likely to already know places where many people gather, including local landmarks and large parks. Such places are not appropriate as the location of the story because these places may already have a fixed impression. To avoid this, a less impressionable location with low traffic is selected.

Benches or perched objects that users can sit on
: It is important not to block the traffic of people at the location when the user reads the novel. The valid concern of causing annoyance to others serves as a detriment for reading novels. To avoid this, it is necessary to ensure to secure the environment where the user can read the text safely without causing any public nuisance.

Object associated with the content of the novel
: When an object that exists only at the location appears in the story, the user can feel the synchronism between the novel and the real world. In addition, deliberately adopting objects that the user is not conscious of in daily life will attract the user's attention to the objects. This has the effect of provoking users to notice new aspects of the location.

From the above viewpoint, several spots shown in Fig. 1 were selected.

B. Application: OnSiteStory

The *OnSiteStory* is a mobile application for reading a location-linked novel. This application provides a novel that can only be read at specific places. The position of the mobile device is acquired using GPS, and the story becomes available only when the user is at a predetermined place.

The novel currently provided by the *OnSiteStory* is titled *NE-IRO*, which means a tone color in English. It consists of one prologue and four chapters. For this novel, four places with a low impression around Takatsuki Station were selected in advance and these four places were used as the stage for each chapter.

When the application is launched, a screen showing the table of contents is displayed as shown in Fig. 2-(a), and the user can select the chapter to read. The prologue can be read independent of the location. However, chapters 1 to 4 can only be read in specific places. The location at which the user can read the story is preset for each chapter.

When the user is not in a location where the novel can be read, a map around the user is displayed on the screen of the mobile device. The light spot on the map denotes where the user can read the next chapter (see Fig. 2-(b)). When the user goes to a place where the novel can be read, the story is displayed on the screen as shown in Fig. 2-(c).

The stage of this novel is inconspicuous spots around Takatsuki Station, and the target user is a student who goes through this station as a route to his/her school. These spots

(a) stone bench

(b) under the footbridge

Fig. 1. Selected location

are explicitly described in the story. For example, in the first chapter, the following text is included:

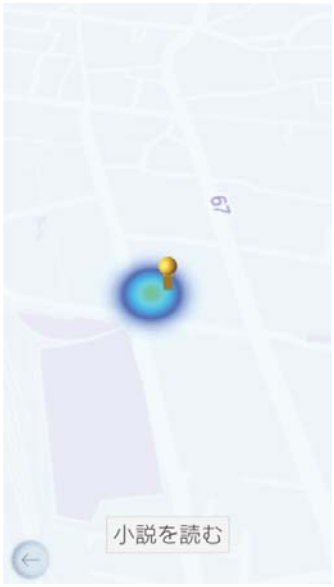
> The plaza was covered with cream and light brown tiles, forming a strange space that created a different atmosphere forcibly.

This text is a description of the place where the user can read the chapter (see Fig. 1-(a)). The user is expected to read the text at that place and feel the synchronicity between the story and reality. Synchronizing the user with the main character of the novel brings the user's immersive feeling. It is expected that the synchronization will encourage users to immerse themselves in the story, and the user will pay attention to their surroundings as an extension of the story.

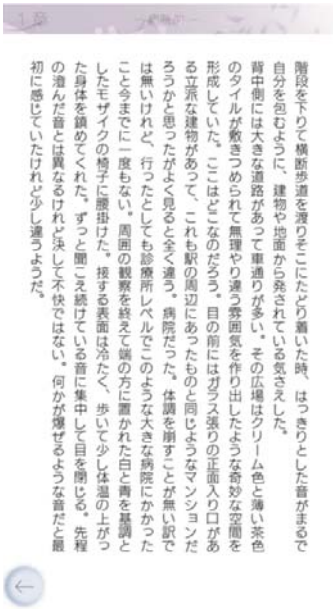
V. Discussion

This application has intentionally set the destination in advance. This is where the user consumes the content. This system provides a novel that includes a scene description of the destination when the user arrives. This feature was designed to

(a) Table of contents (initial screen)



(b) Map screen



(c) Text of novel

Fig. 2. OnSiteStory —NE-IRO—

immerse the users in the novels. This feature makes it possible to obtain a reading experience that includes scene descriptions linked to the user's surroundings. Through this content, users will get impressions and knowledge about their surroundings.

The limitation of this method is its low versatility. The text provided by this system requires a scene description very particular to the area, so it cannot be used in other areas. Therefore, the effect of provoking a subtle deviation is expected only under a limited area. In order to solve this problem, it is possible to extend the system in which multiple users participate in the creation and posting of geo-tagged text data. By adding a function for creators to post local content, this system can be used in various places. This extension exempts the application from having to grasp the user's spatial and temporal context nationwide. Collecting content created by many people allows various users to collect the viewpoints they have for a specific location. It means collecting impressions based on different contexts for a point. Users are expected to discover a new aspect of their surroundings by reading novels created by people with different contexts. However, the quality of the content used by the current system is important to provoke a subtle deviation, and those of created contents don't always satisfy the same. Therefore, it is necessary to consider how to guarantee the quality of the content. Currently, this application does not consider temporal context. As a method to consider the temporal context in this application, to switch the content according to the time zone is being studied. For example, a branch occurs in the story provided to the user. An evaluation experiment using this application is ongoing. In this experiment, the focus is on the occurrence of subtle deviation, and a new perspective on the space obtained by users.

VI. Conclusion

In this paper, a method is proposed to change a user's fixed behavior to deepen their understanding of their surroundings. This method is composed of provoking subtle deviation considering spatio-temporal context, and providing content linked to the real environment.

A mobile application that embodies this concept provides stories that can only be viewed at specific locations. Linking the description of the story and the environment that receives the content provokes the user's interest in the surroundings.

In future, a system using content with different modalities from novels will be implemented and compared to the current system. Content that includes stories and not just novels. For example, comics are content that combine multiple modalities, images and text. The design guidelines for provoking subtle deviation, including the possibility of such other content is considered.

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