The Design of a Map for Tourists to Engage in Circuitous Movements

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Abstract

Circuitous tourism helps to deepen the understanding of local cultures; however, the encouragement of circuitous movement by tourists through design is still under exploration. This study investigated the cultural area of Lukang in Taiwan through think-aloud protocols, behavioral observation, and circuitous movement planning to understand how tourists pre-plan and use the circuitous movement indicated on a site map. We then suggested a new map design that encourages circuitous movement and compared its effect on pre-planning and touring with that of the old map. This study found that in using maps for wayfinding people must rest. Site maps have always been a tool for tourists to plan their trips. When planning trips, tourists with maps relied on their past experiences; however, the existence of resting areas affected the planning of trips. Adding resting area icons effectively increased the touring periods and the number of attractions visited. Information on resting areas helped tourists independently arrange periods of repose, which aided planning and experiencing local specialties. Information on resting is thus an important factor for circuitous tours.

Keywords: map design; circuitous movements; tourism activities

1. Introduction

Tourism has become one of the main economic activities of many countries. Maps that support tourism must not only promote places, they must also guide tourists. Tourists usually bring their own maps to move around easily and to enrich their trips (Ikebe Satoru, 2010). In terms of mobility, traveling circuitously is an important behavioral characteristic of tourism. Circuitous tourism means that tourists start from one attraction, retrace their routes of choice, and finally come back to their original starting points (Suzuki Ryohei, 2010). Circuitous tours enable tourists to know better particular areas and travel ranges (Sanda Takashi, 2005) It can be defined according to the moving distances, moving ranges, and traversed areas of tourists (Higashi Kaori, 2011). Most tourists agree on a destination before setting off; thus, they plan their own movement ranges and routes beforehand (Shiga Sakuho, 2006). Moreover, to link movements that are circuitous, we must acknowledge the visibility of environmental features, such as the names of shops or roads, in order encourage tourist familiarization with a place (Sueshige Yuichi, 2007). Therefore, site maps must both support circuitous movements and provide enough information to help tourists plan in advance.

Existing research points out that when people find their way in a space, they are influenced by personal factors and environmental characteristics. The process of wayfinding is conducted when users sense an environment, grasp environmental information, and make judgments, which in turn lead to movement (Arthur and Passini, 2002). When people are moving in a space, their physiological characteristics affect the acceptance of environmental information. Their past experiences also help them to assess a route (Eaton, 1992). Passini (1992) explains that people define their wayfinding strategies by cognitive maps. There are two-wayfinding strategies: one is an orientation strategy and the other a route strategy (Lawton and Kallai, 2002). Even if a traveling route can connect each space, when too many decision points exist, it is easy to get lost (Best, 1970). Therefore, site maps have become a guidance tool for tourists. Consequently, it is crucial for site maps to provide information on destinations and to permit circuitous and free movement.

This study targets the Lukang tourist area, which is situated in the middle of Taiwan, as its experimental base. Lukang used to be Taiwan's second largest city and became the biggest harbor during the reign of Yongzheng in the Qing Dynasty. Lukang's historical architecture, traditional street patterns, and customs, make it an important cultural tourist spot. As terrain influences tourist routes, long and narrow streets and...
complicated alleys make Lukang a great place for sightseeing and exploration. We discuss how to permit tourists to move freely and to engage in circuitous movement in this traditional tourist environment. Thus, through wayfinding experiments, think-aloud method analysis, on route planning, and the validation of design proposals, this study treats Lukang as its investigative base; it employs the site map of the Lukang township office to understand the design of a tourist site map that permits general movement, encourages circuitous movement, and permits in-depth knowledge of a locale.

2. Method

Through the think-aloud protocol method, behavioral observation, and circuitous movement planning, we understood how tourists pre-plan and follow the circuitous movement of the site map. We then suggested a new map design that encourages circuitous movement. Further, the effects of trip planning and field circuitous movement of the old and new maps are compared. We conducted four surveys. The first three investigations analyzed the moving strategies of tourists and defined the conditions that encouraged circuitous movement. The last investigation proved the effects of the new map.

The first investigation was a task-based experiment. Among the 12 participants, there were six males and six females, all of whom were between 25 to 50 years of age and had been to Lukang fewer than two times. The participants had to select and visit the tour attractions on the assigned map, starting from a requested point and return to the starting point. Participants were asked to wear a video camera on their heads, which recorded their movements and spoken thoughts.

The second investigation was a non-participatory behavioral observation. We randomly targeted 30 subjects in Lukang and followed them with a camera; all started from the parking lot. The hand-held camera permitted unobtrusive observation of the whole process.

The third investigation was an experiment on circuitous movement planning. We asked eight female and eight male participants to plan tour routes based on the requested starting and ending points of the assigned map. They verbally described their touring plans, including traveling routes, tour attractions, estimated activities, visiting durations, and walking times. These three investigations all set the parking lot as the starting point and the goal in order to understand the characteristics and problems of the subjects' movement.

The fourth investigation was based on how the new map was used. Through the investigations of the site map and tour planning, we suggested a new map design and replaced the original map. The investigation, which

Table 1. The Code of the Participants' Think-Aloud Protocols

| Wayfinding behavior | Code | Context of behavior                     |
|---------------------|------|----------------------------------------|
| Gathering information | Is   | Finding information from the environment |
|                     | Im   | Reading Maps                           |
|                     | Ir   | Reading road signs                     |
|                     | Ii   | Reading signs                          |
|                     | If   | Unable to find other information       |
|                     | I?   | Unable to find useful information      |
|                     | Ie   | Judging from personal experience       |
|                     | Iu   | Finding useful information             |
| Decision Making     | Dd   | Deciding on a direction                |
|                     | Di   | Determining the current position       |
| Decision Execution  | Am   | Movement                               |
|                     | Ap   | Validating decision                    |
|                     | Ad   | Doubting decision                      |
|                     | A?   | Getting lost                           |
| Other               | Oa   | Attracting attention                   |
|                     | S    | Suggestions                            |

Fig.1. The Places of the Participants' Think-Aloud Protocols

included non-participatory behavioral observations and experiments on tour planning, was conducted in
the same way as with the original map. After the new map was set, the second investigation (observation) and the third on circuitous movement planning were conducted again. There were 30 observed subjects for the non-participatory behavioral field study and 16 participants (eight females and eight males) for the other two investigations. By comparing and analyzing wayfinding behaviors and verbal route descriptions, we examined the effects of circuitous movement with the new map. It is uncertain whether the subjects in the observation were doubly observed. The movements of participants in the other investigations were non-repetitive. They had been to Lukang at least once.

3. Results
3.1 Results of Task-Based Field Experiment on Site Maps

In the task-based experiment, the 12 participants' average walking distance was 3.4 km and their average time was 28 minutes, 19 seconds.

According to wayfinding behaviors, we coded the participants' reports. Among the behaviors, finding information from the environment (Is) accounted for 16% of the total reports and appeared mostly in the initial stage. This result means that participants needed large amounts of information on the tourist area in order to plan their circuitous tour routes. Just like other visitors, they used the site map first to plan or consider possible touring routes. Therefore, detailed site maps and information must be placed in transfer places, such as parking lots and train and bus stations, to allow tourists to readily their tours.

Further, reports of reading maps (Im, 7%) and reading signs (Ii, 8%) appeared often, which means that participants used site maps and tourist signs as wayfinding clues. They employed them to determine their current positions and to move. Reports of deciding on a direction (Dd, 18%) and moving (Am, 19%) were most common. If participants saw other site maps on the way to the destination, they checked their current position to decide if their walking directions were accurate; thus, reports of determining current positions (D1) accounted for 14% of the total. Even though the percentage of reports of unable to find information (If, 3%) and getting lost (A1, 0.2%) were not high, they all occurred at intersections and on long distance roads (Fig.1.). Participants paid extra attention to locate information when they made turns. However, they were unable to find existing signs in the site. At some spots, there were no signs. As the site map provides limited information, if no other touring information was found after long distances, the participants doubted their planned routes and searched again for information. The places in which these reports occurred indicate that no site maps or signs were available. These places thus became important references for adding site maps or signs in the future.

More than half of the 9% of other reports were related to physical fatigue and the need for rest. For example, participant T1 spoke of this requirement in 7th report ("There seems to be a resting area across from the Chen Huang Temple") and the 15th report ("This is Lukang Guild Hall, and you can see things inside. There is a wide space up front; you can rest before moving on").

Similarly, in the 6th report, participant T2 said, "I found that we are on our way to Chung-Shan Road on the site map; if we want to go to Tian-Ho Temple, we need to walk straight. I feel tired and there is no resting area nearby." In the 7th report, the same person indicated, "Here is better, so we can rest for a bit, or else we'll be very tired." In the 12th report, participant T9 said, "This is just the place for me to rest"; in the 19th report, he or she remarked, "There are places for tourists to rest, or it would be tiring to walk down." We can see from these reports that a resting area is a place where tourists can stay for a short time and that serves as a stop before the next attraction.

3.2 Non-Participatory Behavioral Observations

In this field observation, the observed subjects' average touring period was 43 minutes and 22 seconds (2533 seconds), and the average walking distance was 1963 m. The average touring period was longer in the task-based experiment, but the walking distance was comparatively shorter. We know that the subjects in non-experimental situations feel less pressured and take longer tours.

From the results, we determined that touring behaviors involved mainly walking, reading maps, visiting attractions, shopping and eating, and resting. Therefore, we did an analysis of circuitous movement according to these behaviors. We found that walking accounted for 52.3% of the trip and 31.5% of the time in visiting attractions, as shown in Table 2. Each subject visited 2-3 attractions (average: 2.3). They spent 13% of the time shopping and eating, females devoted more time to these activities than did males. Even though this observation picked subjects randomly without knowledge of their understanding of a place, each subject read maps in the beginning of the tour, as in the task-based experiment. Subjects on average read maps for 45 seconds and more than once (average: 1.5 times); thus we know that site maps are crucial for moving and for supporting pre-tour planning.

| Walking | Map-reading | Visiting attractions | Shopping & eating | Resting | Total |
|---------|-------------|----------------------|-------------------|---------|-------|
| Average time (Sec) | 1324        | 45                   | 798               | 333     | 33    | 2533 |
| Average time (%) | 52.3%       | 1.8%                 | 31.5%             | 13.1%   | 1.3%  | 100% |

Table 2. The Average Time of the Observed Subjects' Behaviors (30 Subjects)
In all, 7 subjects evinced resting behavior. They toured longer than those who did not rest and visited more attractions with a greater frequency. Resting time is very much related to traveling companions, since children and elders take more time to rest. Therefore, facilities, such as seating or shaded areas, should be considered in relation to resting behavior, and signs should show their positions. The integration of site maps and resting information is thus important for circuitous movement.

3.3 Experiment on Circuitous Movement Planning

We found that participants engaged in five activities: walking, visiting attractions, eating, shopping, and resting. They spent 33% of the time visiting attractions, and each participant planned to visit an average of 6.2 attractions. They used 31% of the time for walking, and most participants intended to shop and eat. The average planned tour period was 370 minutes, with 124 minutes for attractions and 69 minutes for shopping (Table 3.).

Eight participants of the 16 planned resting activities. However, it is worth noticing that resting activities were usually not individually planned. Overall, 83% of resting activities were planned with other activities, such as visiting attractions or eating and shopping. Existing maps did not give precise locations for resting, so the tourists relied on their past experiences, which restricted planning and exploring. Thus, if we provide resting information, it will perhaps help tourists to plan better their circuitous movements and to experience sites more fully.

4. Discussion of the New and Old Map

We investigated tourists' behavior and needs with the existing Lukang tourist area site map. In task-based experiments, we discovered that tourists used the map to reach attractions, and from the verbal analysis, we found their need to rest. In behavioral observation, we understood that tourists engage in five main behaviors (walking, reading maps, visiting attractions, shopping, and resting). Those who rested had longer circuitous movements. Over half of the tourists planned to rest, thus, we think that information on resting areas can help tourists take breaks and engage in more planning.

However, we need to validate if the information on resting areas is helpful for circuitous movement by comparing the old and new maps.

According to Symbol Signs for Public Information (Iiyama, 2001), the icon for resting areas on site maps (Fig.3.) tells tourists that these are places of repose. Organizing the icons and moving those related to tourism to the top of maps allows tourists to easily find the information (Fig.3.).
The behavioral observation analysis of the new map was conducted with the same activities as with the old one. Tourists using the new map increased their circuitous movement by 1.28, and the distance that they covered was 1.3 times greater. Tourists using the old map made more changes in their touring range (Fig.4.). However, those that used the resting area icon moved in the same direction as the visited attractions and employed the resting areas more often (Fig.5.). Thus, the resting areas served as a guide for field movements; they not only affected routes of movement, but they also made tourists stay longer in particular places. The resting area icons on the new map allowed for longer visits.

The average time for visiting attractions, shopping, and resting significantly increased; only the time for reading maps decreased (Table 4.). Of the participants, 15 of 30 refreshed themselves in the resting areas (with the old map only seven did so), and their resting time markedly increased. Resting allows tourists to relax, which makes them willing to spend more time touring and boosts the quality of tours.

Moreover, tourists with the new map visited fewer attractions than those who employed the old one (New: 2.03 < Old: 2.33), but the stopping period increased by 1.2, meaning that more tourists had the chance to know the local culture and history in depth. All the results indicate that the new map made the tourists more willing to spend more time in the Lukang tourist area and to engage more carefully the local culture. Moreover, the resting areas allowed for more breaks and more detailed planning.

(2) Comparative Analysis of Planning in Circuitous Movement

The participants who employed the new map planned 404-minute trips, which was 1.1 times more than those who relied on the old map. Their touring distance increased by 175 meters (2138 m > 1963 m). Further, the planning time for visiting attractions, eating, and resting were prolonged. However, the number of visited attractions of each participant decreased to 6.3 (old: 150; new: 103). With resting information added, 16 participants planned to utilize the area of repose. The participants rested 1.7 times in the whole trip. It is worth mentioning that 96.3% of participants with the new map planned their resting activities as independent activities (Table 5.); in comparison, 83% of resting activities were combined with other activities when the old map was used. For example, resting was arranged with shopping, so participants relaxed in shops.

Lukang, a famous historical tourist spot, was strongly influenced by industry in earlier times. Its long and narrow streets and old alleys make Lukang's street environment very complicated. Besides, the hot weather throughout the year creates more movement difficulties. Experienced visitors will prioritize their destinations. These environmental characteristics

| Table 4. Comparison of Non-Participatory Behavioral Observations |
|---------------------------------------------------------------|
| **The average time each person takes in each activity**       |
| Walking | Map-reading | Tourism | Shopping | Resting | Total |
|-------|------------|---------|----------|---------|-------|
| New map (30 observed subjects) | 1604 | 31 | 968 | 483 | 150 | 3235 |
| Old/new increased rate | 1.21 | 0.67 | 1.21 | 1.45 | 4.56 | 1.28 |

Fig.4. Using the Original Walking Route

Fig.5. Using the Route with Marked Resting Area
they indeed spent shorter times reading the map and longer times and higher frequencies for other activities. This showed that in complicated tourist areas, such as Lukang, maps with marked resting areas can efficiently help visitors stay longer. Although visitors will plan to visit fewer places, the duration of circuitous movements will take longer and thus influence visitors' understanding of the local culture.

5. Conclusion

Taiwan has been actively developing tourism. However, commercialization is only a part of this economic activity. From the viewpoint of sustainable management, the core values of a tourist area are found in the understanding of local culture, the experience of local specialties, and the willingness to revisit. Tourist areas have limited effects if tourists over-indulge in foods and other commodities rather than in attaining a deep understanding of local cultures. We found that by adding resting area icons to new maps, tourists visited longer and engaged in more shopping, which meets the benefits of a circuitous tour. We suggest placing the maps at the middle of intersections and at corners, including those of buildings. The landscape and viewing perspectives of tourists must affect the placement of the maps (Zheng, 2008). We hope to explore whether the suggested routes and the improvement of software and build facilities will enhance the experience of circuitous tour.

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Table 5. Comparison of Circuitous Movement Planning

| The average time each person takes in each activity | Walking | Visiting attractions | Eating | Shopping | Resting | total |
|----------------------------------------------------|---------|---------------------|--------|----------|---------|-------|
| Old map (16 participants)                          | 115     | 124                 | 40     | 69       | 22      | 370   |
| New map (16 participants)                          | 114     | 150                 | 59     | 51       | 30      | 404   |
| Old/new increased rate                             | 0.99    | 1.2                 | 1.5    | 0.7      | 1.3     | 1.1   |

Fig.6. Route Description of the Old Map

Fig.7. Route Description of the Map with Marked Resting Area

limit the chances of visitors to undertake circuitous movements and to understand this place.

In the present study, most of the participants had visited Lukang only once. Thus, in the comparison of the new and old maps, the participants with fewer visits to Lukang focused on more activities, since the map with marked resting areas altered their route planning. In the third investigation, although we could not ensure how many times the participants had visited Lukang, the average time each person takes in each activity is shown in the table below:

| Activity       | Old Map (16 participants) | New Map (16 participants) | Old/New Increased Rate |
|----------------|---------------------------|---------------------------|------------------------|
| Walking        | 115                       | 114                       | 0.99                   |
| Visiting Attractions | 124                   | 150                       | 1.2                    |
| Eating         | 40                        | 59                        | 1.5                    |
| Shopping       | 69                        | 51                        | 0.7                    |
| Resting        | 22                        | 30                        | 1.3                    |

Fig.6. Route Description of the Old Map

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