Spatial behavior pattern of visitors in City Park
Case study: Flora and Bungkul Park, Indonesia

V Dharmawan 1,* and N Rachmaniyah2
1 Department of Architecture, Universitas Muhammadiyah Surabaya- Indonesia
2 Department of Interior, Institut Teknologi 10 Nopember Surabaya- Indonesia

*Email: vippy.dharmawan@ft.um-surabaya.ac.id

Abstract. Knowledge of park visitor behavior needs to be owned by architects or public facilities designers. This is so that they can predict how visitors will behave in the park they designed. On the other hand, research on the behavior of park visitors is still rare in Indonesia. This research was located in Taman Bungkul and Taman Flora Surabaya-Indonesia and aimed to observe behavior patterns of park visitors. The research uses a qualitative descriptive approach, with behavior mapping techniques whose data are mostly obtained from direct observation in the field. Behavior mapping identified visitor’s position, elements and facilities of the park, and the time they spend in the park. The results of the observations revealed that park facilities acted as a prominent stimulus to visitors’ behavior pattern, and there was interrelation between city park facilities and spatial behavior pattern. In addition, it was also found that the strength of stimulus changed time to time depended on density in the park.

1. Introduction
City Park is an outdoor public open space that is owned and operated by local government. As a public space, it can be accessed by all citizens of the city. There are many benefits of City Park, including promoting human health and wellbeing, and strengthening social cohesion, air quality and carbon sequestration. Most parks in Indonesia are green spaces used for recreation, aesthetic function, or air quality maintenance. Parks may consist of trees and bushes, soil, grassy areas, rocks, but may also consist of buildings and other artifacts, such as fountains, sport arena, monuments, or animal cages.

This article relates to public open space design, particularly to the relationship between city park facilities and spatial behavior pattern. It focuses on the density of visitors and the placement of facilities. The research problem addresses a lack of knowledge about the influence of physical features to people behavior in public space, especially in a city park. The majority of planners and designers recognize that public spaces can influence people’s behavior and experiences. In addition, the physical and ambient features of public spaces can facilitate crowding, affect personal space needs, create places that are desirable and attractive, deter people through unpleasant sounds and smells, and cause behavioral changes in response to perceptions of safety [1].
Some research in public space have been conducted. Razavivand Fard [2] studied how people use public open spaces and factors that impact the use of these spaces as well as physical features which are the most influential on the behavior patterns and specific activities related to the space in Kadıköy square, Istanbul. This study reveals that design and quality of public open space influence the use of it, and activities occurring in the place are only meaningful and dynamic as long as humans’ everyday life takes place within it.

In context of Indonesia, study of behavior in public spaces have been done quite a lot, for example, a study of visitor behavior in a shopping center that describes the response of visitors to the atmosphere of a shopping center [3]. There are also studies in educational facilities that map early childhood behavior patterns [4], as well as research on the behavior patterns of fast food restaurant visitors [5].

Whereas, research on urban parks rarely discusses behavioral aspects of park visitors. Research conducted by Sasongko [6], for example, is about changing the function of city parks in Semarang. This research shows that changes in the function of the park can result in decreased environmental quality, such as increased air temperature, dust, and dirty. There is also research conducted by Kustianingrum et al [7] which is about the function and role of Taman Ganesha in the city of Bandung. The research by Kustianingrum [7] shows examples of the functions and roles of parks that are well preserved even though they are decades old. Currently, the latest research on the behavior of park visitors is a study conducted by Dharmawan [5] in the play area of Surabaya city parks. This research was conducted to find out the influence of density of visitors on their behavior. The result of this study indicates that when the park is crowded, there will be many unusual behaviors, such as sitting in any place.

Whereas, the research conducted by Rachmaniyah [8] examined the relationship between physical features and human behavior with the stimulus response theory approach. By using behavior mapping techniques, she found that physical features act as stimuli that shape spatial human behavior patterns.

2. Methods

A qualitative approach study was used to reveal the distribution pattern of visitors in Bungkul Park and Flora Park, located in Surabaya. These two parks were selected because both cover a wide area of visitors, and have become one of Surabaya's icon. Most of the data were obtained by direct observation in the field and presented using behavior mapping technique. This was a direct-observation technique that tracks people’s behavior in specific space and time. This method was started to be used in the late 1960’s to study how physical environment features affect the people’s behavior, including the activity level, type of activity, etc. [9]. This technique was developed by Ittelson since the 1970s. It is a very popular mapping technique and often used in behavioral observation. It was also used by Rachmaniyah [8] who examined the behavior of shopping center visitors in a mall in Surabaya. The latest research in Indonesia that uses this technique is research conducted by Fitria [10] who examined the relationship between space settings and their users in the campus of Aisyah University in Yogyakarta.

Field observation was carried out using a type of mapping techniques, namely person centered mapping. This type of mapping focuses on how humans organize themselves in a particular location (Sommer et al, 1980). In this study, visitor distribution patterns were obtained by this technic. The steps taken for mapping were: (1) Doing preliminary observations on both park locations to get an outline of activity patterns and determine observational schedules, (2) Making a basic map of the park, (3) Making observations in the field, and (4) Making data analysis obtained from observations. The observation schedule was grouped into two time categories, i.e. workdays and holiday or weekends. This is because on weekdays the park's situation generally tends to be quiet, while on holidays or weekends the park is generally crowded by visitors.
3. Results and discussion

The discussion begins with the existing condition of the two parks. Bungkul Park is located in the center of Surabaya. The name Bungkul refers to the existence of Mbah Bungkul grave that located within the park. The park is surrounded by road and accessible from all direction. It has three main facilities: playground area, skateboard area, and open theater area. Playground area has several playing equipment for children (swing, slides, see saw, etc.). Skateboard area is an open court that has several tracks for players. Whereas, open theater area is a circular courtyard surrounded by a spectator seats. The second is Flora Park that located in the east of Surabaya near a bus station. This park was formerly called Kebon Bibit because it was used by the city for nurseries of various green plants. This park is unique due to its collection of plants, deer's cages, giant bird nest, and outdoor sport arena that cannot be seen in other parks in Surabaya. In addition, there are also fountain pools, playgrounds, and multi-function courtyard. Unlike Bungkul Park, Flora Park is only open to the public until sunset.

There are various activity in the park, such as standing while enjoying the atmosphere, walking, pushing prams, jogging, sitting, playing ball, playing skateboard, performing, or just watching other visitors' activities. The following table shows the activities that were seen in the park facilities. Visitor activities could be categorized in two groups, i.e. activity with moving position (walking, jogging, playing ball, etc.) and stationary position (sitting, standing, playing see saw, etc.). People in moving position tended to be in pedestrian path, while the other tended to be in area of park facilities. Preliminary observation in both parks showed that people spent more time at the park facilities than on pedestrian path. It revealed that park facilities were the main attraction for visitors. That was why the position of visitors was influenced by existing facilities. They tended to stop or swarm around park facilities. Whereas, on the pedestrian path they tended to move (Table 1).

Furthermore, the observations showed that density of visitors in the park changed from time to time. According to social distance (Hall, 1963), researcher categorized them in three level: high, medium and low density levels. A high density level is specified when the distance between visitors is less than 1.2 m, medium density level when the distance is 1.2 m – 3.7 m, and low density level when the distance is more than 3.7 m.

Table 1. Facilities and kinds of activity

| Bungkul Park | Kind of Activity |
|--------------|------------------|
| Circular Plaza | sitting (+), standing (0), walking around (0), perform ( ), push a prumm ( ), playing ball ( ) |
| Skateboard Area | sitting (+), standing (0), walking around (0), playing skateboard (0), playing BMX bike (0) |
| Children Playground | sitting (+), standing (0), walking around (0), playing skateboard (0), playing BMX bike (0) |
| Culinary/Food Center | sitting (+), standing (0), walking around (0), playing see saw, slide, swing set, and others (+) |
| Around Fountain | sitting (0), standing (+) |
| Pedestrian Way | sitting ( ), standing ( ), walking ( ), jogging (0), push a prumm ( ) |

| Flora Park | Kind of Activity |
|------------|------------------|
| Around Animal Cage | standing (+), feed the animals (0) |
| Around Fountain | standing (+) |
| Children Playground | sitting (+), standing (0), walking around (0), playing outboard equipment (+) |
| Outboard Area | sitting (+), standing (0), walking around (0), playing see saw, and others (+) |
| Multi Recreation Area | sitting (+), standing (0), walking around (0), playing see saw, slide, swing set, and others (+), perform (0) |
| Pedestrian Way | sitting ( ), standing ( ), walking ( ), jogging (0), push a prumm ( ) |

(+) often
(0) occasionally
(−) seldom
High and medium level densities were more often seen in the area of the park facilities. Whereas, in pedestrian areas, the density tended to be low. For example, in the morning when the park was still quiet, low level density was seen in all parts of the park. Then, when the park started to bustle, the visitors would begin to gather around the park’s facilities (Table 2). These results indicated that there were several patterns of spatial distribution of park visitors, and park facilities became a stimulus to visitors.

Table 2. Density of visitors

| Time        | Bungkul Park | Time        | Flora Park |
|-------------|--------------|-------------|------------|
|             | Circular Plaza | Skateboard Arena | Children Playground | Culinary/Food Center | Around Fountain | Pedestrian Way |
|             | w-day | w-end | w-day | w-end | w-day | w-end | w-day | w-end | w-day | w-end | w-day | w-end | w-day | w-end | w-day | w-end |
| 05.30-07.00 | low    | high   | low   | med    | low   | high   | low   | med    | low   | med    | low   | med    |
| 07.00-09.00 | med    | high   | med   | high   | med   | high   | low   | high   | low   | high   | low   | high   |
| 09.00-12.00 | low    | med    | low   | med    | low   | high   | low   | high   | low   | high   | low   | high   |
| 12.00-15.30 | low    | low    | low   | low    | med   | med    | low   | med    | low   | low    | low   | low    |
| 15.30-21.00 | med    | med    | med   | med    | med   | med    | med   | med    | med   | med    | low   | low    |

Figure 1 illustrates several visitor distribution patterns in Bungkul Park. The first pattern (Figure 1a) occurred early in the morning of the weekdays. There was low level density in the pedestrian area and all park facilities. The second pattern (Figure 1b) occurred on the afternoon of the weekdays. There was a crowd of visitors with medium level density on the playground and skateboarding arena. Whereas, the pedestrian and plaza areas were in low level density conditions. Next, the third pattern (Figure 1c) occurred on the morning of the weekdays. Crowds with high level density occurred in all facilities, including playgrounds, circular plazas, and skateboarding arena. Whereas, in most pedestrian areas, the condition was medium level density. The fourth pattern (Figure 1d) occurred on the morning of the weekends. Crowds with high level density occurred in all parts of the park. There was high density in all facilities and pedestrian areas. Similar distribution pattern can be seen in Flora Park (Figure 2). There was a crowd of visitors with medium level density on the park facilities. Whereas, the pedestrian ways were in low level density conditions.

In line with the previous research conducted by Rachmaniyah [8], this phenomenon showed that the physical element of the environment acted as a stimulus that influenced behavior patterns in space. When the park was quiet, park facilities became a neutral stimulus. Then, when the park started to get crowded, it would be a strong stimulus for park visitors.
Figure 1. Behavior pattern in Bungkul Park

Figure 2. Behavior pattern in Flora Park
4. Conclusion
Visitors spent more time in the facility area, while the density of visitors in the facility area was also higher than pedestrian area. This leads to the conclusion that in public spaces, such as city parks, facilities in the park became a stimulus that shaped visitor behavior. It can also be concluded that the strength of the stimulus in the form of park facilities always changed time to time, depending on the level of visitor density. This finding confirms the result of a study conducted by Rachmaniyah [10] which revealed that existing facilities in public spaces became the dominant stimulus in influencing visitor behavior.

These findings are very useful for designers. It can be a reference in the design process. The fact that facilities in the park became a stimulus that shaped visitor behavior, lead to the conclusion that these facilities are the most taken into account in the city park design process. During the design process the designer can arrange the placement of the facilities as a first step in arranging the park lay out. Furthermore, the other elements of park will follow the pattern of the placement of these facilities.

References
[1] Sangar V A 2007 Human behavior in public spaces Thesis (University of New South Wales, Sydney).
[2] Fard H R 2014 Evaluating spatial behavior in the urban public space of Kadikoy square, 2nd International Conference on Architecture and Urban Design Tirana Albania.
[3] Hijaz T 2007 Desain interior dan perilaku pengunjung di ruang public Jurnal Dimensi Interior UK Petra Surabaya.
[4] Makalew L V and Waani J O 2015 Pengamatan arsitektur dan perilaku Proseding Temu Ilmiah IPLBI UNSRAT Manado.
[5] Dharmawan 2018 Study of behavior in fastfood restaurant at shopping mall Jurnal Desain Interior ITS Surabaya.
[6] Sasongko P D 2002 Kajian Perubahan Fungsi Taman Kota di Kota Semarang Thesis UNDIP Semarang.
[7] Kustianingrum D, Angga K S, Rifan A N, Franderdi R 2013 Fungsi dan Aktivitas Taman Ganesha Sebagai Ruang Publik di Kota Bandung Jurnal Rekakarsa vol 2 no1 ITENAS Bandung.
[8] Rachmaniyah N 2000 Kajian Perilaku di Ruang Publik Pusat Perbelanjaan Thesis ITS Surabaya.
[9] Cosco N G, Moore R C and Islam M Z 2010 Behavior mapping: A method for linking preschool physical activity and outdoor design Medicine and Science in Sports and Exercise.
[10] Fitria T A 2018 Keterkaitan perilaku pengguna dengan pola ruang kawasan Jurnal Arsitektur dan Perencanaan UNISA Yogyakarta.