Estimation of Bicycle Park Occupancy in Oikoshi and Hirasuna Dormitory

Hepi Hapsari Handayani (Doctoral Student in Geoenvironmental Sciences)

1. Motivation

Bicycles, as a mode of transportation, are emission-free, can promote a healthy and active lifestyle. Therefore, cycling becomes an important mode of transportation, especially in campus area. The increasing of bicycle number needs the adequate parking. However, the parking space frequently does not meet the occupancy.

2. Purpose

The purpose of this study is to estimate the bicycle park occupancy in Oikoshi and Hirasuna dormitory areas. The estimation is based on the ratio of building population and the bicycle number. This study assumes that all student living that building has one bicycle.

3. Methodology

The data used in this study consisted of campus and ZENRIN data including building, bicycle park, and campus road. The field survey was conducted to identify and get additional information about the building dormitory such as the room type and number of floor. Also, collecting and updating for the bicycle park was conducted to check the number of rows and the corresponding building. ArcGIS collector was used in the field survey due to the convinience in upadate and edit the data. However, three bicycle parks were not covered in the data. Therefore, the direct measurement was conducted in order to get high accuracy. Compass and TruPulse range finder with distance accuracy of ±10cm were used to define the azimuth angle and distance for the update parks. Here, trigonometry calculation was applied to determine four points of the parks. Also, those equipments were used to check the consistency of the existing length of parks. Finally, 32 parks in Oikoshi and 30 parks in Hirasuna were used this study.

The population per building was calculated using building volume and volume standard per person. The number of floor also was applied to check this population number. Then, the bicycle number was determined using the park area and the standard area per bicycle. The final stage is to determine the ratio of population and bicycle number and model the occupancy.

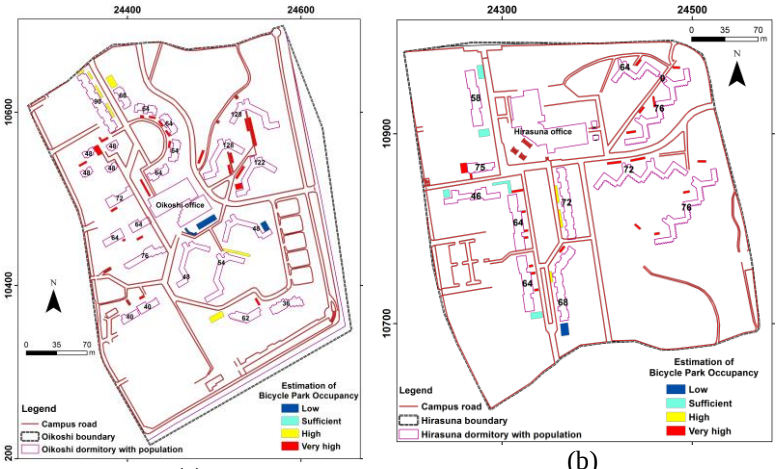
4. Result and Discussion

Fig.1 shows the map of the bicycle park occupancy estimation in according building with population. The occupancy is classified into 4 categories: low, sufficient, high and very high. For Oikoshi area, the low level is found in the middle part, the high level is shown in the south and northwest part, while, the very high level is distributed evenly. For Hirasuna area, the low level is presented in the south area, the sufficient level is shown in the west area, while, the very high level is frequently found in northeast part. Table 1 presents the portion of occupancy level in percentage. Oikoshi has the portion of low level larger than those of Hirasuna. However, both areas have a very high level in the portion more than 50%. The very high occupancy is found in the building with high population. Thus, the fig.2 shows the high correlation (R=0.7) between the population and bicycle number.

Fig.3 presents the pattern of bicycle occupancy using Anselin Morans I with 95% confidence interval. For Oikoshi, a low cluster

Table 1. The portion of the occupancy level

Occupancy level	Oikoshi (%)	Hirasuna (%)
Low	9.375	3.333
Sufficient	0	16.667
High	25	10
Very high	65.625	70



(a) (b)

Fig.1. The map of the bicycle park occupancy estimation (a) Oikoshi area (b) Hirasuna area.

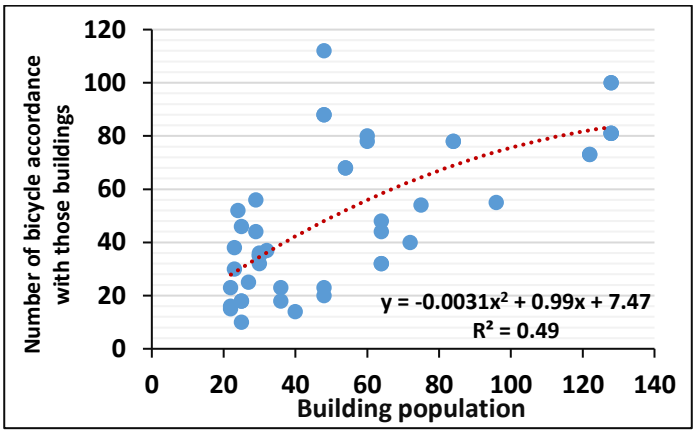
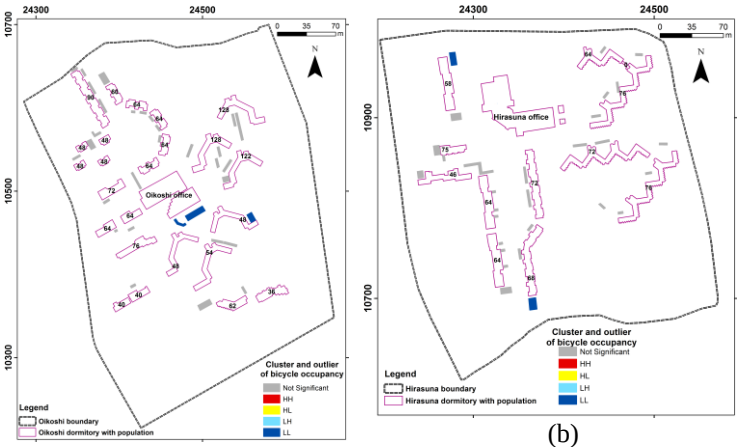


Fig.2. The regression using second orde polynomial for population and bicycle number

of occupancy (LL) is presented in the middle part which is surrounded by building with population in range 48-54. While for Hirasuna, the low cluster of occupancy (LL) is found in the north and south part which is surrounded by building with population in range 58-68. Here, the bicycle park occupancy is correlated with the building population and the parking area. When the population is low and the parking space is large, it produces the low occupancy. Interestingly, the adequate space of bicycle park was identified in medical and nursing dormitory through field survey, even, the fig.1 shows the very high occupancy. Contrary to the car parking, it presented a high occupancy. Therefore, the scholar level and subject type might be correlated with the real condition of bicycle occupancy.



(a) (b)

Fig.3. The cluster and outlier pattern of the bicycle occupancy