

Multidimensional evaluation system for pedestrian environment

Oh, Sung-Hoon
Seong, Eun-Young

Pedestrian environment is a terminal of the personal experience and everyday urban life. This study is about finding ways to evaluate pedestrian environment with more rationality and objectivity. Through the review of the literature on pedestrian needs and environmental elements related to walking and re-arrangement of evaluation system from the viewpoint of pedestrians, this study, in the long term, aims to contribute to:

- establishment of a practical foundation for comprehensive improvement of pedestrian environment, which is the essential part of the urban infrastructure for low-energy and low-carbon society.
- development of multidimensional evaluation system for pedestrian environment, through integrated approaches over existing evaluation methods and instruments.
- suggestion of principles and guidelines for policy, planning, and management concerning pedestrian environment

In the literature review, we examined the relationship between pedestrians and the environment, collected related indicators, set five categories, and selected indicators. We also reviewed theories and methods of behavior analysis and sought for the link between behavioral observation and network analysis. Further, we conducted a field survey and in-depth interview of pedestrians in the commercial street to find out what is important with regard to pedestrian-oriented analysis on the environment and behaviors.

In fact, what pedestrians want in commercial streets was not just a through-pass, but constant interaction with surroundings features and other pedestrians. Unlike other streets in residential or business area, what pedestrians expect to experience in commercial street is something extraordinary and attractive, with variety of continuous streetscape and people.

The result of survey on pedestrian perception and behavior in commercial street showed that an average pedestrian visit consists of 4.19 steps. Activities like dining, drinking teas, going movies/pubs, or shopping involve walking between one and another. Average duration of a visit is 50 minutes, and most of them include one or more dining and other activities. Dining usually takes place in earlier steps, first or second, while walking tends to occur in later steps. Dining is likely to be followed by walking, which means the location of dining places has significant influence on the walking route.

Based on literature review and the survey, 5 categories for the multidimensional evaluation system of pedestrian environment are established as follows:

- Integrity: attributes focused on pedestrian network
- Functionality: attributes focused on physical attributes and performances
- Connectivity: attributes focused on composition and connection of spaces
- Legibility: attributes focused on orientation and placeness
- Comfort: attributes focused on quality and attractiveness of spaces

The previous literatures on pedestrian environment evaluation were reviewed according to these 5 categories, and only a few evaluation cases have covered the integrity category. It implies that further research is needed for this, combining analysis of behavior observation and pedestrian network. We suggested several concepts and methods needed for this analysis such as Pedestrian Environment Evaluation Unit(PEEU), Pedestrian Focus(PF), accessibility and bypass-rate, and total-area-distribution method. PF refers to points where pedestrians flow in or out of certain PEEU. When PFs are defined, properties of them and spatial structure of PEEU are analyzed together, to estimate and allocate the pedestrian flow. Concepts

and approaches on accessibility and bypass-rate are derived from existing researches. The total-area-distribution method combines the amount of pedestrians on each PF, spatial structure, and total area data to configurate pedestrian network in PEEU,

3 commercial districts in the region of Gangnam Station, Hongdae in Seoul, and Beomgye Station in Anyang City were selected for application of evaluation system. Physical investigation, behavior observation, and GIS analysis were conducted on 3 districts. We paid special attention to the visual and behavioral connection on building frontages, which can comply with pedestrian needs, as they define the edge of the pedestrian space. The result showed that Beomgye Station district, where the behavioral connection of building frontage was highest among 3, also had highest rate of pedestrian behavior. It confirms the importance of connectivity in pedestrian environment.

This study also has significant implications on methodological improvement. It suggested a new method, using PF, to measure and estimate pedestrian flow within the network. The outcomes of estimation was compared to the actual pedestrian behaviors, revealing the proportion of goal-oriented and circular walking. Circular walking took significant proportion, and was more closely related to surrounding landuse than network properties. It implies that walking in commercial district is closely influenced by attractiveness of surrounding landuse.

In further studies, data on PF properties like pedestrian flow, duration, position, and seasonal changes should be accumulated to estimate pedestrian flow more accurately for different types of PF. In-depth verification on evaluation elements is also needed to find out effective factors on pedestrian satisfaction and their degree of importance. Finally, practical recommendations to deliver significant and effective improvements on pedestrian environment can be derived from such results.

Keywords : Pedestrian Environment, Pedestrian Focus, Pedestrian Behavior, Evaluation System