Network Spatial Analysis of the Service Areas of Perishable Food Sales Stores for Elderly People

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Abstract: In Japan, motorization has progressed since a high economic growth period. The diffusion of urban functions also became active as a result of the removals of large stores and public institutions into suburbs. In addition, we experience a rapid aging society in recent years. There have been researches concerned with the ability of elderly people. For instance, the permissible walking distance of elderly people for their daily life is generally considered as 1 kilometer. On the other hand, much attention is focused on a social problem called food deserts in western countries. The food deserts mean the areas where it is hard for residents to obtain perishable food. The areas where there are not stores supplying perishable food within about 500-meter radius are defined as the food deserts. The problem with regard to the weak for shopping is also discussed in Japan, i.e. the ability of elderly people. It is required to analyze service areas of perishable food sales stores along migration pathways in detail for dealing with an aging society.

The purpose of this study is to extract local features through the comparison between the service areas of the perishable food sales stores and population distributions. In this study, after the definition of the factor of impassableness for people over the age of 65, we make the zones within 500-meter radius of the perishable food sales stores along the road networks attributed population distributions.

Firstly, we restructure the road network data through plotting manually pedestrian roads as refer to parts of sidewalks on Digital Mapping data. We also plot pedestrian bridges from the Digital Mapping data and pedestrian crossings from aerial photographs. Then, we define a stair and a slope of more than 8% (4.57 degrees) as the factor of impassableness for elderly people with reference to a longitudinal slope on a pavement in the Barrier-Free Transportation Act. We acquire the stairs from the Digital Mapping data and the slopes from an interpolation result using a Digital Map 5m Grid (Elevation).

Secondly, we calculate the number of obstruction of migration pathway to each store based on the distributions of the impassableness factors. As a result, it is clear that there are many impassableness factors in east side hilly areas, while the numbers of the obstructions indicate low values because there are a few stores. It is shown that the numbers of the obstructions tend to be high around the stations.

Finally, we pick up a local area where the number of the obstruction shows high, and we particularly analyze population distributions along the networks. We compare between additional populations within the service areas of the stores through removing virtually each impassableness factor. It is suggested that the comparison may contribute to the prioritization of redevelopment sites for the aging society.

Keyword: Aging Society, the Weak for Shopping, Road Network, Local Features Comparison