Research for the improvement of efficiency and advancement of urban traffic investigation, analysis, and planning method using new technologies

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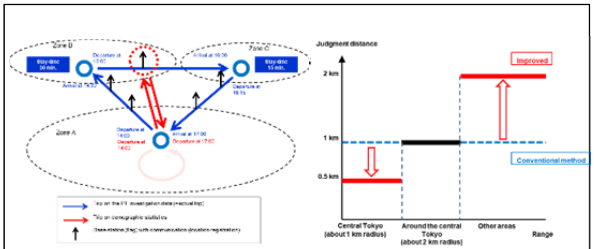
1. Background and purpose of study

Studies for using the various types of big data and its application in the field of urban traffic have been rapidly advancing in recent years. This study is intended to refine and improve the efficiency of urban traffic investigations, analyses, and planning methods by improving demographic statistics,[1,2] which is generated from the data of the use of mobile phone networks that provide a large volume of samples meaning high representability (see relevant study on page ○).

2. Main research and findings

Trips in demographic statistics are usually generated by determining travel and congestion depending on the distance between base stations that identify mobile phones at certain intervals. In the current method, the movement is identified every hour, and the judgment time is one kilometer. Therefore, the current method is known to generate statistical errors caused by missing data or excessive data generation, such as judgment of excessive travel that occurs because of the connection of multiple trips with short stays in-between and with a slight deviation in the mobile phones when the distance between base stations is one kilometer or more.[1]

Thus, researchers tried two improvement proposals (figure 1) including [1] the division of connected trips by checking details of identification information and [2] changing the judgment distance depending on regional characteristics, such as population density. The comparison with the result of the PT investigation for individual trip distance ranges found that the results were nearly matched (figure 2).[1]



Improvement plan 1: Division of connected trips Improvement plan 2: Change to judgment distance

Figure 1: Improvement plan of demographic statistics (image)

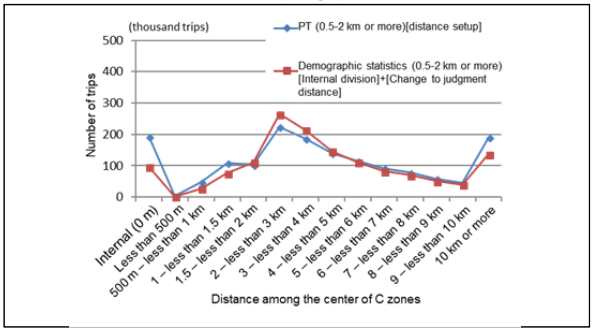


Figure 2: Comparison of OD load by distance ranges (after improvement)

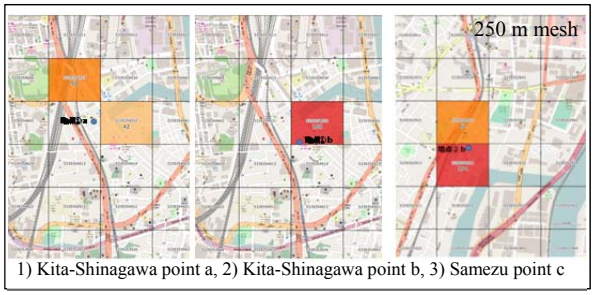


Figure 3: Spatial resolution of demographic statistics (when devices are not moving)

Then, to clarify spatial resolution, about 80 mobile phones were actually moved around and remained still in multiple urban areas in Tokyo, and statistical data were obtained. As a result, the radio wave travel range of one base station, that is, the minimum resolution when a mobile phone is not moving, was approximately 300 meters (figure 3).[1]

In addition, as a presumption to identify activities that are repeated daily, researchers calculated the structure of objectives by departure and arrival zones by creating an algorithm that would sort trips into going home or going to work. The obtained result was about the same as the result of the PT investigation.[2]

3. Future perspective

To further advance and improve the efficiency of the current investigation, analysis, and planning method, researchers are going to improve the practicability of data uses by comprehensively and inclusively comparing and examining the data acquisition precision and reliability of traffic-related bid data, which are advancing in various ways without being limited to demographic statistics.

☞For detailed investigation

1) Research concerning the trip data acquisition precision from the perspective of the spatial resolution of demographic statistics based on the mobile phone network operation data. Compilation of civil engineering planning and research and lectures. Vol. 56, Committee of Infrastructure Planning and Management Nov. 2017

2) Research concerning methods to estimate purposes of trips in demographic statistics based on mobile phone network operation data. Compilation of civil engineering planning and research and lectures. Vol. 55, Committee of Infrastructure Planning and Management Jun. 2017