Examination of Alley Area Extraction Method by GIS

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The presence of alleys (narrow streets that exist in densely built towns, where traffic of general cars is difficult) as a living space due to human scale and as a lively or facility space is being reviewed in the city planning. For that reason, it is considered important to recognize the position and distribution situation of the alleys, but in the map specification of the Geospatial Information Authority of Japan (GSI), the road width is 1.0 m or more widely even at the scale level 2500, that many alleys will be not expressed in general geospatial information data. Also, it may be obstructed by eaves etc., so there are difficulties in reading aerial photographs and satellite images.
In this research, we examined a method of extracting an area where the presence of alleys is semi-automatically estimated from large scale GIS data (roughly 1/2500 equivalent). We focused on the presence or absence of a houses that doesn't contact with the road line on the data in a block with a houses density above a certain level. At this time, if there is a non-contacted house, it is estimated that alleys exist in the neighborhood to access the house.
The flow on GIS as follows.

1. Structure the road edge and generate blocks (polygons)
2. Extract the blocks, whose building density is equal to or greater than a certain level in the block
3. Create buffer from road edge data and extract uncrossed buildings
4. Extract the extracted building with a certain area or more
5. Extract the building (4.) intersecting the block (2.)

As a sample, we focused Tokyo area 23 wards (Arakawa Ward, Taito Ward etc.) and Tokushima prefecture Kaiyo-cho, Kaifu-gun area, using the "Fundamental Geospatial Data" (made by GSI) and the "GEOSPACE Digital Maps" (made by NTT GEOSPACE Corp.), and Esri ArcGIS for Desktop v10.4.1.
As a result of field survey to verify estimation accuracy for the area extracted by the above estimation method, it was found that the existence of alleys can be estimated with high probability. However, because there was a difference in accuracy in spaces with different building density, in order to improve the accuracy of alleys estimation, it is necessary to calculate the area parameters (buffer distance, building density threshold, building area threshold based on street patterns and building densities) may need to be adjusted.
By this method, if we can comprehensively recognize the position and distribution situation of alleys in the area, it will be possible to utilize by municipality and planning entity, etc. for conservation of alleys and creation of new alleys landscape.

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