

An inconsistency detection and processing method for patch boundary under multiple constraints

Hongmei Yin ^{a,*}, Qifei Mao ^a

^a Chinese Academy of Surveying and Mapping, No. 28 Lianhuachi West Road, Haidian District, Beijing, China

* Corresponding author yinhm@casm.ac.cn

Keywords: land-use patch; topological decomposition model; boundary inconsistency patterns; merger method; dissecting method

Abstract:

As a key component of land use data, land type parcels are spatially characterized by seamless coverage, non-overlapping boundaries and full-area enumeration. Variations in operational methods and proficiency among different data producers often lead to data quality issues. In particular, inconsistent boundary problems such as gaps and overlaps tend to occur more frequently in areas with complex topological relationships. Therefore, inspecting and processing boundary consistency of land type parcel data constitutes an essential step in data processing, database loading and quality inspection.

The traditional inconsistency detection and processing methods are difficult to take into account multiple constraints such as topology correctness, semantic consistency, and area balance, and they usually require manual intervention, which takes a long time. In view of this, an inconsistency detection and processing method for patch boundary based on topological decomposition model is proposed. First, the topological decomposition model was built, topological polygons were converted from patches, and the polygons were dimensionally reduced to agent points. Second, 4 boundary inconsistency patterns were defined, and they were recognized through the topological relationship between agent points and patches and the semantic information of the arcs which were composed of topological polygons. Finally, the merger method and the dissecting method were proposed to modify boundary inconsistency patterns, taking into account semantic similarity and space adjacent indicators.

Experimental verification is carried out on the land-use data in Guizhou Province, and the result shows that the algorithm for detecting and correcting inconsistencies in parcel boundaries proposed in this paper can automatically detect and handle inconsistencies in the boundaries of land-use parcels. While ensuring the accuracy and rationality of the results, it overcomes the shortcoming of mainstream software that requires extensive manual intervention, and improves the efficiency of consistency inspection and processing for shared parcel boundaries.

References

- Liang Lei, Zhou Qi, Ren Dongyu, et al. Generalization method for land polygons of the third national land survey[J]. *Bulletin of Surveying and Mapping*, 2021(12): 124-129. .
- Sun Qun, Wen Bowei, Chen Xin. Research on consistency processing of multi-source geospatial data[J]. *Acta Geodaetica et Cartographica Sinica*, 2022, 51(7): 1561-1574.
- Liu Yuangang, Guo Qingsheng, Cai Yongxiang, et al. Identifying proximity conflicts of map objects based on CDT skeleton[J]. *Engineering of Surveying and Mapping*, 2017, 26(8): 10-13. .
- Ai Tinghua, Wu Hehai. Consistency correction of shared boundary between adjacent polygons[J]. *Journal of Wuhan Technical University of Surveying and Mapping*, 2000, 25(5): 426-431.
- Yang Jiannan, Yin Yong, Guo Peipei, et al. An entity derivation method for linear area features[J]. *Science of Surveying and Mapping*, 2023, 48(4): 231-239.