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Research on Improvement of Rural area Population Spatial Distribution Model Based on Random Forests

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Since the founding of New China, especially since the reform and opening up, China has experienced the fastest economic development and the most profound population migration in history. The large-scale migration of China's rural population and labor force is particularly evident. China's rural population accounts for 40.42% in 2019. China's rural population is large, and urban-rural and regional differences are also large. Due to the current data and information limitations and the characteristics of China's national conditions, there are very few related studies on China's overall rural population.

Fine-scale population distribution data at the fine scale play an essential role in numerous fields, for example urban planning and management, and disaster assessment and developing population differentiation policies. The rapid technological development of remote sensing (RS) and geographical information system (GIS) in recent decades has benefited many fine resolution population spatialization studies. However, most of the existing population spatialization methods have been studied at the regional or urban scale, and few studies have been conducted on the unit population in rural areas. In view of the fact that existing demographic data cannot meet the actual needs of analysis, management and scientific research in terms of spatial precision, a new population distribution estimation method combining nighttime lighting and residential building attributes is proposed in our study. In view of this, studying the spatial distribution of the population in rural areas is used as the purpose of this article. Based on the night light data, natural city boundaries are determined. A rural area delineation method based on Head-to-Tail segmentation classification combined with administrative village verification is proposed, which provides a feasible method for large-scale automatic extraction of rural area boundaries. Coupled with POI (Points of Interest) data, based on elevation, slope, night light images, and land cover, the population spatialization model of the random forest is developed and improved based on the weight of the house properties and light intensity. Finally, a high-precision population distribution dataset is obtained, which is closer to the actual population distribution. The research results show that based on the proposed population spatialization model, street demographic values can be fitted better, and the basis for more accurate population estimation is laid. It provides a reference for data fusion and is of great significance for rural area development planning.