ID and investigation of metropolitan practical region

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ABSTRACT

The exact recognizable proof of metropolitan useful regions is of incredible importance for advancing metropolitan spatial construction, normally assigning spatial components, and advancing the supportable advancement of the city. This paper proposes a technique to definitively distinguish metropolitan practical regions by coupling Open Street Map (OSM) and Point of Interest (POI) information. It takes the focal metropolitan area of Hangzhou as a contextual analysis to investigate the spatial dissemination attributes of the practical regions. The outcomes show that: the focal metropolitan areas of Hangzhou are partitioned into 21 practical regions (6 single utilitarian regions, 14 blended useful regions and 1 exhaustive useful region). The single utilitarian regions and the blended practical regions show the topographical conveyance attribut of the circling definition, and that si-

-gnifies "Center outskirts" separation is self-evident, and the extensive useful region is generally dissipated. The blended level of territorial capacity in with environmental capacity and creation work is low while far reaching useful regions are normally connected with higher potential and imperativeness. An examination of spatial distribution patterns, development trends, and the hierarchy of different social roles can reveal the urban structures. The efficiency of the proposed strategy is supported by the findings of a case study conducted for Munich.

Key Words: OSM; Urban; Block; Green space land; Spatial metrics

INTRODUCTION

n urban planning, management, and resource allocation, the functional area is the fundamental unit. Residential land, industrial land, commercial and business facilities land, and urban functional areas are important geospatial attributes of urban land in which people carry out various socio-economic activities, which are usually determined by two perspectives of land use type and human activities, including residential, industrial, commercial, and business facilities land. The notion of urban functional area emerged as the basic spatial unit of urban development from the "functionalism" planning idea created by the Athens Charter, which emphasises the clear form of the city and pays attention to the division of functional regions and the purity of usage [1]. The ability and efficacy of urban spatial structure analysis in the exploration and prediction of urban morphology and dynamics has been proved on several occasions. Diversified urban functions make it easier for city residents to live, work, play, and communicate, which is the foundation and allure of urban sustainable development. It reflects the interaction of many complex aspects, such as urban history, economy, terrain, infrastructure, urban planning, and policy; the building distribution pattern is a basic element for identifying urban functional zones. In addition to the limits of geographical metrics, there are flaws in the evaluation of urban functional zones.

Each analysis unit in present urban spatial structure analysis approaches is usually associated with a particular social function. However, with the fast growth of metropolitan regions, the social functions are changing. However, as urban areas get more complex and diversified the social functions of an urban unit become more complicated and diverse, making it impossible to apply a single functional type to an urban unit [2]. Traditional urban function zoning relies heavily on remote sensing photos, land use data, panel data, and other sources of information. Based on the probabilistic topic model, suggested a semantic allocation level multi-feature fusion technique for high spatial resolution image scene categorization. To breakdown the highresolution remote sensing photos a full hybrid scene decomposition system. However, typical remote sensing methods can only classify urban functions based on the land's natural features. Breaking the traditional idea of functional zoning, fully mining the urban social and cultural information contained in big data, and establishing a methodology system for identifying urban functional areas has become an innovation direction of urban geography, particularly in the context of information. Liu studied the temporal variation of boarding and alighting and its association with diverse land-use characteristics by collecting 7-day taxi trajectories in Shanghai.

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Laiye

In Singapore, we used mobile phone data to identify inhabitants' daily travel behaviours in order to reflect the social function of land use [3]. The centre urban region of Hangzhou, China, was chosen as the study location. Hangzhou, Zhejiang Province's capital is situated in the northern portion of the province, along the lower reaches of the Qiantang River, and at the southern terminus of the Beijing-Hangzhou Grand Canal. E120°19', N30° 26' are the core geographical coordinates. With a total area of 16853.57km2, the city oversees ten districts, two counties, and one county-level city. It is also one of the Yangtze River Delta's most important cities. With a permanent population of 10.36 million people, the city's GDP in 2019 was 222.85 billion USD. With a total size of 706.27 km2, the central urban regions of Hangzhou include Xihu District, Gongshu District, Shangcheng District. In Hangzhou, the key urban regions are densely populated, densely populated, and densely populated. Hangzhou's urbanization process exemplifies China's rapid development. At the same time, Hangzhou's urban development model, which considers science and technology, industry, humanities, and ecology, embodies the future city's growth path. The major metropolitan region of Hangzhou has been separated into 1542 block units using OSM network grading and buffer operation. The identification result of functional regions in Hangzhou central district is derived after calculating the weight and frequency density of various POI in each block unit. As can be observed, downtown Hangzhou has 21 different types of functional zones, including 6 single functional areas, 14 mixed functional areas, and comprehensive functional area. Commercial and business facilities land (422 blocks total, total area of 153.032 km2), residential land (76 blocks total, total area of 48.128 km2), administration and public services land (11 blocks total, total area of 8.703 km2), green space land (5 blocks total, total area of 2.369 km2), industrial land (35 blocks total, total area of 7.957 km2), science and education land (4 blocks in total, with a total area of 2.989 km2 The mixed functional areas include a mix of commercial and business facilities land and administration and public services land (350 blocks total, with a total area of 144.794km2), a mix of commercial and business facilities land and residential land (234 blocks total, with a total area of 83.733km2), a mix of commercial and business facilities land, science and education land (136 blocks total, with a total area of 34.917 km2). the combination of commercial and industrial facilities land (39 blocks total, with a total area of 10.678km2), the combination of commercial and business facilities land, and green space land (7 blocks total, with a total area of 5.466km2), the combination of administration and public services land, and residential land (14 blocks total, with a total area of 15.317 km2), and the combination of administration and public services and green space land (7 blocks total, with a total area of 5.466km2), the combination of industrial and residential land (2 blocks total, total area of 0.258km2), the combination of residential and green space land (1 block total, total area of 0.411km2), the combination of science and education, and residential land (4 blocks total, total area of 2.838km2), the combination of science and education, and industrial land (1 block total, total area of 0.961km2), the combination of science and education, and industrial land (1 block total, total area of 0.961km2), the combination of (2 blocks in total, with a total area of 2.938km2).

There are two types of functional areas: mixed and comprehensive.

Mixed functional zones in Hangzhou's downtown region are widely spread, covering 319.767km2 and accounting for 55% of the total

area of the research area, indicating that the mixed degree of urban functions in Hangzhou's downtown area is relatively high. Commercial and business facilities land, as well as administrative and public services land, makes up the majority of the mixed functional areas, accounting for 25% of the total research area [4]. In terms of geographical distribution, the middle area is more densely packed, whilst the perimeter is sparsely distributed. They're mostly concentrated in Shangcheng and Xiacheng districts, as well as the south of Gongshu, the east, and west of Xihu District. The next section is a mix of commercial and business facilities land and residential land that makes up 14% of the total research area and is interspersed throughout various functional sectors. The number of other mixed functional areas is 223, accounting for 14% of the entire research area's total area, while the area of other mixed functional areas is 16% of the total research area's total area The "single-mixed-comprehensive" cohabitation pattern in the city [5]. Overall, the single functional zones are primarily spread towards the city's outskirts. Single residential areas, for example, Jianggan District's east, and Binjiang District's southern boundary. The single industrial areas are mostly found in the Jianggan District's eastern half. The single scientific and education zones are primarily located in the northern half of Hangzhou's major urban region. The more single-functional land there is, the more it hinders the city's mobility Residents leaving the residential region to visit two or more additional functional areas, for example, incur a greater time cost. From the standpoint of sustainable development, function simplification will not only impair the city's "mobility," but will also reduce the city's attractiveness and vitality. Policies, history, and land use costs all play a role in the development of single-use regions [6]. The cost of land use in central locations, for example, could be ten times higher than in the suburbs. As a result, large-scale land development is common in the suburbs. At the same time, Chinese-style development area policies will result in the formation of large-scale single-functional areas in the suburbs. Regional function, ecological function, and production function are all intermingled to a low degree. The mixed degree of some regions in the research area is purposefully regulated, primarily in locations that perform ecological services, such as the Qiantang River, Xixi Wetland, West Lake Scenic Area, and the surrounding areas. This is because China's core state policies, the ecological civilization plan and the protection of cultivated land, both demand stringent controls on the expansion of the ecological and agriculture areas [7]. Mixed-use development is frequently associated with diverse and high-intensity land development. As a result, the availability of such a low-mixed land use strategy for urban development is quite important. In the suburbs, there are a variety of functional regions.

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