remote sensing

Editorial

Editorial for Special Issue: "Remote Sensing for Urban Morphology"

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Remote sensing remains critical for measuring the rate of growth of cities around the world, particularly the rapidly expanding cities in economically developing countries. While growth has become stagnant in cities in Europe and Japan, average annual growth rates of 5% are evident in cities such as Surat and Ghaziabad in India, Suzhou and Guangzhou in China, Luanda in Angola, and Kinshasa in the DR Congo. Predicted rates over the next twenty years are to only increase, reaching up to 30%. The world's population is expanding, and the majority is now living in urban areas. Concerns regarding overcrowding, traffic congestion, lack of green space, and air and water pollution affect the quality of the urban ecology, particularly human life. Urban morphology is central to these concerns; the spacing and configuration of buildings and roads directly affect the social form and economic consumption of urban areas [1]. This Special Issue focuses on research regarding the techniques and applications of remote sensing for measuring urban morphology. The five papers focus on new high spatial resolution data and methodologies that measure the location of buildings and transportation infrastructure.

The first paper, by Small, outlines Operational Land Imager (OLI) data at 15-m spatial resolution to map pixels representing built land. Based on many sample points from OpenStreetMap and MOD13Q1-NDVI classifications and centered on feature learning, the methodology uses convolutional neural networks and seven-neighborhood random forests to produce accuracies of over 90% [2]. The problem of blurred images from continuous scanning imaging is addressed by the second paper, where Tian et al. propose a novel synchronized control method of multiple image compensation units to resolve image rotation problems [3]. They apply a four-channel bilateral control method based on sliding mode control and disturbance observation to compensate for image rotation. With this they propose using high spatial resolution panoramic data from both airborne and spaceborne sensing at long integral time to scan continuously. Dasymetric mapping is an established procedure that has been used for areal interpolation of remotely sensed data using an ancillary variable (usually demographic information from a population census). In the third paper, Rebelo et al. [4] apply dasymetric mapping to three-dimensional high spatial resolution data at 6-cm resolution from an unmanned aerial vehicle (UAV). They conclude that the extraction of accurate building volumes depend on the location of sample points from the UAV along eaves of roofs. In remote sensing, urban areas are defined by the heterogeneous mixtures of land covers that constitute urban land use. Measures of density of land cover types and spatial limits of the urban land use are open to interpretation by national administrative specifications. In response, the fourth paper by Lehner and Blaschke, proposes a generic hierarchical classification scheme for urban structure types (UST) that can be applied internationally [5]. Urban areas are stripped of their social aspects and their buildings treated as object-oriented features described in terms of their texture, pattern, shape, association, etc. The broadest scale is a dichotomous distinction between built-up and non-built-up. From there, built-up is divided between continuous built-up, discontinuous built-up, and traffic areas. The hierarchy continues with distinctions in impervious surfaces and individual buildings, such as multistory buildings, linear blocks, and high-rise buildings. The final paper by Zhang and Tang, circles back to OLI imagery as used by the first paper [6]. They too use feature learning based on convolutional neural networks as the classification algorithm and report higher accuracies than feature engineering based on spectra, shape, and texture as input parameters. They also confirm that groups of pixels as patches produce higher accuracies than classifications of single pixels.

Research into techniques that improve our ability to measure urban morphology more accurately is critical for monitoring the rate of global urbanization. Data from high spatial resolution sensors, LiDAR, and links with GIS measure the tangible physical structures that create urban morphologies. Over time, measurements from remote sensing determine the spatial extent and rate of urban change, which are both critical for understanding how cities develop, including the extent of urban sprawl, the value of sustainable and eco-cities, and the management of unregulated construction.

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References

1. Wentz, E.A.; Anderson, S.; Fragikas, M.; Netzband, M.; Mesev, V.; Myint, S.W.; Quattrochi, D.; Rahman, A.; Seto, K.C. Supporting global environmental change research: A review of trends and knowledge gaps in urban remote sensing. *Remote Sens.* **2014**, *6*, 3879–3905. [CrossRef]
2. Small, C. Multisensor Characterization of Urban Morphology and Network Structure. *Remote Sens.* **2019**, *11*, 2162. [CrossRef]
3. Tian, D.; Wang, Y.; Wang, Z.; Wang, F.; Gao, H. Long Integral Time Continuous Panorama Scanning Imaging Based on Bilateral Control with Image Motion Compensation. *Remote Sens.* **2019**, *11*, 1924. [CrossRef]
4. Rebelo, C.; Rodrigues, A.; Tenedório, J. Dasymetric Mapping Using UAV High Resolution 3D Data within Urban Areas. *Remote Sens.* **2019**, *11*, 1716. [CrossRef]
5. Lehner, A.; Blaschke, T. A Generic Classification Scheme for Urban Structure Types. *Remote Sens.* **2019**, *11*, 173. [CrossRef]
6. Zhang, T.; Tang, H. A Comprehensive Evaluation of Approaches for Built-Up Area Extraction from Landsat OLI Images Using Massive Samples. *Remote Sens.* **2019**, *11*, 2. [CrossRef]