**Urban Extraction Based on Scattering Decomposition Using PolSAR Data**

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***ABSTRACT***

Urban area extraction and classification are essential for effective urban planning, environmental monitoring, and disaster management. Traditional optical sensors, which depend on sunlight, often encounter limitations due to atmospheric conditions such as clouds. In contrast, Synthetic Aperture Radar (SAR) sensors provide consistent imaging capabilities regardless of weather. This study leverages Polarimetric SAR (PolSAR) data, which utilizes multiple polarizations, to improve urban feature extraction through scattering decomposition techniques. Our research proposes a new approach for urban extraction using PolSAR data, with a focus on sustainable urban development through optimized energy and resource use. The methodology involves collecting microwave scattering data from concrete blocks at various angles in an anechoic chamber, using this data to train machine learning models, and validating these models with real-world satellite data from ALOS PALSAR. The four-component scattering power decomposition method, based on Yamaguchi's decomposition model, is employed to accurately categorize urban features. Initial results show that PolSAR's scattering decomposition significantly enhances urban classification accuracy compared to traditional methods relying solely on raw channel data. Validation against real-world reference datasets confirms the robustness and applicability of the developed model. Future work includes further comparison with existing methods, evaluating the proposed method's capability across different temporal datasets, and extending the study to other urban regions.

**Keywords:** urban area extraction, polarimetric SAR, scattering decomposition, machine learning