Special Section Guest Editorial: High-Performance Computing in Applied Remote Sensing: Part 3

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Part 3 of this Special Section on High-Performance Computing in Applied Remote Sensing continues to present the state-of-the-art research in incorporating high-performance computing facilities and algorithms for effective and efficient remote sensing applications. "Land cover classification in multispectral imagery using clustering of sparse approximations over learned feature dictionaries" by Moody et al. presents results from an ongoing effort to extend neuro-mimetic machine vision algorithms to multispectral data using adaptive signal processing combined with compressive sensing and machine learning techniques. "Graphics processor unit accelerated finite-difference time domain method for electromagnetic scattering from one-dimensional large scale rough soil surface at low grazing incidence" by Jia et al. applies the Compute Unified Device Architecture (CUDA) technology to compute an electromagnetic scattering problem on GPUs and achieves significant speedup factors. "High-performance meshing processing of remote sensing data on large displays" by Hsieh et al. presents a technique that visualizes LIDAR point clouds on a tiled display wall, termed highly interactive-parallelized display (HIPerDisplay), which has twenty 24-inch liquid-crystal displays with a total resolution of 46 Mpixels. The results also showed that the HIPerDisplay offered superior performance for the processing of large LIDAR datasets. "Real-time implementation of optimized maximum noise fraction transform for feature extraction of hyperspectral images" by Wu et al. presents a parallel implementation of the optimized maximum noise fraction (G-OMNF) transform algorithm for feature extraction of hyperspectral images on commodity graphics processing units (GPUs). The proposed approach explored the algorithm data-level concurrency and optimized the computing flow. "Hyperspectral band selection based on parallel particle swarm optimization and impurity function band prioritization schemes" by Chang et al. presents a framework for band selection in hyperspectral imagery that uses two techniques, referred to as particle swarm optimization (PSO) band selection and the impurity function band prioritization (IFBP) method. The experimental results demonstrate that the proposed PPSO/IFBP band selection method can not only improve computational speed but also offer a satisfactory classification performance. "Graphics processing unit implementation of the maximum likelihood solution to the inverse problem for retrieval of geophysical parameters from high-resolution sounder data" by Wei et al. explores the use of GPU in speedup of the maximum likelihood solution to an ill-posed retrieval problem. For the infrared atmospheric sounding interferometer high-resolution sounder having 8641 channels, the use of GPU on maximum likelihood estimation shows a promising speedup of 1986× compared to a single-threaded native CPU version.

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