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Multi-source classification of Meridiani Planum landforms using deep learning for analysis of HIRISE and Opportunity imagery

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The proposed solution using deep learning of neural networks from multi-source image data was evaluated for the Meridiani Planum area. The data sources used were the High-Resolution Imaging Science Experiment (HIRISE), the image processing system of the Mars Reconnaissance Orbiter (MRO), and image data acquired by the Opportunity rover cameras. The developed analytical system enables conversion of orbital data into cartometric orthophotos and digital terrain model (DTM) and its derivatives - slope, curvature, denivelation, etc., as well as automatic positioning and orientation of Opportunity camera images to create image panoramas. The deep learning neural networks with VGG-16 architecture used in the study enabled automatic classification of aeolian and impacted Mars landforms. Proposed concept of multi-source classification and author's system of deep learning can be without loss of generality of solution extended by analysis of other Mars regions and use of multispectral imaging.



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