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HIGH SPATIAL RESOLUTION SATELLITE IMAGERY AND MACHINE LEARNING METHODS IN POST–CONFLICT TERRITORY REHABILITATION

Abstract

Thanks to improvement of satellite sensor parameters, especially in the spatial, spectral, radiometric and temporal resolution, an area of application of remote sensing data is expanding. In this regard, there is opportunity to plan and implement activities on infrastructure in order to assess the destruction and restore the territories that occurred as a result of the military conflict. No doubt that restoration of critical infrastructure in the territories after the conflict is a difficult issue. The assessment of the existing situation in the conflict territory is considered one of the main stages in the reconstruction process. At this stage, remote sensing method plays vital role. Remote sensing method in the initial stage of planning to restore post-conflict territories considering serious mining of territories take an important information source. High-resolution satellite data and a high-altitude model of the territory have wide possibilities for using infrastructure resources, including in the preparation of preliminary plans for residential buildings, roads, water, electricity, gas pipelines. Machine learning was mainly used to assess the condition of the area. These methods improve the results of the process of detecting destroyed structures in the preliminary assessment of the of infrastructure, including existing in residential premises. Deep learning algorithms applied to different test zones and have demonstrated comparatively more accurate results than other machine learning methods. The studies show that the use of artificial intelligence methods in satellite data can provide automatic detection of infrastructure elements destroyed as a result of a military conflict, in particular buildings. While the results are encouraging, real-life applications require high accuracy, especially when damages is rare. The detection of destroyed buildings is a rather complex issue, so the used methods must meet certain requirements. This relates primarily to spatial separation of images. Using the specific properties of destroyed buildings it can significantly improve the training process for automated detection of damage. In addition, the machine learning method using surrounding areas satellite images and numerous sequential satellite images of the same region improves detection accuracy. The results of the method have been validated by detecting destroyed buildings using machine learning methods based on high-frequency satellite images. For this purpose deep study methods were used. The proposed methodology has demonstrated in the context of the reconstruction work carried out in the territory of Nagorno-Karabakh of Azerbaijan Republic.