Detection of Built-Up Areas from ERS-2, Envisat and Sentinel-1 Synthetic Aperture Radar Data

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Accurate data on urban growth and on-going processes is needed to sustainably plan the expansion of cities. Satellite remote sensing has great potential for mapping urban areas regularly in a global and regional scale. Synthetic aperture radars are inherently well suited for built-up area mapping as they are sensitive to the metal and cuboid structures there. In my work I further developed mean-median-method (MM-method) for detecting built-up areas according to their texture and amplitude features from local area statistics of backscatter. I proposed a 13-step processing chain with the aim of improving MM-method's accuracy and reducing misclassification. The city of Tartu, Estonia and its surroundings was chosen as a study area. The results were compared to spatial data from Estonian National Topographic Database. My hypothesis was proven: combining two different pairs of both ascending and descending orbit images reduced the number of misclassifications significantly. The accuracy of the improved method is 95.6%, outperforming the most accurate result of the previous methods by 6.5 percentage points and having at least 11 times less misclassifications. For the first time, MM-method was tested on the data of ERS-2 and Envisat synthetic aperture radars, affirming that MM-method is universal. Developed processing chain is suitable for detecting buildings and built-up areas which are comparable to the resolution of radar images. The up-to-date maps of built-up areas can be used for monitoring the current trends in urbanisation. This provides a valuable tool for studying urbanisation processes, such as urban sprawl.

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