Arbitrary Shaped Water Region Detection with Deep Learning for Unmanned Aerial Vehicle-Based Imagery

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The increased precision of segmented results has led to widespread interest in using Deep Learning (DL) for semantic segmentation across different fields. This study delves into using DL methods to accurately segment water bodies in aerial images. Efficiently and precisely identifying water bodies from aerial images is highly valuable for various applications ranging from environmental monitoring to urban planning and natural disaster emergency response. In line with the practical scenario, conventional approaches for extracting water bodies face challenges due to the shadows of buildings and other ground objects. Additionally, training deep-learning networks for this task proves to be challenging, requiring significant computing resources, and these methods often fall short of meeting real-time processing requirements. This research presents a novel deep-learning network designed for water identification in aerial images. We employ the SegNet architecture, a state-of-the-art CNN-based semantic segmentation method, as the backbone for our model. Compared to the standard SegNet model, the modified SegNet model demonstrates significant improvements in accurately predicting water areas. The proposed model achieves an impressive 10.7% increase in overall accuracy for water prediction, showcasing the effectiveness of the proposed model in accurately identifying water areas in aerial images. These results highlight the model's potential in various applications requiring precise water area segmentation, such as environmental monitoring, urban planning, and disaster management.

Keywords: *Water segmentation, Aerial images, SegNet, Deep-learning network*