

KLASIFIKÁCIA RIPARIÁLNEJ VEGETÁCIE Z HISTORICKÝCH LETECKÝCH ČIERNOBIELYCH SNÍMOK S VYUŽITÍM JEJ TEXTÚRNYCH CHARAKTERISTÍK

TEXTURE-BASED TECHNIQUES FOR VEGETATION CLASSIFICATION IN RIPARIAN ZONES USING HISTORICAL BLACK AND WHITE AERIAL ORTOPHOTOS

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Abstract

Historical aerial photographs are well-known as a reliable source of information on historical land cover and land use. However, extracting this information can be challenging due to the limited spectral characteristics in black-and-white orthophoto. In this study, we evaluate a textural-based approach for analyzing vegetation dynamics using historical aerial images.

To extract textural information from five aerial datasets (1949 – 1992), we first applied Gray level Co-occurrence Matrix (GLCM) and geomorphological filters on High-resolution, preprocessed and normalized orthophotos. Next, we used Random Forest (RF) machine learning methods to classify images into five main classes: water, willow young vegetation, mature vegetation (spruce forest), build-up area and croplands. To reduce the dimensionality of the data cube, we measured feature importance using RF feature importance and Sequential Forward Selection (SFS). We selected the eight most informative features out of 17 to optimize classification performance and reduce data dimensionality. Finally, each dataset was classified based on the selected features, and riparian vegetation was masked on the final classified map. The accuracy assessment was evaluated using 5-fold cross-validation across all datasets.

The results indicated the efficacy of textural and geomorphological features on the final classified map. Morphological operations (dilation, opening, closing, mean morph, gradient) and GLCM features (contrast, entropy) contributed significantly to the final classified map. Despite the improvement in vegetation classification accuracy achieved using textural features, shadow effects and radiometric differences within the orthophotos remain challenging for more detailed classified maps.

This research was supported by the Science Grant Agency (VEGA) of the Ministry of Education of the Slovak Republic and the Slovak Academy of Sciences (02/0016/24).

Keywords: historical imagery, riparian vegetation, GLCM, Random Forest

Kľúčové slová: historické snímky, ripariálna vegetácia, GLCM, Random Forest

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