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UAV image classification of a riverine landscape by using machine learning techniques

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This presentation examines machine learning techniques for classifying land cover conditions in UAV (Unmanned Aerial Vehicle, i.e. drone) images of a riverine landscape. The UAV images were taken in a river course of Kurobe River, Japan in November 2017, where it had a braided channel with a well-vegetated gravel bed. The UAV image analyzed was composed of a RGB and four multispectral band components. In addition, a DSM (Digital Surface Model) of the river geomorphology was made through a SfM (Structure from Motion) image processing of the UAV images. Both the UAV images and the DSM of the river course, and NDVI (Normalized Difference Vegetation Index) calculated from the multispectral band components as well, were all used in combination to examine the effectiveness of each machine learning technique for the land cover classification. The machine learning techniques examined in this study were SVM (Support Vector Machine), RF (Random Forest), and GBDT (Gradient Boosting Decision Tree), and the true values of trees, grasses, bare gravel/sand bed, and water surface in part of the river course were given as a training dataset. The results showed that the F-measure, which is consist of precision and recall rates, had high enough with ranging from 0.79 to 0.98 in all machine learning techniques, while the F-measure in grasses had lower values than that in the other three classification categories. As for the comparison of the three techniques, GBDT indicated relatively low accuracy compared to the other two techniques due mainly to difficulties of the parameter detection. Furthermore, the applicability of the machine learning techniques was discussed in detail in terms of the choice of input datasets, the calculation time, and the quality of input images for accurate classification.