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Analysis of river bed material composition with Deep Learning based on drone video footages

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In recent years, computer vision and pattern recognition methods improved at an immensely fast pace which happened partly because of improvements in computing hardware and also the algorithms became more sophisticated. Currently the deep neural networks are the state-of-the-art techniques in these fields. In this research the aim is to investigate whether deep learning is suitable to accelerate and lastly automatize the analysis of grain size composition of river bed material. A supervised learning task will be performed first, where the model will be trained with images created from drone video footages, which were captured at the Upper-Hungarian section of the Danube River along the littoral zone. The model should recognize and segment the different grain size classes. Notable that conventional bed material sampling methods are only capable to provide pointwise information on bed material composition, moreover, these methods are often time and cost demanding. On the contrary, it is expected from the tested deep learning method that based on a series of images, which were created from drone footages, it will be able to evaluate the areal distribution of the river bed composition. Another significant potential inherent in the method is that after a proper training of the model, the time of image analysis will be greatly reduced and so it will be possible to produce river bed material maps in large areas over a short period of time. Compared with the methods currently applicable, this method would be a significant development in the morphodynamic studies of rivers.