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Detecting lost persons using the k-mean method applied to aerial photographs taken by unmanned aerial vehicles

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The objective of this work is to discuss the usefulness of the k-mean method in the process of detecting persons on oblique aerial photographs acquired by unmanned aerial vehicles (UAVs). The detection based on the k-mean procedure belongs to one of the modules of a larger Search and Rescue (SAR) system which is being developed at the University of Wroclaw, Poland (research project no. IP2014 032773 financed by the Ministry of Science and Higher Education of Poland). The module automatically processes individual geotagged visual-light UAV-taken photographs or their orthorectified versions. Firstly, we separate red (R), green (G) and blue (B) channels, express raster data as numeric matrices and acquire coordinates of centres of images using the exchangeable image file format (EXIF). Subsequently, we divide the matrices into matrices of smaller dimensions, the latter being associated with the size of spatial window which is suitable for discriminating between human and terrain. Each triplet of the smaller matrices (R, G and B) serves as input spatial data for the k-mean classification. We found that, in several configurations of the k-mean parameters, it is possible to distinguish a separate class which characterizes a person. We compare the skills of this approach by performing two experiments, based on UAV-taken RGB photographs and their orthorectified versions. This allows us to verify the hypothesis that the two exercises lead to similar classifications. In addition, we discuss the performance of the approach for dissimilar spatial windows, hence various dimensions of the above-mentioned matrices, and we do so in order to find the one which offers the most adequate classification. The numerical experiment is carried out using the data acquired during a dedicated observational UAV campaign carried out in the Izerskie Mountains (SW Poland).