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UAV areal imagery-based wild animal detection for sustainable wildlife management

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The surveillance of wild animal populations is important for wildlife sustainability, conservation and management. It has been estimated that the UAV-based survey of 100 ha large territory is ~10 times less time-consuming in comparison to surveys based on traditional field visits. Aerial surveys using thermal and visible light cameras allow remote observation of wildlife over relatively large geographical areas where the thermal imager is often used as a primary sensor for the detection of animal shape similar hot-spot, but higher-resolution visible light imaging data is used for the reduction of false-positive detections. Recent developments in unmanned aerial vehicles (UAVs), artificial intelligence and miniaturized dual imaging systems made it more flexible, affordable and accurate for aerial surveillance of wild animals. This study was conducted as part of project "ICT-based wild animal census approach for sustainable wildlife management" co-financed by the ERDF program "Industry-Driven Research" (dnr 1.1.1.1/18/A/146) and managed by the Institute for Environmental Solutions, Latvia. One part of the project activity is to develop the detection and classification workflow of wild animals from areal imaging data. This study describing data acquisition, detection and automated data pre-processing of thermal and RGB image co-registration as input for the development of animal classification algorithm. The focus of the study was a detection of the four dominant even-toed ungulate species in Latvia - elk (Alces alces), red deer (Cervus elaphus), roe deer (Capreolus capreolus) and wild boar (Sus scrofa). The data acquisition was performed over the fenced deer garden and open forest pilot territory located in Ramuļi, Latvia. The chosen UAV system was a quadrocopter platform with a dual-camera on the board. Initially, the main focus in data acquisition was over-fenced deer garden at different day times, weather conditions to collect data with animal presence as well as test different data acquisition regimes, strategies and animal behavioral response. Three flights with total coverage were performed over the deer garden area. After the post-detection of individuals, the average estimated accuracy was 88% of the known reference number of deers. Further on, drone flights were conducted over the whole pilot territory to obtain data of other species and behavioral overview in open forest land conditions. All collected data were registered in the database to annotate the weather conditions and the presence of an animal in a certain minute. In total 10 flights (3 h) were performed over the deer garden and 93 (45 h) flights over the open forest land pilot territory. The capabilities of the drone-based monitoring system with a dual-camera imaging setup will be presented.

Keywords: UAV, elk, deer, roe deer, areal imagery, dual-camera, detection