New tools and methods

New methods for testing the effectiveness of wildlife-vehicle collision mitigation measures

Bíl, Michal[1*]; Andrášik, Richard[1]; Cícha, Vojtěch[1]

[1] CDV – Transport Research Centre, Department of Geoinformatics, Brno, Czech Republic
* michal.bil@cdv.cz

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Mitigation measures against wildlife-vehicle collisions (WVC) on transportation infrastructure can be categorized into three types, depending on the target group they affect. The first group comprises animals, where measures aim to prevent them from entering roads, particularly in areas with a high risk of collision. For secondary roads, it is advisable to deter or appropriately warn wildlife from crossing. The second group includes drivers, who, on unfenced roads, must remain vigilant during critical periods of the day when wildlife may enter the roadway. The third group involves management practices, encompassing both road infrastructure management and the surrounding landscape. We focus on the first group: animals, and on testing mitigation measures designed for secondary roads. How can we assess the effectiveness of these measures? It is reasonable to expect that effective measures will reduce the number of collisions, and that this reduction will be significant. The common approach involves studies based on monitoring the number of animal carcasses found before and after the installation of measures, including observations on control sections. However, a limitation of such studies is the need to wait until a minimum number of casualties accumulate, which can take a long time. As a result, these studies are time-consuming and therefore costly.

Aware of the limitations of traditional studies, we have focused on monitoring animal movements and behaviour in areas close to the implemented measures. When studying behaviour, it is not necessary to install many mitigation measures, but rather it is crucial to carefully evaluate the movements of the animals. There are two approaches available: the first is to use GPS collar data, though these are usually used for other purposes. The second approach is video analysis. GPS collars are frequently used for tracking the home range or migration/dispersion of wild animals. Due to the limited battery capacity of the devices, GPS positions (fixes) are often recorded at relatively long intervals. However, our objective was to reconstruct the animal's movement trajectory as accurately as possible using a mathematical model. Camera recordings must comprehensively capture the area where the mitigation measures are installed and, crucially, must record the presence of the animal. Since ungulate activity peaks during low-visibility periods, cameras with infrared illumination or thermal cameras are required. In addition to this, it is necessary to identify the animal’s movement and, ideally, its behaviour. Given that manual image analysis is time-consuming, we focused on leveraging artificial intelligence methods, specifically image analysis, to automate this process. We will demonstrate how both methods—GPS tracking and image analysis—can be applied to test the effectiveness of mitigation measures and to observe animal behaviour near roads.