The role of unmanned aerial vehicles in ecology

Environment, Ecology



An Unmanned Aerial Vehicle (UAV), also known as a drone, is a pilotless radio-controlled aircraft used for various purposes. An UAV can be a cost effective low-impact solution to ecosystem problems. Their agility and image quality abilities make them a great mapping tool for environmental monitoring in conservation, but there are still several challenges and concerns to be overcome.

Drones play numerous roles in ecology. They have been used in monitoring previously inaccessible areas and for creating a map of the wildlife that live there. Drones can monitor the earth through rapid and accurate data collection. This includes behavior monitoring of undisturbed organisms and collecting biological material. They allow for automatic surveying of individual populations through image processing, or via detection of animals that will be electronically marked.

UAVs have been used in many different habitats, including the ocean, freshwater aquatic habitats and rivers. They have been used hands on, for seed dispersion as part of a restoration project. Drones have also been used to monitor illegal activities such a deforestation and illegal hunting; as they can take high quality photographic evidence that can secure prosecutions.

However, on the other hand, Hartmann and Steup, 2013 suggests that drones are vulnerable to security breaches. Hackers might steal data from drones, due to the fact that they can be shot down, collected and dismantled by those wishing to get access to data. Data collected by drones might fall into the wrong hands through hacking or because corrupt officials sell or the data for personal gain. In some cases, data might lead to illegal activity by providing the location of endangered wildlife.

Drones have been used to take high-resolution photos in mapping vegetation communities. If flights are possible over the site at various times of year, it is easier to identify these communities. Multi-spectral imagery that offers NIR wavelengths can be especially useful in distinguishing between vegetation types.

Remote Sensing can assist in classifying vegetation types in the aerial photograph. The software divides an image into polygons that contain pixels of a similar color, intensity, and texture. The user creates and puts the representative polygons into different categories so that the program will be able to identify these categories in the future. The program then classifies the remaining polygons into one of the user-defined vegetation communities. Any errors made by the program are reclassified by the user and the recognition process continues until there are minimum errors. The file can be exported into GIS, cleaned, and maps can be generated.

Using a similar process to vegetation community mapping, individual target weed species can also be identified and mapped. For some species timing of the drone flight may be an important consideration. For example it may be beneficial to capture imagery during the winter when the canopy trees that may cover certain plants below it are leafless. On the other hand, photographing of some plants when in bloom is helpful to pick them out from the surrounding species. In areas where there is vegetation coverage (deserts etc.), drone-derived DSMs can be very important for mapping watercourses. Without vegetation present, a GIS spatial analysis can be done to identify flowlines and divide them into watercourses based on values from the DSM. By identifying watercourses ahead of time, fewer hazards are posed to field staff and field time is reduced. This results in safety benefits and cost-savings for clients.