Integrated Telemetry and GIS-System for Wildlife Management

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Current project "Integrated Telemetry and GIS-System for Wildlife Management Next Generation" aims the implementation of an integrated telemetry application for wildlife monitoring. It is based on two predecessor projects which covered a feasibility study and a development of technical components. Out of the experiences and results of long term tests in the second project phase, technical enhancements and further development steps where detected. This experimental knowledge is integrated in the present development of the wildlife management system. The main components are divided into the construction of a telemetry collar and the development of a GIS and remote sensing toolbox. Experiences made in previous implemenation steps should bring the telemetry system to a state, ready to be produced in small series as well as bringing the GIS toolbox to a state, ready to be used for diverse game management projects.

Requirements and use

The implemented system has to fullfil technological requirements which are inevitable in monitoring wildlife behavior. The operating life of the telemetry collar must be at least one year in all seasons. This requires high demands on the telemetry collar in terms of electronical and mechanical desgin. An intelligent resource management regarding to data storage and power supply is needed to achieve this specified service life. Recording positional data via the GNSS interface must be available 24/7 for a complete and virtually seamless monitoring of animals movement patterns. The collar must be designed that it is suitable for deer and moose and must be adaptable for bear and big cats like tigers.

The designed telemetry system can be used for several cases. Obervation of wildlife behavior for traffic security issues may document the number of animal crossing of existing and projected roads and railroad lines. This can for example serve as planing basis for wildlife bridges. Damages in protective and economic forests led back to wild animals can be doumented. Starting from this information countermeasures can be taken. Through the possibility of the implemented photo documentation on the collar, information about habitat types and behavior of animals within a herd can be won.

Telemetry collar

The telemetry collar system main components are a Global Navigation Satellite System (GNSS) module, a micro camera, acceleration sensors, power supply units and a transmission module. The GNSS component is responsable for the position tracking of the animal. The sensor unit is able to detect GPS and GLONASS satellites and is also Galileo ready. A camera mounted on the telemetry collar provides additional significant information on the animal's behavior and serves pictures of it's habitat. With use of acceleration sensors

it is possbile in a power-saving way to determine whether the animal is moving or not. Accumulators are used for power supply of the electronic components. With a neck-side collar surface it is possible to charge these accus whenever the animal is in sunny conditions. Data from this bundle of sensors is locally stored on the collar. In intelligent defined temporal intervals these data are transmitted via a communication unit to a central database. The data transmission is realized by GSM and WLAN technology. Beside these electronic developments a mechanical component of the collar is implemented. The challenges in the mechanical component design are the closing mechanism with an adjustment to different animal neck sizes, the construction of a battery pack, the design of the neck-side solar panel surface and the assembling of a water-, dust- and impact-resistant electronic housing.

GIS and remote sensing toolbox

In order to identify the location, residence time and movement patterns of animals and precisely analyze their habitat requirements, all recorded information is integrated into a Geographical Information System (GIS). GIS and remote sensing technologies allow the spatio-temporal analysis and visualization of movement patterns of the tracked animals. A spatial database collects all incoming data as main component of the GIS. Together with further available geodata, e.g. topographic maps, digital elevation models, satellite and aerial imagery and land cover information it is possbile to do spatio-temporal analyses. This means that all GIS and remote sensing data are inserted as data source into the wildlife management system and yields the basis for all subsequent analyses. For visualization and administration of the database content a web based GIS application is implemented, which can be operated through a common web browser interface. It allows the user to get statistics of the animal behavior as well as spatial and temporal tracking of animals. As a time stamp is stored for every data entry transmitted from the collar to the database, a history of animal behavior can be modeled and visualized in several ways with various user-defined parameters.