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REMOTE SENSING IN SUPPORT OF ENDANGERED SPECIES MANAGEMENT AND ANIMAL MOVEMENT RESEARCH - THE ENV-DATA TOOL PACK

Abstract

The movement of animals is strongly influenced by external factors in their surrounding environment such as weather, habitat types, and human land use. With advances in positioning and sensor technologies, it is now possible to capture animal locations at high spatial and temporal granularities. Likewise, modern space-based remote sensing technology provides us with an increasing access to large volumes of environmental data, some of which changes on an hourly basis. Environmental data are heterogeneous in source and format, and are usually obtained at different scales and granularities than movement data. Indeed, there remain scientific and technical challenges in developing linkages between the growing collections of animal movement data and the large repositories of heterogeneous remote sensing observations, as well as in the developments of new statistical and computational methods for the analysis of movement in its environmental context. These challenges include retrieval, indexing, efficient storage, data integration, and analytic techniques.

We have developed a new system – the Environmental-Data Automated Track Annotation (Env-DATA) – that automates annotation of movement trajectories with remote-sensing environmental information, including high resolution topography, weather from global and regional reanalysis datasets, climatology, human geography, ocean currents and productivity, land use, vegetation and land surface variables, precipitation, fire, and other global datasets. The system automates the acquisition of data from open web resources of remote sensing and weather data and provides several interpolation methods from the native grid resolution and structure to a global regular grid linked with the movement tracks in space and time. Env-DATA provides an easy-to-use platform for end users that eliminates technical difficulties of the annotation processes, including data acquisition, data transformation and integration, resampling, interpolation and interpretation. The new Env-DATA system enhances Movebank (www.movebank.org), an open portal of animal tracking data. The aim is to facilitate new understanding and predictive capabilities of spatiotemporal patterns of animal movement in response to dynamic and changing environments from local to global scales. The system is already in use by scientists world wide, and by several conservation managers, such as the consortium of federal and private institution that manage the endangered Californian Condor populations.