This factsheet is a result of the second Wageningen University & Research (WUR) Data Science and AI Fellowship program. With this program we aim to increase and integrate our expertise in DS/AI throughout the entire organisation. The variety of projects highlights the potential for DS/AI across the WUR domains.

Author: Chris Tyson

Next Level Animal Tracking

Range-free localization for free-range animals

Objective

This project aims to develop an improved method for localizing radio tagged animals by applying approaches from indoor localization and machine learning.

Method

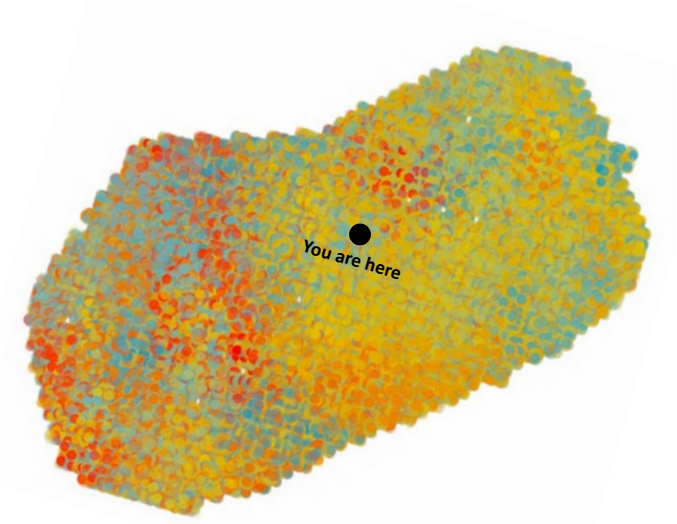
In structurally heterogeneous environments, local patterns of signal interference create 'radio fingerprints' which can be mapped. Using this map, machine learning can then be used to predict the location of new radio signals. We conducted a field experiment to test whether this 'range-free' method could effectively localize radio tags in a dynamic and structurally complex landscape. In this experiment, we used a network of receivers to detect tags at known locations and then predicted the location of tags.

Results

Results from the field experiment indicate that while our new method had a similar level of accuracy compared to traditional methods for locating radio tags, the range-free method produced location estimates that were: 1) more consistent, 2) less affected by missed detections by receivers, 3) less affected by habitat structure, 4) less spatially biased, and 5) less sensitive to the configuration of the receivers. As such, these findings suggest that the range-free localization method is viable for tracking wildlife and offers improvements over existing methods.

Impact

Radio tracking is the most practical means for monitoring small, free-living animals at a high spatiotemporal resolution. Analytical methods, however, are currently lacking in order to fully harness the datasets generated by modern, automated radio tracking systems. In this project, we developed an improved localization method and an associated data processing workflow that will be available to wildlife researchers using automated radio tracking. Ultimately, we hope the methods and tools



developed in this project will help to yield new insights into the ecology and behavior of small, free-living animals. For example, in the Behavioral Ecology Group at WUR, the methods developed here are being used to track social interactions in groups of wild zebra finches.

Future plans

The range-free localization approach developed in this project is currently being prepared for publication. Additionally, the associated data processing workflow will be made freely available. As the method is adopted by other research groups, we hope to validate its effectiveness across environments and study species. In our own group, we are applying the range-free method in two drastically different environments (sub-tropical savanna and arid shrubland) with a variety of small bird species to further test its applicability in different contexts.

Further information

For more information about ongoing research that is applying the tracking methods developed in this project, please visit the Behavioral Ecology Group research website: http://www.behaviouralecology.nl/research.