Using Vornoi Tesselation to estimate Animal Home Ranges

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Keywords: home range estimation; animal biotelemetry; voronoi tesselation; space use

Abstract: Tracking animals through time and space using telemetry is an important tool to study, movement, behavior and habitat relationships of wild animals. Home range estimation is often employed to analyze such data. Over the last decades, many different methods emerged to estimate home ranges from relocation data. Generally, the problem of estimating a home range can also be regarded as estimating a density surface from a finite sample of relocations. Browne (2012) presented a novel approach using tessellation density estimation to obtain such a surface. In order to overcome some of the difficulties of tessellation density estimation (e.g., discontinuity) Browne (2012) put the density estimation within a bootstrap aggregation algorithm and incorporated model selection with complexity penalization to find the model with most favorable bias/variance compromise. We used Penalized Bootstrap Aggregated Tessellation Density Estimation (PBATDE) to estimate home ranges from simulated and real animal relocation data. We then compare different properties (e.g., accuracy to predict the home range area, volume of intersection between the true and the estimated utilization distribution) from home ranges estimated with PBATDE with home ranges estimated using other frequently employed estimation methods such as kernel density estimation and local convex hulls.

References

Browne, M. (2012). Regularized tessellation density estimation with bootstrap aggregation and complexity penalization. *Pattern Recognition*, 45:4, 1531-1539.