Modelling the efficiency of animal movement strategies

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Understanding how an individual animal is able to navigate through its environment is a key question in movement ecology that can give insight into observed movement patterns and the mechanisms behind them. Efficiency of navigation is clearly an important concern in movement strategies and can effect behavioural processes across a range of spatio-temporal scales, from foraging and migration to short scale search and target finding.
In this talk I will present a simple theoretical navigation problem of individual animal movement relevant at all spatial scales. By considering a vector-weighted biased and correlated random walk (BCRW) model where external navigation cues are balanced with forward persistence, I will derive a mathematical approximation of the expected navigational efficiency of the model. From this model I will demonstrate the perhaps counter-intuitive result that a higher navigational efficiency is achieved by giving more weight to indirect navigation cues (such as persistence) rather than direct cues [1]. Finally, I will discuss approaches in extending the analytical result to describe groups undergoing collective movement.

References

[1] J.D. Bailey, J. Wallis, and E.A. Codling, *Navigational efficiency in a biased and correlated random walk model of individual animal movement*. Ecology, 99(1), 2018, pp. 217–223.

⋆Mini-Symposium: Movement: animal strategies, spatial patterns, fragmented landscapes, and disease