

Management frequency and extinction risk

GMSE: an R package for generalised management strategy evaluation (Supporting Information 5)

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Replicate simulations as a tool for model inference

The default submodels of GMSE (`resource`, `observation`, `manager`, `user`) are individual-based (also called ‘agent-based’), meaning that they model discrete individuals (resources or agents), which GMSE are represented by individual table rows (`RESOURCES`, `AGENTS`, `OBSERVATION`) or layers of three-dimensional arrays (`COST`, `ACTION`). Individual-based modelling has been a useful approach in ecology for decades (Uchmański and Grimm, 1996; Grimm, 1999), providing both a pragmatic tool for the mechanistic modelling of complex populations and a powerful technique for theoretical investigation. A key advantage of the individual-based modelling approach is the discrete nature of individuals, which allows for detailed trait variation and complex interactions among individuals. In GMSE, some of the most important traits for resources include types, ages, demographic parameter values, locations, etc., and for agents (manager and users), traits include different types, utilities, budgets, etc. The traits that resources and managers have can potentially affect their interactions, and default GMSE submodels take advantage of this by simulating interactions explicitly on a landscape (see SI7 for an introduction to GMSE default data structures).

References

- Grimm, V. (1999). Ten years of individual-based modelling in ecology: what have we learned and what could we learn in the future? *Ecological Modelling*, 115(2-3):129–148.
- Uchmański, J. and Grimm, V. (1996). Individual-based modelling in ecology: what makes the difference? *Trends in Ecology & Evolution*, 11(10):437–441.