Agent-Based Models for Biodiversity Preservation

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1 Abstract

Conservation and management of biodiversity is crucial for future sustainable development. Among ecologists and biologists, different approaches have been explored and adapted to contribute to the study of the distribution of species and populations. Species Distribution Modeling (SDM) has been widely applied in order to delineate their preferences and predict their distribution by using a set of environmental descriptors.

This research attempts to a) model time-evolution of spatial distribution and variability of species and populations using agent-based models, and; b) propose new graphical methods for the analysis of evolutionary data in an ecological framework.

The analysis of the properties of the populations will allow to efficiently describe the connectivity between populations and estimate migration and dispersal from both ecological and evolutionary perspectives. Therefore, comparative hypothesis testing on time and way of colonizing processes could be proposed in different species with very different life strategies (from both terrestrial and marine environments). Case studies can include (but are not limited to) some of the following species: honeybees (Apis mellifera), white seabream (Diplodus sargus), sea cucumber (Holothuria arguinensis), little Neptune grass (Cymodocea nodosa), and brown algae (Fucus vesiculosus).

2 Objectives and Tasks

T1 Brief literature review on agent-based models and selection of the computational tools

T2 Selection of the biological data and proposal of a model to the problem

T3 Development of a software graphical simulator

T4 Compare results and test hypothesis

T5 To write up the dissertation

3 Timetable

T1 4 weeks

T2 4 weeks

T3 10 weeks

T4 6 weeks

T5 6 weeks

4   Expected Results

- 1 dissertation

- 1 software prototype

C. Macal and M. North, Introductory tutorial: Agent-based modeling and simulation, in Proceedings of the Winter Simulation Conference 2014, Dec 2014, pp. 6–20.

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K. L. Sheehan, S. T. Esswein, B. S. Dorr, G. K. Yarrow, and R. J. Johnson, Using species distribution models to define nesting habitat of the eastern metapopulation of double-crested cormorants, Ecology and Evolution, vol. 7, no. 1, pp. 409–418, 2017.