

SWA: Management Application of an Agent-Based Model: Control of Cowbirds at the Landscape Scale

Tom Wallace

Spring 2018

Research Question

This paper does not have a research question, but it does have a clearly stated purpose: to build a model capable of predicting cowbird movement patterns in a specific geographic region so as to aid development of better trapping strategies. This clarity of purpose contributed to a focused and well-posed research effort.

Model Effectiveness

I judge that this model is highly effective.

First, a brief description of the model. There are three main agent types: feeding areas (immobile), cow herds (mobile), and cowbirds (mobile). Feeding areas have attributes that make them more or less attractive for grazing. Herds choose feeding areas based on those attributes and some simple logic (e.g., avoid recently-used areas, prefer near locations over far, and so on). Cowbirds search for herds. Optimal trap placement thus can be determined by placing them at the areas of greatest cowbird density.

One, this model is effective because we have a standard by which to measure it. The model's goal is to help catch cowbirds; model-generated strategies do so at a 42% greater rate than prior, non-model-based strategies; ergo, the model is effective. Such focus is a contrast to some other models surveyed in this course that are paired with vague, non-measurable, non-falsifiable research goals (e.g., "explore the potential of MAS...").

Two, this model is effective because we can understand it. The documentation is extensive and clear. Key parameters are identified and their values are backed by

theory and empirical evidence. Sensitivity analysis reveals the effect of changing model elements. Verification and validation is conducted.

Three, this model is effective because it is well-suited for the problem at hand. I discuss this in greater length below, but this model is a great advertisement for ABM-GIS integration because integrating the two is not just a “science project” done for the fun of it, but because the research goal cannot be achieved without integration.

Course Themes

I focus on only one topic in greater depth: ABM-GIS integration. Counterfactuals are a good way to illustrate why both modeling paradigms were needed to achieve research goal. Consider a purely ABM approach. Because the location of cowbirds depends on the location of cows depends on specific geographical features, knowing the decision rules of agents would be useless if they were not paired with accurate information on the geographic features driving those decisions. Conversely, consider a purely GIS approach. Knowing the location of geographic features is irrelevant if they are not coupled the phenomena we actually are interested in (cowbird movement). Clearly, both elements are needed.