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ALICANTE * 19/20/21/22 SEPTEMBER 2018

CONGRESS PROCEEDINGS

EURAU18 alicante

RETROACTIVE RESEARCH

CONGRESS PROCEEDINGS

ISBN: 978-84-1302-003-7
DOI: 10.14198/EURAU18alicante

Editor: Javier Sánchez Merina

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Anatomizing NetLogo

Some advices on how to consider a programmable environment for designing inhabited landscapes

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Synopsis

NetLogo is a freely programmable environment that offers an interface whose graphic synthesis is sufficient to depict emergent and complex phenomena as long as they are characterized by the appropriate variables; it looks for ways to incorporate geometric and geographical bases of real cartographies; it has the capacity to speculate with the future of reciprocal, cooperative societies; is able to diagram the virtual model on the graph of real data; finally, it helps researchers and teachers to set methodologies to project from the consideration of minimum knowledge units and neighbourhood conditions. This paper explains some resource implications as well as examples chosen in recent years by students of the UA.

Key words: programmable learning, hybrid societies, landscape design, process depiction, agent-based modelling.

1. Introduction

Anatomize, in its greek root, means cut and turn to make visible the portions, like a scanner

NetLogo emulates how natural communities unfold at multiple scales from systemic to microscopic, through coexistence rules, cohabitation and cooperativism. Members that make up the communities are called particles or agents, and have been used in recent decades to characterize algorithms in Artificial Intelligence (Wilensky, 1999 and 2015).

2. Statements

Statement 1. As if it were a dialect, these parametric models accurately convey arguments for the description of contemporary complex societies. If a biologist parametrizes shared concerns, reciprocal observance, minimal leader influence, diversity in opinions and forms of quorum and solidarity in a bee colony searching for hives (Seeley, 2010, 208-253), it is likely that part of his methodology can be extrapolated to the design of ways of living in hybrid human and non-human societies based, e.g., on care ethics (Puig, 2017) (Netlogo\ BeeSmart Hive Finding).

Statement 2. Each model includes a graph called "world" divided into a matrix made of "plots" in which the families of agents (originally called "turtles") behave following rules or neighbourhood considerations. This "world" is shown thanks to a reduced chromatic range and a degree of abstraction, sufficient for the understanding of the phenomenon (see figure 1). Each model is accompanied by a description about agent definition, interaction rules, and editing mode to continue with the versioning. Some small rectangular labels are added to the “world” depiction and correspond to display or dimensioning options.

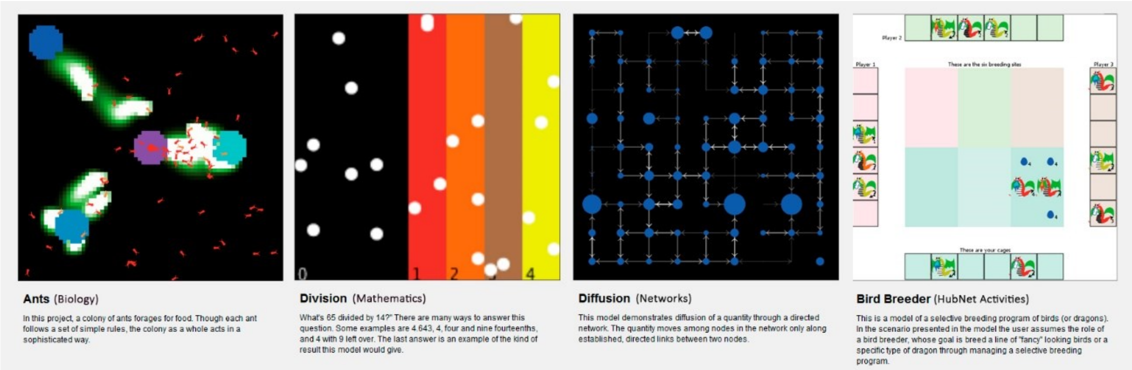


Figure 1. Four samples of graphic display of agents over the world.

Statement 3. Success of the resource involves facilitating the reversibility of graphic standards between vectorial (eg DXF), raster, GIS files and those produced in the "world" of NetLogo. Solving certain difficulties in modelling and integration methods (Crooks and Castle, 2012), advances are being produced, like those referring to settlements in the East Anglia region, UK (Fontaine and Rounsevell, 2009); settlements in classical Greece and Rome (Graham and Steiner, 2006); or gentrification processes in Salt Lake City, Utah (Torrens and Nara, 2007).

Statement 4. A model emulates a natural or social phenomenon. If it has already happened over time, as in the dynamics of depopulation that occurred more than six centuries ago in Longhouse Valley, Arizona (Netlogo \ Artificial Anasazi, Janssen, 2009 and Swedlund et al., 2015), we can consider it successful when real and virtual graphics are close enough. In the Artificial Anasazi model, data such as remaining corn harvests, household location, hydrological and paleontological values or seasonal cycles have been crossed over (see figure 2), with agents characterized by families with life expectancy, fertility, nomadism, food and ability to generate pantries. Precisely these ones became graphic variables (sliders) in the visual interface.

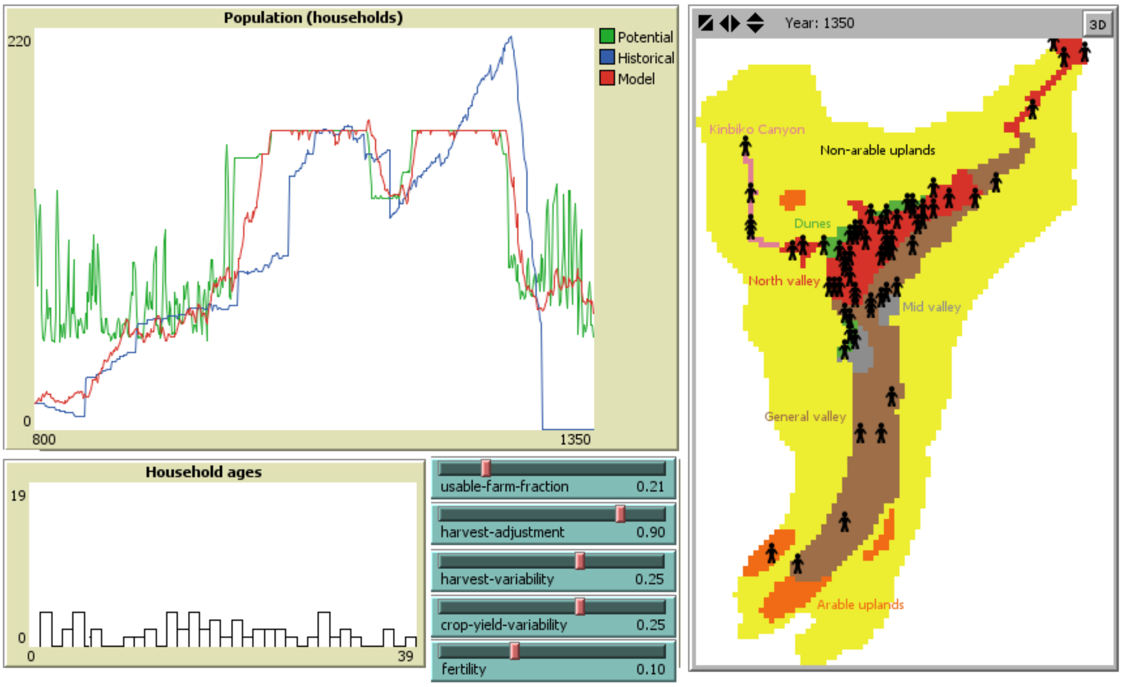
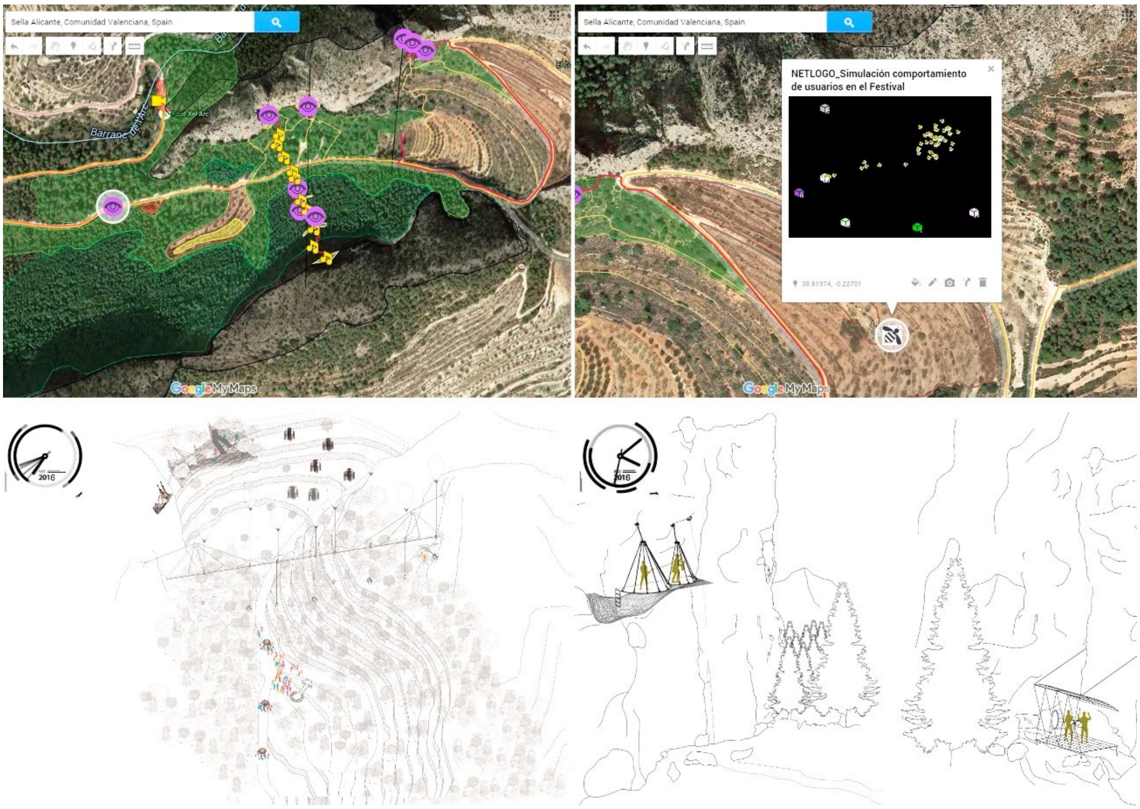


Figure 2. “Artificial Anasazi” model.

Statement 5. Applying analogies and little creativity, indicators that regulate the evolution of a model can be extrapolated to new ones of different natures. For example, in 2016 some professors fostered Architectural students to design sustainable, light, scenic devices in Sella’s Valley (Marina Baixa, Alicante), taking into account acoustic conditions of rock walls, ways water is distributed, forests, trails and roads, farms and glades, and new mountain uses such as hiking and climbing. Some of them decided to test NetLogo through one model that simulated how scout bees looked for locations to locate hives (Netlogo \ BeeSmart Hive Finding). In the model, a number of scout bees were flying following a random drift. When one of them found an ideal hive location, it returned to the community. Depending on the dance mode the rest of the members understood the opportunity of moving together to the candidate hive. This caused other bees to start exploring and if "quorum" arrived (a certain quantity of bees observing the dance of a certain quantity of scouts) then the relocation started (Seeley, 2010). If the goal of architecture students had to do with transferring the neighbourhood lodgins (“barracas”) to suitable places in the landscape in order to enjoy musical rehearsals, NetLogo’s strategy could be applied: number of beehives became candidate acoustic locations, number of scout bees would be hikers, maximum search time would had to do with the people's tiredness, types of "beedances" could be translated into musical abilities using voices and instruments, etc. Netlgo gave students some keys: acoustic relocations ended up depending on human aspects (physic fatigue, orientation), natural variables (wind direction, sound absorption, reverberation) and technical questions (musical and climbing tools). And the main lesson was that communitarian agreements let multiple design solutions be possible.



Designs considering the "BeeSmart Hive Finding". (Professors: Abellán and Carrasco)

3. Conclusion

The resource is useful for researchers when the student succeeds in isolating a goal from his design or landscape project and discretizes it in environmental or social parameters. The tool helps us to understand our discipline as an ecology, a place for controversies in which architecture deals with humans and non-humans, as agents in a colony or a swarm in the which the relevant are the interactions and the way of self-organizing.

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Biography

Francesc Morales Menárguez. PhD Student. Architect by the University of Alicante (2015) and Agricultural Technical Engineer by the Miguel Hernández Universitat d'Elx (1998). Honorary professor in the year 2016-2017. Member of network "Viceversos" in the application of new technologies to achieve interactive architectures. Research agent-based design and programming in order to obtain adaptive solutions. Teacher of workshop "Worldmaking and Technoledge" among universities of Alicante, TuDelft (Netherlands) and York (Canada) (2017).

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