Newly certified models in the CoMSES model library and newly published models added to the model library.

... a node in the CoMSES Network

# CoMSES Digest: Spring 2016

## Volume 4, No. 1  December 16, 2015  – March 15, 2016

Welcome to the Spring 2016 issue of the CoMSES Digest! I'm writing from Chicago, where this spring follows a winter that was extremely mild: there were only one or two days where the Chicago wind cut through freezing air and stung with sleet and freezing rain. Most of the time it was quite warm and, for true Chicagoans, a little disappointing.

Also disappointing: We continue to work on the content-centered articles we hope to place in the CoMSES digest, but these are still forthcoming.

But Spring brings good news, both in CoMSES management and in the continuing activity on the OpenABM Archive.

### CoMSES Elections

The CoMSES Executive Board Elections were completed earlier this month. Joining the Board through 2018 will be Forrest Stonedahl (Augustana College) and Moira Zellner (University of Illinois Chicago). They replace outgoing members Volker Grimm and Bruce Edmonds; I hope you will join me in thanking Volker and Bruce for their service on the Board. Stonedahl and Zellner join Christophe LePage, William Rand, Mariam Kiran, and Gary Polhill as current Board members. The Board in 2016 will be tasked with helping the CoMSES organizers grow the organization further and in new directions this year and beyond, including expanding the CoMSES network and finding new and continuing sources of support and funding. The composition of the board and current terms are:

| Member | Through Year |
|---|---|
| Christophe Le Page | 2016 |
| William Rand | 2016 |
| Mariam Kiran | 2017 |
| Gary Polhill | 2017 |
| Forrest Stonedahl | 2018 |
| Moira Zellner | 2018 |

**OpenABM Activity**

The top 5 most downloaded models included one first-time top-5 entry, Anna Klabunde's model of circular migration, and a collection of perennial favorites. In compiling this quarter's list, we realized something new: we have been providing counts of downloaded models, but documentation for models- ODD protocols, especially- can be downloaded too, and in some cases are downloaded more often than the code itself. It is not always possible to distinguish this from our records (a .zip file might contain both code and documentation), but in the cases where this can be distinguished, it's clear that the documentation for the code is being viewed and used very often.

Among the newly uploaded models, ant colony behavior and the rise of hierarchies are modeled in two submissions from the social insect world. Consumer behavior, and opinion dynamics are modeled, along with land use change in Asia and biofuel crop decisions. Ivan Smarzhevskiy has provided a reimplementation of the Garbage Can decision model; previously he had uploaded a version in Excel, and now he has provided one in NetLogo. Chris Thron has examined lifestyle tradeoffs and the impact on overall well-being. And Bruce Edmonds has submitted a model of 'making', examining the dynamics of resource extraction, assembly, sale and trade. Edmonds's model is explicitly a model for model-building, a basis for other models that are built using more specific components than are in his abstract representation.

Spring is typically a good time to emphasize model archiving: if you are teaching courses that involve modeling, encourage your students to archive their models on OpenABM. Model Certification would also be an excellent high-bar to set, to help train the next generation of modelers not only how to model but how to participate in the community of modelers that CoMSES and OpenABM support.

**Warm regards,**
**John T. Murphy,**
**CoMSES Digest Editor**

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## Newly Published Models in the Model Library

### Composite Collective Decision Making- Ant Colony Foraging Model

***Tomer J Czaczkes, Benjamin I Czaczkes***

Individual animals are adept at making decisions and have cognitive abilities, such as memory, which allow them to hone their decisions. Social animals can also share information. This allows social animals to make adaptive group-level decisions. Both individual and collective decision-making systems also have drawbacks and limitations, and while both are well studied, the interaction between them is still poorly understood. Here, we study how individual and collective decision-making interact during ant foraging.

### A Simple Behavioral Model Predicts the Emergence of Complex Animal Hierarchies

***Takao Sasaki, Clint A. Penick, Zachary Shaffer, Stephen C. Pratt, Jürgen Liebig***

Social dominance hierarchies are widespread, but little is known about the mechanisms that produce non-linear structures. In addition to despotic hierarchies, where a single

individual dominates, shared hierarchies exist where multiple individuals occupy a single rank. Our model shows that all three hierarchy structures–linear, despotic, and shared–can emerge from different combinations of simple interactions present in social insects. Our model shows that a linear hierarchy emerges when a typical winner-loser interaction (dominance biting) is present. A despotic hierarchy emerges when a policing interaction is added that results in the complete loss of dominance status for an attacked individual (physical policing). Finally, a shared hierarchy emerges with the addition of a “winner-winner” interaction that results in a positive outcome for both interactors (antennal dueling).

## A Consumer in the Jungle of Product Differentiation

***Alessio Emanuele Biondo, Alfio Giarlotta, Alessandro Pluchino, Andrea Rapisarda***

We present a graph-based model of consumer choice, which describes the hypothetical cognitive journey that each individual experiences in the process of buying a product by exploring a given market. The topological structure of the market is represented by a graph with different types of nodes, identified by different shapes. The role of the causes that influence the decision can be measured by means of behavioral differentiation in several parametric simulations. The relevance of information and knowledge, in the form of individual awareness, discriminating ability, and perception of market structure, can be evaluated.

## Lifestyle Tradeoffs and the Decline of Well-Being

***Chris Thron***

This code implements a semi-quantitative mathematical model of the changes over time in the statistical distribution of well-being of individuals in a society. The model predicts that when individuals overvalue the more socially conspicuous aspects of well-being in their lifestyle choices, then the average well-being of the overall population may experience continuous decline. In addition to tradeoff cost and overvaluation, we identify statistical variation in individuals’ well-being and turnover within the population as key factors driving negative trends. We investigate the influence of the effects of heterogeneity in the population, as well as economic and/or technological progress.

## A Model of Making

***Bruce Edmonds***

The purpose of this model is to provide the simulation infrastructure needed in order to model the activity of making. That is individuals using resources they can find in their environment plus other things that other individuals might sell or give them, to design, construct and deconstruct items, some of which will be of direct use to themselves, some of which they might sell or give to others and some of which might be used as a tool to help in these activities. It explicitly represents plans and complex objects as separate entities in the model – embedding the “Atoms – Bits” distinction highlighted within the DiDIY project. This allows plans to be shared between agents which give the steps of how to make objects of use – either on a commercial or a free basis.

## A Relative Agreement Model and Network Structure

***David T. Adelberg, Spiro Maroulis***

This is an adaptation of the Relative Agreement model of opinion dynamics (Deffuant et al.

2002), which models how extreme, minority views in a population can take hold in a population of individuals who are influenced by each others' opinions. This particular adaptation extends the Meadows and Cliff (2012) implementation of the Relative Agreement model in a manner that enables the exploration of the effect of the network structure among the agents. This model implements three initial network structures among agents, which bias the likelihood of interaction: fully connected graph (equivalent to the random mixing assuming by the original model), small world network, and preferential attachment (scale-free) network.

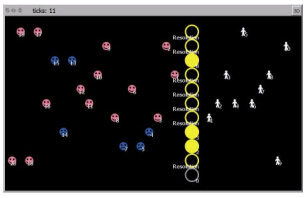
## Musical Chairs

***Andreas Angourakis***

This agent-based model intends to explore the conditions for the emergence and change of land use patterns in Central Asian oases and similar contexts. Land use pattern is conceptualized as the proportion between the area used for mobile livestock breeding (herding) and sedentary agriculture (farming). We assume that these two forms of land use interact in recurrent competitive situations, given that the land useful for both activities at the same time is limited and there is a pressure to increase them, due to demographic and/or economic growth. Implementation and simulation of the Musical Chairs model were done using Netlogo.

## Garbage Can Model NetLogo Implementation

***Ivan Smarzhevskiy***



The concept of GCM is decision making, which resolve Problems. Problems have Energy Required (ER) for their decision, Managers (decision makers) have Effective Energy (EE) for the decisions generation. The place of decision-making is the Choice Opportunities (Choices) - abstraction of commitees, consul boards and so on. The Choices and Problems open randomly. The Problems activated by two items and Choices by one item per step of modellig (tick) in first halfe of modelling time. All Managers are ready for action from first modelling step. Problems and Managers access to Choices in according with system structrure. There is three types of Problems access to Choices and three types of Managers access to Choices. Presented model literally reproduces the original logic of GCM (with one exception: the equal effective energy distribution between managers assumed).

## MixFarm ABM Model

***Leigh C. Anderson***

MixFarmABM Model examines the competitiveness of second-generation biofuel crops with existing crops and beef cows at the farm level and their impact on the farm structure. In addition, three sequential (strategic, tactical and recourse) optimization stages are used in order to better reflect the uncertainty and recourse decisions available to Prairie farmers to determine short-run and long-run production decisions using linear and integer programming techniques. The simulation results indicate that energy crops have the potential to change the structure of agriculture. Energy crops emerge in the model in both of the energy price scenarios, while total farm sector equity and total sector net income is improved over the base scenario.

## Between Pleasure and Contentment: Evolutionary Dynamics of Some Possible Parameters of Happiness

***Yue Gao, Shimon Edelman***

We offer and test a simple operationalization of hedonic and eudaimonic well-being ("happiness") as mediating variables that link outcomes to motivation. In five evolutionary agent-based simulation experiments, we compared the relative performance of agents endowed with different combinations of happiness-related traits (parameter values), under four types of environmental conditions. We found (i) that the effects of attaching more weight to longer-term than to momentary happiness and of extending the memory for past happiness are both stronger in an environment where food is scarce; (ii) that in such an environment "relative consumption," in which the agent's well-being is diminished by that of its neighbors, is more detrimental to survival when food is scarce; and (iii) that agents with a positive outlook, whose longer-term happiness gets more increase from positive events than decrease from negative ones, is generally advantageous.

## Product Diffusion Model in an Advance Selling Strategy

***Peng Shao***

SIR is the model in complex network transmission dynamics. The models characterize the critical processes of product diffusion within complex networks. We retained their major features as the three basic states of our model, and introduced Buy as the forth states. Individuals who stay at the same state can be considered into a classification of population. SIRB can provide four classifications of individuals, such as Susceptible, Infected, Remove, and Buy. SIRB has three state transitions, S→I, I→R, and I→B. 1. Product information susceptible (S, Susceptible).

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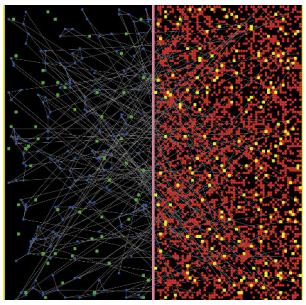
## Most Downloaded Models in the Model Library

**(December 15, 2015 – March 15, 2016)**

**1. (51 Downloads)** Land Use Model to Illustrate Ambiguity in Design ***by Julia Schindler***



**2. (50 Downloads)** A Computational Model of Workers Protest ***by Jae-Woo Kim***

**3. (46 Downloads)** A Mathematical Model of the Beer Game **by *Mert Edali, Hakan Yasarcan***

**4. (45 Downloads)** A Model of Circular Migration ***by Anna Klabunde***

**5. (43 Downloads)** Artificial Anasazi **by Marco A. Janssen**

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