Book Review

Multi-Agent-Based Simulations Applied to Biological and Environmental Systems

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Section I - Theoretical Models and Tools

Section II- Applications in Biological and Environmental Systems

Simulations and (discipline-) applications are the two major influences and reasons for the extensive applications of systems across domains. Multi-agent simulations are one of the significant technologies evolved in the last few years. Simulations change over time and effective models can able to track such changes. Since multi-agents are complex involving heterogeneous environments, simulations can enable to sense such complexities. Multi-agents are considered to have influence across domains and sectors and one such major influence is on biological and environmental domains. Realizing this value Diana Adamatti has brought this companion to aid the researchers and other users to keep record of the agent based simulations.

Under the first section on Theoretical Models and Tools, the authors *Magessi* and *Antunes* with a chapter on Ignition of Algorithm Mind have outlined how neurons ignite the algorithm formation. They explained how agents represent neurons where neurons depend on decisive algorithms. The characterization of neurons would lead to understand the formation of algorithms pertaining to it.

Costa in the second chapter on Ecosystems as Agent Societies, Landscapes as Multi-Societal Agent Systems has give descriptive architectures and structure of ecosystem and treated it as multiagent systems. The interaction of the ecosystems of a landscape is enumerated with details by the author.

Portegys and his co-authors in the third chapter on Morphozonic, Cellular automata with nested neighborhoods as metamorphic representation of morphogenesis have presented basically a cellular automation model. They have given an excellent introduction to morphogenesis which is essential to understand the biological intelligent agents and how these agents can work for the understanding of biological simulations. The cellular automation contributes to morphozoics; how the cellular automation emerges and what are the development and how they form are the few ingredients in this chapter. The wonderful list of references is quite amazing. We can realize the pain of the authors to develop a very exhaustive reference list which direct the user in the future research directions as well as to gain understanding.

In the fourth chapter on 'A Scalable Multi-agent architecture for monitoring biodiversity scenarios' the authors *Rocha* and *Brandao* have addressed the scalability issues in environmental and biodiversity tracking. According to the authors the Internet of Things in bio-environmental science is crucial for which the scalability is a key challenge. To aid the solution the researchers can make use of the proposed algorithms, architecture and solutions.
In the next chapter on 'A Multi-agent-based environmental simulator', the computational tools to analyze the environmental scenarios of land change was advocated by *Ralha* and *Abreu.* The agent based simulator they have developed is named as MASE, which is really a conceptual model based on real environmental cases, a reality-based one.

In the sixth chapter, the authors Ballet and his co-authors have outlined in details with enough background, the intuitive agent-based software for modeling and simulating complex systems in biology. While introducing this software they have detailed a good background and provided real time processing environment.

Montagna and *Omicini* in their contribution on Agent based modeling in multi-cellular systems biology have documented the content of multi-agent based simulation for modeling and simulating computational biology using well construct methodologies and framework. They have codified the simulations in the multi-cellular biology and they developed the model using a case study which ensures some kind of reality. However no application details of the system is supported in the chapter.

In the section 2, seven chapters contribute to the applications in the biological and environmental systems. In the opening chapter of this application section the authors *Andrade* and *Modesto* with their work on Architecture with multi-agent for environmental risk assessment by chemical contamination enlightened the risk assessment in the environmental systems. They basically presented a comprehensive architecture for environmental risk assessment. The risk assessment model they provided is unique which normally may not be available in any literature except in hand books. The risk model and architecture they have presented would serve as supporting aid for the risk assessment researchers in computational biology.

Machado, Adamatti and *Goncalves* in their work on 'Microbial Fuel Cells using agent-based-simulation' have reviewed the agent based models for microbial fuel cells. Using simulation scenarios they presented the brief results. This is a condensed chapter with a good list of reading.

In the tenth chapter on Use SUMO Simulator or the determination of light times in order to reduce pollution, the authors Born et al., proposed simulations performed in urban mobility simulator using dispersion of pollutants and genetic algorithms. This study is based on a model and data which yielded very positive results as we read in the results part.

In the next chapter on 'Multi-agent systems in three-dimensional protein structure protein' the authors *Lima Correa* and *Dorn* have offered compendium of protein structure related to the application and implementation in multi-agent systems. The most important feature in this unit is the very exhaustive reference list. In the chapter on Biomass Variation Phytoplanktons using agent-based simulation the authors *Porcellis, Adamatti* and *Abreu* have demonstrated the variations of the phytoplankton biomass in the estuary of the Patos Lagoon. To implement it they initially proposed a well built model and conducted simulations. *Briot* and his co-authors using a chapter on Participatory Management of Protected Areas for biodiversity conservation and social inclusion have used multi-agents for participatory management of protected areas for biodiversity conservation and social inclusion. This chapter has a very detailed background and model.

In the fourteenth chapter on 'Using Probability Distributions in Parameters of Variables at Agent-based simulations', the authors *Moraes* et al initially modeled the growth of Mycobacterium tuberculosis with the help of the agents based simulations. They built the model using a strong architecture and validated the model with simulated data.

The potential features of this collected work is the reporting of sound background theory-based models and validation with real as well as simulated data. In this respect this book departs from conventional books which are mostly theory-confined ones. Many implementation models using agent-based simulations in biological sciences are presented extensively throughout this volume.

I would love to read it again which has influence in mind.

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