

## Virtual Worlds: Synthetic Universes, Digital Life and Complexity

Edited by Jean-Claude Heudin

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Cover of book

Those of us who teach agent-based modelling are often confronted by one consistent question from initiates to the field. This question, in its most general form, concerns the lack of "realism" in the graphical presentation of agent-based models. In short, those new to the field are often confused by the abstract nature of two-dimensional squares or circles representing both individual agents and their related landscapes of action. The standard answer to such questions involves the retort that the research task is concerned with determining probability distributions of model outcomes, rather than with the visual realism of the simulation. Thus, as with all of social science modelling, the demands of simplifying a complex reality in an effort to meet the statistical requirements of the dominant research paradigm predominate over efforts to capture all of a complex reality.

This edited volume seeks to add visual realism to the production of virtual worlds by generating more lifelike evolving agents and more lifelike evolving "worlds" that these agents inhabit. The editor of the volume, Jean Claude Heudin, poses a more extensive task for the volume when noting that the goal of the varied chapters is to make the production of virtual worlds, "... a legitimate field of scientific inquiry" (p. xv). Heudin is not referring to the making the virtual worlds

often referenced in agent-based models a legitimate field of scientific inquiry as this process of legitimisation is well underway. Instead Heudin is referring to the software engineering and graphical means of producing virtual worlds that will enhance the visual and evolutionary elements of agents and their environments.

Heudin's introductory chapter traces the developmental history of virtual reality and virtual worlds. This history ranges from the two-dimensional tracings of "Conway's Game of Life" to more recent effort to produce fine-grained three-dimensional visual presentations of virtual worlds. This chapter provides the reader with many thoughts as to the potential relevance of enhanced graphical display and visualisation to the production of social simulation and agent-based models.

One does not have to work hard to find the centrepiece of this edited volume. The chapter by Thomas Ray stands above the other contributions. Ray's chapter, "An Evolutionary Approach to Synthetic Biology: Zen and the Art of Creating Life", is a reprint of his oft-cited 1994 article published in *Artificial Life*. This reviewer has read this article several times over the last few years and is still amazed at the depth of Ray's analysis and knowledge. The wealth of insight embedded in this article makes it required reading for all students of artificial life and agent-based modelling. Ray's understanding of the process of evolution and the requisite adaptations serves as a foundation for any researcher interested in producing either evolving agents, evolving landscapes or both.

The chapters by Jeffrey Ventralla and by Nadia Magnenat-Thalmann and Laurent Maccozet examine the production of computer-generated human forms. These chapters present considerable technical detail as to the knowledge of morphology, kinesiology and software engineering necessary to produce lifelike presentations of the human form on the computer. These chapters are likely to appear tangential to most students of agent-based modelling. However, one does not have to possess the most ripe of imaginations to appreciate the potential for more lifelike human presentation in the production of agent-based simulation or in the production of virtual worlds.

The chapters by Daner, Gold, Marcelo and Revi and by Refsland, Ojika, Loeffler and De Fanti examine the production of "inhabited" virtual worlds in cyberspace. These chapters trace the development of both human, animal and plant environments as interactive and ongoing simulations in cyberspace. At the core of the analysis by Daner *et al.* are the simulated human town of Sherwood Forest and the evolving plant and animal realm of Biota's Nerve Garden. Sherwood Forest is a collaboratively constructed virtual town comprised of numerous agents with various forms and informal roles comprised of distinct physical representations embedded in a virtual town. Sherwood Forest is thus a virtual town with three dimensional renderings of people interacting within the physical space of buildings transportation routes and one physical space. This is an evolving environment that allows the introduction of additional agents and physical structure. Sherwood Forest seems to represent the open-ended continuous virtual environment that many researchers have long imagined.

The Virtual Great Barrier Reef developed by Refsland *et al.* is an immersive virtual reality which allows visitors the opportunity to examine artificial life. This virtual environment represents the potential "richness" of virtual environments as a means for learning and exploration. Visitors to the reef may play differing roles in the environment or simply serve as innocent bystanders examining the many "life" forms inhabiting the reef. This chapter presents a detailed outline of the environmental systems logic underlying the model and a detailed presentation of the technologies used to interface with the simulation.

Another "would be world" presented in the book is Noda and Frank's Virtual Soccer game. While this presentation lacks the graphical sophistication of Sherwood Forest, the Great Barrier Reef or Nerve Garden, its value stems from the sophisticated system of agent rules necessary to simulate player behaviour on the landscape of the playing field. When considering the complexity of this multidimensional sport, one can see that this simulation represents more than just sport. Such simulations lay the groundwork for extrapolation to many more "arenas" for simulating the human experience.

A brief interlude of a chapter by Yaneer Bar-Yam serves to tie the complexity paradigm into the chapters of the book. This chapter examines the elements of precision and scale in models as essential features for promoting understanding. Bar-Yam uses his notion of the complexity profile to explore the linkage of both independence and coherence in the development of virtual worlds. This chapter, placed near the end of the book, may have better served as an introduction to the challenges of incorporating complexity into the production of virtual worlds.

The remaining chapters by Rodney Berry and Olga Kisseleva examine the more artistic elements in the production of virtual worlds. These explorations of sound and art in virtual worlds reveal efforts to build complete environments that capture the "complexity" of the human sensation. Clearly, sound and artistic visualisation can add to the production of virtual worlds that may be increasingly consistent with the "real" world of experience.

This book suffers from the usual maladies inherent in edited volumes. At times, it is difficult to find the coherence in the volume. This may, however, be a result of the editor's desire to present the "global" scope of the material rather than present a tightly configured sequence or presentation. For social scientists researchers engaged in agent-based modelling, the notion of more lifelike "virtual worlds" may also not have much initial appeal. Most agent-based modellers at this point in the evolution of the field are concerned with defining proper agent rules and landscapes, rather than enhancing the quality of the computer graphics.

The value of this book is the questions it poses for the future development of artificial societies and social simulation. Readers of this book will readily imagine future social simulations in which lifelike human forms, on realistic human landscape, interact and strive to succeed, or perhaps just survive, in the varied landscapes that constitute the human experience. Other recent developments in social simulation help to emphasise the previous point. Consider Trappl and Petta's volume [Creating Personalities in Synthetic Agents](#) and the potential for creating agents with unique personality constructs. Add to this conception the notion of agents with lifelike human physical attributes - we know that physical appearance and height are conducive to "success" in human organisations - and we can begin to see the production of simulations that provide much greater detail and realism than current agent-based models.

Many students of social simulation may also think that chapters in this book represent a technological leap that is not yet feasible given the current state of social simulation. This is likely to be a genuine concern. Defining the "rules" that drive agents and define landscapes are often daunting tasks. However, given the potential for adding greater realism to social simulation that exudes from this book, it should be on the shelves of social scientists engaged in agent-based modelling. In a decade, you will be glad to have this resource in your personal library.

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It introduces virtual worlds as a field, and reviews its historical roots, its goals, and its methodological approaches. Virtual worlds enable the study of a wide variety of "what if" questions relevant to our understanding of the world around us, by using image synthesis, modeling, multimedia, and virtual reality. The contributors to this volume investigate the relationships between the natural and the artificial from both theoretical and philosophical points of view.

Virtual reality is easily distinguished from the experience of actuality; participants are never in doubt about the nature of what they experience. Simulated reality, by contrast, would be hard or impossible to separate from "true" reality. There has been much debate over this topic, ranging from philosophical discourse to practical applications in computing.Â 2. A comparable civilization reaching aforementioned technological status will likely not produce a significant number of simulated realities (one that might push the probable existence of digital entities beyond the probable number of "real" entities in a Universe) for any of a number of reasons, such as diversion of computational processing power for other tasks, ethical considerations of holding entities captive in simulated. An action-oriented session to discuss homelessness as a complex problem.Â Virtual Worlds Synthetic Universes Digital Life And Complexity New England Complex Systems Institute - Duration: 0:20. orald 7 views. 0:20. Louise Casey Keynote Homelessness in a Global Landscape - Duration: 44:56.