Introduction
(Cargese CNRS Interdisciplinary Seminar, Corsica – April 20th-24th, 2009)

The objective of this seminar was to develop generic and common methods, reusable, in the domain of evolutionary agents in virtual worlds. In physical and extended virtual worlds resources are considered to be limited. Lively, physical or computational systems have to track and optimize activity adapting structure. Agents are activity-aware of self and external resources. Their structure evolves according to fitness functions and objectives. The whole virtual world is constituted of activity-tracking and activity-aware systems, efficiently allocating simulation resources. "Activity" relates to structural and behavioral state changes of systems.

The number of participants has been limited to 20 by invitation only. Participants have been selected according to their competence domain and to the quality of their researches. The multidisciplinary origin of participants leads to the fact that they learned from each other according to their domain expertise.

The seminar was located at the CNRS-Università di Corsica Pasquale Paoli research center of Cargese (www.iesc.univ-corse.fr) in the island of Corsica. During the seminar, theory and application oriented workshops have been organized to compare and integrate contributions. A selected set of invited papers have been retained for inclusion in this book after peer-reviewed process. After a foreword where Bernard P. Zeigler presents a synthesis of the retained papers, we present the seminar program with all oral presentations (http://msdl.cs.mcgill.ca/conferences/Cargese/2009/15_Presentations).

Alexandre MUZY (General Chair)
& David R. C. HILL (Program Chair)

Foreword

This collection of papers represents an unusual cross-section of work in agent-oriented modeling and simulation in which agent concepts are examined from various perspectives ranging from practical to theoretical. The collection is unusual in that it spans contributions from various disciplines that normally do not interact with each other. This is in keeping with the multi-disciplinary nature of the Cargese Workshop, held in April 2009, a gathering that is reminiscent of the early days of cybernetics, before the extreme specialization and fragmentation of today rendered such meetings difficult to hold. Three themes emerge from the articles in this book: agents as artificial emulators of human intelligent activities, agents in modeling and simulation methodology, and activity concepts in complex agent systems. Let's look at the contributions from this point of view:

Agents as artificial emulators of human intelligent activities

- **Jean-Pierre Briot** discusses the software systems design of a virtual park manager that interacts with humans in planning to meet the park's multiple economic, social, and ecological objectives.
- In a first of its kind study, **Guillame Deffuant** demonstrates simple prototypes of agents that may be said to empathize with other agents in the sense that they can "imagine" what others are perceiving and planning.
- From a philosophical perspective, **Franck Varenne** analyzes the prospects for achieving a universal automated modeler agent, one that could develop models and simulations in the social sciences in the manner that only humans can at present.

Agents in modeling and simulation methodology

- **Levent Yilmaz** and **Bradley Mitchell** consider how an ensemble of models, each perhaps only partially representative of an uncertain environment, can support better decision making than a single authoritative one. Agents control simulation of the models and collaborate to allow the ensemble to evolve to better fit the environment.
- In his discussion of the universal automated modeler agent, **Franck Varenne** compares approaches based on system theory with those

based on a multi-level epistemology of modeling and simulation in social science. He finds that when critically examined, much is found to be in common between the two. However, his analysis also reveals insights into why researchers from the respective communities find it difficult to communicate with each other as well as why they will need to do so as the fields converge.

Activity concepts in complex agent systems

- **Xiaolin Hu** introduces discrete event modeling and simulation of pedestrian crowd behavior and shows it can exploit spatial and temporal heterogeneity of agent activity to speed up execution when compared to conventional time-stepped techniques.
- **Coquillard**, **Muzy** and **Wajnberg** first show that inclusion of spatial representations is important in agent-based models in ecology. However, simulations of such models encounter high orders of complexity, especially since stochastic processes are usually involved. Therefore, the authors develop a new approach to discovering and eliminating component processes that are irrelevant to objectives of the study.
- In a remarkable theoretical study, **James Nutaro** employs discrete event formalism to establish an isomorphism between self-clocked cellular automata and hybrid differential automata in order to carry over a theorem concerning the prevalence of limit cycles from the first to the second. Since self-clocked cellular automata are widely employed instances of asynchronous multi-agent systems, this result throws light on the unlikelihood of long term emergent behavior in such systems. Indeed, this study opens up a new area of theory that explores links between activity properties of multi-agent systems and the behaviors that they are capable of exhibiting. One might conjecture for example, that the greater the heterogeneity in space and time of agent activity, the more likely it is that truly "interesting" behavior continues to emerge without limit.

The reader, who looks to these articles as a source of new concepts, and new connections between familiar ones, will not be disappointed.

Bernard P. ZEIGLER (Honorary Chair),
June 2009

Monday April, 20th

18:00	Welcome of participants & schedule

Tuesday April, 21st

8:45	Schedule & planning **Alexandre Muzy** & **David Hill**
9:00-10:30	**Alexandre Muzy**: Activity tracking and awareness: Sketch for a transdisciplinar automatic framework
	Discussions
10:30-11:00	Coffee break
11:00-12:30	**Patrick Coquillard:** Activatability for tractable simulations of NP problems. Application to Ecology
	Olivier Michel: Domain-specific Language for the Modeling of Dynamical Systems with a Dynamical Structure
12:30-14:00	Lunch
14:00-16:30	**Xiaolin Hu:** Exploiting Spatial-temporal Heterogeneity for Agent-based Pedestrian Crowd Simulation
	Levent Yilmaz: Generative Multisimulation: Decision-Support under Uncertainty using Evolutionary Multimodels
	Luc Touraille: DML: a MarkupLanguagefor DEVS Models
16:30-17:00	Coffee break
17:00-19:00	**Hans Vangheluwe:** Exploring "Activity Tracking" a Language Engineering perspective
	Discussions

Wednesday April, 22nd

8:45	Introduction speech by **N. Maupertuis**
9:00-10:30	**Dominique Prunetti:** An interdisciplinary project between Economists and Computer Scientists
	Jean-Pierre Briot: A Computer-Supported Role-Playing Game for Participatory Management of Protected Areas: The SimParc Project + An Abstract Component-based Model for Constructing Operational Models (of Agent Behaviors) for Multi-Agent-based Simulations
10:30-11:00	Coffee break

11:00-12:30	**N. Lameta**: Genesis of behavior in economics: Application to an environmental issue
12:30-14:00	Lunch
14:00-16:30	**Philippe Caillou**: Modelling and analyzing activities on Rungis Wholesale Market: *Some methodological issues on Cognitive Agent Based Simulations*
	Guillaume Deffuant: The Empathon: an agent aiming at mimicking empathy
16:30-17:00	Coffee break
17:00-19:00	**Franck Varenne**: Framework for M&S with Agents (FMSA) in regard to Agent-based Simulations in Social Sciences: Emulation and Simulation
	Discussions

Thursday April, 23rd

8:45	Schedule & planning: **David Hill**
9:30-10:00	**Bernard P. Zeigler** Synthesis (part I)
10:00-10:30	Coffee break
10:30-12:30	**Bernard P. Zeigler** Synthesis (part II)
	Discussions
12:30-14:00	Lunch @ Institute
14:00-17:00	Coffee break
17:00-20:00	Working groups

Friday April, 24th

8:45	Schedule & planning: **David Hill**
9:00-10:00	Working groups
10:00-10:30	Coffee break
10:30-12:30	Working groups and discussion of new articles
12:30-14:00	Lunch @ Institute
14:00-18:00	Local visit of the Calanche di Piana
18:00-19:00	Plenary synthesis