

Special Issue Proposal for Simulation Journal

Topic: Agent-based Modeling and Simulation of Complex Adaptive Communication Networks and Environments (CACOONS)

Guest Editors:

Muaz Niazi (man@cs.stir.ac.uk)*

Amir Hussain (ahu@cs.stir.ac.uk)*

Affiliation:

*Institute of Computing Science and Mathematics,
School of Natural Sciences
University of Stirling,
Scotland, UK

Introduction

Complex Adaptive Systems (cas) are a special classification of complex systems with a large number of simple components interacting in a nonlinear fashion resulting in specialized adaptive behavior. Due to recent rapid advancements in Communication technology, today's Communication networks such as those formed by wireless sensor, ad-hoc, Peer-Peer (P2P), multiagent, nano-Communication and mobile robot communication networks, are all expected to grow larger and more complex than ever previously anticipated. Thus, these networks, at times, can possibly give rise to complex global behaviors similar to cas encountered in the life sciences. Thus, network designers can, at times, expect to observe unprecedented global patterns termed as emergence, a term eliciting the fact that the effects of these phenomena cannot be easily traced back to the individual components. Such patterns can be important to understand since, at times, they can have considerable effect on various aspects in a communication network such as unanticipated traffic congestion, unprecedented increase in communication cost or perhaps a complete network/grid shutdown as a result of emergent behavior. Some well-known examples include the emergence of cascading faults in Message Queue-based Financial transactions after New Year holidays, recent cascading failures reported in the Amazon.com cloud, effects of viral and worm infections in large networks, effects of torrent and other complex traffic in ISP and corporate networks, multi-player gaming and other similar P2P traffic in company intranets, self-organization and self-assembly related effects in sensor and robotic networks.

Because of the ease and flexibility associated with agent-based modeling and simulation in assisting the conceptualizing of complex phenomena, agent-based modeling paradigm can prove to be an effective tool for exploring application case studies, testing of new communication protocols, exploring large-scale networks for possible problems before deployment or improvement of existing algorithms and hardware.

In the past, the prevalence of a wide variety of network simulation tools such as NS2, NS3, OPNET, OMNET++ etc. demonstrates the vibrant simulation culture prevalent in communication networks. Although Agent-based modeling and simulation has been used extensively in social, biological, ecological and other domains, recently it has been demonstrated to offer a much shorter learning curve (ranging from a few hours to a few days) as well as having

the capability of assisting Communication researchers, engineers and practitioners in developing effective models of various types of Complex Adaptive Communication networks such as those discussed above.

The goal of this special issue is to solicit state-of-the-art papers, not submitted elsewhere for review, focused on using agent-based modeling and simulation for theoretical frameworks, application case studies as well as novel communication models of CACOONS. Suggested topics include but are not limited to:

- Wireless Sensor and Actuator Networks (Routing, data aggregation, fusion, energy consumption and any other issues)
- Complex environments surrounding sensors and mobile robots
- Mobile and swarm robotic networks
- Nano-Communication networks
- Mobile ad-hoc networks
- P2P networks (Structured and Unstructured etc.)
- Engineered self-organization for Green computing in networks
- Planning and management of home and corporate (Wired/Wireless) Networks
- Modeling and Simulation of Multiagent Systems (including Mobile agents, Learning and Communicating agents etc.)
- Effects of cooperative, competitive agents and peers on networks
- Game theoretical approaches in communication networks
- Fault-tolerant and self-healing large scale networks
- Emergent effects of security and trust policies in large scale network
- Use of agent-based modeling for or in conjunction with network emulation
- Service Oriented Architectures, Semantic web, use of XML/SOAP, etc.
- Client Server, three tier and n-tiered architectures
- Pervasive Communication networks, for example, those using Mobile Devices, RFIDs and others
- Simulation of Internet and Intranet scale networks
- Complex Network analysis itself or else combined with agent-based modeling for classifying or Modeling and Simulation of large networks (including measures of Degree, eccentricity and other Centralities, Clustering Coefficients, Matching indices etc.) of Networks
- Internet based Social Networking (including the use of Social Network Analysis)
- Coupling Formal Specification Models with agent-based modeling of Communication Networks (using frameworks such as DEVS, FABS etc.)
- Verification, Validation and Accreditation of network simulation models
- Signaling and Communication Networks inside living beings (cells, animals, plants etc.) or between living or intelligent beings
- Modeling Communication Networks as Social Simulation problems
- Critical Comparative Reviews of studies using traditional Network Simulators and agent-based modeling
- Use of agent-based, multiagent tools and toolkits (NetLogo, Repast, Mason, Jade etc.) for modeling of communication networks

Full papers, describing original, previously unpublished research work, reviews, experimental efforts and practical experiences are solicited. The due dates given below are firm and must be observed in order to ensure timely reviews and, in the event of acceptance, inclusion of a paper in the special issue.

Instructions for Manuscript Preparation

For manuscript formatting and other guidelines, please visit the [Author Guidelines for SIMULATION](#).

Submissions for Full Paper Review

All manuscripts must be submitted electronically through the paper submission system to the [SIMULATION Manuscript Submission System](#). In your cover letter author(s) must specifically mark that the paper is intended for this special issue as follows: "**Submission for the Special Issue of Simulation: Modeling and Simulation of Complex Adaptive Communication Networks and Environments.**"

Note: Manuscripts must not have been previously published or be submitted for publication elsewhere. Each submitted manuscript must include title, names, authors' affiliations, postal and e-mail addresses, an extended paper, and a list of keywords. For multiple author submission, please identify the corresponding author.

Due Dates

Full Papers Due	May 31, 2012
Notification of Acceptance	June 30, 2012
Minor Revisions Due	July 31, 2012
Major Revisions & Final Papers Due	September 30, 2012
Publication Expected	Spring 2013

Final paper submissions

Each final submission must be prepared based on the Simulation journal requirements (see [Author Guidelines for SIMULATION](#) page).