Tutorial

Title

Computational Social Simulations using E-CARGO

Abstract

Humans are social beings and people cannot live alone. Computational social simulation is a way to reproduce a real-world society and study the behaviour of people in that society using computer-based systems. Computational social simulation is a long-term, cutting-edge topic in the interdisciplinary field where information technology, computer science, social science, and sociology overlap.

Role-Based Collaboration (RBC) has been proposed as a computational approach to facilitating collaboration. It utilizes roles as underlying mechanisms to support collaboration by taking advantage of roles. It is divided into several phases: role negotiation, role assignment, role execution, and role transfer. RBC and its related components are an abstract model, which is a perfect mapping for social activities, because Social and economic systems are typical collaboration systems.

The Environments – Classes, Agents, Roles, Groups, and Objects (E-CARGO) model, which has been developed into a general model for complex systems have a good match for the requirements of computational social simulations. In this talk, we establish the fundamental requirements for social simulation and demonstrate that RBC, E-CARGO, and the subsequent Group Role Assignment (GRA) optimization model are highly qualified to meet these requirements. Based on E-CARGO and GRA, we present a new approach to social simulation with E-CARGO related components, models, and algorithms.

This tutorial also illustrates several interesting case studies of computational social simulations.

Duration

TWO-hours.

Motivation -

Social systems are complex and present grand challenges to researchers and practitioners.
Traditional ways of decision making could not meet the requirement of social systems.
Computational Social Systems (CSS) are promising ways to replace traditional methods.
Computational Social Simulation using E-CARGO is a novel methodology to contribute to this CSS area and provide broad and attractive perspectives and visions to social systems research including politics, economics, policy making, and management.

Expected audience

Managers, Researchers, Practitioners, Graduate Students, and Senior Students of Computer Science, Computer Engineering, Information Systems, Systems Engineering, Industrial Engineering, Decision Making, Management, and Computational Economics and Social Science.

Outline of contents

Contents
Background:
Society, Collaboration, and Social Simulations/Computing
Role-Based Collaboration (RBC)
The E-CARGO Model
Group Role Assignment (GRA), GRA+ and GRA++
Conduct Social Simulation using E-CARGO
Case Studies
Conclusion

Social Simulation (SS) & Social Computing (SC)
In general, they are overlapped. They are also different.
Objects of research:
SC: The platforms built for people to socialize and the behavior of people when using such platforms.
SS: Human Society.
Goal:
SC: To build better platforms for people to socialize.
SS: A better society.
Methodology:
CS: Social Network Analysis, e.g., agent systems, E-CARGO
SS: Modelling and Simulation, e.g., agent systems, E-CARGO.

Social Networks (SN) and SN Analysis (SNA)
Components of a Society

The Nature a Society
Collaboration is an activity/process that involves more than one agent to participate in.
To be skilful in collaboration requires a life-long time to learn and practice.
A team is a group of people who are mutually dependent on one another to achieve a common goal.
Without collaboration, there would be no team.

Competition
Competition is a normal activity in a society.
It is interleaved with cooperation.
Competition comes from resource sharing, resource lacking, or temporary resource lacking, 1/10, 3/40, 7/100…
Sufficient or ample resources decrease competition.

Role-Based Collaboration (RBC)
What is RBC?
Role-based collaboration (RBC) is a computational / research /problem solving methodology that mainly uses E-CARGO to model and formalize problems
in collaboration and complex systems.

Flowchart of RBC

Collaboration made easy/efficient!
-The goal of E-CARGO/RBC
-Through modeling and algorithms

The Model
The Development of E-CARGO
Environments
Classes
Agents
Roles
Groups
Objects

The Nature of Collaboration revealed by E-CARGO
A GROUP of AGENTS play different ROLES by sharing the ENVIRONMENT that is composed of CLASSES of OBJECTS.

It is E-CARGO that Makes
Roles the Spirits of a System!
Roles provide a template for agents to behave.
Roles provide dynamics of a society.
Collaboration
(RBC)

Group Role Assignment (GRA)

Clarified Concepts by GRA
Clarified concepts by GRA+/GRA++ in a group.
Group Performance
Role Performance
Agent Performance
Using these concepts, we could analyse individuals and a team.

GRA+/GRA++ can be very complex.

Social Problems

Simulation Process with E-CARGO

Case Study 1: Comparison between collectivism and individualism
Case Study 2: Why Did Mr. Trump Oppose Globalization?
Case Study 3: Pareto 20/80 distribution formation
Case Study 4: Pareto Assignment

Social topics to simulate:
Team establishment: original employees or new employees?
GRA, mix qualifications, get sigma.
Why is the organizational structure layered?
GRA, Manager's benefit, individual relations, …
Why does a democratic system also produce bureaucratic government?

Social networks using GRA
Social networks using E-CARGO

Conclusions
RBC is a computational methodology and a discovery methodology.

References
Search by
"Collaboration and Haibin Zhu" on ieeexplore.ieee.org

https://github.com/haibinnipissing/E-CARGO-Codes

Key references

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List of speakers

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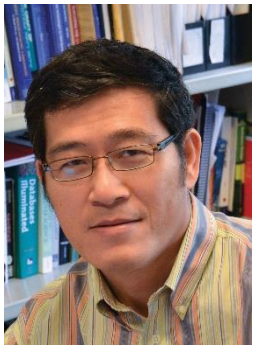

Dr. Haibin Zhu is a Full Professor and the Coordinator of the Computer Science Program, the Founding Director of the Collaborative Systems Laboratory, Nipissing University, Canada. He is an affiliate professor of Concordia Univ. and an adjunct professor of Laurentian Univ., Canada. He has accomplished (published or in press) over 230+ research works including 40+ IEEE Transactions articles, six books, five book chapters, four journal issues, and four conference proceedings. He is a fellow of *I2CICC*, a senior member of *IEEE* and *ACM*, a full member of *Sigma Xi*, and a life member of *CAST-USA*.

He is serving as Vice President, Systems Science and Engineering (SSE) (2023-), a member-at-large of the Board of Governors (2022-), and a co-chair (2006-) of the technical committee of *Distributed Intelligent Systems* of *IEEE Systems, Man and Cybernetics (SMC) Society (SMCS)*, Editor-in-Chief of *IEEE SMC Magazine* (2022), Associate Editor (AE) *of IEEE Transactions on SMC: Systems* (2018-), *IEEE Transactions on Computational Social Systems*(2018-), *Frontiers of Computer Science* (2021-), and IEEE Canada Review (2017-).

He is the founding researcher of *Role-Based Collaboration* and the creator of *the E-CARGO model*. His research monograph *E-CARGO*. He has offered 20+ keynote and plenary speeches for international conferences and 90+ invited talks internationally. His research has been being sponsored by NSERC, IBM, DNDC, DRDC, and OPIC.

He is the recipient of many awards including the best paper award in international collaboration from the 25th Int'l conf. on Computer-Supported Cooperative Work in Design, Hangzhou, China, 2022, the meritorious service award from IEEE SMC Society (2018).