BEMooSSIG: 9 Month Review

Peer-Olaf Siebers

(16/01/2014)

Mission

Behavioural Economics Meets object oriented Simulation Special Interest Group (BEMooSSIG)
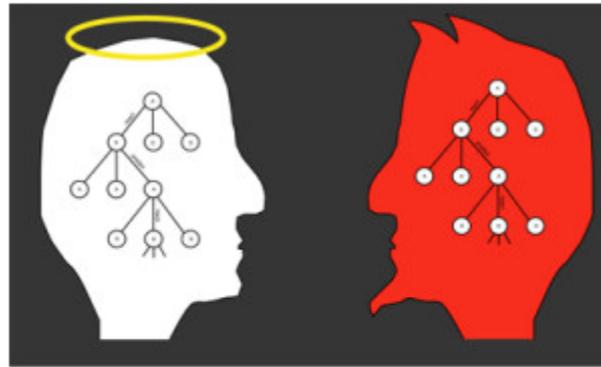
Image courtesy of QuickEconomics (http://www.quickienomics.com/?p=444)

BEMooSSIG (formerly known as GTMooSSIG) is a local discussion forum at the University of Nottingham for people interested in studying how to use games (lab experiments) as a data collection tool or as a mechanism to inform/support modelling the decision making of actors in object oriented social or socio-technical system simulation models and how the simulation results can be used to cross-validate game results.

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Members

BEMooSSIG Participants

- Peer-Olaf Siebers (University of Nottingham, School of Computer Science) [url]
- Jiawei Li (University of Nottingham, School of Computer Science) [url]
- Tuong Vu (University of Nottingham, School of Computer Science) [url]
- James Burnett (University of Nottingham, Horizon) [url]
- William Darler (University of Nottingham, Business School) [url]
- Anya Skatova (University of Nottingham, Horizon) [url]
- Chris Starmer (University of Nottingham, School of Economics) [url]
- Polla Fattah (University of Nottingham, School of Computer Science) [url]
- Alejandro Lee (University of Nottingham, School of Economics) [url]
- Theodore Turocy (University of East Anglia, School of Economics) [url]
- Thorsten Chmura (University of Nottingham, Business School) [url]

Presentations

BEMooSSIG Presentation Slides

- Jiawei Li: Evolutionary Game Theory and Iterated Prisoner's Dilemma [url]
- Chris Starmer: Why CompSciEcon? [url]
- Tuong Vu: Comparison of Crisp and Fuzzy System in Agent-Based Simulation [url]
- Peer-Olaf Siebers: A Software Engineering Approach to Designing Agent-Based Models (v3) [url]
- Anya Skatova: Emotions predict decline of cooperation in a real life social dilemma [url]
- Tuong Vu: Brainstorming about Simulation of Collective-Action Games [url]
- Peer-Olaf Siebers: Academic AI vs. Game AI [url]
- Peer-Olaf Siebers: Simulation in a Nutshell [url]

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Resources

- [Peer] An interesting BSc dissertation: Andrew Errity - Evolving Strategies for the Prisoner's Dilemma [url]
- [Peer] YouTube Video: "Professor Robert Axtell - ESSA 2013: Full-scale models: What can be learned from studying entire economies computationally?" [url]
- [Peer] Agent-Based Computational Economics (ACE) HQ (maintained by Leigh Tesfatsion) [url] (Business and Management Systems [url])
- [Peer] A classic in Social Simulation which cuts accross all disciplines: "Macal and North (2010) Tutorial on Agent-Based Modelling and Simulation" [url]
- [Peer] Discussion on ResearchGate: Does anyone know examples where software agents have been used for social simulation? [url]
- [Peer] Excellent book on modelling norms using ABM: "Elsenbroich and Gilbert (2013) Modelling Norms" [available in the library]
- [Anya] Recent Conferences that had some presentations about ABM [url]
- [Peer] Theory based ABM decision making framework we are planning to translate into object oriented ABM: "Wander and Janssen (2012) An updated conceptual framework for integrated modeling of human decision making: The Consumat II" [url]
- [Peer] Applying Game ABM to Tragedy of Commons: "Ishiyama et al (2005) Design of a Hybrid-Learning Environment Based on SOARS" [url]
- [Peer] The Big Book of AnyLogic: Agent Based Modeling - Technology Overview [url]
- [Enrique] Comparing human experiments with ABM results: "Andrighetto et al (2013) Punish and Voice: Punishment Enhances Cooperation when Combined with Norm-Signalling" [url]
- [Peer] Thinking Object Oriented > Chapter 1 from the book: "Budd (2002) An Introduction to Object-Oriented Programming" [3e] [url]
- [Peer] A comprehensive introductory book: "Phan and Amblard [eds] (2007) Agent-Based Modelling and Simulation in the Social and Human Sciences" [review]
- [Peer] An example from Archeology: "Kohler et al (2012) The coevolution of group size and leadership: An agent-based public goods model for prehispanic Pueblo societies" [url]
- [Peer] Model Driven Engineering paper: "Ghorbani et al (2013) MAIA: A Framework for Developing Agent-Based Social Simulations" [url]
- [Peer] Imressive review of the state-of-art in 2002: "Gotts et al (2002) Agent-Based Simulation in the Study of Social Dilemmas" [url]
- [Peer] The Network for Integrated Behavioural Science (NIBS) [url]
- [Peer] Book on experimental-based modelling (linking games and agent-based modelling): "Squazzoni (2012) Agent-Based Computational Sociology" [amazon]
- [Peer] Flaminio Squazzoni's ESSA Summer School talk on linking games and agent-based modelling [url]
- [Peer] Public goods game: "Antoci et al (2009) Free Riders and Cooperators in Public Goods Experiments: Can Evolutionary Dynamics Explain their Coexistence?" [url]
- [Polla] Public goods game: "Fischbacher et al (2012) The behavioral validity of the strategy method in public good experiments" [url]
- [Peer] Emergence of collective behaviour: "Goldstone and Janssen (2005) Computational Models of Collective Behavior" [url] (for James)
- [Peer] Overview of empirically based ABM: "Janssen and Ostrom (2006) Empirically Based, Agent-Based Models" [url]
- [Peer] JASSS article: "Siebers and Aickelin (2011) A First Approach on Modelling Staff Proactiveness in Retail Simulation Models" [url]
- [Tuong] Video: "Richard Dawkins - Nice Guys Finish First" [url] [wiki]
- [Peer] Complete Conference Proceedings (Springer Book): "Arai et al (2003) Agent-Based Modeling Meets Gaming Simulation" [url]
- [Robert] JASSS article: "Hoffmann (2000) Twenty Years on: The Evolution of Cooperation Revisited" [url]
- [Peer] Online Book: "Poole and Mackworth (2010) Artificial Intelligence: Foundations of Computational Agents" [url]; see in particular chapter 10: [url]
- [Tuong] Video: "Game Theory 101 - Soccer Penalty Kicks" [url]

Different Philosophies

- (Classical?) Game Theory [Source: Wikipedia 2014]
  - The study of mathematical models of conflict and cooperation between intelligent rational decision-makers

- Evolutionary Game Theory [Source: Sandholm 2012] (Wikipedia got it wrong!)
  - The study of the behavior of large populations of agents who repeatedly engage in strategic interactions; changes in behaviour in these populations are driven either by natural selection or by the application of myopic decision rules by individual agents

- Behavioural Game Theory [Source: Wikipedia 2014]
  - The analysis of interactive strategic decisions and behaviour using the methods of game theory, experimental economics, and experimental psychology

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Different Philosophies

- Experimental Economics [Source: Wikipedia 2014]
  - The application of experimental methods to study economic questions; data collected in experiments are used to estimate effect size, test the validity of economic theories, and illuminate market mechanisms; economic experiments usually use cash to motivate subjects, in order to mimic real-world incentives.

- Experimental Psychology [Source: Wikipedia 2014]
  - Refers to work done by those who apply experimental methods to the study of behavior and the processes that underlie it; experimental psychologists employ human participants and animal subjects to study a great many topics (e.g. sensation and perception, memory, cognition, learning, motivation, emotion)

Different Philosophies

- **Agent-Based Computational Economics** [Source: Wikipedia 2014]
  - Studies economic processes, including whole economies, as dynamic systems of interacting agents; in corresponding agent-based models, the agents are computational objects modeled as interacting according to rules over space and time; the rules are formulated to model behaviour and social interactions based on incentives and information

- **Social Simulation** [Source: Wikipedia 2014]
  - Social simulation aims to cross the gap between the descriptive approach used in the social sciences and the formal approach used in the hard sciences, by moving the focus on the processes, mechanisms, and behaviours that build the social reality. This field explores the simulation of societies as complex non-linear systems, which are difficult to study with classical mathematical equation-based models.

Different Philosophies

- ## Object Oriented Agent-Based Simulation [my personal interpretation]
  - Using Computer Science principles (object orientation and graphical modelling notation; can be directly translated into object oriented computer code, often without direct consideration of theoretical models) to build data driven representations of humans and their interactions with other humans and their environments.
  - Individual agents have memory and can act independently or at group level in a rational, bounded rational or irrational way. Their average behaviour can be defined by archetypes. Their individual behaviour is often determined through predefined stochastic distributions (probabilities) which are based on collected data. This behaviour is influenced by what other agents are doing and by changes in the environment.

Contrasting Application Fields

- What would be good contrasting categories?

Operations Research	Business, Economics, Social Science
Empirical basis	Theoretical basis
Improving the real world	Thinking about the real world
Data collection and analysis	Dynamic hypothesis
Validation: Sufficient accuracy for purpose	Plausibility: Seeming reasonable or probable
Implementing findings	Learning + understanding

after Robinson (2010)

Questions for Discussion

- What can we do with ooABS that we cannot do otherwise?
- Is UML just a notation or a modelling methodology?
- What are you trying to achieve with the different methods?
- How credible are all these models? How much do they help us to make real world decisions (beyond the science context)?
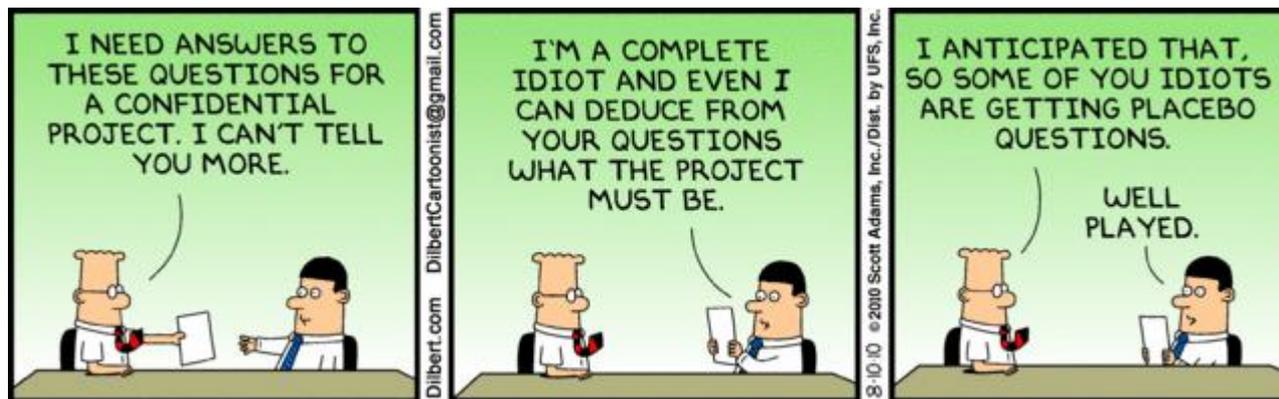
Questions

References

- Sandholm WH (2012). Evolutionary Game Theory. In: Meyers RA (ed). Computational Complexity: Theory, Techniques, and Applications. pp1000-1029.