Agent-Based Simulations in Economics

The Fourth Herbert Simon Seminars Series

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AI-Econ Research Center,
National Chengchi University, Taipei
23–28 October 2005.

Outline of Lectures

1. Introduction: models and simulation.
2. Agent-based models: What is an agent? How to model agents?
3. Learning and evolutionary models: Genetic Algorithms, Reinforcement Learning, Artificial Neural Nets.
4. Market Design.
5. Applications: Designing electricity markets and other markets.

Who am I and what is my interest?

1. Bob Axelrod's 1984 tournaments of the iterated Prisoner's Dilemma.
2. MIT's 1985/6 3-person computational strategy (differentiated Bertrand oligopoly) tournaments.
3. Axelrod's use of John Holland's Genetic Algorithm to replicate his 1984 Tit-for-Tat results.
4. My serendipitous connection with Michigan from Sydney.
5. My co-evolution model of oligopolists in 1988.

Herbert Simon

The late Herbert Simon is perhaps best known to economists (apart from his Nobel prize) as the man who coined the terms:

- bounded rationality, and
- satisficing.

As we shall see, both ideas have a rôle to play in agent-based modelling:

- the agents must be boundedly rational, and
- reinforcement learning can model satisficing as a realistic response of agents.

An anecdote.

How we learn.

- Five 3-hour lectures.
- Start from modelling, then simulation, in theory.
- Then some hands-on simulations: Life, segregation.
- Four lectures on ACE models, agent learning of various kinds, applications.