SIMULATION MODELS FOR ECONOMICS

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The course introduces a selection of computer programs useful in doing numerical and symbolic calculations in economics and finance; a special attention is devoted to the construction of agent-based models, as a new way to build models, applying a rigorous formalism in a high flexibility perspective.

Program

The course will cover the following topics:

1) Tools for symbolic and numerical calculations in economics:
   a) basic programming in Python (http://www.python.org), with Numpy (http://www.numpy.org) and R (http://www.r-project.org), for calculus development and simulation model building;
   b) advanced calculation tools, symbolic and numeric, with Octave (http://www.gnu.org/software/octave), Scilab (http://www.scilab.org) e Maxima (http://maxima.sourceforge.net).
2) Simulation tools to build agent-based models, with interacting and learning agents:
   a) tools and algorithms useful in agent construction: fixed rules, neural networks, classifier systems, genetic algorithms, reinforcement learning;
   b) construction of agent based-models to study complexity and emergence in social and economic phenomena, with: NetLogo (http://ccl.northwestern.edu/netlogo); StarLogo TNG (http://education.mit.edu/starlogo-tng/); SLAPP, Swarm-Like Agent Protocol in Python (http://eco83.econ.unito.it/terna/slapp/).

Expected learning results

Knowledge and understanding.
The course will provide students with the ability of building, with advanced computer techniques, numerical and simulation models of the social and economic reality.

Applying knowledge and understanding.
During the course, students will learn how to use directly the above mentioned tools to reproduce and understand reality via computerized artifacts.

Making judgements.
The students will become familiar with the process of choosing and formalizing the contents of a simulation model, to reproduce reality.

Communication skills.
Students will learn how to effectively organize ideas both in written and oral form, possibly with the help of presentation of the results of their projects during the course.

Learning skills.
The course will enable students to apply state of the art tools in computer programming for economic simulation and calculus.

Other information

The examination will be based on the preparation and discussion of a project work on economic simulation via agent-based models.

Text books

The course is not based on a textbook. For most topics, lecture notes will be circulated; moreover, for each topic, a set of readings and presentations will be provided. All the material will be on line, organized via a conceptual map, using CMapTools (http://cmap.ihmc.us/).