Laboratory Simulation in Social Sciences (Spring 2007)

課程名稱：社會科學模擬研究方法　　授課學期：95學年度第2學期
授課教師：劉正山 助理教授　　研究室：社4041
上課時間: M 1:10 ~ 4:00pm　　談話時間 (Office Hours)：W 1-3pm
上課地點：社3008　　聯絡電話：07-5252000 分機5555
電子郵件：csliu@mail.nsysu.edu.tw

Course Description

很多理論性的研究議題往往會遇到實證資料取得不易、資料不可靠、或是無法分析性語言進行詮釋等限制。本課程介紹近年新興的代理人基模擬研究途徑（agent-based modeling），可視為在質化、量化途徑之外的選擇。本課程目標是帶領同學認識代理人基模擬的方法論基礎以及它目前應用在不同研究議題上的潛力與限制，因此歡迎使用不同途徑、持不同認識論觀點、有興趣一窺模擬研究的世界、或是擴充自己研究領域的同學選修。本課程不要求修課的同學要有任何統計和程式設計的背景，但學期後半有上機的作業，因此，欲修習此課同學必須有願意學習使用以英文為介面的應用程式，並有興趣接觸研究方法相關的文獻。注意本課程為初階課程，因此不包括程式設計的訓練。（進階課程才訓練同學自行建構模型的能力）。本課程包括九個主題一、模擬的基本概念；二、複雜適應系統的理論基礎；三、聖塔菲學派；四、模擬研究方法在政治學的應用（一）：宏觀政治學篇；五、模擬研究方法在政治學的應用（二）：微觀政治學篇；六、基本工具介紹：作業系統篇；七、基本工具介紹：應用程式篇；八、模擬研究的發展與展望；九、學生研究專題發表與研討。

Course Texts and Readings

The course requires a few books and a pack of journal articles. The content and required readings are subject to change during the semester.

- Waldrop, M.M. (1992). Complexity: The Emerging Science at the Edge of Order and Chaos. New York: Simon & Schuster. 中譯本：複雜（天下文化出版）
- Epstein, J.M. & Axtell, R. (1996). Growing Artificial Societies: Social Science from the Bottom Up. Cambridge, MA: The MIT Press.

Grading Policy

Requirement	% of Grade
Class Participation	20
Mid-term paper	20
Mid-term Presentation	10
Term paper	30
Oral Presentation	20
Total	100

- Class participation (20%): involvement in class discussion will reflect your preparation for the class. Credits are given based on your attendance, raising questions, responding to questions, and leading discussion. Assigned readings should be completed *before* the class.

- Mid-term paper and mid-term presentation (20%, 10%): You should choose a temporary topic for your term paper (topics related to the subjects listed below or any other topic with my consent) in the middle of the semester and present your idea and your paper outline. This temporary topic can be changed when you are writing a term paper, but this mid-term paper and oral presentation should show your effort in collecting literature. Oral presentation reflects your ability to present your idea clearly and communicate with the audience effectively.
- Research paper and final presentation (30%, 20%): Your term paper should be a semester-long project and should the topic that interest you most and that also have scholarly importance in the discipline. You are encouraged to enrich your term-paper to a complete term paper, or start over a new project. Your research paper is no longer than 10,000 words or 25 pages in Chinese, or 15 pages in English. It should not be lesser than 8,000 words for doctoral students or 5,000 words for master students. You should cite at least 5 journal articles when formulating your paper. Use APA style when formatting your paper.
- The cover page of your papers should include the following information: class name, athor's name and student id, paper type (mid-term paper or final term paper), turn-in date, and contact information.

Weekly Topics

1、[Feb. 26] Introduction to the Class

- In Class: lecture on the role of theory, the purpose of experiment, the scope and the requirement of the class
- In Class: introduction of using JabRef and SSCI in your research projects.

2、[March 5] Experiment and Simulation

- Before Class:
  - Johnson, P.E. (1999). Simulation modeling in political science. American Behavioral Scientist, 42 (10), 1509-1530.
  - Druckman, J.N.; Green, D.P.; Kuklinski, J.H. & Lupia, A. (2006). The growth and development of experimental research in political science. American Political Science Review, 100 (4), 627-635.
- Supplemental:
  - Axelrod, R. (1997). Advancing the Art of Simulation in the Social Sciences. Simulating Social Phenomena. Conte, R.; Hegselmann, R. & Terno, P.(Eds.) 21-40. Berlin: Springer.
  - Simon, H.A. (1969). The Sciences of the Artificial. Cambridge: M.I.T. Press.
  - Simon, H.A. (1957). Models of Man: Social and Rational, Mathematical Essays on Rational Human Behavior in Society Setting. New York: Wiley.

3、[March 12] Complex Studies and the Santa Fe School

- Before Class:
  - Waldrop, M.M. (1992). Complexity: The Emerging Science at the Edge of Order and Chaos. New York: Simon & Schuster. 中譯本：複雜（天下文化出版）

4、[March 19] Agents in Agent-Based Modeling (ABM)

- Before Class:
  - Gross, L. Agent-based Modeling in Ethnobiology: A Brief Introduction from Outside. `http://www.tiem.utk.edu/~gross/missouri.402.talk.fmt` (a useful overview of ABM)
  - Hayes, C. C. (1999). Agents in a nutshell: A very brief introduction. IEEE Transactions on Knowledge and Data Engineering, 11 (1). Google for this article online or download directly from `http://www.cse.mrt.ac.lk/lecnotes/cs5901/readinglist/hayes99agents.pdf`.

- Supplemental:
  - my manuscript on scientific realism
  - Davidsson, P. (2002). Agent based social simulation: A computer science view. Journal of Artificial Societies and Social Simulation, 5 (1): http://jasss.soc.surrey.ac.uk/5/1/7.html.
- In Clsss: Talk about operating system Linux and open-source softwares.

5、[March 26] Cellular Automata: The Most Basic ABM

- Before class:
  - Gilbert, N. & Troitzsch, K.G. (1999). Cellular Automata. Simulation for the Social Scientist. 120-141. Buckingham: Open University Press. (the last part on List is not needed).
  - Find online materials and study Conway's Game of Life, such as Game of Life http://bloemenbuurt.bitstorm.org/gameoflife/.
- Supplemental:
  - Nowak, A. & Lewenstein, M. (1996). Modeling Social Change With Cellular Automata. Modeling and Simulation in the Social Sciences from a Philosophical Point of View. Mueller, U.; Hegselmann, R. & Troitzsch, K.G. (Eds.) 249-285. Boston: Kluwer Academic Publishers.
- In Class: Discuss Conway's Game of Life and Heat Bugs in Swarm.

6、[April 2] The Bottom-Up Approach (I)

- Before Class:
  - Schelling, T.C. (1978). Micromotives and Macrobehavior. New York: Norton. Read Chapters 1 & 4.
  - Nowak, A.; Szamrej, J. & Latane, B. (1990). From Private Attitude to Public Opinion: A Dynamic Theory of Social Impact. Psychological Review, 97 (3), 362-376.
- In Class: Demonstration of Swarm Model of Schelling's segregation theory

7、[April 9] The Bottom-Up Approach (II): Artificial Societies

- Before Class:
  - Epstein, J.M. & Axtell, R. (1996). Growing Artificial Societies: Social Science from the Bottom Up. Cambridge, MA: The MIT Press.
- In Class: Demonstration of Sugar Scape
- In Class: hand out my manuscript on scientific realism.

8、[April 16] No Class

- Note: I will be attending the Midwest Political Science Association (MPSA) Annual Conference in Chicago. You should work on your mid-term presentation and start collecting your reading materials.

9、[Apil 23] Student Mid-term Presentation

- Before Class:
  - This is the time you voice out your comments about the simulation approach. Have you persuaded yourself about the future of this approach? Share your perspectives with the class. Be sure you have found a clear topic that interests you. Your presentation should be based on at least two original argicles. Every student will have 10 to15 minutes to present your literature review and your reflections about this approach.

10、[April 30] ABM Toolkits (I): Swarm and RePast

- Before Class:
  - Minar, N.; Burkhart, R.; Langton, C. & Askenazi, M. (1996). The Swarm Simulation System: A Toolkit for Building Multi-agent Simulations. The PDF File http://www.swarm.org/images/b/bb/MinarEtAl96.pdf
  - Browse Brief Overview of Swarm http://www.swarm.org/swarmdocs-2.2/set/book149.html.
- Supplemental:
  - This webpage provides a comprehensive list of toolkits for agent-based modeling: http://www.econ.iastate.edu/tesfatsi/acecode.htm
  - Swarm User Guide http://www.swarm.org/swarmdocs-2.1.1/userbook/userbook.html. This book-length handout gives a clear description about the concepts of Swarm modeling.
  - Castel, C.J. & Crooks, A.T. (2006). Principles and Concepts of Agent-Based Modelling for Developing Geospatial Simulations. This working paper, which gives a comprehensive comparison across toolkits, is available online at http://www.casa.ucl.ac.uk/publications/workingPaperDetail.asp?ID=110, or simply download the pdf version of the paper at http://www.casa.ucl.ac.uk/working_papers/paper110.pdf.
- In Class: Demonstration of (1) the installation and the use of Swarm and RePast, (2) related tools of programming

11、[May 7] Swarm and Its Applications: The Opinion Formation Model

- Before Class:
  - Huckfeldt, R.R.; Johnson, P.E. & Sprague, J.D. (2004). Political Disagreement: The Survival of Diverse Opinions within Communication Networks. New York: Cambridge University Press. Pay close attention to Chapters 6 & 7.
- In Class: Demonstration of the Opinion Formation Model and my Swarm project

12、[May 14] ABM Toolkit (II): StarLogo and NetLogo

- Before Class:
  - Try out StarLogo http://education.mit.edu/starlogo/ (and browse Netlogo http://ccl.northwestern.edu/netlogo/)
  - Laver, M. (2005). Policy and the dynamics of political competition. American Political Science Review, 99 (2), 263-281.
- Supplemental:
  - Resnick, M. (1994). Turtles, termites, and traffic jams: Explorations in massively parallel microworlds. Cambridge, Mass. : MIT Press.
- In Class: Demonstration of StarLogo and Discussion about its application.

13、[May 21] The Appliction of ABM (I): Political Science

- Before Class: Take a look of what the graduate students do in the 2006 EITM:
  - go to http://www.isr.umich.edu/cps/eitm/eitm2006/participants2006.html and evaluate the presentations of David Schwab, Ian McDonald, and Dominick Wright.
- Before Class: Pick up one of the readings and evaluate it carefully.

  - Rousseau, D. & Van der Veen, A.M. (2005). The emergence of a shared identity: An agent-based computer simulation of idea diffusion. Journal of Conflict Resolution, 49 (5), 686-712.
  - Lustick, D.M. & Eidelson, R.J. (2004). Secessionism in multicultural states: Does sharing power prevent or encourage it?. American Political Science Review, 98 (2), 209-229.

- Before Class: check out PS-I `http://ps-i.sourceforge.net/`.
- In Class: Evaluation of the published works in the discipline and ideas of outstanding American graduate students.

14、[May 28] The Appliction of ABM (II): Economics and Prisoner's Dilemma (PD)

- Before Class:
  - Axelrod, R.M. (1997). The Complexity of Cooperation: Agent-Based Models of Competition and Collaboration. Princeton University Press.
- Supplemental:
  - Holland, J. & Miller, J. (1991). Artificial adaptive agents and economic theory. American Economic Review, 81 (2), 365-70.
  - Axelrod, R. (1981). The Evolution of Cooperation among Egoists. American Political Science Review, 75 306-318. (For a book-length version, see, Axelrod, R.M. (1984). The evolution of cooperation. Basic Books.)
  - Arthur, B.W. (1991). Designing Economic Agents that Act Like Human Agents: A Behavioral Approach to Bounded Rationality. Learning and Adaptive Economic Behavior, 81 (2), 353-359.
  - Arthur, B.W. (1994). Inductive Reasoning and Bounded Rationality. American Economic Review, 84 (2), 406-411.
  - See also, the online version of the Appendix of Handbook of Computational Economics (Vol.2) `http://www.econ.iastate.edu/tesfatsi/hbace.htm`.
- Note: I am attending the International Communication Assoication (ICA) conference; the class of this week may be rescheduled.

15、[June 4] The Application of ABM (III): Communication Studies

- Before Class:
  - Latane, B. (1996). Dynamic social impact: The creation of culture by communication. Journal of Communication, 46 (4), 13-25.
  - Latane, B.; Nowak, A. & Liu, J.H. (1994). Measuring Emergent Social Phenomena: Dynamism Polarization, and Clustering as Order Parameters of Social Systems. Behavioral Science, 39 1-24.
- In Class: Demonstration of my project presented in ICA

16、[June 11] The Application of ABM (IV): Sociology and Business

- Before Class:
  - Black, J.A.; Oliver, R.L.; Howell, J.P. & King, J.P. (2006). A dynamic system simulation of leader and group effects on context for learning. Leadership Quarterly, 17 (1), 39-56.
  - Halpin, B. (1999). Simulation in sociology. American Behavioral Scientist, 42 (10), 1488-1508.
- Supplemental
  - Hall, R.I. (1999). A study of policy formation in complex organizations: Emulating group decision-making with a simple artificial intelligence and a system model of corporate operations. Journal of Business Research, 45 (2), 157-171.
  - Paul, R.J.; Giaglis, G.M. & Hlupic, V. (1999). Simulation of business processes. American Behavioral Scientist, 42 (10), 1551-1576.

17、[June 18] Concluding Remarks and Critiques

- Before Class:
  - Jacobsen, C. & Bronson, R. (1995). Computer simulations and empirical testing of sociological theory. Sociological Methods & Research, 23 (4), 479-506.
  - Midgley, D.F.; Marks, R.E. & Kunchamwar, D.D. (2007). The Building and Assurance of Agent-Based Models: An Example and Challenge to the Field. Journal of Business Research, forthcoming.

18、[June 25] Final Oral Presentation

- Research paper due in the class. I will not give "I" for incomplete works.

Alternative Topics for Term Papers

- Among the journals of your interest, what research interests you most? Evaluate three research projects and give your critics.
- There must be some fields that ABM applies but not fully covered in this class. What are the applications of ABM in the field of your interest? Write a review essay about it. (Must cite original articles published in the recent 5 years.)
- In your research, how do you apply the concept of agent-based modeling to your projects? Design a workable model.
- In the field of your interest, such as international relationships and organizational behavior, what is the state of art of using ABM? Give three examples and your evaluation.
- Evaluate at least 3 simulation toolkets and make a report. Available toolkits include Swarm, Repast, Ascape, Starlogo, PS-I, NetLogo, MASON, etc.
- Find a specific model that has already been created, then hack the codes, add some features, and then write a paper about your modeling experience.