

# GPH591 (23861): Geographic Agent-Based Modeling, Spring 2009

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Office hours: flexibly; just stop by my office or make an appointment

## Course objectives

This is an upper-level seminar focused on agent-based modeling and its use in geographic research. The specific focus of the course is to examine the uses of agent-based modeling for studying movement behavior. As with most upper-level courses, this seminar will focus heavily on current literature on these topics. Students should view the course as an opportunity to explore the literature and state-of-the-art in this area, with a view to developing their own research in this field.

## Course topics

- Automata, cellular automata, multi-agent systems
- Physics-based models of particle flow
- Behavioral geography for agent-based modeling
- Path-planning algorithms
- Way-finding algorithms
- Heuristics for robot motion planning
- Flocking, herding, swarming, schooling, and animal movement
- Traffic simulation
- Pedestrian simulation
- Crowd simulation
- Models of anti-social behavior
- Models of escape, egress, and panic behavior
- Data and dataware for mobile agents
- Mobile agents in video gaming
- Mobile agents in computer animation and special effects
- Agent development architectures
- Agent development software
- Agent-based models as planning and decision support systems

## Coursework

Your performance in the course will be evaluated in the context of two term papers. You will also be asked to lead discussion in the seminar on various topics that will emerge as we proceed through our exploration of agent-based modeling. It is also expected that you participate constructively in class discussion.

- Paper 1: 40% of your grade
- Paper 2: 40% of your grade
- Discussion and participation: 20% of your grade

## Required Reading Material

The guiding books for this class are:

Benenson, Itzhak & Torrens, Paul M. (2004), *Geosimulation: Automata-Based Models of Urban Phenomena*, London: Wiley. (Available on reserve in the ASU library system)

Batty, M. 2005. *Cities and Complexity: Understanding Cities with Cellular Automata, Agent-Based Models, and Fractals*. Cambridge, MA: The MIT Press.

We will also draw heavily from journal articles, which will be distributed in class.

## Please note

There is a Website for this class; you should check this Website regularly for updates. Students are expected to obtain and read relevant and assigned course material and to take independent initiative to read relevant material outside items assigned through the course. Students are also expected to attend class meetings, participate in class discussion, in a collegial and constructive manner, and participate in fieldwork. Your independent work for this course may well require that you study and research outside course meeting times using your own initiative and that you work on practical exercises outside course meeting times. Recording devices (video, audio) should not be used in the classroom without my permission. Accommodations regarding coursework may be made only in exceptional cases. Please refer to University policy regarding grades of incomplete. Please refer to University policy regarding academic misconduct. All exams must be attended in class and completed within the allotted time. Students who do not attend an exam will receive a grade of 0% for that exam. All project-based work must be submitted at the time listed. Students who submit material late will receive a grade of 0% for that assignment. Persons with disabilities requiring special accommodations to meet the expectations of this course are encouraged to bring this to the attention of the instructor as soon as possible. Schedule conflicts should be discussed with the instructor in the first two weeks of the course. If you do email me, I

cannot always guarantee a quick response. Generally, I try to return emails within a week. Email can be an unreliable form of communication. Email messages regularly become trapped in spam filters. Please do not rely on email as a substitute for face-to-face contact. I am generally available to talk with students before and after class; you are always welcome to visit my office hours or make an appointment to meet with me outside of these times. I will not reply to your emails on the weekend or over University holidays. Please use your @asu.edu email address and check it regularly, as this is the most reliable way for me to get in contact with the class outside of class meetings. I have no direct line at the University for phone calls. As a general policy, I do not return phone calls to students at their private numbers. I am generally available to talk with students before and after class; you are always welcome to visit my office hours or make an appointment to meet with me outside of these times. If an urgent matter arises relating to this course, and I am unavailable, you may contact the staff in the School of Geographical Sciences office in COOR for assistance. I do not offer extra credit. Some of the writings, lectures, films, or presentations in this course may include material that some students may find offensive. Please review the syllabus carefully to see if the course is one that you are committed to taking. If you have a concern, please discuss it with me at your earliest convenience. I love teaching this material and I hope will enjoy the course.