Syllabus

CSC 86030 Modeling and Simulation

Fall 2014

Time and Place	Wednesday, 2:00-4:00 p.m., 3305
Instructor:	Dr. Feng Gu (Feng.Gu@csi.cuny.edu)
Office Hours	Wednesday, 1:00-2:00 p.m. or by appointment
Web Page:	http://www.cs.csi.cuny.edu/~gu/teaching/courses/csc86030/csc86030.html
Textbook and Software	1. Theory of Modeling & Simulation, 2nd edition, by Bernard P. Zeigler, et. al, 2000 (Optional) 2. Users-guide for using DEVSJAVA modeling and simulation software tool (available online) 3. DEVSJAVA modeling and simulation software including source code 4. NetLogo: http://ccl.northwestern.edu/netlogo/
Course Description	This course will introduce the theories and applications of computer modeling and simulation. It covers basic concepts of systems modeling, in-depth discussions of modeling elements, simulation protocols, and their relationships. The modeling and simulation techniques will be illustrated by examples in DEVSJAVA, which is a Java implementation of the systematic and generic DEVS (Discrete Event System Specification) approach to modeling and simulation. Possible application domains of this course include communication, manufacturing, social/biological systems, and business. Selected advanced concepts and practices will also be presented.
Learning Goals	Students are expected to • Understand concepts of computer modeling and simulation • Apply concepts of modeling and simulation to a wide variety of technological, natural, and social systems • Learn a set of computer-based tools for constructing, simulating and analyzing dynamic models of complex systems • Prepare students to conduct research in modeling and simulation
Topics	• Systems concept, basics of modeling and simulation • Discrete time model and discrete event model • Discrete event modeling and simulation as exemplified by DEVS • Agent-based modeling and simulation • Cellular space modeling and simulation • Complex systems science • System dynamics models

- Data assimilation
- Simulation performance, parallel and distributed simulation

Grading This course will include a literature review and a term project, and each accounts for 50% of the final grade.

Last Date for Withdrawal November 6, 2014 (**double check with the registrar's office**)

Others Disruptive classroom behavior will not be tolerated. Cell phones must be turned off during the class time. Class participation is strongly encouraged. Please refer to the policies of graduate center of CUNY on academic integrity, plagiarism, and cheating.

Disclaimer This syllabus represents a general plan for the course and deviations from this plan may be necessary during the duration of the course.

Survey Paper

Each student is required to choose an appropriate topic, perform literature search of the recent publications including conference proceedings, journals, theses/dissertations and technical reports, catalog the related publications on the chosen topic, read the highly related ones, classify the papers, and finally write a survey paper on the state-of-the-art the research on the chosen topic. Use ACM Computing Survey papers as guides for the style of the final paper.

The final survey paper should typically report on (i) 4 foundational papers, (ii) 8 most recent (and relevant) journal papers and (iii) 8 most recent and relevant conference papers and technical reports to convey the state-of-the-art techniques and knowledge.

Students are asked to create a web page for this survey, on which the related components will be posted by the following due dates. All the online references should include the links on the website.

Due date:

1. Sep. 17. Select a topic, write a half-page description of your chosen topic, and post it on your web page.

2. Sep. 24. 1. Find bibliography of literature and provide the links on your web page (at least 50 papers).

3. Oct. 8. Annotate the found bibliography of the literature by writing brief comments on the selected papers and identify 20 to 25 main ones to thoroughly read.

4. Oct 15. Provide the detailed comments on the papers read thoroughly and classify the papers. The classification scheme will help organize the paper.

5. Nov. 5 to Nov. 26. Each student will develop slides to present the survey in class. Two students will present in each class, ordered alphabetically by students' last names.

6. Dec. 10. Final paper submission. The final paper should contain an abstract, topic/problem introductions, definitions of basic terminologies, various approaches taken, major results obtained justifying your classification, presentations of each major result, discussions of minor results within each category, current trend and future work in the area, and references. All work and explanations must be adequately referenced throughout the survey. A good survey paper should have publishable quality.

Possible topics:

- Agent modeling and simulation
- Cellular space modeling and simulation
- Data assimilation methods
- Resampling algorithms in particle filters

- Data assimilation in transportation systems
- Composability of modeling and simulation
- Reproducibility of modeling and simulation
- Cloud-based modeling and simulation
- Cellular automata
- Big data modeling and simulation
- Parallel simulation

Term Project

The term project can be done individually or in group (two members). Each individual/group should choose a topic for your term project. You should email Dr. Gu (Feng.Gu@csi.cuny.edu) a brief description of your project topic, the scope of your project, and the M&S goals of your project. If your topic has been approved, you should have received a confirmation email from Dr. Gu.

The term project includes a presentation (including live demonstration) in the class and a term project report. Both the presentation and project report will be graded, each accounting for 50% of the final grade of the term project. The order of presentation will be decided before November 19. The presentation will be 60 minutes, among which about 40 minutes for PPT presentation, 10 minutes for live demonstration, and 10 minutes for Q&A. Below is a general guideline for what to include in your PPT presentation: background (problem description), M&S goals, the developed model (using diagrams and pseudo code if needed), experiment setup, experiment results and preliminary analysis (e.g., outcomes, numerical measurements and analysis), and conclusion/future work.

The project report should include a cover page, background/problem description, M&S goals, the developed models (including diagrams and some pseudo code), experiment setup, experiment results (including snapshots of the simulation, and analysis of the results), a conclusion/future work section, and a reference page. The project report will be 10-12 pages (Times New Roman, 12 font size, single space, and single column) excluding the cover page and the reference page.

The final due date for the term project is December 10. You should email your project report (doc or pdf), PPT slides, and the developed model to Dr. Gu (Feng.Gu@csi.cuny.edu).