GAM 376: Artificial Intelligence in Computer Games
Professor Robin Burke
Fall 2006, Section 401, Rm. CS&T 214
M/W 1:30 – 3:00 pm

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Description
Artificial Intelligence (AI) is one of the essential components of a computer game. The course introduces basic concepts of AI in the gaming context such as finite state machines, fuzzy logic, subsumption architectures, planning and search. Emphasis will be place on applications of AI in various genres of computer games. Students will work with implementations of common game AI algorithms for behaviors such as pathfinding, and behavior selection.

Prerequisites
CSC 262 or CSC 309

Course Text
On-line materials as assigned.

Resources
Students in the class will have access to the CTI Computer Game Development Lab (CS&T 707) for programming assignments. We will be using Visual Studio 2003 for our C++ work. The course web site will be an important resource for all aspects of the course:

http://josquin.cti.depaul.edu/~rburke/courses/f06/gam376/

The schedule and other syllabus information may change during the quarter; the web site will contain the most up-to-date information.

Organization and Assessment
The course will include both lecture and hands-on lab components. Participation will be extremely important. Students are expected to attend all classes, do the assigned reading and homework before class time. Student grades will be determined through programming projects, a final project, a midterm, and class participation.

- Midterm – 20%
- Regular Programming Assignments (4) – 20%
- Programming Projects (2) – 30%
- Participation / Labs – 30%

Programming Projects
There will be five programming assignments and two programming projects. On the due date for the projects, we will holding tournaments in which the programs will compete against each other.

Tentative Class Schedule
9/6: Introduction to the course. Discussion of syllabus, grading and requirements. AI and Game AI.
9/11: Game physics. Basic physics and math concepts needed for the course. Vector and matrix algebra. Coordinate transformations
Reading: Buckland, Ch. 1.

9/13: Finite State Machines. Uses and applicability of FSMs in games. FSM implementations and design choices. Extensions. Reading: Buckland, Ch. 2
Due: Homework #1

9/18: FSM Lab. Class meets in CS&T 707.

9/20: Steering behaviors. Flocking, following, obstacle avoidance and other steering behaviors. Managing groups of agents. Spatial partitioning. Reading: Buckland, Ch. 3
Due: Homework #2


9/27: Simple Soccer. Detailed discussion of a sport simulation. Integrating steering behaviors and finite state machines in a game architecture. Reading: Buckland, Ch. 4
Due: Homework #3

10/2: Soccer Lab. Class meets in CS&T 707.

10/4: Graphs I. Graphs and tree. Graph implementations. Uses of graphs in game AI: navigation graphs, dependency graphs, state graphs. Simple graph algorithms. Reading: Buckland, Ch. 5 (up to pg. 209)

10/9: Graphs II. Graph algorithms. Uninformed and cost-based search. A* search and variants. Reading: Buckland, Ch. 5 (from pg. 209)
Due: Soccer team design outline

10/11: Midterm

10/16: Scripting. Dynamic languages in game AI. Efficiency and integration issues. The Lua language and applications in finite state machines and behaviors.

10/18: Soccer tournament. Class meets in CS&T 707.
Due: Soccer team implementation (10/17)

10/23: Raven. An agent-based AI example. Sensing and sensory memory. Issues of path finding and planning. Reading: Buckland, Ch. 7


10/30: Path planning. Handling navigation graphs and navigation meshes. Hierarchical path planning. Smoothing and caching. Reading: Buckland, Ch. 8

11/1: Path finding lab. Class meets in CS&T 707.

Reading: Buckland, Ch. 9

11/8: Goal and behavior lab. Class meets in CS&T 707.

Reading: Buckland, Ch. 10

11/16: Raven tournament. Class meets in CS&T 707. (Final exam schedule: 11:45 – 2:00 pm)
Due: Raven implementation (11/21)

Policies
Students are expected to attend all classes and participate in in-class exercises. Class will start promptly. Students are individually responsible for material they may have missed due to absence or tardiness.

Assignments will be submitted to the Course On-Line site. Do not submit assignments by email. Late assignments will not be accepted without written (or email) permission of the instructor and will incur a penalty of ½ grade per day up to three days. The Soccer and Raven assignments cannot be accepted late.

Assignments must represent a student's individual effort. While students are permitted to discuss assignments at the conceptual level, under no circumstances should students share specific answers (electronically or otherwise).

School Policies

Online Instructor Evaluation
Course and instructor evaluations are critical for maintaining and improving course quality. To make evaluations as meaningful as possible, we need 100% student participation. Therefore, participation in the School’s web-based academic administration initiative during the eighth and ninth week of this course is a requirement of this course. Failure to participate in this process will result in a grade of incomplete for the course. This incomplete will be automatically removed within seven weeks after the end of the course and replaced by the grade you would have received if you had fulfilled this requirement.

Email
Email is the primary means of communication between faculty and students enrolled in this course outside of class time. Students should be sure their email listed under "demographic information" at http://campusconnect.depaul.edu/ is correct.

Plagiarism:
The university and school policy on plagiarism can be summarized as follows: Students in this course, as well as all other courses in which independent research or writing play a vital part in the course requirements, should be aware of the strong sanctions that can be imposed against someone guilty of plagiarism. If proven, a charge of plagiarism could result in an automatic F in the course and possible expulsion. The strongest of sanctions will be imposed on anyone who submits as his/her own work a report, examination paper, computer file, lab report, or other assignment which has been prepared by someone else. If you have any questions or doubts about what plagiarism entails or how to properly acknowledge source materials be sure to consult the instructor.

Incomplete:
An incomplete grade is given only for an exceptional reason such as a death in the family, a serious illness, etc. Any such reason must be documented. Any incomplete request must be made at least two weeks before the final, and approved by the Dean of the School of Computer Science, Telecommunications and Information Systems. Any consequences resulting from a poor grade for the course will not be considered as valid reasons for such a request.