



Artificial Intelligence in Video Games

ITP 461 (1 Unit)

Objective This course focuses on path finding and path traversal in the context of a modern computer game. Additional topics include Finite State Machines, Actor Formations and Team AI. The students will design and implement a complete pathing system using a pre-existing game framework.

Instructor Instructor: Bill Schofield
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Location: OHE 540
Course website: <http://www.itp.usc.edu/bschofield/index.htm>

Lab 1.5 hrs/week; Tuesdays 5-6:20pm

Textbook **AI Game Programming Wisdom (with CD-ROM)**
by Steve Rabin

Grading The following grading structure will be used to determine the final grade:

Project 1:	100 points
Project 2:	100 points
Project 3:	100 points
Final Exam:	100 points
TOTAL	400 points

Policies *Projects:* Projects are due at the start of class and are considered late 30 minutes after class begins.

Late Projects: Only one assignment may be turned in late. All other late projects will NOT be accepted. The Final project may not be turned in late. (Late projects are due by the class before the day of finals)

Academic Integrity The use of unauthorized material, communication with fellow students during an examination, attempting to benefit from the work of another student, and similar behavior that defeats the intent of an examination or other class work is unacceptable to the University. It is often difficult to distinguish between a culpable act and inadvertent behavior resulting from the nervous tension accompanying examinations. When the instructor determines a violation has occurred, appropriate action, as determined by the instructor, will be taken. Though working together is encouraged, the projects must be your own effort. "Duplicate" projects will all receive zero points and possible referral to the Office for Student Conduct.

All students should read, understand and abide by the University Student

Conduct Code

<http://www.usc.edu/dept/publications/SCAMPUS/governance/gov03.html>

**Students
with
Disabilities**

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me (or to your TA) as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. - 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

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Course Outline

Week 1 – An Introduction to Game AI concepts

- Overview of the course
 - OGRE
 - Project #1 assigned
- Reading Assignment:** Rabin 3.1 & 3.2
Lab: none

Week 2 – Creating a Path

- A*
 - Weighted, Directed Graphs
 - Pathnodes versus Zones
- Reading Assignment:** Rabin 4.3 & 4.4
Lab: Project 1

Week 3 – Following a Path

- Moving along a path
 - Arriving at nodes
 - Overshooting/undershooting nodes
 - Repercussions of leaving the path
- Reading Assignment:** Rabin 5.6
Lab: Project 1

Week 4 – Actor Formations

- Actor Formations
 - Students suggest topics for future classes
- Reading Assignment:** Handout
Lab: Project 1

Week 5 – Obstacle Avoidance

- Traces
 - Getting back on track
 - Searching every frame versus creating a sub-path
- Reading Assignment:** none
Lab: Project 1

Week 6 – Project #1 Due

- Project #1 Due
 - Discussion of Project #1
- Reading Assignment:** Handout
Lab: none

Week 7 – Suggested Topic #1

- Project #2 Assigned
 - Lecture based on topic of student interest
- Reading Assignment:** Rabin 6.5, 6.6 & 2.5
Lab: none

Week 8 – Finite State Machines

- Uses of Finite State Machines
 - Variant application of the basic Finite State Machine
- Reading Assignment:** none
Lab: Project 2

Week 9 – Advanced Obstacle Avoidance

- Dealing with pathing failure
 - Actor pathing cooperation
- Reading Assignment:** none
Lab: Project 2

Week 10 – Project #3

- Project #2 Due
 - Discussion of Project #2
- Reading Assignment:** Rabin 4.5
Lab: none

Week 11 – Real World Pathing Complications

- Project #3 Assigned
 - Sudden elevation changes
 - Actors with different collision volumes
 - Nodes connected by travel method other than walking
 - Automated node/zone creation
- Reading Assignment:** Rabin 5.3, 5.4 & 5.5
Lab: Project 3

Week 12 – Team AI

- Groups of Actors cooperating to achieve a common goal
 - Individual roles within a group
- Reading Assignment:** Handout
Lab: Project 3

Week 13 – Suggested Topic #2

- Lecture based on topic of student interest
- Reading Assignment:** none
Lab: Project 3

Week 14 – Project Review

- Review student's progress on Project #3
- Reading Assignment:** none
Lab: Project 3

Week 15 – Final Project Presentations and Exam Review

Course Projects and Papers:

1. Create and Traverse a path in a non-trivial static environment using a weighted node system.
2. Create and Traverse a path in a non-trivial dynamic environment using a weighted node system. Non-moving objects can be added to the environment before or after the path has been initially created. These obstacles will never completely disconnect the node graph.
3. Multiple Actors Create and Traverse a path in a non-trivial dynamic environment using a weighted node system.