

CSC481: An Introduction to Artificial Intelligence with AI Game Development

Syllabus – Spring 2015

Webpage: <http://homepage.cs.uri.edu/faculty/hamel/courses/2015/spring2015/csc481>

Prerequisites: CSC301

Instructor:

Dr. Lutz Hamel

email: hamel@cs.uri.edu

office: Tyler Hall, Rm 251

Course Description

Advanced graphics hardware and novel rendering algorithms have revolutionized the look and feel of interactive computer games. With the ever-increasing computational power of desk- and laptop computers, not to mention game consoles, we are about to witness another revolution in games: the very smart NPC (non-player character). The increase in computing power of today's machines allows game designers to implement sophisticated AI techniques for their synthetic creatures that are beginning to blur the difference in the experience between a multi-player game and a single player game populated with smart synthetic creatures.

In this course we will examine AI techniques which are beginning to be routinely deployed in games including the A* path finding algorithm, rule based reasoning, neural networks, and genetic algorithms. We will also be concerned with knowledge representation and problem formalization.

To make the theory accessible (and fun!) we will be using a mod of the Quake II game engine that allows us to replace the brains of the Q2 monsters with AI routines of our own choosing and design. We will design synthetic creatures that will have special roaming abilities, that will be able learn to pick up loot, and make tactical decisions based on learned behavior.

The goal is that you take two things away from this course:

1. A solid understanding of popular AI techniques that can help solve problems in artificial (and real) worlds.
2. A better understanding of how some of the complex behavior in today's interactive games is generated and managed.

Texts

Artificial Intelligence: Foundations of Computational Agents, by David Poole and Alan Mackworth, Cambridge University Press, 2010.

Software

All the software needed for this course is available as a VirtualBox appliance.

Grading

Homework, Quizzes, and Programming Assignments	60%
Midterm	20%
Final Project	20%

Policies

- Check the website (often)! I will try to keep the website as up-to-date as possible.
- Class **attendance, promptness, participation, and adequate preparation** for each class are expected. If you are absent, it is your responsibility to find out what you missed (e.g. handouts, announcements, assignments, new material, etc.)
- **Late assignments** – no late assignments will be accepted.
- **Make-up quizzes and exams** will **not** be given without a valid excuse, such as illness. If you are unable to attend a scheduled examination due to valid reasons, please inform myself, or the department office in Tyler Hall, prior to the exam time. Under such circumstances, you are not to discuss the exam with any other class member until after a make-up exam has been completed.
- All work is to be the result of your own individual efforts unless explicitly stated otherwise. **Plagiarism, unauthorized cooperation or any form of cheating** will be brought to the attention of the Dean for disciplinary action. See the appropriate sections (8.27) of the University Manual.
- **Software piracy** will be dealt with exactly like stealing of university or departmental property. Any abuse of computer or software equipment will subject to disciplinary action.

Tentative Schedule

1. AI, Agents
 - architecture
 - control
 - embodiment
2. Quagents
 - The Quake II mod
3. AI as search
 - searching – state space
 - heuristic search: the A* algorithm
 - searching – features and constraints
 - population based searches – genetic algorithm
 - Quagent map navigation
4. Logic and Formal Reasoning
 - Rule Based Systems and inference
 - Knowledge Representation
 - Map navigation revisited
5. Reasoning under Uncertainty
 - Probability
 - Belief Networks
 - Probabilistic inference
6. Planning
 - Representing states, actions, goals
 - forward planning
 - partial order planning
7. Learning
 - supervised learning
 - basic models for supervised learning (decision trees, neural networks)
 - case-based reasoning
 - Bayesian learning
 - beyond supervised learning
8. Social and Ethical Consequences of AI