

There's Something about AI Exercises

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Conclusion

- Perhaps, the “something” about AI exercises has to do with enjoyment
 - Certainly, I have more fun with AI exercises
 - Students seem to as well, either from something *intrinsic* in the problems, or by infection

Results

- Largest CS2 class in five years (14 w/ 5 women)
- Four students currently taking machine learning
- Three women and two men interested in an AI emphasis
- “you've got to stop giving us such fun projects because my other classes are suffering.”

Westmont

- Residential undergraduate liberal arts college in the evangelical Christian tradition
- 1200 students, 60% female, 2 CS faculty, graduate 8 students per year
- Busy, broadly involved students with Santa Barbara distractions
- CS1 using TeachScheme! (www.htdp.org)
- CS2 introduce object-oriented paradigm in C++ (was Java)



Santa Barbara

Projects

- Flocking Boids (C. Reynolds)
- Cellular automata and Conway's Game of Life
- Neural networks
- Minimax game-tree search
- Simulated evolution and natural selection (R. Dawkins)

Swarming

- objectives:
 - process lists with abstract functions, generative recursion
- provide:
 - data definitions for critter and swarm
 - flocking behavior defs: alignment, separation, cohesion
- require
 - part 1: random swarm with edge wrapping
 - part 2: get neighbors, flocking behaviors, edge avoidance
 - part 3: object-oriented implementation

Neural Networks

- objectives:
 - OO-style; practice with new language
- provide:
 - interfaces for LTU and Neural Network
 - guided instruction on backpropagation algorithm
- require:
 - part 1: single LTU, weight update, Boolean function
 - part 2: neural net, training on 7-segment LED domain

Cellular Automata

- objectives:
 - vectors (arrays), indexing, OO-style, generative recursion
- provide:
 - data definitions for cell and grid
 - rules for determining new grid
- require:
 - part 1: 1D CA displaying time in 2D
 - part 2: Conway's Game of Life
 - part 3: convert to OO-style

Game-tree Search

- objectives:
 - Natural number recursion and tree data types, processing grid structures
- provide:
 - game state defs and drawing functions
- require:
 - determine game result, find next moves, static score of game state, data def for game-search tree, minimax, select best move (sort the top level of the tree)

Simulated Evolution & Natural Selection

- objectives:
 - generative recursion, abstract functions, MVC GUI
- provide:
 - data defs for gene, gene-sequence, individual, population
- require:
 - part 1: random seq, sequence fitness, generate individual, offspring and population, compute next generation
 - part 2: repeat next-gen till done, GUI

Sample Demos

Key Points

- Employing AI problems in intro courses require:
 - simplify problem to scope accessible to novices
 - retain interesting/engaging features of AI problem
 - exercise the concept/skill
- This is really difficult

Questions

- “It's too hard”
 - lowering frustration vs. raising expectations
 - “It's supposed to be hard. If it wasn't hard, everyone would do it. It's the hard that makes it great.”
- Physical robots vs virtual
- What are those intrinsic features of engaging problems