Artificial Intelligence in Games

CMPS 244 Fall 2014

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Introductions

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Office hours: TBD and by appointment
Class Administration

- Website:  
  www.soe.ucsc.edu/classes/cmps244/Fall14/
  - Piazza forums
- Policies
- Grading
- Schedule
Artificial Intelligence

- Goals
- Approaches
  - Cognitive systems (SOAR, ACT-R)
  - Classical logic-based reasoning (logic programming, CSP, ASP)
  - Statistically-based methods (Machine Learning)
  - Statistical-Relational modeling (hybrid) (Inferring logical relationships through statistical data mining)
- Methods
- Branches
  - Robotics
  - Cognitive Systems
  - Integrated Systems
  - Connectionist Systems
Games

- Rules
- Skills
- Ranking (evaluation and comparison metric)
- Learning
  - observation
  - demonstration
  - teaching
Game AI

- Modern video games
- Goals
  - *illusion* of believability; often a design problem
  - *experience* management
- Real physics vs Game Physics
Games and AI

- Human-level AI
- Challenge problems
  - Chess
  - Jeopardy
  - Starcraft
- Interactive exercise
### Task Environment Properties

<table>
<thead>
<tr>
<th></th>
<th>Chess</th>
<th>StarCraft</th>
<th>Taxi Driving</th>
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<tbody>
<tr>
<td>Fully vs. partially observable</td>
<td>Fully</td>
<td>Partially</td>
<td>Partially</td>
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<tr>
<td>Deterministic vs. stochastic</td>
<td>Deterministic</td>
<td>Deterministic*</td>
<td>Stochastic</td>
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<td>Episodic vs. sequential</td>
<td>Sequential</td>
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<td>Static vs. dynamic</td>
<td>Static</td>
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<td>Discrete vs. continuous</td>
<td>Discrete</td>
<td>Continuous</td>
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<tr>
<td>Single vs. multiagent</td>
<td>Multi</td>
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# AI in Games

<table>
<thead>
<tr>
<th>Game Genres</th>
<th>AI Entity Roles</th>
<th>AI Research Problems</th>
<th>AI Research Areas</th>
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<tbody>
<tr>
<td>Action</td>
<td>Tactical enemies</td>
<td>Interact with environment</td>
<td>High-level perception</td>
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<td>Role playing</td>
<td>Partners</td>
<td>Fast response</td>
<td>Commonsense reasoning</td>
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<td>Adventure</td>
<td>Support characters</td>
<td>Realistic sensing</td>
<td>Natural language</td>
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<td>Strategy games</td>
<td>Story directors</td>
<td>Adapt to environment</td>
<td>Speech processing</td>
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<td>God games</td>
<td>Strategic opponents</td>
<td>Interact with humans</td>
<td>Gesture processing</td>
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<td>Team sports</td>
<td>Units</td>
<td>Adapt to human player</td>
<td>Planning &amp; counterplanning</td>
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<td>Individual sports</td>
<td>Commentators</td>
<td>Difficulty</td>
<td>Cognitive modeling</td>
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<td></td>
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<td>adaptation</td>
<td>Plan recognition</td>
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<td>Strategic adaptation</td>
<td>Soft real-time response</td>
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<td>Interact with other AIs</td>
<td>Reactive behavior</td>
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<td>Coordinate behavior</td>
<td>Teamwork</td>
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<td>Navigation</td>
<td>Scheduling</td>
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<td>Use tactics and strategies</td>
<td>Path planning</td>
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<td>Allocate resources</td>
<td>Spatial reasoning</td>
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<td>Understand game flow</td>
<td>Temporal reasoning</td>
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<td>Humanlike responses</td>
<td>Opponent modeling</td>
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<td>Reaction times</td>
<td>Learning</td>
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<td>Realistic movement</td>
<td>Knowledge acquisition</td>
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<td>Emotions</td>
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<td>Personalities</td>
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<td>Low computational overhead</td>
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<td>Low development overhead</td>
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Game AI research

- Problem-centric
  - Path-planning
  - Dialogue generation
  - Camera control
- Technique-centric
  - Machine Learning
  - Planning
- Hybrid
  - General game playing
Computer as

- Player
- Character
- Opponent/Friend
- Assistant Designer
- Designer
- Tester/Critic
• Send me email ID you want to use for shared google docs
• Watch history of Chess AI video on YouTube: Here
• Next Class
  • Overview of topics and papers
  • Quick intro to competition domains
Policies

- Homework submission
- Academic integrity
  - Presentations
- Reports
- Projects
Homeworks

- Written Assignments
  - Literature Review
    - Expectations
      - State game AI problem
      - Summarize current approaches
      - Compare approaches and problem formulations
      - State your own views on the topic
  - Position paper
    - Lead discussion on Piazza for one of the topics discussed in class
    - Summarize the discussion in the form of a paper
- Due dates: Friday of weeks 4 and 8
- Hand-in format: electronic submission via eCommons
Project 1

- Competition entry
  - Individually or in teams of up to 3
  - Choose a competition from various choices
    - StarCraft, Geometry Friends, Ms. Pacman, Mario AI
  - Duration: 5 weeks
- Weekly progress reports
- Presentation (your approach and output)
- Code on GitHub publicly available
Project II

- Project of your choice
  - Individually or teams of 2 to 3
  - Get proposal accepted by week 4 (earlier will be better)
- Weekly reports starting week 5
- Due date week before classes end
- Presentations during final exam time
- Submission: Code publicly shared on GitHub
Class Participation

- Piazza
  - Choose a topic (algorithm, research problem, research method, technique)
  - Start a discussion on Piazza around the topic; encourage others to contribute
  - Contribute to at least 3 other topics
  - Class participation grade will be based on number AND quality of contributions