CIS 563 Multi-Agent Systems **Spring 2005**
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Lecture Notes

Lecture 1: Logic-Based Agents and Reactive Agents

- weak AI *vs.* strong AI
- examples: Turing test, the Chinese room experiment
- symbolic AI and logic-based agents (vacuum cleaning world example)
- behavioral AI and reactive agent (Steels's Mars explorer experiments)
- differences between logic-based agents and reactive agents
- limitations of reactive agents

Lecture 2: Practical Reasoning Agents

- practical reasoning = deliberation + means-ends reasoning
- BDI agent model (brief, desire, and intention)
- intentions in practical reasoning
- means-ends reasoning (the blocks world example)
- implementing a practical reasoning agent (the algorithm)
- the procedure reasoning system (PRS)

Lecture 3: Hybrid Agents; Agent Properties

- horizontally layered architecture *vs.* vertically layered architecture
- horizontal layering example: TouringMachines
- vertical layering example with two-pass: InteRRaP
- agent properties: situatedness, autonomy, and sociability
- differences between agents and objects

Lecture 4: Multi-Agent Interactions

- agent cooperation (example: air traffic control system)
- agent negotiation (example: e-commerce)
- self-interested agents: cooperation *vs.* defection
- the prisoner's dilemma (one-shot game)
- outcomes, utilities and preferences
- the utility function and environment function
- payoff matrix for 2-player games

Lecture 5: Game Theory – Part I

- introduction to game theory
- dominant strategies and dominated strategies
- strongly dominate *vs.* weakly dominate
- Nash equilibrium and examples
- revisit: the prisoner's dilemma
- iterated prisoner's dilemma and Axelrod's tournament

Lecture 6: Game Theory – Part II

- symmetric 2x2 interactions
- examples: cooperation dominance and defection dominance
- examples: the stag hunt and game of chicken
- competitive and zero-sum games
- finding max-min strategies
- pure strategies *vs.* mixed strategies

Lecture 7: Game Theory – Part III

- mixed strategies and mixed equilibrium
- finding mixed equilibrium for 2-player games
- pure strategies *vs.* mixed strategies in a Nash equilibrium
- interpretation of mixed strategy probabilities
- case study I: compliance inspection game
- case study II: two-finger Morra