Extensive Form Games

2/14/18
Alpha-Beta Pruning Exercise
Discussion Questions

1. How can we organize the search to maximize the amount of work saved by pruning?
   A. Explore best nodes first (estimate with heuristic).

2. How can we modify alpha/beta pruning to work on non-zero-sum games?
   A. We can’t.

3. How can we modify alpha/beta pruning to work on 3-(or more)-player games?
   A. We can’t.
Iterative Deepening in Min/Max

• We generally impose a depth limit on alpha/beta min/max, based on how much time we want to allow.

• If we have time left over, we could re-run with a larger depth limit. If we run out of time, we can just return the move from the last run.
What can we model so far?

With minimax, we can solve:

• two-player, zero-sum, complete information, sequential move games
  • lots of classic board games: chess, checkers, connect 4...
  • not much else, and the search space for the above is often too big

With backwards induction (so far) we can solve:

• complete information, sequential move games
  • simple models of economic competition, a few other economic applications
Game theory isn’t just about playing games.

• We’d like to model decision making in all sorts of multi-agent interactions.

• To do so, we need to come up with a model (such as a game tree) that describes the interaction.

• We need to identify the players, when they make decisions, and how what they want to achieve.
Example Application: Resource Sharing

Also known as cake-cutting, as in “I cut, you choose”.

- One agent proposes a division of a desirable resource, the other accepts or rejects that division.
- Here, we model the agents as getting utility +1 for each unit of resource, but they’re also spiteful so they feel a disutility of 0.5 if they receive less than half.
- MANY variations on this model are possible.
What can’t we model so far?

Random Outcomes

Incomplete Information

Simultaneous Moves