Canonical game theoretic domains
Modeling Human Strategic Behavior

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Lecture Overview

Non-strategic Domains

Canonical Domains
Many popular games are not \textbf{strategic} in the game theoretic sense:

- **Montezuma’s Revenge** (and many other Atari games)
  - Single-player; no need to reason about other players’ incentives
  - Every action always has the same consequence
- **Snakes and Ladders**
  - Outcomes entirely determined by dice roll
  - No choice of actions
- **War (the card game)**
  - Outcomes entirely determined by shuffle order
  - No choice of actions
Lecture Overview

Non-strategic Domains

Canonical Domains
A “Defender” wants to prevent attacks on a set of targets
- Airport terminals and terrorist attacks
- Staten Island Ferries (and terrorist attacks)
- Fare evasion on public transit

But Defender cannot afford to guard every target all the time
- E.g., not every ferry gets an escort
- Not every LRT passenger gets checked

So the Defender has to randomize their defenses

But the Attacker gets to watch the Defender before attacking
- They observe the Defender’s random distribution before acting
- But not the Defender’s realized actions
Peer grading:

- Gives students more feedback and exposure to others’ work
- Lets us run large classes without giant teams of TAs

But graders might be **strategic** about how much effort they put into their grading

- Low-effort strategy: don’t read the assignment; give 80%

How can we incentivize high-effort grading?

- Compare student grades with each other; reward agreement with other graders
- TA spotchecks: randomly grade some assignments; reward agreement with TAs
Recommendation systems are *ubiquitous*.

How do we imagine these systems as permitting a *strategic setting*?

Think of all stakeholders in an interaction:

- Users
- System Designers
- Content Providers
Spectrum Auctions

**Repurpose radio spectrum** from broadcast television to wireless internet

- pay broadcasters for voluntarily relinquishing their licenses
- potentially assign new channels to stations that keep broadcasting
- resell contiguous blocks of spectrum to telecoms

Many **elements of design freedom**; many **objectives**

- Participants’ property rights
- Definition of goods to be traded
- Quantity of goods to trade
- Outcomes the market should seek to achieve
  - efficiency; revenue; increased competition in the consumer market;
  - bidding simplicity for unsophisticated participants
- Computational tractability
Questions *(roughly, same for Assignment 1):*

- **Describe the setting** and justify why a strategic model is appropriate
  - Who are the players?
  - What actions are available?
  - Where do their payoffs come from?
  - Why is the setting strategic? *(e.g., how do one agent’s actions influence another’s payoffs?)*

- **What game representation(s) are appropriate** to model key parts of the domain?
  - Do agents choose actions simultaneously or sequentially *(and if the latter, do they observe each other’s moves)*?
  - Do agents interact once or repeatedly?
  - Do agents have knowledge of their and others’ payoffs?

- **Why do human behavioral considerations** come into play in this setting?
  - How might skilled actors behave different from unskilled actors?
  - What irrational behaviors might agents exhibit?
  - What data would be useful to have?