Revelation Principle

Game Theory Course:
Jackson, Leyton-Brown & Shoham

Game
Theory
Online

- It turns out that any social choice function that can be implemented by any mechanism can be implemented by a truthful, direct mechanism!
- Consider an arbitrary, non-truthful mechanism
  - may be indirect

Revelation Principle

type θ_1 —— strategy $s_1(\theta_1)$ ——→ Original Mechanism ——→ outcome

⋮

type θ_n —— strategy $s_n(\theta_n)$ ——→

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Revelation Principle

- It turns out that any social choice function that can be implemented by any mechanism can be implemented by a truthful, direct mechanism!
- Consider an arbitrary, non-truthful mechanism
  - may be indirect
- Recall that a mechanism defines a game, and consider an equilibrium $s = (s_1, \ldots, s_n)$

Revelation Principle

- We can construct a new direct mechanism, as shown above
- This mechanism is truthful by exactly the same argument that s was an equilibrium in the original mechanism
- "The agents don't have to lie, because the mechanism already lies for them."

Discussion of the Revelation Principle

- The set of equilibria is not always the same in the original mechanism and revelation mechanism
  - of course, we've shown that the revelation mechanism does have the original equilibrium of interest
  - however, in the case of indirect mechanisms, even if the indirect mechanism had a unique equilibrium, the revelation mechanism can also have new, bad equilibria
- So what is the revelation principle good for?
  - recognition that truthfulness is not a restrictive assumption
  - recognition that indirect mechanisms can't do (inherently) better than direct mechanisms
  - for analysis purposes, we can consider only truthful mechanisms, and be assured that such a mechanism exists