2-3-BoS-Computation

2020年6月6日 星期六 下午2:39

2-3-BoS-Comput...

Computing Mixed Nash Equilibrium (I)

Game Theory Course:
Jackson, Leyton-Brown & Shoham

Computing Mixed Nash Equilibria

Battle of the Sexes

	B	F
B	2, 1	0, 0
F	0, 0	1, 2

all actions

- It's hard in general to compute Nash equilibria, but it's easy when you can guess the support set of actions
- For BoS, let's look for an equilibrium where all actions are part of the support

Computing Mixed Nash Equilibria

Battle of the Sexes

	B (p)	F ($1-p$)
B	2, 1	0, 0
F	0, 0	1, 2

- Let player 2 play B with p, F with $1-p$.
- If player 1 best-responds with a mixed strategy, player 2 must make him indifferent between F and B (why?)

play B. F sometimes → BR → indifferent.

Ex. ② Better more u on B, less Utility on F → F utility = 0

Computing Mixed Nash Equilibria

Battle of the Sexes

② randomize

	B (p)	F ($1-p$)
B	2, 1	0, 0
F	0, 0	1, 2

① → $p = 1-p$

- Let player 2 play B with p, F with $1-p$.
- If player 1 best-responds with a mixed strategy, player 2 must make him indifferent between F and B (why?)

given 2 $(p, 1-p)$

$u_1(B)$ – player 1 response with B

$u_1(F)$ – player 1 response with F

$$u_1(B) = u_1(F)$$
$$2p + 0(1-p) = 0p + 1(1-p)$$
$$p = \frac{1}{3}$$

Computing Mixed Nash Equilibria

Battle of the Sexes

	B	F
B	2, 1	0, 0
F	0, 0	1, 2

- Likewise, player 1 must randomize to make player 2 indifferent.
  - Why is player 1 willing to randomize?

Computing Mixed Nash Equilibria

Battle of the Sexes

②

① randomize

		B	F
q	B	2, 1	0, 0
$1-q$	F	0, 0	1, 2

- Likewise, player 1 must randomize to make player 2 indifferent.
  - Why is player 1 willing to randomize?
- Let player 1 play B with q, F with $1-q$.

given $(q, 1-q)$ given $(q, 1-q)$

$$u_2(B) = u_2(F)$$
$$q + 0(1-q) = 0q + 2(1-q)$$
$$q = \frac{2}{3}$$

- Thus the mixed strategies $(\frac{2}{3}, \frac{1}{3})$, $(\frac{1}{3}, \frac{2}{3})$ are a Nash equilibrium.

① ② ① ② this way → make other indifferent. → MS. N.E.

Interpreting Mixed Strategy Equilibria

What does it mean to play a mixed strategy? Different interpretations:

- Randomize to confuse your opponent
  - consider the matching pennies example
- Randomize when uncertain about the other's action – find in balance. end up better
  - consider battle of the sexes – diff. preference

2.1	0
0	1.2

- Mixed strategies are a concise description of what might happen in repeated play: count of pure strategies in the limit
- Mixed strategies describe population dynamics: 2 agents chosen from a population, all having deterministic strategies. MS gives the probability of getting each PS.

proportion → sampling population