Correlated strategy and equilibrium

Recap: MSNE → weakest notion of equilibrium so far

existence is guaranteed for finite games

computationally expensive

Alternative approach - entry of a mediating agent/device

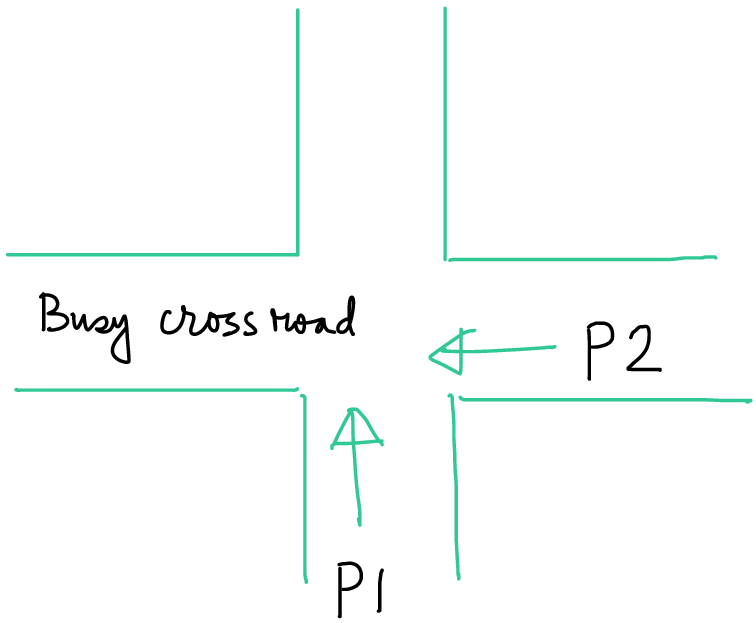
Why? ① Alternative explanation of player rationality

② Utility for all players may get better

③ Computational tractability

Example

P1 \ P2	Wait	Go
Wait	0, 0	1, 2
Go	2, 1	-10, -10



Nash solutions are ① one waits other goes or ② large probability on waiting

In practice something else happens

A traffic light guides the players - and the players agree to this plan - Why?

The trusted third party is called the mediator

Role: randomize over the strategy profiles and suggest the corresponding strategies to the players

If the strategies are enforceable then it is an equilibrium (correlated)

Definition: A correlated strategy is a mapping $\pi : S \to [0,1]$ s.t. $\sum_{s \in S} \pi(s) = 1$

example: $\pi(W,W) = 0$, $\pi(W,G) = \pi(G,W) = \frac{1}{2}$, $\pi(G,G) = 0$.

A correlated strategy is a correlated equilibrium when no player "gains" from deviating while others are following the suggested strategies

The correlated strategy π is a common knowledge

Definition: A correlated equilibrium is a correlated strategy π s.t.

$$\sum_{s_{-i} \in S_{-i}} \pi(s_i, s_{-i})\, u_i(s_i, s_{-i}) \geq \sum_{s_{-i} \in S_{-i}} \pi(s_i, s_{-i})\, u_i(s_i', s_{-i}), \quad \forall s_i, s_i' \in S_i, \forall i \in N$$

Discussions: the mediator suggests the actions after running its randomization device π, every agent's best response is to follow it if others are also following it.

Ex. 1

	F	C
F	2,1	0,0
C	0,0	1,2

MSNE: $\left(\left(\frac{2}{3}, \frac{1}{3}\right), \left(\frac{1}{3}, \frac{2}{3}\right)\right)$

Q: Is $\pi(C,C) = \frac{1}{2} = \pi(F,F)$ a CE?

Expected utility: MSNE $= \frac{2}{3}$, CE $= \frac{3}{2}$

Ex. 2

	Wait	Go
Wait	0,0	1,2
Go	2,1	-10,-10

Consider $\pi(W,G) = \pi(W,W) = \pi(G,W) = \frac{1}{3}$

Is this a CE?

Are there other CEs?