1-4-Examples-2

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pure competition ≥ $a \in A$ $u_1(a) + u_2(a) = c$ $c=0$,

Cooperation $\forall a \in A$ $\forall i,j$ $u_i(a) = u_j(a)$

1-4-Example...

Game Theory Intro

Game Theory Course:
Jackson, Leyton-Brown & Shoham

More General Form

Prisoner's dilemma is any game

	C	D
C	a, a	b, c
D	c, b	d, d

with $c > a > d > b$.

Games of Pure Competition

Players have exactly opposed interests

- There must be precisely two players (otherwise they can't have exactly opposed interests)
- For all action profiles $a \in A$, $u_1(a) + u_2(a) = c$ for some constant c
  - Special case: zero sum
- Thus, we only need to store a utility function for one player
  - in a sense, we only have to think about one player's interests

Matching Pennies

One player wants to match; the other wants to mismatch.

	Heads	Tails
Heads	$1, -1$	$-1, 1$
Tails	$-1, 1$	$1, -1$

same side ≥ win 1 you: -1
mismatch ≥ loss -1 you win 1

Rock-Paper-Scissors

Generalized matching pennies.

	Rock	Paper	Scissors
Rock	$0, 0$	$-1, 1$	$1, -1$
Paper	$1, -1$	$0, 0$	$-1, 1$
Scissors	$-1, 1$	$1, -1$	$0, 0$

$\Sigma = 0$

...Believe it or not, there's an annual international competition!

Games of Cooperation

Players have exactly the same interests.

- no conflict: all players want the same things
- $\forall a \in A, \forall i, j, u_i(a) = u_j(a)$ utility same
- we often write such games with a single payoff per cell
- why are such games "noncooperative"?

Coordination Game

Which side of the road should you drive on?

	Left	Right
Left	$1, 1$	$0, 0$
Right	$0, 0$	$1, 1$

same side - x collision

General Games: Battle of the Sexes

The most interesting games combine elements of cooperation *and* competition.

Husband

wife	B	F
B	$2, 1$	$0, 0$
F	$0, 0$	$1, 2$

diff. movie - equal x happy
same movie - diff. conflicts.