CS-49: Game Theory

Amittai Siavava

05/01/2023

Problem 14.

Find an equilibrium for Alice and Bob playing Rock, Paper, Scissors with the following amendment:

- If Alice crushes Bob's scissors with her rock, or Bob cuts Alice's paper with her scissors, it's treated as a double win for one (and a double loss for the other).

		Bob			
		R	P	S	
Alice	R	(0,0)	(-1,1)	(2,-2)	$\frac{+1}{3}$
	P	(1,-1)	(0,0)	(-2,2)	$\frac{-1}{3}$
	S	(-1,1)	(1,-1)	(0,0)	**0**
		0	**0**	**0**	

TABLE 1. Payoffs for Alice, Bob respectively.

Also: read in Tadelis about proving that Nash equilibria exist.

Bob's outcomes remain unchanged; while the modification let's him potentially win double if he plays scissors and Alice plays paper, he also loses double if he plays scissors and Alice plays rock, so the advantage and disadvantage even out. Therefore, Bob does not have a best strategy since he has no advantage to any of his choices. Alice, on the other hand, has a clear advantage if she plays rock — she can either go even with Bob, lose one, or win two. Thus, Alice's best strategy is to play rock, while Bob does not have a dominant strategy. Therefore, a nash equilibrium does not exist.