Solving of Tow Related Games

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Abstract

We talk about two simple games to introduce Nash point in Game theory. Both of them are played with two players. In game one player states are different. Second Game is easier and socialy interesting! We continue with some real life problems and mode them to a simple game.

Contents

1 Money Hiding Game

1.1 The Game

There is a 2-player popular game in ordakestan, which player 1 hides some cash from these values:100 tomans, 200 tomans. Player 2 guesses player 1 has hidden which one. If his guess was correct he receives the money that is hidden, else he pays 150 tomans to player 1. What is winning strategy and find it.

1.2 Deciding is problematic!

Now take a look to player 1. If he hide 100 toman, In bad case he loses 100 toman and the good one he receives 15o toman. So what about this : player 1 always hides 100 toman, with this expression player 2 concludes to choose 100 toman every time. So if Player 1 thinks about this and changing his mind??

1.3 Player 1 doesn't lose

You know what if Player 1 act randomly?

In this case player 2's decide has equal probablity to become true or not. We calculate omide riazi for player 1. Its value is 0.So not losing strategy for player 1 is to act randomly. It's better for player 1 to not play by his decidings!!! :)

In other words if a player's strategy forces him to act exactly, it is not a good strategy. So we can consider their strategies force them to do action 1 with p possibility and 1-p for the other action.

1.4 Player 2 is a loser

With what we know from previous section we can model each player strategy with a possibility to act one of the two possible actions. Consider player 1 hides 100 tomans with p possibility and 1-p for 200 tomans. And player 2 chooses 100 tomans with q possibility and 1-q for 200 tomans. Now it's omide riazi's turn. We calculate it for player 1's gain :

$$G(p,q) = -100pq+150p(1-q)-200(1-p)q+150(1-p)(1-q) = 350p+350q-6pq-200 \quad (1)$$

Now if we play in player 1's role we want find a p that for any q it has gain. Means minimum value for G(p,q) for a constant p be maximum. If we solve this problem we find p=0.5833. In next section we tell more about how we compute this possibility.