1 Oct 2014

Math 181

Prisoner's Dilemma: Last time, I introduced Game Theory using the Prisoner's Dilemma. You then watched two videos that both contain variations on this situation.

There are other kinds of games, however, so we'll come back to the Prisoner's Dilemma and the videos later.

Total-conflict Games: In the Prisoner's Dilemma, there was a benefit to cooperating, even if the dominant strategy was to be uncooperative. Sometimes, one person's gain is the other person's loss, and there is no benefit to cooperating. Such games are said to be *Total-conflict Games*. Examples are Tic-tac-toe, Chess, Checkers, and the Location Game (Example 1, page 531).

Here is the table from Example 1. We assume that the payouts represent the gains for the "Row" Player.

$$\begin{bmatrix} 10 & 4 & 6 \\ 6 & 5 & 9 \\ 2 & 3 & 7 \end{bmatrix}$$

The book defines several terms: maximin, minimax, saddlepoint, value.

For this example, finding the value is not difficult. There are strategies for both players that cannot be improved on.

The book continues with a restricted game with the following payoff matrix: $\begin{bmatrix} 10 & 6 \\ 2 & 7 \end{bmatrix}$

Videos: So far, we have encountered solutions where assuming the other player's choice is fixed, that the outcome cannot be improved apon. This idea can be formalized by defining *Nash equilibria*. We'll hold off on the formal definition and instead look at a few examples.

Consider the Prisoner's Dilemma example. The cooperation state is not stable; How does the second video clip resolve the instability?

In the first video video, we have someone trying to use math to "get the girl". Don't trust everything Hollywood says, there are some flaws in Nash's reasoning. His proposed solution isn't stable!

Homework: Watch `tinyurl.com/apbmahoney` Read Section 15.2, pp536–543.