Multi-Agent Systems

Homework Assignment 3

MSc AI, VU

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3 Sequential Games with Perfect Information

3.1 Reduced centipede game

Consider a sequential 2-player game with the following game-tree: at each decision node the associated player needs to decide whether to continue (c) or stop (s). The tree (including utilities) and the players' rationality are common knowledge. Notice that the utility for **both** players increases along the game tree – and this is known to both players (perfect and complete information).

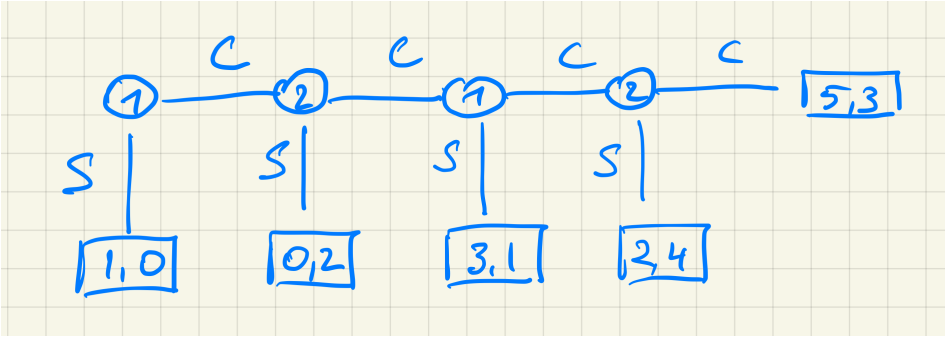

Figure 1: Shortened version of the centipede game.

Questions

1. Use backward induction to predict the (rational) outcome of this game. Does it make sense to you?
2. Write the normal form for this game and find all Nash equilibria in pure strategies (PNEs).
3. List all subgames and determine which of these PNEs are also subgame-perfect?

3.2 Boss and stealing employee

A boss notices that one of her employees has been stealing company material lately. The material was not all that valuable, so she is inclined to let it pass, preferring to keep the employee around rather than firing him and having to hire and retrain a replacement. Nevertheless she wants the stealing to stop.

She is therefore thinking to issue a warning at the next company meeting: the next person caught stealing company property will be fired immediately. She envisages the following game tree with pay-offs (see fig below).

1. Analyse this game using backward induction.
2. What are the pure actions for the two players (boss and employee)? Construct the normal form matrix.
3. Use this matrix to identify all the pure Nash equilibria of the normal form game.
4. Determine the subgame-perfect equilibrium (equilibria?) by eliminating all the Nash equilibria that fail to induce a NE in subgames.
5. Compare to the solution based on backward induction.