Game Theory Week 6: Monday Exercises

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1. Two players are playing the following game at time $t \in \{1, 2, \ldots T\}$, $T \geq 3$. There is a growing pile of money. In each period, players simultaneously choose whether to grab the money or not.

   - If player i grabs the money and the other player does not, player i receives a payoff of 2^{t+2}, where t is the current period and j gets 0.
   - If both players grab the pile, then they split it evenly, but half the money is destroyed, so they receive 2^t.
   - If neither player has grabbed the pile at the end of the game, each player receives 2^{T+1}.

   The game ends whenever either player grabs the pile, or at the end of period T.

   (a) Is this a game of complete information? Why or why not?

   (b) Show that if the game reaches period T, both players will grab the money that period in any subgame perfect equilbirium.

   (c) Describe the unique SPE.

   (d) Suppose with probability $\epsilon \in (0, 1)$, player 2 is not paying attention and will never grab the money. Player 1 does not know player 2's type. Why is subgame perfect equilibrium not the appropriate solution concept to use here? What is an appropriate solution concept?

   (e) Show that if $\epsilon > \frac{1}{2^{T+1}-3}$, then there are no equilibria where either player (player 1, or player 2 if they are paying attention) grabs the money with probability 1 in period 1, so in any equilibrium the game must continue past the first period with probability *strictly* greater than ϵ.