ZICE 2014
COMPUTING SUPERGAME EQUILIBRIA EXERCISE

Repeated Bertrand Duopoly

This question will introduce you to the computational algorithm developed in Judd, Yeltekin, Conklin (2003). Attached is a .zip folder with Matlab programs computing the outer approximation of the repeated prisoner dilemma game described in Judd, Yeltekin, Conklin (2003). This question asks you to modify the attached algorithm to compute a repeated Bertrand duopoly pricing game and to explore nature of the worst and best equilibria in this supergame.

1. Static, one-period game:
   a. Let demand be defined by $Q = 100 - 5P$ and the marginal cost of production as $MC = 2$. Using this MC and demand function find the static (one period),
      I. monopoly price, quantity, profit,
      II. Nash equilibrium price, quantity and profit earned by each firm.
2. Repeated game:
   a. Write down the recursive optimization problem associated with the infinitely repeated Bertrand duopoly game.
   b. Choose an initial equilibrium value correspondence. This will be the starting point for your algorithm.
   c. Compute the outer approximation of the equilibrium value correspondence by modifying the Matlab outer approximation code supplied. The rest of the parameters and grids should be set to:
      * Discrete Price Set $= \{0, 0.5, 1, 1.5, ..., 20\}$
      * Number of search hyperplanes $= 36$
      * Discount factor $\delta = 0.8$.
   d. Plot the equilibrium value correspondence computed. What is the worst, symmetric equilibrium payoff pair? What are the prices, quantities, period profits and continuation values associated with this worst equilibrium payoff pair? Is it a stationary Nash equilibrium?
   e. What is the symmetric best equilibrium value pair? Compare it to static, shared monopoly. Can the firms do better than shared monopoly in the repeated game?