LTCC Intensive Course

Mathematical Game Theory

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Prof Olivier Gossner, o.gossner@lse.ac.uk
Prof Bernhard von Stengel, stengel@nash.lse.ac.uk
(Department of Mathematics, LSE)

Game theory is the formal study of conflict and cooperation. It is a main tool in economic theory, and poses interesting mathematical questions related to geometry, topology, and information theory.

In the first part (afternoon of Monday, May 17, 2010, given by Bernhard von Stengel), we introduce the main concepts of noncooperative games such as games in strategic form and Nash equilibrium. The existence of a Nash equilibrium is closely related to fixed point theorems (by Brouwer or Kakutani), and geometric path-following arguments as used to show Sperner's Lemma. The equilibrium correspondence that maps games to equilibria has topological properties related to the "stability"of equilibria.

In the second part (morning of Tuesday, May 18, 2010, given by Olivier Gossner), we consider games that are played repeatedly between a group of players. We will review the classical ''Folk Theorem'' that characterizes the set of equilibrium payoffs in such a game when players are sufficiently patient. Emphasis will be put on equilibrium strategies of these games that are robust to small perturbations of players' idiosyncratic preferences. The lecture will then cover repeated games in which players have non-symmetric information about the game. Interesting conceptual and technical questions arise in the optimal revelation and communication of information in such games, and the use of information theory in this context.