Some matrix games based on graphs **Ravindra Bapat**

We consider two-person zero-sum games, or matrix games, in which the pure strategies of the players are the vertices, or the edges of a graph, and the payoff is determined by the incidence structure. We identify some cases where the value and the optimal strategies can be explicitly determined. In particular, we consider the incidence matrix game in which the payoff matrix is the vertex-edge incidence matrix of a graph. A graph-theoretic description of the value and the optimal strategies is provided.

Stable sets and the core in assignment games **Tamás Solymosi**

In the first part of the talk, I will review known results on the core of assignment games and on the characterization of cases when the core is the unique von Neumann-Morgenstern stable set.

In the second part, I will present some new results on the existence and properties of stable sets in the general case. I will demonstrate how the core can always be extended to a stable set, and thus give a (constructive) proof for a long-standing conjecture of Shapley. For the one-seller special case a full characterization and a possible auction interpretation of all stable sets will also be given.

Hamiltonian Cycles, Critical Parameters and Gröbner Bases **Jerzy Filar**

Solutions of many of most important mathematical problems depend on values of one or more parameters. Sometimes, values of these parameters are known rather precisely, sometimes they are only rough estimates of true values and, interestingly, there are also important situations where previously “missing" parameters can be inserted into a problem to aid its analysis. Furthermore, there are often situations when configurations of two or more parameters arise where the nature of solutions to the original problem changes qualitatively at these precise critical configurations. This presentation outlines two, seemingly separate, lines of research that are nonetheless connected by the underlying approach that focuses on the importance of understanding the behaviour of solutions to problems in neighbourhoods of critical values of parameters. The first line considers the classical (NP-hard) problem of determining whether a given graph possesses a Hamiltonian cycle. Exploiting singularly perturbed controlled Markov chains and their fundamental matrices we reduce the problem to that of minimising the variability of the “first return time" to the home node. The latter is a highly structured, non-convex, optimisation problem whose properties shed light on both the theoretical complexity of the problem and its algorithmic tractability. A recent innovation in this approach is the restriction to doubly stochastic Markov chains.

Using Game Model for Optimal Control of Hybrid Vehicle **Hubert Chin**

In this talk, I will present a new solution for design a control system of a hybrid vehicle by using two-person game model. Hybrid vehicles combine the benefits of gasoline engine and electric motor which can be configured to obtain different objectives, such as improved fuel economy, electric usage, and emission control. Players are considered as electric motor and gasoline engine. Payoff matrices are calculated by different objectives. The state-of-arts of hybrid vehicles and progress of our project are also introduced.

Interactive Partially Observable Markov Decision Processes **Piotr Gmytrasiewicz**

This talk will summarize work on Interactive Partially Observable Markov Decision Processes (IPOMDPs). IPOMDPs generalize a well-known formalism of Partially Observable Markov Decision Processes (POMPDs) to settings in which a decision-maker is interacting with other agents. POMDPs describe how an agent should revise its beliefs and act optimally in an environment. IPOMDPs obtain when one introduces the notion of other agent(s) types into POMDPs. The agent's beliefs are now interactive, i.e. they include beliefs about other agents and about their beliefs. We discuss relations between decision-theoretic and game-theoretic solution concepts, and variations motivated by some work in behavioral game theory.