THE
HONG KONG
UNIVERSITY OF
SCIENCE &
TECHNOLOGY

Clear Water Bay
Kowloon
Hong Kong

Design of Multiuser Non-Cooperative Communication Systems via Game Theory

ABSTRACT:

The development of game theory goes back to the 1920s with the contributions of von Neumann and later further popularized by Nash. This mathematical theory was initially aimed at economics, politics, as well as military strategic decisions. The basic idea is to model the system as a game with several players that have different objectives and behave in a selfish manner without cooperation. Incidentally, this approach is also well suited for multiuser communication systems in the form of a network of uncoordinated users, e.g., ad-hoc networks. The solutions to such problems are called Nash equilibrium points.
The goal of this project is to design and mathematically analyze iterative and distributed algorithms that converge to Nash equilibrium points.

DELIVERABLES:

- A survey of the current state of the art.
- A technical report with alternative distributed method(s) along with a mathematical proof of convergence.
- A numerical performance analysis comparing the proposed method(s) with the existing ones.

TASK OUTLINE:

- Study basic game theory, convex optimization theory, and distributed algorithm theory.
- Perform literature search on journal and conference papers.
- Understand well the existing approaches.
- Formulate the problem in a mathematical way.
- Propose alternative distributed algorithms algorithm(s) that converge to the Nash equilibria.
- Proof converge of the algorithm(s) in a formal mathematical way.
- Perform numerical simulations with Matlab to compare with existing approaches.
- Prepare documentation.

PRE-REQUISITE / REQUIREMENT:

This is a research-oriented project. The student must enjoy mathematics and have an excellent mathematical level, as well as a good knowledge of communication systems and probability (with very good GPA).

TEAM SIZE: 1
TOTAL TEAM: 1
TEAM MEMBERSHIP: ELEC or CPEG students (communication stream)

SUPERVISOR(S):

Dr. Daniel P. Palomar Room 2437 palomar@ust.hk Ext. 7060
http://www.ece.ust.hk/~palomar