Application of optimal control and game theory in communication networks

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With fast evolving wireless technology and huge increases in wireless traffic, network engineers are faced with new challenges in scaling up the network capacity to meet demand. Centralised solutions for network protocols are often not possible, and network operators rely more and more on self organisation and decentralised control. In this project we shall propose new protocols for wireless network design based on communication and information theoretic tools on one hand, and on optimal control and game theory on the other. We plan to contribute to various technologies such as cellular networks, sensor networks, and ad hoc networks. We shall study tradeoffs between performance measures and energy efficiency.

The objectives of the projects are:

a) In a multiserver queueing system with multiple user classes, find optimal routing strategies to minimize sum delay across user classes. The routing strategy must be oblivious to queue sizes.

b) Identify pricing and admission restrictions to attain load balancing in the above setting.

c) Identify and analyse methods to obtain balanced fractional loads in random sparse Erdos-Renyi networks. Characterize the average load in a balanced fractional assignment.

d) Devise and analyse algorithms for reaching consensus over a graph with communication constraints. The function to be reached may be a consensus function (ranking of nodes, preferential orders, time-synchronization parameters, etc.). Optimize the computations to speed up convergence to the consensus values.

e) Competition for content spread over online social networks.

f) Study of distributed algorithms for large-scale MIMO systems**.**

g) Estimation and filtering issues in wireless cellular networks

h) Study

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