CMPUT 641

Modelling and Performance Evaluation: Wireless Networking

The course teaches a number of fundamental techniques that have broad applications in the area of modelling and performance evaluation. Some emphasis is put on providing tools for analyzing reliability and dependability aspects of many of today's non-traditional networked systems. Selected results of both combinatorial and stochastic nature will be examined.

The combinatorial analysis part concerns the use of a simple probabilistic graph model to analyze problems where we want to quantify the likelihood that the collaborative work of nodes in a network where components are subject to working in degraded modes can collectively succeed in performing a given task. This line of techniques examines reducibility among the obtained problems, complexity results, and methods for obtaining lower and upper bounds. We start the stochastic part by reviewing some probability distributions that occur frequently in performance analysis. The course then introduces some operational laws, selected results from Markov Chain Theory, and Queueing Theory.

In the sequel, and as time permits, problems and/or applications of some techniques from other areas (e.g., geometric algorithms, approximation algorithms, Monte Carlo methods, and machine learning) may be encountered and discussed.

Problem contexts and examples are drawn from recent research topics such as wireless sensor networks relying on energy replenishment, sensor networks for object detection and tracking, underwater sensor networks, and vehicular networks. In doing course projects, students are encouraged to work on contemporary research problems, possibly in other application areas, where performance evaluation techniques are needed.

Objectives

The course aims at enhancing the participants' skills in identifying, formalizing, and tackling problems in the broad area of analytical modelling and performance evaluation. The lecture component emphasizes some foundational results.

Course Work
- Assignments
- Participation
- Presentation
- Project