Csc 546 Course Project Guidelines for Graduate Students

Course Project for Graduate students

- There are three aspects to this project

1. A basic M/M/1 queue project
2. A basic M/G/1 queue project
3. An extended queuing model project

Students can choose any language/tool of their choice to implement these. It would be easy to do in Omnet++ though. If you have any other project ideas that you want to try out let me know.

Basic M/M/1 Project

- This project studies M/M/1 system in detail
- The following will be studied in detail:
  - Performance metrics L, L_Q, w, w_Q, ρ
  - Statistics collection for inter-arrival and service time distributions
  - Testing of Random number generator used
  - Collection of system state histogram and compare it with theory
- Run the simulations for ρ = 0.1, 0.2, 0.4, 0.6, 0.8.
- Compare the above metrics with theoretical values

Basic M/G/1 Queue

- Change the service distribution to a general one of your choice and repeat the simulation. This will be M/G/1 queue model.
- Compare the above metrics with M/G/1 analysis.
- Service Distribution choices (pick one)
  - Uniform (0,2) mean = 1.0
  - Triangular (0,2) mean = 1.0
  - Weibull use v=0, beta=2 and compute alpha based on mean service time you need for a given rho. Note that for non-integers, gamma(1.5)=squareroot(pi)/2. For integers gamma(n)= factorial(n-1).

Extended Queuing Project

- Extend the basic system to incorporate any of the following:
  - Three queue priority system
  - Three queue round-robin system
  - Three queue Weighted Fair Queuing system
- Compare the simulations with analysis. For extended queues (such as WFQ, Priority) please see me for analysis.

Projects

The single queue model can equivalently be thought of as a simulation of:

- Bank Teller
- Supermarket Cashier
- Airline counter
- Runway access
- Assembly line
- E-mail server
- Database server
- Computer System

*Please pick any one example for your pr*oject

Simulations

- Make sure you run the simulations long enough producing enough data
- Run the simulations for utilizations ρ=0.1, 0.2, 0.4, 0.6 and 0.8 (total of 5 data points)
- For each utilization, run the simulations with ten different seeds (total of 50 runs)
- For each run, collect the stats server utilization, average number of customers in the system, average number of customers in the queue, average time spent in the system, average time spent in the queue.
- Compute confidence intervals for each of these metrics

Report

- Write the report in the following format:
  - Problem (Project) Description
  - The problem mapping to each of the queuing models
  - Simulation goals and Simulation parameters
  - Methodology:
    - What tools did you use to translate the model?
    - How did you setup the simulations?
    - How did you collect the stats?
  - Analysis
    - For each run, report the collected statistics
    - For each utilization, find the average stats across ten different runs using different initial seeds
    - Compare them with theoretical results
  - Conclusion
    - Is there any discrepancy between simulated results and theory