Operating Systems Laboratory
Spring Semester 2018-19

Assignment 3

Simulation of CPU Scheduling Algorithms

Assignment given on: January 29, 2019
Assignment deadline: February 04, 2019

The objective of this assignment is to evaluate various process scheduling strategies. This is achieved by generating random arrival times and CPU bursts for a set of processes following some probability distribution, and determining the performances of the chosen scheduling algorithms through simulation. The specifications for the problem are as follows.

a) Read the number of processes N, and generate the arrival times and CPU bursts of the processes using some probability distribution. The first process is assumed to arrive at time 0; for all subsequent processes the *inter-arrival time* is generated as a random variable (between 0 and 10) following exponential distribution with some given mean. Also the CPU bursts of the processes are generated as uniform random variables (between 1 and 20). Save the generated table in a file.

   Hint*: If R is a uniform random number in the range (0, 1), a random variable from an exponential distribution with mean λ can be generated as:*

   `(-1.0 / λ) * ln R`

b) Simulate the following CPU scheduling algorithms on the process arrival trace as generated in (a) above, and compute the average turnaround times (ATN) for the processes:

   (i) Non-preemptive First Come First Serve (FCFS)

   (ii) Non-preemptive Shortest Job First

   (iii) Pre-emptive Shortest Job First

   (iv) Round Robin with time quantum δ = 2 time units

   (v) Highest response-ratio next (HRN)

c) Run the simulation for N = 10, 50 and 100, ten times for each value of N using a shell script (bash/python), and generate the plot comparing the average values of ATN obtained for various scheduling techniques for different values of N.

d) For FCFS (non-preemptive) determine the theoretically expected lower bound on the turn-around time and check whether that is satisfied by your simulation.

Submission Guideline:

- Create the program as a single file as **`a3_<groupno>.c`** or **`.cpp`**. Create the plot file as **`a3_plot_<groupno>.pdf`** . Upload the two files.

Evaluation Guidelines:

While entering marks, the partwise break up should also be entered according to the marking guidelines given below. There is a separate component for individual assessment, based on how the student answers questions.

Sl	Items	Marks
(a)	Random number generation (uniform, exponential)	8
(b)	Maintaining job queues for scheduling	8
(c)	Simulation of five scheduling strategies	15
(d)	Generation of results and plots	15
(e)	Shell script for running the jobs	4
(f)	Theoretical analysis of FCFS	5
	Total	55