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COMP 303 Operating Systems

Homework 2 Report

In this homework, we were asked to implement a deadlock-free solution dining philosophers problem. The problem can be solved either by using semaphores or monitors. In my work, I tried to implement a monitor solution. The distribution of chopsticks is controlled via a monitor.

In the code, each philosopher is initialized in thinking state. Then when they get hungry, they need to check whether neither of their neighbors are eating. If they are not using their chopsticks, philosopher(i) can change his state to eating. Otherwise, he will stay in the hungry state.

The output of the program for some given inputs are given below:

Input: phs 7,10,15,12,20, uniform, 1

Output:

Philosopher 3 stayed in hungry state for 0 s

Philosopher 1 stayed in hungry state for 0 s

Philosopher 6 stayed in hungry state for 0 s

Philosopher 4 stayed in hungry state for 12 s

Philosopher 7 stayed in hungry state for 24 s

Philosopher 2 stayed in hungry state for 19 s

Philosopher 5 stayed in hungry state for 37 s

Average waiting time = $\frac{12+24+19+37+0}{7} = 13{,}1428571\ s$

Standard deviation = $\sqrt{\frac{(1.1428571)^2+(-10{,}8571429)^2+(-5{,}8571429)^2+(-23{,}8571429)^2}{6}} = 10.9305619$ s

Input: phs 5,12,30,18,45, uniform, 2

Output:

Philosopher 4 stayed in hungry state for 7 s

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Philosopher 1 stayed in hungry state for 17 s

Philosopher 2 stayed in hungry state for 45 s

Philosopher 3 stayed in hungry state for 85 s

Philosopher 4 stayed in hungry state for 45 s

Philosopher 5 stayed in hungry state for 15 s

Average waiting time = $\frac{7+17+45+85+45+15}{5} = 40.8\ s$

Standard deviation = $\sqrt{\frac{(33.8)^2+(23.8)^2+2(-4.2)^2+(-44.2)^2+(25.8)^2}{4}} = 33.015148\ s$

Input: phs 7,4,18,6,22, exponential, 1

Output:

Philosopher 3 stayed in hungry state for 0 s

Philosopher 1 stayed in hungry state for 0 s

Philosopher 5 stayed in hungry state for 0 s

Philosopher 7 stayed in hungry state for 9 s

Philosopher 4 stayed in hungry state for 15 s

Philosopher 2 stayed in hungry state for 15 s

Philosopher 6 stayed in hungry state for 16 s

Average waiting time = $\frac{45}{7} = 6.42857143\ s$

Standard deviation = $\sqrt{\frac{(-2.57142857)^2+2(-8.57142857)^2+(-7.57142857)^2+(0)^2}{6}} = 5.928428\ s$

Input: phs 5,12,30,18,45, exponential, 2

Output:

Philosopher 2 stayed in hungry state for 14 s

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Philosopher 4 stayed in hungry state for 37 s

Philosopher 3 stayed in hungry state for 63 s

Philosopher 1 stayed in hungry state for 30 s

Philosopher 5 stayed in hungry state for 58 s

Average waiting time = $\frac{202}{5} = 40.4\ s$

Standard deviation = $\sqrt{\frac{(26.4)^2+(3.4)^2+(-22.6)^2+(10.4)^2+(-17.6)^2}{4}} = 20.2299283\ s$