Operating Systems
2019 - 2020 Fall
Project 2

Version 0.1

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Task 1: Describe your solution

I used semaphores to solve the critical section problem. According to my solution, when a philosopher finished thinking, s/he starts to seek for chopstick. In order to make sure that both chopstick is available, instead of checking chopsticks, s/he checks if philosopher that sits his/her right and philosopher that sits his/her left are eating or not. Because of that, there is no deadlock problem. If both left and right philosophers aren't eating at that time, s/he starts to eat. Hungry time is started when the philosopher finish thinking and start to seek chopstick and ends when s/he start eating.

Task 2: Write how you generated the random values

In order to generate random values, I used random() function in math.h library which gives a random value between 0 and MAX_INTEGER. In order to make it between given min and max values I used following operations;

For uniform ditribution
thinking_time = ((rand() % (max_thinking_time - min_thinking_time)) + min_thinking_time);
eating_time = ((rand() % (max_eating_time - min_eating_time)) + min_eating_time);

For exponential distribution
eating_time = ((rand() % (max_eating_time - min_eating_time)) + min_eating_time);
eating_time = (sqrt((rand() % ((max_eating_time*max_eating_time)
(min_eating_time*min_eating_time)) + min_eating_time*min_eating_time)));

Task 3: Try to measure the duration of hungry state for each philosopher, find out the average hungry state and the standard deviation of hungry state

I calculated total hungry times and mean hungry times for each philosopher and their mean and standard deviation. Generally, standard deviation decreases as eat number increase and there is insufficient difference between uniform distribution and exponential distribution. The results are as following for given inputs;

With inputs; 5 500 1000 50 100 exponential 10

TOTAL HUNGRY TIME FOR PHILOSOPHER 1 IS   :39 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 1 IS   :3.900000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 2 IS   :149 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 2 IS   :14.900000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 3 IS   :25 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 3 IS   :2.500000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 4 IS   :196 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 4 IS   :19.600000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 5 IS   :245 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 5 IS   :24.500000 ms
AVERAGE HUNGRY STATE FOR ALL PHILOSOPHERS IS   :12.400000 ms
STANDARD DEVIATION OF HUNGRY STATE FOR ALL PHILOSOPHERS IS :8.685620 ms

With inputs; 5 500 1000 50 100 uniform 10

TOTAL HUNGRY TIME FOR PHILOSOPHER 1 IS   :280 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 1 IS   :28.000000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 2 IS   :234 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 2 IS   :23.400000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 3 IS   :104 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 3 IS   :10.400000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 4 IS   :187 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 4 IS   :18.700000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 5 IS   :780 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 5 IS   :78.000000 ms
AVERAGE HUNGRY STATE FOR ALL PHILOSOPHERS IS   :31.400000 ms
STANDARD DEVIATION OF HUNGRY STATE FOR ALL PHILOSOPHERS IS :24.046621 ms

With inputs; 5 500 1000 50 100 exponential 100

TOTAL HUNGRY TIME FOR PHILOSOPHER 1 IS   :815 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 1 IS   :8.150000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 2 IS   :1557 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 2 IS   :15.570000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 3 IS   :891 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 3 IS   :8.910000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 4 IS   :1976 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 4 IS   :19.760000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 5 IS   :1626 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 5 IS   :16.260000 ms
AVERAGE HUNGRY STATE FOR ALL PHILOSOPHERS IS   :13.200000 ms
STANDARD DEVIATION OF HUNGRY STATE FOR ALL PHILOSOPHERS IS :4.445222 ms

With inputs; 5 500 1000 50 100 uniform 100

TOTAL HUNGRY TIME FOR PHILOSOPHER 1 IS   :2001 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 1 IS   :20.010000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 2 IS   :2102 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 2 IS   :21.020000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 3 IS   :2032 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 3 IS   :20.320000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 4 IS   :1250 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 4 IS   :12.500000 ms
TOTAL HUNGRY TIME FOR PHILOSOPHER 5 IS   :1429 ms
AVARAGE HUNGRY TIME FOR PHILOSOPHER 5 IS   :14.290000 ms
AVERAGE HUNGRY STATE FOR ALL PHILOSOPHERS IS   :17.400000 ms
STANDARD DEVIATION OF HUNGRY STATE FOR ALL PHILOSOPHERS IS :3.666061 ms