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CS13B1040
28 October 2015

Solving Producer Consumer Problem using Semaphores

OS: Assignment 9

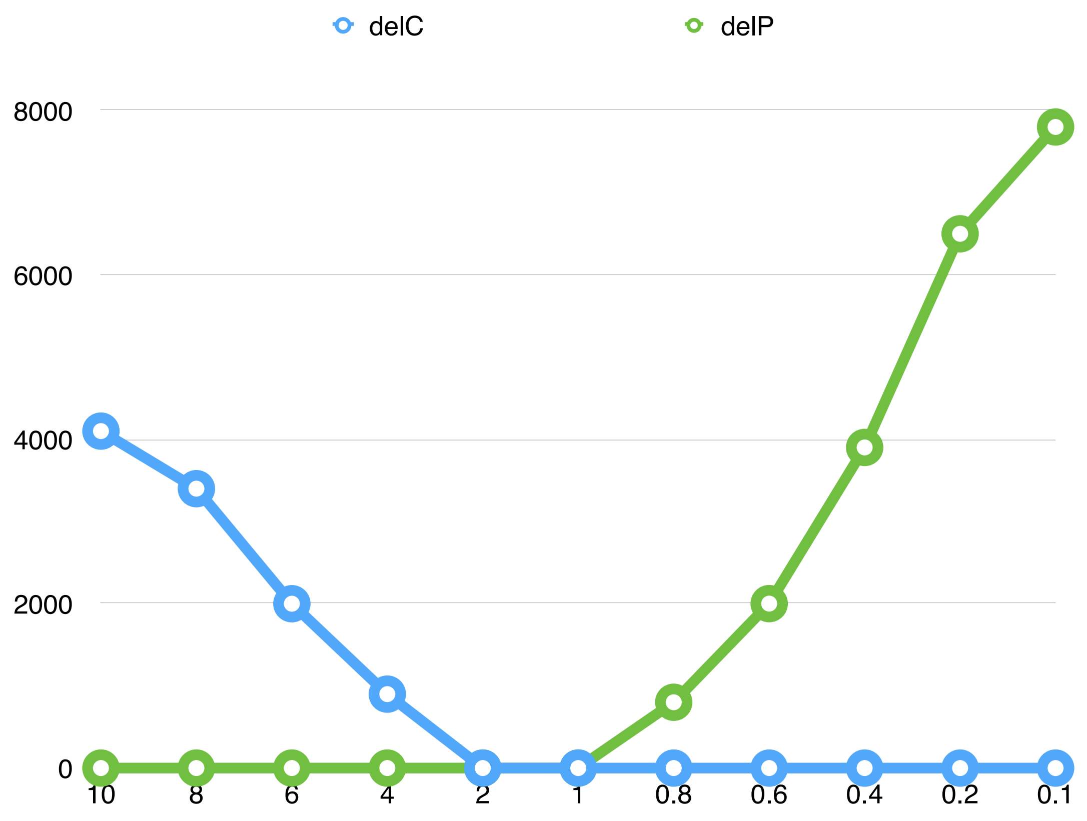
SEMAPHORES:

There are several ways to solve the critical section problem. Some attempts include Mutex locks, which have the main problem of busy waiting. A more sophisticated method to solve the critical section problem would be Semaphores. Apart from fixing the busy waiting problem, its mechanism allows for several processes to synchronise their activities. In the given assignment we use counting semaphores to solve the producer and consumer problem.

THE STUDY:

The following graph depicts the activities of the average delays in the producer threads and the consumer threads. The time is measures in milliseconds (y-axis). The x-axis depicts the ratio of mean delays (uP/uC), where uP and uC are the means of exponentially distributed delays for producer and consumer threads, as given by the user. In the study the other parameters that affect the process apart from the delay are the size of the buffer, the number of producer and consumer threads, and the requests per thread.

The size of the buffer is maintained as 5 throughout the test cases. To maintain symmetry the number of threads and request per thread have been set to 3 and 10 respectively, for both the producer and the consumer threads.



THE RESULTS:

The graph show that the delays in consumer and producer threads is a non-linear distribution. Also, it shows that the average delays in the consumer and producer threads are inter-dependent. For different ratio's of uP/uC we can see that the greater the delay in the producer threads, the greater the average delay value of the consumer. This can be explained as follows:

Suppose the producer threads take a much longer time to produce a given item in comparison to the consumer, it can produce quickly without having to wait having to wait much for the consumers to consume. On the other hand consumers have to wait a greater amount for the item to be produced in order to consume it. This is why we see such an inverse relationship.