EECS 678: Lab 6 - Dining Philosophers

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1 *Describe the asymmetric solution. How does the asymmetric solution guarantee the philosophers never enter a deadlocked state?*

The asymmetric solution relies on cleverly defining how philosophers pick up their chopsticks. In this scenario we instruct each odd numbered philosopher to reach right first while their even numbered counterparts reach left first. Essentially, the means neighboring philosophers reach for a common chopstick, thereby eliminating circular chopstick competition. So only half of the chopsticks are contentiously requested, ergo when a philosopher does receive the first chopstick he/she should be free to safely grab the other. Everybody wins.

2 *Does the asymmetric solution prevent starvation? Explain.*

In short, no. Chance dictates that a philosopher may never be granted his first chopstick because no one is moderating access frequency. It's entirely possible a philosopher may wait without clearance until program termination.

3 *Describe the waiter's solution. How does the waiter's solution guarantee the philosophers never enter a deadlocked state?*

The waiter's solution implements a waiter mechanism such that threads are individually granted available chopsticks. Explicitly, in this scenario the waiter is the governing body that prevents philosophers from looking/locking chopsticks because the waiter atomically assigns chopsticks to philosophers (removing the philosophers capacity to misappropriate chopsticks).

4 *Does the waiter's solution prevent starvation? Explain.*

In short, yes. In this implementation philosophers check chopstick status as soon as they are signaled, meaning there exists an inherent priority in the assignment of chopsticks.

5 *Consider a scenario under a condition variable based solution where a philosopher determines at the time it frees its chopsticks that both chopsticks of another philosopher (Phil) it shares with are free, and so it sends the (possibly) waiting Phil a signal. Under what circumstances may Phil find that both of its chopsticks are NOT free when it checks?*

In this scenario the problem arises between the time Phil receives the signal and when he begins to check for both chopsticks, it may be that in this very slight gap another philosopher scopes up one of Phil's potential chopsticks. This slight gap could lead to problems, if there weren't more clever safeguards at play.