Problem Set 4, Part b

Due: Thursday, April 10, 2008

Reading:

Sections 10.6, 10.8, 10.9 (skim), Chapter 11 (skim),
Mellor-Crummey and Scott paper,
Magnussen, Ladin, and Hagersten paper

Reading for next week:

Chapter 12. Sections 13.1 and 13.2.

Problems:

1. Exercise 10.17.
2. Exercise 10.29.
3. Exercise 10.31. You should state and prove separately for each property (mutual exclusion and progress) whether the algorithm satisfies the property.
4. Prove that Anderson's array algorithm implements a queue lock by giving a simulation relation from that algorithm to the QueueME automaton in the book. This means you need to write automaton code for Anderson's algorithm You should use Tempo to typecheck your code. (You can also write the simulation in Tempo, but that's not required for this problem.) You may find it easier to do the proof assuming an infinite array first.
5. Give an execution of the MCS algorithm in which a process must wait (i.e., spin at the *waitfor* statement) in its exit region. Why does this not violate the progress condition for exiting the critical section? Assuming an upper bound ℓ on the local step time of any process (including access to shared memory), can you bound the time a process may have to wait in its exit region?