

Problem Set 5, Part b

Due: Thursday, April 24, 2008

Reading:

Chapter 13.

Herlihy paper on “Wait-Free Synchronization” (read carefully).

Attiya-Welch, Chapter 15 (optional).

Reading for next week:

Borowsky, Gafni, Lynch, Rajsbaum paper.

Attie, Guerraoui, Kouznetsov, Lynch, Rajsbaum paper.

Problems:

1. Exercise 13.11.
2. Exercise 13.17.
3. Exercise 13.24.
4. Exercise 13.26.
5. Herlihy’s paper contains an algorithm, covered in class, that shows how to implement 2-process wait-free consensus using queue objects. However, the queue objects used in the algorithm are initialized by enqueueing the value 0 and then the value 1. Describe a new algorithm that uses initially-empty queues.
6. This exercise is about determining the consensus number (defined in Herlihy’s paper and in class) of the “stack” variable type.
 - (a) Give a formal definition of the “stack” variable type (see Section 9.4 for the notation we use for variable types). It should have two operations, push and pop. The pop operation should return, and remove, the last item pushed onto the stack, from among those still remaining on the stack. If the stack is empty, the pop operation should return a special “empty” indicator.
 - (b) Prove that the consensus number of your stack datatype is at least two.
 - (c) Prove that the consensus number of your stack datatype is at most two.