Problem Set 7, Part b

Due: Tuesday, December 13, 2011

Readings:
Chapters 23-25.
Fischer, Lynch, Merritt paper
Attiya, Welch, Chapters 6 and 13
Rambo papers

Next week:
Various papers on distributed computing in dynamic networks: Rambo papers; Kuhn, Locher, Oshman gradient clock synch paper; Kuhn, Lynch, Oshman paper on computing in dynamic networks

Problems:

4. Describe a timed execution of the FischerME timed mutual exclusion algorithm that takes as long as possible from when some process is in T until some process is in C. Try to get as close as you can to the upper bound proved in the text (Theorem 24.2, part 1).

5. Consider a fully-connected system of three reliable processes, communicating by FIFO reliable channels with delay at most d for every message. Processes wake up at arbitrary times.

Each process has a real-valued clock variable. The clocks start with arbitrary real values, possibly with a different value for each process. Clocks increase at rate exactly 1—they do not drift.

The problem is for each process to output a real-valued “correction” to be added to its clock, in such a way that, the worst-case difference between the corrected clock values at any point after the corrections are made is as small as possible.

(a) Design a simple algorithm for this problem, and analyze the worst-case difference between corrected clocks.

(b) (Extra credit:) Prove a lower bound on the worst-case difference between corrected clocks. (It’s nice, but not essential, if your lower bound matches the upper bound from part (a).)