Massachusetts Institute of Technology | Handout 10
6.852: Distributed Algorithms
Prof. Nancy Lynch | October 2, 2003

Problem Set 3, Part a

Due: Thursday, October 16, 2003

Reading:

Chapter 8. Chapter 14 (skim). Chapter 15.

Reading for next week: Chapters 16 and 18.

Problems:

1. Exercise 8.9.
2. Exercise 8.13.
3. The standard FIFO reliable channel automaton $C_{i,j}$, defined on p. 204, can itself be regarded as an "optimized version" of another automaton $C'_{i,j}$, which keeps track in its state of the entire history of messages that have been sent. C' also maintains a pointer that indicates the last message that has been delivered.
   (a) Write I/O automaton pseudocode for $C'_{i,j}$.
   (b) Prove that $C_{i,j}$ implements $C'_{i,j}$, in the sense that $\mathit{traces}(C_{i,j}) \subseteq \mathit{traces}(C'_{i,j})$, using a simulation relation.
   (c) Is it also true that $C'_{i,j}$ implements $C_{i,j}$, in the same sense? If so, give a simulation relation to demonstrate this implementation relationship; you do not need to prove that it is in fact a simulation relation. If not, then show a counterexample.
4. Exercise 15.7.
5. Exercise 15.20.

   We only require a proof sketch. If you adapt an algorithm from the book, it is ok to use its correctness in this proof. Be precise about what kind of proof methods you use (e.g., for an induction, describe what are you inducting on, and what is the base case).