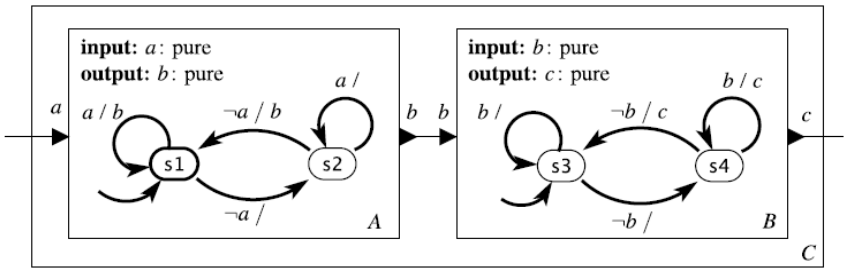
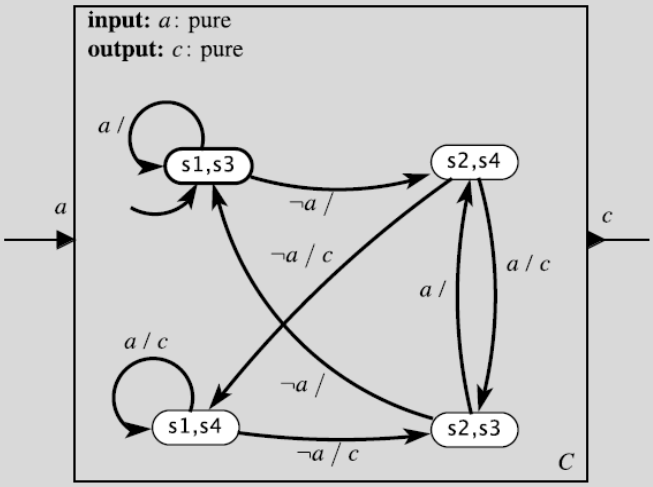
Chapter 5 Composition of State Machines

4. Consider the following synchronous composition of two state machines A and B:



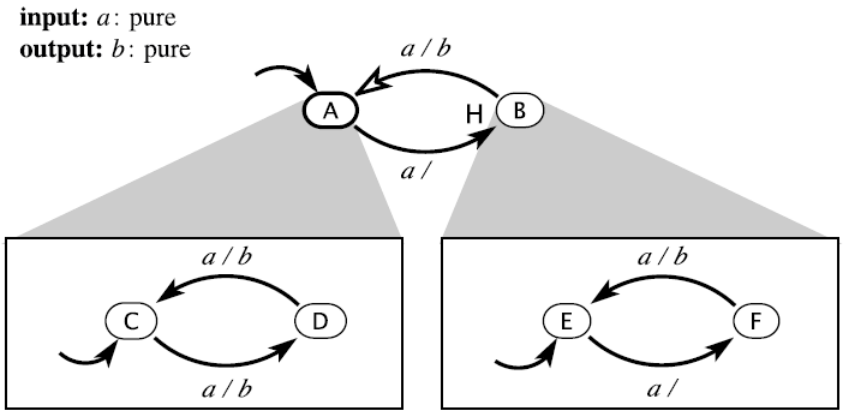
Construct a single state machine C representing the composition. Which states of the composition are unreachable?

Solution:



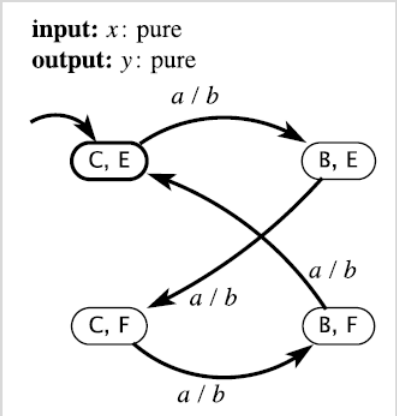
All states are reachable.

5. Consider the following hierarchical state machine:

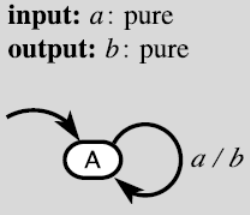


Construct an equivalent flat FSM giving the semantics of the hierarchy. Describe in words the input/output behavior of this machine. Is there a simpler machine that exhibits the same behavior? (Note that equivalence relations between state machines are considered in Chapter 14, but here, you can use intuition and just consider what the state machine does when it reacts.)

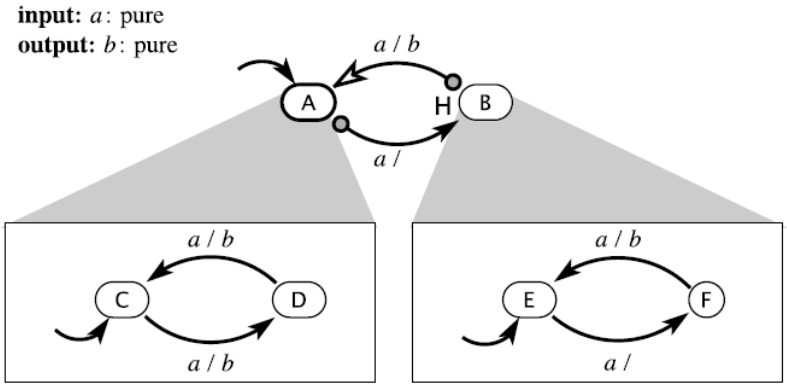
Solution: Without showing unreachable states, the flattened state machine looks like this:



The behavior of the machine is extremely simple. Given a present input a, it produces a present output b. If the input is absent, the output is absent. Thus, a simpler equivalent machine looks like this:



6. How many reachable states does the following state machine have?



Solution: Two. Both top-level transitions are preemptive, and the guards on those transitions will be enabled whenever a transition out of the initial state of the refinements would be enabled. So the refinements never leave their initial state.